The Effects of Financing Status on Firm Behavior: The China Experience

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The Effects of Financing Status on Firm Behavior: The China Experience

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Abstract

In this thesis, we investigate the impact of firms' financial conditions on three key corporate activities: fixed capital investment, cash holdings, and acquisition behavior. Our study provides an important extension to the related literature in the Chinese context by employing a 14-year panel of Chinese listed firms during the period 1998-2011.

In chapter 2, we investigate the sensitivity of abnormal investment to free cash flow. First, we find that firms with free cash flow below (above) their optimal level tend to under- (over-) invest, which can be attributed to financial constraints (agency costs). We also find that significant heterogeneity in the sensitivities appear among firms with different financial conditions, ownership structure. Whether or not firms engage in exporting or Mergers & Acquisitions also affects the sensitivities. Additional analyses show that the 2005 exogenous split share reform reduced the agency problems faced by state controlled firms, particularly those controlled by local governments.

In chapter 3, we focus the behavior of corporate cash holdings. We find evidence supportive of a cost-benefit trade-off model of cash holdings, suggesting that Chinese firms tend to actively manage their cash balances towards a target level. Reported evidence also shows that consistent with the presence of adjustment costs, there exists considerable heterogeneity in adjustment speeds of cash holdings across firms. Furthermore, we show that cash-rich, acquiring, and state-owned firms are characterized by a lower value of additional cash. At the same time, financially constrained firms have a higher marginal value of cash, suggesting that more difficulties in accessing capital markets encourages firms to make better use of additional cash.

In chapter 4, we investigate the extent to which corporate liquidity affects Chinese listed firms' acquisition decisions, method of payment choices, and consequent performance following mergers. In line with the free-cash-flow motive of acquisitions, we find that cash-rich firms are more likely to attempt acquisitions. Furthermore, the agency costs effect of acquisitions is greater for firms who are subject to tunneling. Finally, we provide empirical evidence to support the fact that financially constrained firms with higher growth prospects tend not to use cash payments in acquisitions. We attribute this finding to the higher opportunity cost of cash faced by firms who face more difficulties in accessing capital markets. This finding is consistent with the under-performance of cash acquisitions in both the short and long-term.

Declaration

This dissertation is the result of my own work unless referenced to the contrary in the text. The material in this thesis has not been submitted elsewhere for any other degree or qualification in this or any other university.

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At the end, I would like to dedicate this thesis to all whom I love.

Junhong Yang

22 February 2014

"Try not to become a man of success, but rather try to become a man of value."

--- Albert Einstein ---

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Introduction

1.1. Backgrounds and related literature

1.1.1. China's economy

As the world's second-largest economy in terms of nominal GDP since 2010, China has undergone a remarkable economic transformation from a centrally planned to a market-based economy. Over the last 30 years, China experienced a rapid economic and social development, suggested by a rapid GDP growth rate (about 10 percent a year on average), accelerated capital accumulation (22.5% average annual growth rate in total fixed investment)[1,2], a rapid growth of the urban scale (the urban share of the total population rose from 18% in 1978 to 50% in 2010), and a decline in the poverty rate (more than 500 million people out of poverty during this period) (Zhang 2007; The World Bank 2014, March 1). China's rise is one of the most successful stories over the last three decades.

1.1.2. China's financial system

A large number of researchers find that financial development is positively related to economic growth (Demirgüç-Kunt & Maksimovic 1998; Levine 2005). However, China is considered a counterexample to this finding since it has achieved a rapid growth rate despite a malfunctioning financial system (Allen *et al.* 2005; Guariglia *et al.* 2011). Yet, China's underdeveloped and inefficient financial system hinders to some extent the fast progress of

[1] Data source: National Bureau of Statistics (NBS), Statistical Yearbook of China, various issues, Beijing, China Statistical Press.

[2] China has become the world's largest investor since 2010. The $4.4 trillion of total fixed-asset investment in China in 2013 was worth more than the sum of the corresponding figures in the US ($3.1 trillion) and Japan ($1.2 trillion) (Carpenter *et al.* 2014).

economic growth. We will next briefly describe the characteristics of China's financial system.

1.1.2.1. The formal financial system

The formal financial sector in China primarily consists of banks, financial intermediaries, and financial markets.

1.1.2.1.1. China's banking sector

The financial system in China remains mainly bank-based. According to Elliott & Yan (2013), the ratio of total bank credit to GDP reached 128% in 2012, which was much larger than the corresponding ratio in the US in the same year (48%). However, the large banking system, which is characterized by a large amount of NPLs (non-performing loans) and an outstanding government debt, dwarfs all other forms of finance and prevails in the current financial system of China (Aziz & Duenwald 2002). Based on research by Boyreau-Debray (2003), the insignificant sensitivity of GDP growth to total deposits of the banking system indicates that formal finance thorough the banking sector does not contribute to economic growth in China.

The majority of Chinese banks, including the "Big Four"[3], are controlled by the government. The banks' ownership structure is crucial since China used to rely on a central planning system. There is a significant government stake in many Chinese banks. Furthermore, the influence and intervention of the government play a significantly role in banks' decisions. For instance, the central bank explicitly sets primary deposit and lending interest rates and target levels for loan volumes. Furthermore, due to political reasons, in many circumstances, the government controls lending by pushing a large amount of loans to particular firms, sectors, and regions (Elliott & Yan 2013). According to La Porta *et al.* (2002), government ownership of banks is negatively associated with countries' financial and economic development. In China, 99.45% of the assets of the 10 biggest commercial banks were owned by the government in 1995, which is much higher than the average of 41.74% observed in 91 other countries around the world, including developed or developing countries with different origins of the commercial law (common law, French civil law, German civil law, Scandinavian law, and socialist law). Guariglia & Poncet (2008) note that measures used traditionally for financial development and China-specific indicators for the level of state intervention in finance all have a negative impact on economic growth and its sources. Therefore, the high government ownership of banks in China may have slowed down economic growth.

The dominance of state-owned banks also causes a massive misallocation of financial resources in China, as these banks have a preferential policy of lending to stated-owned enterprises (SOEs), which crowds out the access to credit for SMEs (small- and medium-sized enterprises) and the private sector. There is evidence that although the ratio of total

[3] China's banking sector is dominated by the "Big Four" stated-owned commercial banks, which are the Bank of China (BOC), the People's Construction Bank of China (PCBC), the Agriculture Bank of China (ABC), and the Industrial and Commercial Bank of China (ICBC).

bank credit to GDP (111%) in China was much higher than those of other developed countries over the period 2000-2002 (Allen *et al.* 2007), if we focus on the bank credit directed to the hybrid sector (which includes non-state, non-listed firms with different types of ownership structures), the ratio plunges to 24%. This suggests that most of the bank credit is offered to the state-owned, public and large firms. Yet, non-state SMEs contribute to most of China's prominent growth and actually require more capital to grow (Aziz & Duenwald 2002).[4]

1.1.2.1.2. China's stock markets

In order to introduce modern corporate governance practices and to revitalize its ailing state-owned enterprises (SOEs), China established two main stock exchanges in the early 1990s: the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange (SZSE). Most listed firms are carve-outs or spin-offs from former large stated-owned enterprises. To prevent the state from losing the control and influence on these firms, a split share structure was introduced. The government itself or government entities typically held two-thirds of the listed shares, which were not publicly tradable. Domestic individuals and institutional investors held the remaining tradable shares (Allen *et al.* 2007).[5] Given the same voting and

[4] There is also evidence from the World Business Environment Survey (WBES) that between 1999 and 2000, 80% of private firms considered financing constraints to be a main barrier to grow (Claessens & Tzioumis 2006). Consequently, non-state enterprises have to rely more on self-financing and informal credit markets, due to the inefficient capital allocation intermediated by China's banking sector (Allen *et al.* 2005).

[5] A-shares trade alongside B-shares, which were issued by Chinese listed firms, on either the SHSE or SZSE. The key distinction of two types of shares is that A-shares, which were generally only available to domestic citizens, are traded in RMB, while B-shares, which were initially only available for purchase by overseas investors including those from Hong Kong, Macao and Taiwan, are traded in US dollars in the Shanghai exchange and in Hong Kong dollars in the Shenzhen exchange. In order to boost the B-share market, after February 2001, the Chinese authorities allowed both overseas investors and domestic investors to purchase B-

cash flow rights assigned to non-tradable shares (NTS) and tradable shares, the split share structure increased the probability of expropriation of minority shareholders by the controlling shareholders holding NTS, and impeded the quality of corporate governance and firms' performance. In May 2005, the Chinese Securities Regulatory Commission's (CSRC) implemented the split share structure reform, by floating the non-tradable shares through the open markets. Under the mutual agreement of the holders of tradable shares and NTS, the reform obliged the latter to compensate the former through a share conversion process. As a result, the reform significantly diluted the government-owned share portion and relieved government-related agency costs. By the end of 2007, the restructuring process was almost completed, having affected 1,254 firms, which constitute over 97% of the Chinese A-share market capitalization. By the end of 2011, the transfer of NTS was completed, and thus non-tradable shares no longer exist (Li *et al.* 2011).

Although China's stock market has been growing fast since it was established in 1990, there is abundant evidence showing that the role of stock markets in financing and allocating resources has been limited. For example, Fan *et al.* (2005) document that the development of stock markets does not play a positive role in China's economic growth in the long run. The inefficiencies in the Chinese stock markets can be attributed to several factors. First, before the split share structure reform in 2005, two thirds of Chinese shares were untradeable. Second, stock prices and shares are usually driven by speculation rather than investment, and thus do not reflect their fundamental value. According to Elliott & Yan (2013), the average annual turover rate in the Chinese markets over the past 5 years was 205%. Given that large portions of Chinese shares are restricted on sales as the government wants to have control

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shares, as long as investors could provide legal investment accounts in the proper currency. Besides, many Chinese companies float their shares (simultaneously) on the Hong Kong Exchange (H-shares) and on the New York Stock Exchange (N-shares).

over the firms, this high turover rate suggests extremely frequent changes of hands of shares, as well as a speculative motive among investors.[6] Third, given poor minority investor protection, corporate opacity, and lack of sound auditing, controlling shareholders tend to expropriate resources from minority investors. Fourth, poor and unprofessional regulation leads to frequent illegal insider trading and manipulations (Allen *et al.* 2007). Fifth, the wide existence of bureaucracy as well as size requirements prevent private enterprises from going public and accessing equity markets. For this reason, most listed firms are former state-owned enterprises. Last but not least, although it has been growing fast over last three decades, the size of China's stock markets (32% of GDP) as of 2005, in terms of total market capitalization, is much smaller than that of the banking sector (111% of GDP), and that of most of the stock markets in the LLSV sample countries[7], whose weighted average size is 102% of GDP and of other major emerging economies whose weighted average size is 65% of GDP. If only tradable shares in the markets are taken into account, the percentage of China's stock market to GDP plummets to 11% (Allen *et al.* 2007; Barth *et al.* 2009). Even after the split share reform, the size of China's stock markets only provided credit equivalent to 44% of China's GDP in 2012, compared to 118% in the US (Elliott & Yan 2013). Accordingly, especially for non-state firms, the Chinese stock market only provides narrow support to the financing of companies and the growth of the economy (Allen *et al.* 2007).

[6] If we only consider tradable shares in the markets, the average turover rate jumped to 341%, compared to an annual rate of 188% in the US.

[7] Based on a sample of 49 countries (but Chins is excluded), La Porta, Lopez-de-Silanes, Shleifer and Vishny (LLSV) (1997, 1998) investigate the legal protection of investors and its consequences.

1.1.2.1.3. China's bond market

China's bond market, which includes treasury (government) bonds, policy financial bonds, and corporate bonds, is relatively under-developed, due to lack of independent auditing and high-quality credit-rating agencies as well as a poor legal system. The ratio of total bonds to bank credit was around 33% at the end of 2008, suggesting that the bond market in China is less important in terms of size relative to the banking sector. Additionally, compared to the West or other Asian countries, the size of the Chinese bond market is fairly small: it only represented 41% of GDP in 2012, compared to the US percentage of 243% (Elliott & Yan 2013).

Although the size of China's bond market is relatively small, the growth rate of government bonds has been high, reaching an average annual rate of 25.3% over the period 1990-2009. Total government bonds reached $721.3 billion US dollars at the end of 2008, which accounts for about 50.1% of total bonds. The policy financial bonds, the second largest component of the bond market, made up around 36.9% of the total bonds at the end of 2008. Under the supervision of the Ministry of Finance, these bonds are issued by the government and used to fund expenditures such as infrastructure construction or public projects. The corporate bond market in China is rather trivial relative to the other types of bonds: due to the existence of bureaucracy, undue government regulation, and lack of sound bond-rating agencies, these bonds made up only around 12.9% of the total bonds in China at the end of 2008 (Allen *et al.* 2012).

1.1.2.1.4. Foreign direct investment (FDI)

Foreign direct investment can be seen as one form of equity finance. It can take the form of wholly foreign-owned enterprises (WFOEs), joint ventures (JVs), or of mergers and acquisitions (M&As). There are different pros and cons across these different entry modes. A wholly foreign-owned enterprises as a limited liability company and wholly owned by foreign investors, has gradually gained its popularity and became the most common mode of foreign investment structure due to the launch of the WFOEs law in 1986 and China's joining the WTO in 2001. The advantage of setting up WFOEs (i.e. a 100% subsidiary) is to offer foreign investors greater flexibility and control over the firms and avoid a number of problematic issues with uncooperative partners or leakage of the foreign firm's intellectual property rights and trade secrets. However, compared with other modes of FDI, WFOEs face more restrictions to enter certain industries or business areas and limited support from the government (Ng 2013).

A joint venture is a company jointly owned by foreign and Chinese investors. There are two forms of JVs in China, e.g. equity joint ventures (EJVs) and cooperative joint ventures (CJVs).[8] The JVs can benefit foreign investors by enabling them to enter restricted industries or business areas; to use existing facilities, workforce, networks, marketing, and distribution channels; to get preferential government support or treatment; to improve local acceptance; and to diversify risks and costs with Chinese partners (Luo 2000). However, due to conflicting interests with partners, cross-cultural management and communication problems,

[8] A main distinction between these two types of JVs is the way of profits and losses are distributed. An EJV, as the oldest mode of Foreign Invested Enterprises (FIEs), is a limited liability company combining a Chinese partner with land, building and labor, and a foreign firm with advanced technology, good management skills and excess funds. Profits and losses among parties are determined by the proportion of equity contributions in the EJVs. A CJV is referred to as a contractual joint venture, in which each party cooperates as a separate legal entity in joint projects or other business activities under a variety of agreements in a co-operative-venture contract. Unlike EJVs, profits and losses of CJVs are subject to the specific provisions in the contract (Luo 2000).

risks of transferring technology and intellectual property, and the fact that many JVs failed, the popularity of JVs has been declining.

Foreign-inbound mergers and acquisitions are a relatively new form of FDI in China, which provide foreign investors with a quick way to break through China's industrial protection line and take over upstream Chinese assets. Due to the liberalization of the inbound-M&As regulation, especially for the takeover of state-owned enterprises, M&As have gained strength, providing 10% to 15% of FDI inflows into China (Peng 2006). According to data provider *Dealogic*, there were 540 foreign-inbound deals in China in 2013, totaling $31 billion (Koons 2014, January 8).

Thanks to China's open-door policy in which foreign-financed enterprises have superior legal status, as well as tax benefits compared to other private companies, FDI inflows have surged dramatically from the mid-1990s (Greenaway *et al.* 2013). Over the last 20 years, China has been the leading destination for foreign direct investment in the developing world. According to a report by *The World Bank* (The World Bank 2014), China received between 131 billion and 280 billion US dollars FDI inflows during the period 2009-2012, accounting for between 2.6% and 4.1% of GDP.[9] As pointed out by Allen *et al*. (2007), FDI contributed to around 10% of Chinese firms' total funding over the period 1994-2002. Prasad & Wei (2007) document that China made up one-third of gross FDI flows to all emerging markets and 60% of flows to Asian emerging markets between 1993 and 2003. As such, China became one of the largest foreign direct investment recipients in the word.

FDI inflows can be used to ease the financing constraints associated with the inefficient banking sector, particularly for private domestic firms, and could be an important channel to

[9] It is noteworthy that the pattern of FDI has been changing over the recent years. The proportion of manufacturing has been decreasing from over 70 percent of total FDI in 2005 to around 43.7 percent in 2012.

support economic growth (Havrylchyk & Poncet 2007; Prasad & Wei 2007; Guariglia & Poncet 2008; Héricourt & Poncet 2009). De Mello (1997) points out that FDI plays an extremely important role in the economic growth of developing countries. Based on a study by Aziz & Duenwald (2002), FDI exhibits a positive effect on per capita income of China's provinces, suggesting that FDI is a vital source of support for economic growth in China. Hung (2003) notes that the primary benefits of FDI inflows is to help China's privatization processes and to alleviate private firms' financial stress. Greenaway *et al.* (2013) find that the degree of foreign ownership has a positive effect on corporate performance in the Chinese context.

1.1.2.2. The informal financial system

According to Allen *et al.* (2012), the informal system in China comprises "informal financial intermediaries, internal financing and trade credits, and coalitions of various forms among firms, investors, and local governments" (p.3). At the beginning of the Chinese opening-up, the scale and influence of the financial sector were restricted. With the development of the market economy and the rapid boom of the private sector, a sizable informal financial sector has played a crucial role in supporting the growth of China's economy in the last 30 years, especially for private sector firms and rural areas. Elliott & Yan (2013) propose several reasons to explain the rapid growth of the informal sector in China. The first is the lending bias of China's banking sector. The majority of bank loans often go to state-owned firms or government infrastructure projects. The second reason is due to the under-developed stock and bond markets. Therefore, many small- and medium- sized firms (SMEs) or individuals with opportunities have to rely on informal finance to relieve their financial constraints. The third reason is the negative real deposit rates observed over the last few years. To avoid the government-mandated ceiling on deposit interest rates and high inflation, large amounts of money go into the informal sector.

Informal finance is accompanied by trusts or wealth management products (WMPs), which are mainly sponsored by banks that engage in indirect financing and lend money out to businesses. This is referred to as the "shadow banking" sector. The shadow banking system in China has quadrupled since 2008 and reached $3.2 trillion in 2013. It accounts for 40% of gross domestic product (GDP) (Rabinovitch 2013, February 26). The explosive expansion of shadow banking, to an extent, provides new sources of funding and liquidity and boosts China's economic growth. However, it also poses an increasing risk to Chinese economic stability due to its quality, complexity and transparency. Given the high yields they often promise, many wealth management products are heavily based on the cash flow from overheated real estate properties, long-term infrastructures, or other high-risk projects, which are highly exposed to repayment, refinancing and even default risks. Furthermore, the explosion of shadow banking causes a rapid increase in local government debt (Noble 2013, February 26). Many have warned that these complicated wealth management products that spurs unhealthy debt and lending could pose a significant risk to the whole financial system.[10]

In short, access to inform finance alongside alternative governance mechanisms such as competition in product and input markets, and networking through reputation, relationships, and trust, help Chinese firms overcome to some extent the inefficient banking sector, the

[10] Given the large size, the lack of transparency about how the funds are used, and the high risk characterized by the WMPs, there are fears that some elements of wealth management products resemble the toxic collateralized debt obligations (CDOs), which triggered the 2008 financial crisis. (Tatlow 2013, January 17).

undeveloped contract enforcement and creditor-rights protection mechanisms, and the severity of asymmetric information.

1.1.2.2.1. Internal finance

Internal finance or self-fundraising, which includes retained earnings, cash reserves, internal funds and funds from family, friends and other investors constitutes a huge portion of the financing needs for the growth of the overall economy. The size of internal finance reached $2,213.2 billion at the end of 2009, which is much larger than domestic bank loans ($565.7 billion) for the same year (Allen *et al.* 2012). Thus, internal finance is the most vital source of finance for many Chinese firms, particularly the financially constrained ones e.g. small firms or firms in the private sector (Poncet *et al.* 2010; Guariglia *et al.* 2011). For example, Ayyagari *et al.* (2010) document that internal finance has a positive effect in firms' productivity growth and reinvestment. According to Allen *et al.* (2012), roughly 60% of total financing raised by non-state and non-listed firms are generated internally. Even for SOEs, 45% of total financing comes from internal finance. This suggests that internal finance alleviates the costly premium of raising external finance, particularly faced by private firms, and allows these firms to finance their NPV investment. Numerous studies confirm positive effects of internal funds on investment or assets growth, especially for non-state firms (Chow & Fung 1998; Chow *et al.* 2010; Poncet *et al.* 2010; Guariglia *et al.* 2011).

1.1.2.2.2. Informal financial intermediaries

Informal financial intermediaries consist of interpersonal lending (minjian jiedai) and non-delegated monitors, such as pawnbrokers (diandang) and money lenders, and informal delegated lenders that operate without state charters, such as private money houses (siren qianzhuang), underground lending originations, informal banks, and rotating credit associations (hui) [11]. These various forms of informal lending have proliferated in the last ten years, which enables small- and medium- sized firms in China to borrow short-term money from wealthy households or lenders, overcoming in this way liquidity problems. These financial intermediaries are often not registered with any authorities and charge rather high lending rates. Furthermore, most of these lending is in violation of Chinese law, and is not sanctioned by in parts of China. However, the Chinese government usually turns a blind eye and allows them to remain operating unless they are involved in serious crime or endanger the harmony or stability of the society and economy. Without supervision, the underground operation of informal financial intermediaries is difficult to trace, and it is therefore hard to estimate the accurate aggregate scale of this lending. However, according to Elliott & Yan (2013), a rough size of private lending was around 4 trillion RMB ($635 billion) in 2012, accounting for around 10% of gross domestic product (GDP).

[11] Rotating credit associations (hui) are organized based on a relatively small group of people. Each member pools a certain amount of money at regular intervals, which is, in turn, used by another member in order to guarantee mutual assistance. Rotating credit associations (hui) are based on personal credit, and lacking legal support, are highly likely to be exposed to fraudulent schemes, particularly with the increase in membership enrollment (Li & Hsu 2009).

1.1.2.2.3. Trade credit

Trade credit can be seen as an important informal financing mechanism in China, due to the country's poor legal system and weak financial institutions. [12] Trade credit can provide finance through inter-firm transactions. In other words, firms are able to extend trade credit to their customers and receive trade credit from their suppliers, via this implicit contractual relationship. By investigating how high growth of the non-state sector can be sustained by informal financing channels, Ge & Qiu (2007) find that non-state-owned firms utilize more trade credit than state-owned firms. They argue that high usage of trade credit helps non-SOEs bypass the limited access to formal banks and meet their financing needs. Further, according to Cull *et al.* (2009), SOEs with poor performance tend to redistribute bank loans via trade credit to prop up their faltering customers. On the contrary, they find a positive relation between trade credit and bank loans for profitable private firms, suggesting that profitable private firms are more likely to extend trade credit.

1.1.2.3. Other evidence about formal versus informal finance

A large economics literature has argued that the Chinese financial system has not significantly contributed to its exceptional economic growth, due to its under-development. Private firms and/or SMEs tend to face limited access to external finance, and have to rely on alternative informal financing channels. Therefore, the informal financial system in China is likely to serve a more important role, compared to the formal financial sector. However, there are some conflicting opinions on the economic effects of different financing channels when

[12] Trade credit is more likely to be considered to be formal finance in developed countries.

authors use different indicators, time periods, and techniques. For instance, according to some authors, financial development has significantly benefited China's economic growth (Liang 2005; Hasan *et al.* 2009). Further research from Liang (2006) shows that financial development only positively affects economic growth in coastal areas, but not in interior regions. Cull & Xu (2005) declare that access to bank loans is positively connected with China's profit reinvestment. The authors argue that, first, investment projects tend to be lumpy and thus require a vast amount of both internal and external funds. Second, the cost of external funds in China is not necessarily higher than that of internal funds because of China's excessive regulation in interest rates. Third, valuable investment even from non-SOEs can be supported by loans. This is confirmed by the fact that better performing private firms have more chances to receive loans.

Chen (2006) states that China's financial intermediation nurtures economic growth mostly by means of the substitution of loans for state budget appropriation and the accumulation of household saving, rather than inefficient loan expansion. Using two components of economic growth (physical capital accumulation and productivity improvement), Li (2009) detects a correlation with the development of China's financial sector. Specifically, their empirical analysis shows that there is a strong positive correlation between financial development and economic growth in the long run. This may be explained by the fact that financial development is likely to facilitate the allocation of savings to the corporate sector, thus allowing more capital to be used for physical investment. Moreover, financial development can reduce information costs, improve capital allocation, and increase competition, which in turn may improve China's productivity.

Focusing on the role of informal finance, Ayyagari *et al.* (2010) find that informal financing and governance mechanisms are not able to fully explain high growth of Chinese private sector. However, there is evidence that private firms benefit from utilizing bank loans. Formal finance through banks can therefore indeed facilitate Chinese firms' efficient growth, which is confirmed by the positive relationship observed between bank financing and firms' growth rates and reinvestment rates.

1.1.3. Financial constraints hypothesis

Under a perfect and complete capital market, firms' investment decisions are not affected by their financing conditions (Modigliani & Miller 1958). In this framework, firms will implement all profitable investment opportunities because external finance is able to provide a perfect substitute for internal funds.

However, in the real world, the cost of external finance is often higher than the cost of internal finance, due to imperfections in capital markets. According to this view, firms' investments tend to be constrained by the availability of their internal finance, due to the existence of asymmetric information between firms and suppliers of finance; to agency problems between managers and shareholders, and between controlling shareholders and minority investors; to transaction costs (market liquidity), moral hazard (risk taking over investment) and so on. Therefore, a firm's investment decisions in fact depend on its financial position. The effect could be particularly relevant for small- and medium- sized enterprises (SMEs), whose investments are often constrained by lack of finance. Substantial empirical evidence has documented that financial variables (e.g. cash flow) play an important role in explaining corporate investment expenditure (Kuh & Meyer 1957; Myers & Majluf 1984; Fazzari *et al.* 1988; Stein 2003; Pawlina & Renneboog 2005; Bond & Van Reenen 2007).

1.1.3.1. Financial constraints and investment

According to the financial constraints hypothesis proposed by Fazzari, Hubbard and Petersen (FHP hereafter) (1988), a high sensitivity of investment to internal funds can be seen as a measure of financing constraints. In this influential paper, FHP use firm-level US data to estimate investment equations (as a function of Tobin's *Q* and cash flow) and find that cash flow has a stronger impact on the investment of low-dividend firms rather than that of high-dividend firms. They interpret this fact as supporting the financing constraints hypothesis since firms that pay low dividends are typically smaller and younger firms, for which it is difficult or expensive to obtain external financing. Therefore, if cash flow declines for these firms, investment will go down as well.

However, FHP's hypothesis was followed by a heated debate (Kaplan & Zingales 1997; Bond & Cummins 1999; Erickson & Whited 2000; Fazzari *et al.* 2000; Kaplan & Zingales 2000; Cummins *et al.* 2006). Kaplan & Zingales (1997) use different criteria based on information from the firms' annual reports to reclassify the subset of low-dividend firms from FHP (1988) into categories characterized by different degree of financing constraints. They find that firms with less financial constraints exhibit higher sensitivities of investment to cash flow. Based on this finding, they claim that the investment-cash flow sensitivity provides no evidence of the presence of financing constraints.

A further main challenge to FHP (1988) came with Cummins *et al.* (2006). They suggest that a high sensitivity of investment to cash flow arises because, within a *Q* model, investment opportunities are poorly captured by Tobin's *Q*. In order to construct more accurate measures of the fundamentals and ensure that cash flow does not pick up the effects of future growth opportunities incorrectly measured by Tobin's *Q*, they propose a new measure of investment opportunities, i.e. a direct estimate of the present discount value of expected future profit based on securities analysts' earnings forecasts, and find that once this new measure is included in their investment regressions, the relationship between investment and cash flow is no longer significant. This result holds even when firms are divided into more and less likely to face financing constraints. Thus, the authors argue that a high sensitivity of investment to cash flow cannot be interpreted as an indicator of the presence of financing constraints.

Despite being a huge matter for debate, a large literature following FHP supported the hypothesis according to which a positive and significant relationship between cash flow and investment can be interpreted as evidence that firms are more financially constrained (Schiantarelli 1996; Hubbard 1998; Bond *et al.* 2003; Carpenter & Guariglia 2007; Carpenter & Guariglia 2008; Guariglia 2008). Carpenter & Guariglia (2007) point out that Cummins *et al.* (2006) do not represent a real challenge to the financing constraints hypothesis. They argue that the different results obtained when using the traditional *Q* and the analysts' *Q* possibly derive from the fact that the firms included in Cummins *et al.*'s data are typically large and unlikely to face financial constraints, thus cash flow has no explanatory power to begin with. In order to overcome the fact that Tobin's *Q* represents a poor measure of investment opportunities that only captures outsiders' evaluation of opportunities, Carpenter & Guariglia (2008) augment the investment model with a new proxy, which measures the firm's contracted capital expenditure and picks up the insiders' evaluation of opportunities. They find that even after adopting this new measure for the investment opportunities, cash flow remains significant, especially for small firms, which confirms the role of cash flow in investment equation as an indicator of financial constraints.

1.1.3.2. Financing constraints and other firm behavior

Apart from investigating the links between financing constraints and fixed investment, the studies of financing constraints have been extended to other aspects of firm behavior such as working capital investment (Fazzari & Petersen 1993; Ding *et al.* 2013), assets growth (Carpenter & Petersen 2002; Guariglia *et al.* 2011), R&D investment (Harhoff 1998; Hall 2002; Bond *et al.* 2003), accumulation of inventories (Blinder & Maccini 1991; Carpenter *et al.* 1994; Kashyap *et al.* 1994; Carpenter *et al.* 1998; Guariglia 1999, 2000; Benito 2005; Guariglia & Mateut 2010), employment (Sharpe 1994; Nickell & Nicolitsas 1999), cash holdings (Opler *et al.* 1999; Almeida *et al.* 2004; Riddick & Whited 2009; Denis & Sibilkov 2010), exports (Campa & Shaver 2002a; Greenaway *et al.* 2007; Guariglia & Mateut 2010), acquisitions (Martin 1996; Faccio & Masulis 2005; Chen *et al.* 2009b; Alshwer *et al.* 2011; Du *et al.* 2013; Erel *et al.* 2014), and capital structure choices (Hennessy & Whited 2007). This research generally supports the financing constraints hypothesis.

Studies on how different firms respond to financial constraints provide a better understanding of the relationship between financial development and economic growth as well as of how monetary policy is transmitted to the real economy from a macro perspective. From a micro perspective, these studies also help to better understand firm behavior in the presence of asymmetric information problems and agency costs in the capital markets.

1.1.4. Financial constraints and firm behavior in China

China is a special case study for testing the financial constraints hypothesis since it achieved a rapid growth rate despite a malfunctioning financial system. Furthermore, there is a large imbalance in the allocation of financial resources in China: although firms from the private sector have been expanding very fast and contribute most to China's growth, the majority of domestic bank credit goes to the less efficient state-owned sectors, hence depriving most of the private firms from the access to credit (Allen *et al.* 2007; Héricourt & Poncet 2009; Guariglia *et al.* 2011).

Yet, surprisingly, the effect of financial constraints for Chinese firms has been largely neglected in the literature. There are only a handful of papers, which have attempted to study this issue. Among these, Chow & Fung (1998) first test the financial constraints hypothesis based on a sample of manufacturing firms in Shanghai during the period 1989- 1992. They find that firm investment is positively related to cash flow. This effect manifests itself for private firms, while international joint ventures are least financially constrained due to better access to overseas credit. The authors attribute the higher sensitivities of investment to cash flow that private firms exhibit to the lending bias of China's banking sector: private firms are more likely to be deprived of the access to external financing because of political reasons. In addition, their higher responsiveness of investment to cash flow might be due to the fact that private firms with good investment prospects and high growth rates need to rely more on internal funds. In contrast, state-owned enterprises are less efficient and have poor investment prospects, and thus do not need to heavily rely on internal finance.

Based on the same data set as in their 1998 paper, Chow & Fung (2000) test the financing constraints hypothesis for various firm size classes. They find that small firms are more likely to display lower responsiveness of investment to cash flow compared to their larger counterparts, which contradicts most of the previous results in a developed market. They explain that their apparently contradictory findings may be due to the fact that the majority of small firms operate in the more profitable and efficient non-state sector, and may have access to other informal channels to obtain credit for their investment.

Using an Euler equation approach, Poncet *et al.* (2010) test the conditions of financial constraints for Chinese firms during the period 1998-2005. They find that financial constraints are an important impediment to Chinese private firms' investment. In contrast, being favored by the formal banking sector, SOEs are not subject to liquidity constraints. In addition, the large number of SOEs tends to crowd private firms out of credit markets and magnify the latter's financial stress. Moreover, their paper points out that FDI in China can be seen another source of financing that eases the financial constraints faced by private firms and thus stimulate their investment.

These findings are also consistent with Chen (2008) who find that the investment-cash flow sensitivity for non-state firms is higher than that of state-firms. In addition, Chen (2008) finds that due to China's regional development policies, this sensitivity is larger for firms in eastern and central China compared to the ones in the west. Xu *et al*. (2013) argue that Chinese family firms tend to reduce their financial frictions and overcome the under-investment problem via political connections to the Chinese government. This conclusion is based on the significant drop in the sensitivity of investment to cash flow that they observe for firms with politically connected management.

Instead of concentrating on the connection between firm investment and cash flow, Guariglia *et al.* (2011) focus on the growth of firms' total assets, which incorporates all possible uses of cash flow. They use a panel of 79,841 Chinese firms over the period 2000-2007 and demonstrate that after accounting for investment opportunities, the growth of state-owned enterprises and collective firms is not associated with cash flow due to soft budget constraints. Yet, the opposite happens for private and foreign firms. This implies that SOEs face less financing constraints compared to private firms, and can be explained by the fact that because SOEs need to carry on the role of maintaining social stability and keep low unemployment rates, they are favored by state banks. Conversely, due to restricted access to external funds, private firms and especially those from the coastal regions and with a negligible degree of foreign capital suffer most from financial constraints. However, these highly productive firms have the ability to generate massive internal finance to overcome the financial constraints that they face and achieve high growth rates.

These findings are again supported by Héricourt & Poncet (2009), who find that two firm-level indicators of financial constraints (the debt-to-asset ratio and interest coverage ratio) have positive effects on investment for private firms, but not for state-owned firms. Additionally, they demonstrate that FDI inflows can relieve the credit constraints for private firms.

Cull *et al.* (2009) use a large panel of firms over the period 1998-2003 to demonstrate that the bias of formal credit against the profitable private sector still exists, but is declining over time. Furthermore, trade credit is likely to be used by poor-performing SOEs to prop up connected firms with less access to formal finance. The lending bias and the less efficient allocation of formal credit tends to promote trade credit, as a substitute for bank loans However, according to the authors, trade credit cannot economically significantly explain China’s dramatic growth.

Ding *et al*. (2012) investigate Chinese firms’ divestment behavior. They conclude that negative investment by SOEs is largely associated with the efficiency explanation, according to which assets need to be relocated in more productive firms. On the contrary, divestment by non-SOEs can be explained by the financing explanation, according to which these firms have to divest to raise capital and relieve their financial constraints. Using a panel of 116,000 Chinese firms over the period 2000-2007, Ding *et al.* (2013) investigate whether working capital serves as a substitute to liquidity to overcome the financial constraints faced by Chinese firms. They confirm that non-SOEs suffer more from significant financial constraints than SOEs, suggested by the evidence that the former displays higher sensitivities of investment in fixed capital to cash flow (FSK) and higher sensitivities of investment in working capital to cash flow (WKS). Further, firms with high level of working capital exhibit lower sensitivities of investment in fixed capital to cash flow (FSK) and higher sensitivities of investment in working capital to cash flow (WKS). The authors conclude that using working capital can ease the effects of cash flow shocks on fixed capital investment. Therefore, in addition to the finding from Guariglia *et al.* (2011) that high cash flow contributes the high growth, active management of working capital may also help to explain the Chinese growth miracle.

Contrary to most of the literature that suggest state-ownership can relax the degree of financial constraints faced by Chinese firms, Lin & Bo (2012) find that listed firms with higher state ownership actually exhibit higher sensitivities of investment to cash flow and a higher level of the *KZ* index, and do not have more access to bank loans. These findings suggest that Chinese listed firms do not benefit from state ownership in terms of preferential access to bank loans.

Based on listed manufacturing firms over the period 1999-2008, Firth *et al.* (2012) find that the relationship between investment and cash flow is U-shaped: when cash flow is negative (positive), the sensitivity of investment to cash flow is significantly negative (positive). Additional analyses show that the investment-cash flow sensitivities are greater for government controlled listed firms, compared to privately controlled ones, especially when cash flow is negative. However, the difference in the sensitivities between state firms and private firms appears only among low *Q* firms. This effect suggests that on the one hand, given by multiple social and political objectives, state-owned firms with low investment opportunities tend to use the cash flow to finance their investment projects when they have excess cash flow. On the other hand, even facing a cash-flow deficit, these firms nevertheless find ways to increase capital expenditures. Therefore, the U-shaped investment-cash flow curve can be attributed to the over-investment by SOEs with poor investment opportunities.

The study of financing constraints in this thesis provides an opportunity to better understand how financial conditions affect Chinese firms' activities and performance.

1.2. Research objective

Generally financial development is positively correlated to economic growth (Levine, 2005). However China, as a transitional economy and an emerging country, achieved a rapid growth rate despite a malfunctioning financial system. This puzzle has attracted worldwide attention. To rationalize this puzzle, our study attempts to assess how serious the liquidity conditions faced by Chinese firms, and the extent to which these firms act in response to the financing constraints. In particular, we focus on three aspects of listed firms' behavior: investment in fixed capital, cash holdings, and acquisition behavior. This thesis also takes corporate governance and ownership structure into account, since China still operates under a government-led and relationship-based system. In addition, the dominating state ownership and lack of legal professionals and effective law enforcement have been a major obstacle for firm growth. The aim of this thesis is to gain a better understanding of the behavior of Chinese firms in a world characterized by capital market imperfections and imperfect governance mechanisms, and to offer some policy recommendations for the improvement of the performance of Chinese firms.

The interpretation of the influence of cash flow on investment is controversial. In chapter 2, we attempt to shed light on this issue by using a large panel of Chinese listed firms over the period 1999-2010. We find robust support for the fact that higher sensitivities of abnormal investment to free cash flow can be caused by financial constraints or agency costs. Specifically, our results suggest that given an indication of the acute impact of free cash flow on under-investment, firms with free cash flow below their optimal levels tend to under-invest, which is consistent with to the financing constraints (FC) hypothesis. Moreover, in line with the agency costs (AC) hypothesis, firms whose free cash flow exceeds their optimal level are more likely to over-invest, which is confirmed by the sharp impact of free cash flow on over-investment. Furthermore, based upon our well-supported hypotheses, we also find that there exists significant heterogeneity in the degree of financial constraints and agency problems faced by Chinese firms with different financial conditions, ownership structure. Whether or not firms engage in exporting or mergers and acquisitions (M&As) also affects the degree of financing constraints and agency problems that they face. Finally, we demonstrate that the 2005 exogenous split share structure reform significantly reduced the agency costs faced by state-owned firms, particularly those controlled by local governments.

In chapter 3, we examine the behavior and the implications of corporate cash holdings for Chinese listed firms over the period 1998-2010. First, the chapter seeks to identify whether Chinese firms actively manage their cash holdings. We find that cash holdings are generally in line with those of US and UK firms and that facing adjustment costs, Chinese firms tend to actively rebalance their cash holdings towards the targets, which can best be explained by the trade-off model. Second, given the impact of adjustment costs on cash policy, we find that the adjustment of cash holdings is imperfect but continuous. Based on a dynamic framework, we further show the cross-sectional variation in the adjustment speeds of cash holdings due to the presence of various adjustment costs. Third, our study attempts to explore the consequences of active management of cash holdings. We find that the marginal value of cash decreases with larger cash holdings, and is lower for firms attempting acquisitions, and for state-owned enterprises. Furthermore, a higher marginal value of cash holding appears for financially constrained firms, suggesting that cash accumulation plays a crucial role for constrained firms, preventing them from bypassing value-increasing projects.

In chapter 4, we seek to investigate the extent to which corporate liquidity affects Chinese listed firms' acquisition decisions, method of payment choices, and performance following mergers. Based on a panel of Chinese listed firms during the period 1998-2011, we find that acquisitions in China are motivated by the agency costs of free cash flow, as cash-rich firms are more likely to attempt acquisitions. In addition, there is obvious evidence that cash-rich firms that are more likely to conduct tunneling have a higher probability to make acquisitions. Finally, in line with the opportunity cost of cash hypothesis, we demonstrate that financially constrained bidders with greater growth prospects tend to use stock rather than cash as a method of payment. This effect is consistent with the under-performance of cash acquisitions in both the short and long-term.

The rest of the thesis is organized in the following manner. Chapter 2 examines whether investment inefficiency in China is caused by financial constraints or agency costs. Chapter 3 details the adjustment behavior and value of corporate cash holdings. Chapter 4 discusses how corporate liquidity impacts firms' acquisition decisions and their consequences. Chapter 5 concludes.

Chapter 2

A balancing act: managing financial constraints and agency costs to minimize investment inefficiency in the Chinese market

Using a large panel of Chinese listed firms over the period 1999-2010, we document strong sensitivities of abnormal investment to free cash flow. Specifically, we observe that firms with free cash flow below (above) their optimal level tend to under- (over-) invest due to financial constraints (agency costs). We also highlight significant heterogeneity in the sensitivities depending on firms' financial conditions, ownership structure, and on whether or not they engage in exporting or Mergers & Acquisitions. Finally, we find that the 2005 exogenous split share reform reduced the agency problems faced by state controlled firms, particularly those controlled by local governments.

2.1. Introduction

Problems of information asymmetry between management and financial markets, and agency conflicts between management and shareholders, as well as between controlling shareholder and minority investors have been found to significantly influence firms' investment decisions (Myers & Majluf 1984; Jensen 1986; Fazzari *et al.* 1988; Abhyankar *et al.* 2005; Jiang *et al.* 2010). These problems are particularly severe in emerging markets. Given the capital market imperfections characterizing it and its poor corporate governance mechanisms (Allen et al., 2005), the Chinese setting provides an ideal laboratory to study firms' investment decisions in the presence of both financial constraints and agency problems[13].

China has been seen as a counterexample to most of the literature, which suggests a positive relationship between financial development and economic growth (Levine 2005). Its under-developed financial system is in fact seriously out of step with its thriving growth (Allen *et al.* 2005).[14] Internal finance, trade credit, and other informal funds might speak louder in explaining the Chinese growth miracle than bank or equity finance. In other words, the role of China's external markets in financing and allocating resources has been limited. This is due, first of all, to the fact that dominant state-owned banks are not efficient since they have plenty of nonperforming loans (NPLs) and an outstanding government debt. More

[13] Some researchers (e.g. Bernanke and Gertler, 1989) refer to agency costs as those deadweight losses, which, in the presence of asymmetric information, prevent to reach optimal financial arrangements between borrowers and lenders. These agency costs translate themselves in a higher cost of external finance compared to internal funds. Hereafter, we will refer to these as financing constraints, and will only consider as agency problems those arising from conflicts of interest between managers and shareholders, or between majority shareholders and minority shareholders.

[14] China has experienced a rapid growth rate, which reached 14.4% per year over the 1999-2009 period in terms of GDP (gross domestic product). Data source: National Bureau of Statistics (NBS), Statistical Yearbook of China, various issues, Beijing, China Statistical Press.

importantly, they need to support massive unprofitable state-owned enterprises (SOEs). It is consequently difficult for private firms to access external funding (Allen *et al.* 2005; Héricourt & Poncet 2009; Guariglia *et al.* 2011). Credit markets in China have therefore not been playing a very efficient role in allocating resources and relieving financial constraints, which are a significant issue for several Chinese firms, and may lead them to under-invest.

Second, although it has grown in recent years, the Chinese stock market is still relatively small compared with the banking sector. Due to poor regulation and to the fact that a substantial number of listed firms are controlled by the state, the stock market is not very efficient and stock prices do not reflect fundamental values (Allen *et al.* 2005; Wang *et al.* 2009). These problems were exacerbated before the split share reform in 2005, at which time a large proportion of shares could not be traded freely[15].

China's incredibly fast growth relies heavily on investment. Over the period 1999-2009, China experienced an investment boom (the average annual growth rate for total fixed investment was 22.5%), which was responsible for around 50% of GDP growth.[16] Roaring growth and excessive investment might cause over-heating and over-capacity, and generate inefficiency, which could impair the sustainable development and future wellbeing in China. Given the faint legal system as well as poor corporate governance mechanisms in terms of the weakness of creditor rights and legal protection for shareholders including minority and outside shareholders, the lack of legal professionals and effective law enforcement, and the frequent government intervention, agency problems in China's listed sector are rather severe and likely to lead to over-investment (Allen *et al.* 2005; Chen *et al.* 2011). For instance,

[15] See section 2.5.6.1 for more details.

[16] Data source: National Bureau of Statistics (NBS), Statistical Yearbook of China, various issues, Beijing, China Statistical Press.

government bureaucrats may use their influence to over-invest in order to achieve their political objectives (Firth *et al.* 2012), and politically connected directors sitting on company board tend to exploit minority shareholders. These effects may be amplified by the presence of soft budget constraints[17], and widespread corruption (Chow *et al.* 2010; Firth *et al.* 2012) .

Our work makes several contributions to the literature. First, we distinguish for the first time the extent to which investment inefficiency (intended as the sensitivity of abnormal investment to free cash flow) may be induced by financial constraints, agency problems, or a combination of both.[18]

Second, unlike most prior research, which examines sensitivities of investment to cash flow (Fazzari *et al.* 1988; Kaplan & Zingales 1997; Cleary 1999; Cummins *et al.* 2006), our work focuses on the sensitivity of "abnormal" investment to "free" cash flow. By deducting required (maintenance) and expected investments from capital expenditure and removing mandated components from cash flow, this approach prevents cash flow to pick up future investment opportunities. Consequently, in the absence of financing constraints and agency costs, under- and over- investment should not display a systematic response to free cash flow. Our approach provides therefore a powerful and unambiguous test which will help shed light on whether investment inefficiencies in the unique Chinese context can be explained by financial constraints and/or agency problems.

[17] In the presence of soft budget constraints, state-owned enterprises are in fact always bailed out even if they suffer from chronic losses.

[18] In this study, we define over-investment (under-investment) as investment expenditure beyond (below) its optimal level. Hereafter, we will refer to both under- and over-investment as abnormal or excessive investment. In addition, we argue that the sensitivity of abnormal investment to free cash flow can be seen as evidence of inefficiency due to financial constraints and/or agency problems.

Third, our analysis provides evidence as to whether the levels of financial constraints and agency costs faced by firms (respectively measured through the sensitivities of under- and over-investment to free cash flow) can be differentiated on the basis of firms' characteristics, such as ownership, financial conditions, exporting, and Mergers and Acquisitions (M&As) activities. Finally, for the first time in the Chinese context, we propose a number of policies aimed at reducing investment inefficiency in China.

Our study is conducted using a panel of data from the listed sector in China over the period 1999-2010. We analyze the sensitivity of (under- and over-) investment to free cash flow across groups of firms sorted according to different characteristics. In doing so, we adopt the framework proposed by Richardson (2006) to construct firm-level under- and over-investment and free cash flow measures. Our empirical results show that a combination of both financing constraints and agency problems explain investment inefficiency in the unique Chinese context. In particular, our findings are consistent with the financial constraints (FC) hypothesis (Fazzari *et al.* 1988): higher sensitivities of under-investment to free cash flow can be found for the firms with free cash flow below their optimal levels. Our results are also in line with the agency costs (AC) hypothesis (Jensen 1986): higher sensitivities of over-investment to free cash flow can be spotted in firms with free cash flow above their optimal levels. These results are robust to the use of alternative measures of abnormal investment and free cash flow, of different estimation methodologies, and of various criteria to define financial constraints and agency costs.

We also find that abnormal investment-free cash flow sensitivities vary across different types of Chinese firms. First, non-SOEs face higher financial constraints than their state controlled counterparts, and have to rely more on their internal finance for their investment. Second, given the weak supervision and management that characterizes them, SOEs affiliated with local governments (SOELGs) face higher agency costs and are more likely to invest beyond their optimal levels than SOEs affiliated with the central government (SOECGs) and non-state controlled firms[19]. Last, exporting contributes to relieving Chinese listed companies' financial constraints.

Finally, we find that the 2005 split share structure reform, which represented an exogenous shock to Chinese firms' governance system, affected local-government-controlled enterprises more than other firms, by reducing their agency costs. Decreasing sensitivities of over-investment to free cash flow are in fact evident after 2005 for SOELGs.

The remainder of this chapter is laid out as follows. Section 2.2 develops testable hypotheses regarding firms' investment behavior and its relationship with financial constraints and agency problems. Section 2.3 illustrates our baseline specification and estimation methodology. Section 2.4 describes the main features of the data and presents summary statistics. Section 2.5 discusses and examines the main empirical results and further tests, while Section 2.6 discusses the policy and managerial implications of our findings. Section 2.7 concludes.

[19] In the sub-sample of our dataset which contains detailed information on firm ownership (2003-2010), we observe that 15.83% of all observations represent SOEs controlled by the state (SOECGs); 50.54%, SOEs affiliated with local governments (SOELGs); and 33.63%, non-SOEs.

2.2. Development of hypotheses

In a perfect and complete capital market, investment decisions are not affected by the way firms finance themselves (Modigliani & Miller 1958), suggesting that in order to maximize their value, firms will implement investment projects until the marginal revenue of investment equals the marginal costs. However, substantial empirical evidence has documented a significantly positive correlation between cash flow and investment expenditure (Fazzari *et al.* 1988; Hubbard 1998; Stein 2003; Bond & Van Reenen 2007). The reason for the existence of this positive relation remains, however, controversial.

First, there exists considerable evidence to suggest that the positive correlation between investment and cash flow stems from asymmetric information between corporate insiders and outside creditors (Myers & Majluf 1984; Fazzari *et al.* 1988; Carpenter & Guariglia 2008; Butler & Cornaggia 2011). This explanation is consistent with the financial constraints (FC) hypothesis where the imperfections in capital markets lead to a cost premium when external finance such as bank loans, debt and equity are used. The cost or availability of external funds force firms to use internal finance, like retained earnings, in preference to external finance. In these circumstances, financially constrained firms may have to forego good investment projects to avoid the excessively high cost premiums. Thus, when firms face financial constraints, the more internal funds they have, the more they can invest, while negative cash flow shocks may lead to under-investment. A high sensitivity of investment to cash flow can be therefore seen as evidence of financial constraints.

Second, the positive correlation between investment and cash flow may reflect agency problems between managers and shareholders and between controlling shareholder and minority investors (Jensen 1986; Stulz 1990; Pawlina & Renneboog 2005). This explanation is in line with the agency costs (AC) hypothesis, according to which managers might not have the same objective as shareholders. Managers may in fact focus more on the growth of their firm rather than on maximizing shareholders' wealth, to build empires, since their compensation and wealth are generally positively associated with their firm's growth and expanding the firm would increase the resources in their hands and enhance their power. Moreover, the interests of controlling shareholder may not be aligned with those of other investors due to weak legal system as well as poor minority shareholder protection. Given the high restriction of share trading and the prevalence of dominant shareholders in China, the risk of controlling shareholder to expropriate resources from minority investors (tunneling) is rather severe. As a result, controlling shareholders may make self-interested and entrenched decisions and prefer to spend the firm's free cash flow on unprofitable projects rather than paying dividends to shareholders, resulting in over-investment. In summary, when firms face agency problems, the more free cash flow they have, the more they prefer to invest. The positive relationship between investment and free cash flow can be hence interpreted as evidence of the presence of agency costs.

Taken together, financial constraints and agency problems can prevent firms from making optimal investment decisions. Both financial constraints and agency problems may therefore increase the sensitivity of investment expenditure to cash flow and induce investment inefficiency. To discriminate between these two scenarios within the Chinese context, we will test the following two hypotheses.

H1: The Financing Constraints (FC) Hypothesis: Under-investing firms with negative FCF exhibit significantly positive investment-free cash flow sensitivities resulting mainly from financial constraints.

H2: The Agency Cost (AC) Hypothesis: Over-investing firms with positive FCF exhibit significantly positive investment-free cash flow sensitivities resulting mainly from agency costs.

Both hypotheses are focused on the sensitivity of abnormal investment to free cash flow, which is defined as the cash flow beyond what is required to maintain assets and finance expected new investments (Richardson 2006). *H1* assumes that firms with negative free cash flow, who are already under-investing, are more likely to face financing constraints, while *H2* posits that over-investing firms with positive free cash flow are more likely to face agency costs.[20] In the section that follows, we will outline the methodology that we adopt to test these two hypotheses.

[20] It is important to note that firms can face both financial constraints and agency costs at the same time. However, for firms under different stages, either one may be more pronounced.

2.3. Baseline specification and estimation methodology

2.3.1. Baseline models

2.3.1.1. A framework to measure abnormal investment and free cash flow (Richardson 2006)

We measure both under- and over-investment (abnormal investment) and free cash flow using Richardson's (2006) accounting-based framework. We then test whether the relationship between abnormal investment and *FCF* (investment inefficiency) is caused by financial constraints and/or agency costs.

Fig. 2.1 outlines our methodology. Total investment ($I\_total_{i,t}$) is defined as capital expenditure less receipts from the sale of property, plant, and equipment. $I\_total_{i,t}$ can be decomposed into two main parts: new investment expenditure ($I\_new_{i,t}$), and required investment expenditure to maintain assets in place ($I\_main._{i,t}$), which is given by the sum of amortization and depreciation.[21]

[Insert Fig. 2.1]

New investment expenditure ($I\_new_{i,t}$) can be further split into two components: expected investment expenditure in new positive NPV projects ($I^e\_new_{i,t}$) and unexpected investment or abnormal investment (under- or over- investment, $I^u\_new_{i,t}$).

[21] Using the sum of amortization and depreciation to proxy for maintenance investment may not be appropriate for all firms. For example, if a firm invests in R&D, its maintenance investment cannot be estimated by amortization and depreciation. In order to overcome these limitations, we include prior investment expenditure and time dummies in our dynamic investment expectation model (Eq.2.1). These should contribute to capturing omitted maintenance investment.

We then define firms' optimal level of cash flow as the sum of maintenance investment ($I\_main._{i,t}$) and expected investment expenditure ($I^e\_new_{i,t}$). Free cash flow (*FCF*) is computed by subtracting the optimal level of cash flow ($I\_main._{i,t}$ + $I^e\_new_{i,t}$) from net cash flow from operating activities (*CFO*).[22] Accordingly, *FCF* can be either positive or negative, depending on whether net cash flow from operating activities (*CFO*) exceeds the optimal level of cash flow.

2.3.1.2. Dynamic expectation models of investment expenditure

Following Richardson (2006), a dynamic investment expectation model is used to predict the expected investment expenditure in new positive NPV projects ($I^e\_new_{i,t}$), which can be interpreted as the optimal level of investment expenditure[23]. Specifically, denoting with *I_new* the firm's new investment expenditure; with *Q* (Tobin's *Q*), its market-to-book ratio;[24] with *Cash*, its ratio of cash and cash equivalents to total assets; with *Size*, the natural logarithm of its total assets; with *Age*, the number of years elapsed since its listing; with *ROA*,

[22] The reason why we deduct expected investment expenditure ($I^e\_new_{i,t}$) to calculate *FCF* rather than deduct actual *CAPEX* is because actual *CAPEX* can be influenced by financial constraints or agency costs.

[23] All investment expenditure variables are scaled by total assets.

[24] The shares of listed firms in China can be either tradable or non-tradable. Following the literature (Chen *et al.* 2011; Huang *et al.* 2011), we calculate Tobin's *Q* as the sum of the market value of tradable stocks, the book value of non-tradable stocks, and the market value of net debt divided by the book value of total assets. Our results were robust to using the growth of real sales instead of Tobin's *Q* to proxy for investment opportunities (Konings *et al.* 2003; Ding *et al.* 2010). This test is motivated by the fact that in the Chinese context, Tobin's *Q* may be an imperfect measure of investment opportunities. For brevity, these results are not reported, but are available upon request. .

its return on assets[25]; and with *Leverage*, the ratio of its short-term and long-term debt to total assets, we estimate the following equation:

$$
\begin{aligned}
I\_new_{i,t} = {} & a_0 + a_1 I\_new_{i,t-1} + a_2 Cash_{i,t-1} + a_3 Q_{i,t-1} + a_4 Size_{i,t-1} + a_5 Age_{i,t} + a_6 ROA_{i,t-1} \\
& + a_7 Leverage_{i,t-1} + \sum Year + \sum Industry + \sum Year * Industry + \upsilon_i + \varepsilon_{i,t} \qquad (2.1)
\end{aligned}
$$

where the subscript *i* indexes firms; and *t*, years (*t*=1999-2010). We use a dynamic model to allow for a partial adjustment mechanism and to control for unobserved factors not included among other regressors. We lag all our independent variables (except *Age*) to alleviate the simultaneity issue (Polk & Sapienza 2009; Duchin *et al.* 2010).[26]

Eq. (2.1) also incorporates time dummies (∑*Year*), which account for the possible effects of business cycles as well as the impact of change in interest rates. Industry dummies (∑*Industries*) are included to capture the industry fixed effects associated with firms' investments.[27] In addition to aggregate time dummies, we incorporate time dummies

[25] As firms in an less-developed market may not make investment decisions based on market valuation (Wang *et al.* 2009), contrary to Richardson (2006), we use the return on assets (*ROA*) instead of stock returns in our dynamic investment model. See Appendix 2.2 for complete definitions of all variables.

[26] Similar results were obtained using contemporaneous variables. For brevity, these results are not reported, but are available upon request.

[27] According to the industry classification taken from the China Securities Regulatory Commission (CSRC), firms in China's listed sector are assigned to one of the following twelve industrial sectors: Farming, forestry, animal husbandry & fishing; Mining; Manufacturing; Utilities; Construction; Transportation & warehouse; Information technology; Wholesale & retailing; Real estate; Social services; Communications & cultural; Conglomerates; Finance & insurance. Following previous literature, we exclude the Finance & insurance sector from our study.

interacted with industry dummies (∑*Year**∑*Industries*) to control for industry-specific business cycle effects.[28]

The error term in Eq. (2.1) consists of two components: ν_i, a firm-specific component, embracing any time-invariant firm characteristics which tend to influence firms' investment, as well as any time-invariant component of the measurement error which may affect any variable in our regression; and $\varepsilon_{i,t}$, which represents an idiosyncratic component.

The fitted values of Eq. (2.1) can be interpreted as a proxy for optimal investment ($I^e\_new_{i,t}$).[29] The difference between real investment and optimal investment ($I^u\_new_{i,t}$) is then computed and interpreted as unexpected investment. $I^u\_new_{i,t}$ can be either positive or negative, corresponding to over-investment or under-investment, respectively.

2.3.1.3. Relationship between under- or over-investment and free cash flow

To analyze the sensitivities of under- or over-investment to free cash flow, we initially estimate the following regression:

$$I^u\_new_{i,t} = a_0 + a_1 Dum_{FCF>0} + a_2 FCF_{i,t} * Dum_{FCF<0} + a_3 FCF_{i,t} * Dum_{FCF>0}$$
$$+\sum Year + \sum Industry + \upsilon_i + \varepsilon_{i,t} \qquad (2.2)$$

[28] Because of collinearity, industry dummies (∑*Industries*) cannot be included in the equations when the fixed effects estimator is used.

[29] Because free cash flow is defined as operating cash flow net of depreciation and amortization and net of $I^e\_new_{i,t}$, positive sensitivities of abnormal investment to free cash flow are unlikely to be caused by free cash flow picking up investment opportunities.

We partition firm-years into those characterized by over-investment or under-investment on the basis of their $I^u\_new_{i,t}$. More specifically, over-investing firms are those who have positive abnormal investment ($I^u\_new_{i,t}$). On the contrary, under-investing firms are characterized by negative abnormal investment ($I^u\_new_{i,t}$). As in Richardson (2006), we assume abnormal investment is a function of free cash flow (*FCF*) and investigate whether the sensitivity of $I^u\_new_{i,t}$ to *FCF* differs for firms facing positive and negative *FCF*. To this end, we interact *FCF* with the dummy $Dum_{FCF>0}$ ($Dum_{FCF<0}$), which is equal to 1 if the firm has positive (negative) free cash flow, and 0 otherwise.[30] Therefore, a_2 and a_3 can be used to proxy investment inefficiency. In accordance with the financing constraints hypothesis, we expect a_2 to be positive and precisely determined for under-investing firms, which are likely to suffer from financing constraints, while, in line with the agency costs hypothesis, a_3 should also be positive and significant for over-investing firms, likely to suffer from agency cost problems. We also include $Dum_{FCF>0}$ in the regression, to account for the direct effect that it might have on firm investment. Finally, we control for year, industry and firm fixed effects, as well as industry-specific business cycle effects.

2.3.1.4. Are under- or over-investment-free cash flow sensitivities due to financial constraints or agency costs?

To further test for the financial constraints (FC) hypothesis of under-investment and the agency costs (AC) hypothesis of over-investment, we estimate the following regression:

[30] Since we partition firm-years into under-/over- investing observations, and positive/negative free cash flow observations, our sample can be broken down into 4 sub-groups (2×2): Group1 (under-investing observations with negative *FCF*); Group 2 (under-investing observations with positive *FCF*); Group3 (over-investing observations with positive *FCF*); and Group 4 (over-investing observations with negative *FCF*) (See Fig. 2.2).

$$I^u\_new_{i,t} = a_0 + a_1 Dum + a_2 FCF_{i,t} * Dum + a_3 FCF_{i,t} * (1 - Dum) + \sum Year + \sum Industry + \upsilon_i + \varepsilon_{i,t} \quad (2.3)$$

where *Dum* represents a dummy proxying for the degree of financial constraints (based in turn on traditionally used financing constraints indexes, size, and dividend payments) or agency costs (based in turn on the ratio of operating expenses to total assets, the ratio of other receivables to total assets, and ownership structure) faced by firms. Specifically, we separate firms into different groups on the basis of their *a priori* likelihood of facing financial constraints or agency problems measured on the basis of different criteria, with the aim of investigating the extent to which different groups of firms have different investment behavior and sensitivities of under- and over-investment to free cash flow. These further tests should enable us to shed more light on whether the financing constraints and agency costs hypotheses hold in the Chinese context.

2.3.2. Estimation methodology

2.3.2.1. Dynamic panel models

As it is dynamic, we estimate Eq. (2.1) using the system Generalized Method of Moments (system GMM) approach developed by Arellano & Bover (1995) and Blundell & Bond (1998). This estimator enables us to control for omitted variables bias, the possible endogeneity of the regressors, as well as firm-specific and time-invariant heterogeneity[31]. The GMM estimator is designed for dynamic panel analysis with few time periods and many individuals (small T and large N). The system GMM builds up a system of two equations (the first-differenced equations and the level equations). Adding the original equation in levels to the system has been shown to dramatically improve the precision and the efficiency of the estimator compared with the simple first-difference GMM estimator.[32] First-differencing is aimed at controlling for unobserved heterogeneity. Lagged values of the independent variables are used as instruments to control for the potential endogeneity of the regressors (Bond *et al.* 2001; Baum 2006; Roodman 2006).

In order to evaluate the validity of instruments and the correct specification of the model, two diagnostic tests are used in our GMM estimations. The first is the Hansen (*J*) test for over-identifying restrictions. The test statistic asymptotically follows a *Chi*-square distribution with the value of degrees of freedom equal to the number of over-identifying restrictions (number of instruments less number of parameters). A rejection of the null hypothesis of instrument validity implies that the instruments are correlated with the error term or are being incorrectly included in the regression. The second diagnostic test, $m(n)$, tests for the n^{th} order serial correlation of the differenced residuals, and provides a further test

[31] Some statistical problems may arise when a model includes a lagged dependent variable. First, the presence of a lagged dependent variable leads to serial correlation of the error term. Second, the lagged dependent variable is as stochastic as the dependent variable. This violates the classical assumptions of the linear regression model that both independent variables and error term should be independent. Thus, the estimation of a dynamic model using a conventional approach like the pooled OLS estimator will lead to biased and inconsistent estimates (Maeshiro 1996; 1999).

[32] According to Blundell and Bond (1998) and Blundell et al. (2001), when regressors are persistent over time and the number of time periods is relatively small, the first-difference GMM estimator has been found to have a large finite sample bias and poor performance in simulation experiments. However, the system GMM greatly reduces the finite sample bias and is more asymptotically efficient as it is not dependent on relatively harsh restrictions on the initial condition.

for the validity of the specification of the model and the legitimacy of instruments. The *m(n)* test asymptotically follows a standard normal distribution under the null hypothesis of no n^{th}-order serial correlation of the differenced residuals. If the *m(n)* test rejects the null hypothesis, the instruments need to be lagged at least n+1 times.[33] Since the models in this study generally reject the null hypothesis of no second-order autocorrelation, levels of endogenous variables dated t-3 and further are used as instruments in the first-differenced equations, and first-differences of the endogenous variables dated t-2 are used as additional instruments in the level equations (Baum 2006; Roodman 2006).[34]

For robustness, we also estimate Eq. (2.1) using the pooled OLS (OLS) and the fixed effects (Fe) estimators. It is worth noting that in a dynamic panel model, the pooled (OLS) estimator does not appropriately account for the unobserved firm characteristics and the possible endogeneity of the regressors. Moreover, the fixed effects (Fe) estimator might suffer from endogeneity problems in a dynamic panel setting. Under the circumstance, the coefficient on the lagged dependent variable obtained from the pooled OLS estimator will be upwards biased, and the one obtained from the fixed effects (Fe) estimator will be downwards biased. Estimating our dynamic models via different approaches enables us to check the validity of our estimates: the true estimated coefficient on the lagged dependent variable should lie between the estimates obtained from the pooled OLS and the fixed effects (Fe) estimators (Bond *et al.* 2001).

[33] It is worth noting that using too many lags of endogenous variables as instruments is likely to generate a possible loss of efficiency (Baum 2006).

[34] Neither the Hansen *J* test nor the *m(n)* test can distinguish poor specification of the model from instrument invalidity.

2.3.2.2. Static panel models

For the static panel regression models in Eq. (2.2) and Eq. (2.3), we use the fixed effects (Fe) estimator to control for time-invariant firm-specific heterogeneity.[35] In some cases, we also provide pooled OLS estimates for comparison.[36]

[35] The key variables in Eq. (2.2) and Eq. (2.3) (unexpected investment and free cash flow) are constructed using the residuals from the estimation of Eq. (2.1). For this reason, they can be considered as exogenous, which justifies the use of a fixed-effects estimator.

[36] All estimates using the pooled OLS estimator in our study are generated as cluster-robust. In a panel data setting, it is important to control for cluster heterogeneity. In this study, we allow for arbitrary heteroscedasticity and intra-cluster correlation at the firm-level. With a large number of clusters (1,168) and relative small cluster size (maximum 12), the asymptotic framework is well developed, and the cluster-robust standard error estimator converges to the true value. Even if there is no serial correlation in the error process, the inference is still robust as long as the number of clusters is large (Wooldridge 2003).

2.4. Main features of the data and descriptive statistics

2.4.1. The dataset

The data used in this chapter are drawn from the China Stock Market Trading Database (CSMAR) and China Economic Research Service Centre (CCER). They cover Chinese companies that issue A-share stocks on either the Shanghai Stock Exchange (SHSE) or the Shenzhen Stock Exchange (SZSE), during the period 1999-2010.[37,38] We exclude financial institutions since the operating, investing and financing activities of these firms are distinct from others. Furthermore, observations in the one percent tails for the main regression variables are excluded in order to minimize the potential influence of outliers.[39] Finally, we drop all firms with less than three years of consecutive observations. All variables are deflated using the gross domestic product (GDP) deflator (National Bureau of Statistics of China).

The information on acquisitions for our listed Chinese companies is derived from the Thomson Financial SDC Mergers and Acquisitions Database. Both successful and unsuccessful deals announced between January 1, 1999 and December 31, 2011 are included.

[37] All firms listed on either the SHSE or SZSE market issue tradable shares (which are called A-shares) to domestic investors. Alongside A shares, some of these firms also issue B-shares, which were initially only available to overseas investors including those from Hong Kong, Macao and Taiwan. After February 2001, B-shares have been made available to both overseas investors and domestic investors, as long as investors can provide investment accounts in the proper currency. B-shares listed on the SHSE market trade in US dollars and those on the SZSE market are settled in Hong Kong dollars. Besides, many Chinese companies float their shares (simultaneously) on the Hong Kong Exchange (H-shares) and on the New York Stock Exchange (N-shares).

[38] The cash flow statement in the databases is not available until 1998.

[39] Similar results were obtained using winsorizing instead of truncating to reduce the bias created by possibly spurious outliers. For brevity, these results are not reported, but are available upon request.

As far as data cleaning is concerned, our final panel consists of 1,263 listed firms, which corresponds to 9,508 firm-year observations. The number of firm-year observations of each firm varies from three to twelve, with number of observations varying from a minimum of 415 in 1999 to a maximum of 1,081 in 2008.[40]

2.4.2. Initial summary statistics

As mentioned in section 2.3.1.3, in order to study the relationship between abnormal (under- or over-) investment and free cash flow, we partition firm-years into 4 sub-groups (2×2): Group1 (under-investing firms with negative *FCF*), Group 2 (under-investing firms with positive *FCF*), Group 3 (over-investing firms with positive *FCF*), and Group 4 (over-investing firms with negative *FCF*). Means and medians for the entire sample and four sub-samples based on their abnormal investments and free cash flow are presented in Table 2.3.

It can be seen that relative to total assets, the average total investment and new investment expenditure in our sample are respectively 5.3% and 2.7%. This suggests that new investment represents a large portion of total investment (around 50%). Moreover, the average free cash flow for all firm-years observations is -0.002. This small value might suggest that listed firms in China are short of free cash flow, which could be due to financial constraints.

[Insert Table 2.3]

[40] See Tables 2.1 and 2.2 for details about the structure of our sample. Around 15 percent of firms have the full 12-year observations. Our panel is unbalanced, allowing for both entry and exit. This can be seen as evidence of dynamism and may reduce potential selection and survivor bias.

Interestingly, the total new investment for Group 2 (under-investing firms with positive *FCF*) is negative. This happens because the depreciation plus amortization of firms in this group exceeds their total investment. Depreciation and amortization can be considered as non-cash expenses: if firms are profitable, they might accelerate depreciation and amortization in order to reduce reported profits.

Coming to unexpected investment and free cash flow, we find firms in Group 1 (under-investing firms with negative *FCF*) have the highest negative unexpected investments and free cash flow, which is in line with our Hypothesis 1, according to which, due to financial constraints, firms with negative *FCF* tend to under-invest. As for firms in Group 3 (over-investing firms with positive *FCF*), they have the highest positive unexpected investment and free cash flow, which is in line with our Hypothesis 2, according to which firms with positive *FCF* tend to over-invest, due to agency costs.

As for other financial and operating variables, the statistics show that firms in Group 1 (under-investing firms with negative *FCF*) are relatively younger, smaller, have lower Tobin's *Q* and *ROA*, and higher cash reserves. This could suggest the presence of financial constraints. On the other hand, firms in Group 3 (over-investing firms with positive *FCF*) are relatively mature, large, have higher Tobin's *Q* and *ROA*, and hold less cash reserves, which might suggest higher agency problems.[41]

[41] The *p*-values associated with the t-tests and the Wilcoxon rank-sum test show significant differences in most variables between firms in Group 1 and those in Group 3. Two exceptions are the variables *Size* and *Cash* when focusing on the Wilcoxon rank-sum test.

Finally, it is interesting to note that the number of firms in Group 1 (3,120), is larger than that in Group 3 (1,884), suggesting that there are more firms facing financial constraints than firms susceptible to agency problems.

2.5. Empirical results

2.5.1. Baseline results

2.5.1.1. Dynamic model of investment expenditure

Table 2.4 provides the pooled OLS, fixed effects, and system GMM estimates of our dynamic model of investment expenditure outlined in Eq. (2.1).

[Insert Table 2.4]

Column 1 reports the pooled OLS estimates based on cluster-robust standard errors, which take into account arbitrary heteroscedasticity and intra-cluster correlation. The coefficients on all explanatory variables are statistically significant at the 1 percent level. According to the adjusted R-square, the model is able to explain 31% of the variation in firms' new investment expenditure ($I\_new_{i,t}$). However, as discussed in section 2.3.2.1, the pooled estimates are more likely to be biased because of unobserved firm-specific herogeneity and possible endogenous regressors.

Column 2 reports the fixed effects estimates, which remove the effect of time-invariant firm characteristics. The ρ coefficient indicates that around 37% of the total error variance is explained by unobserved heterogeneity.

Column 3 presents the estimates using our preferred system GMM estimator, which takes the two possible biases (unobserved heterogeneity and endogeneity) simultaneously into account. More specifically, we take first differences of the regressors and treat $I\_new_{i,t-1}$, $Cash_{i,t-1}$, $Q_{i,t-1}$, $Size_{i,t-1}$, $ROA_{i,t-1}$ and $Leverage_{i,t-1}$ as potentially endogenous variables. Given the relatively large number of time periods available, to keep the number of instrument manageable, we specify that the GMM instruments are only constructed for lags 3 to 6 of these endogenous variables. First-differences of these same variables lagged twice are used as additional instruments in the level equations. Statistical diagnostics (the Hansen *J* test and the *m(3)* test) do not reject the null hypothesis of instrument validity and/or model specification, suggesting that our estimates based on the system GMM regression are convincing. The system GMM estimate of the coefficient associated with the lagged dependent variable, $I\_new_{\mathrm{i,t-1}}$, is 0.314, which precisely lies within the range attained using the fixed effects (0.254, lower bound) and the pooled OLS (0.441, upper bound) estimators. The positive and precisely determined prior investment expenditure coefficient suggests that investment behavior is sluggish and smooth. In addition, firms' new investment expenditure ($I\_new_{i,t}$) goes up following increases in cash holdings, *ROA*, and declines with age.[42] It is interesting to note that Tobin's *Q* exhibits a poorly determined coefficient, while *ROA* has a positive and precisely determined coefficient. The point estimate (0.165) indicates that the elasticity of new investment reacting to a change in *ROA*, evaluated at sample means is 0.173 (the mean of *I_new* is 0.0267 and the mean of *ROA* is 0.028).[43] This suggests that a 10 % increase in the return on assets is associated with a 1.73% rise in investment. The profitability of Chinese firms has therefore a greater impact on their investment than the market valuation on investment. This is consistent with the finding from Wang *et al.* (2009), who show that in less-developed markets like China, higher profits are associated with higher investment.

[42] As mentioned before, since market value might not be able to proxy for firms' real performance in the Chinese context, we replace stock return in our dynamic investment model with return on assets (*ROA*).

[43] The elasticity of *ROA* is defined as the ratio of the change of $I\_new_{i,t}$ for a relative change in *ROA*, and is given by 0.173=0.165*0.028/0.0267.

Although our results based on the three estimators are quantitatively consistent, we use the system GMM estimates to predict expected investment expenditure in new positive NPV projects ($I^e\_new_{i,t}$) and unexpected investment ($I^u\_new_{i,t}$). Hence, the subsequent analysis, based on the partitioning of our observations into groups of over-investing and under-investing firms, is based on the estimates of $I^u\_new_{i,t}$ obtained from the system GMM estimates of Eq. (2.1). Results based on the OLS and fixed effects estimates are also presented for robustness.

2.5.1.2. The effects of free cash flow on (under- and over-) investment

Table 2.5 presents the key results from the estimation of the relationship between under- and over-investment and negative/positive free cash flow obtained using the fixed effects and the pooled OLS estimators (Eq. (2.2)). Columns 1 to 4 are based on estimates of $I^u\_new_{i,t}$, which are obtained from the system GMM estimates of Eq. (2.1). Column 1 and 2 report fixed effects estimates. We observe that the free cash flow coefficients are only significantly positive (at the 1% level) for the under-investing firms with negative free cash flow (Group 1, column 1) and the over-investing firms with positive free cash flow (Group 3, column 2). Similar results are obtained when the pooled OLS estimator is used (columns 3 and 4). The *p*-values associated with the Wald tests show significant differences of the free cash flow coefficients between firms facing negative and positive *FCF*.

[Insert Table 2.5 and Fig. 2.2]

To check robustness, we also run fixed effects and pooled OLS estimates of Eq. (2.2), based on estimates of $I^u\_new_{i,t}$ obtained using the fixed-effects and OLS estimators, respectively.[44] The results, reported in columns 5 to 8, confirm our previous findings. Additionally, Fig. 2.2 compares fitted values of the sensitivities of abnormal investment to free cash flow among the four groups of firms. Positive trends of fitted values only appear for Group 1 firms (under-investing firms with negative *FCF*) and Group 3 firms (over-investing firms with positive *FCF*).[45]

Our findings can be explained considering that firms tend to adjust their investment to changes in *FCF* differently during the four stages outlined in Fig. 2.3 and 2.4. These stages are discussed below.

[Insert Fig. 2.3 and 2.4]

Stage1: When firms' free cash flow becomes negative (*FCF*<0), these firms tend to have poor liquidity positions, and are likely to face more severe financial constraints, which, hence contribute to their under-investment.[46,47] According to the financial constraints (FC) hypothesis, these firms might not be able to access capital markets and have to rely on their

[44] In other words, both Eq. (2.1) and Eq. (2.2) are estimated using the same estimator (either the fixed effects or the pooled OLS estimator).

[45] Similar results were obtained when we estimated a relatively parsimonious version of Eq. (2.1) that just contained lagged investment and Tobin's *Q* to measure optimal investment. The rationale for this test comes from the fact that variables such as *Cash* and *Leverage* may be associated with financing constraints or agency costs (which are not optimal). For brevity, these results are not reported, but are available upon request.

[46] The decrease of free cash flow and liquidity may result in adverse selection and moral hazard problems. This increases the risk of firms going bankrupt and makes it more difficult for lenders to know whether the firms are able to pay their bills. Therefore, lenders might be less willing to lend, and the firms are more likely to face financial constraints.

[47] In this stage, firms experience the highest negative free cash flow and unexpected investment.

free internal finance due to the cost premium to use external finance. Thus, when their free cash flow rises, they tend to increase investment in order to bring it to the desired level and generate sufficient revenue. This leads to the significantly positive responsiveness of abnormal investment to free cash flow shown for firms in Group 1.

Stage2: As firms are able to generate more free cash flow (*FCF*>0), the responsiveness of under-investment to free cash flow starts to shrink as the firms are no longer financially constrained (Group 2). Positive free cash flow can be seen as evidence that the firms are in the right direction and are able to generate enough revenue. Under these circumstances, lenders are willing to provide more loans. The firms are able to close the gap between their existing and desired stock of capital through external funding for investment rather than by heavily relying on internal finance. This explains why firms in Group 2 generally exhibit poorly determined sensitivities of under-investment to *FCF* in Eq. (2.2).

Stage3: During this phase, firms accumulate a substantial amount of free cash flow (*FCF*>0). According to the agency costs (AC) hypothesis, being endowed with substantial amounts of free cash flow, these firms might face rather severe agency costs. Specifically, in order to reduce their personal undiversified risk and increase the scale and scope of operating assets in their hands, managers are more likely to use their excess cash flow to make self-interested and entrenched decisions on low-benefit projects, resulting in over-investment.[48] In other words, when they have more free cash flow at hand, managers tend to increase investment for their personal interest. This explains the positive and significant *FCF* coefficients obtained for Group 3 firms in Eq. (2.2).

[48] In this stage, firms have the highest positive free cash flow and unexpected investment.

Stage 4: Once firms' free cash flow becomes negative, the strength of the relation between over-investment and free cash flow is muted as these firms generally face less agency conflicts and have less cash flow at hand (Group 4). Namely, when firms are subject to cash shortfalls from operating activities, managers might invest their internal finance more rationally in order to bring their free cash flow back to the optimal levels. Another reason can be that when firms are short of free cash flow, they might be forced to access more external finance to enhance liquidity and avoid bankruptcy. Capital markets lead to more frequent monitoring and disciplining of free internal funds for investment, which could explain the poorly determined over-investment *FCF* sensitivities observed for firms in Group 4 in Eq. (2.2).[49]

2.5.2. Robustness tests

2.5.2.1. Using alternative measures of under- and over- investment and free cash flow

To address concerns about the robustness of these primary findings, we first use an alternative approach taken from Bates (2005) to compute under- and over-investment and free cash flow.[50] Following this approach, we compute the abnormal investment for a given firm in a given year ($I^{u'}\_new_{i,t}$) as the difference between the firm's new investment expenditure ($I\_new_{i,t}$) and the industry median level of new investment ($I\_new_{j,t}$) in that year.

[49] This explanation is confirmed by evidence from our summary statistics, which show that firms in Group 4 have the highest leverage.

[50] The expected investment estimated based on the approach from Bates (2005) is an out-of-sample estimate in a group of peer companies, which can tackle the concern that the expected investment based on the model from Richardson (2006) might be endogenous.

This difference ($I^{u'}\_new_{i,t}$) can be either positive or negative, corresponding respectively to over-investment or under-investment. As for free cash flow (*FCF'*), we compute it as the difference between $CF_{AIP,i,t}$ for each firm in each year and the industry median level in that same year ($CF_{AIPj,t}$).[51] Accordingly, *FCF'* can be either positive or negative.

To test for the relationship between (under- or over-) investment and free cash flow, we estimate the following dynamic investment expectation model, where $Dum_{FCF'>0}$ is a dummy equal to 1 if the firm has positive free cash flow (*FCF'*), and 0 otherwise:

$$
\begin{aligned}
I^{u'}\_new_{i,t} = {} & a_0 + (a_1 I^{u'}\_new_{i,t-1}) + a_2 Dum_{FCF'>0} + a_3 FCF'_{i,t} * Dum_{FCF'>0} + a_4 FCF'_{i,t} * (1 - Dum_{FCF'>0}) \\
& + a_5 Cash_{i,t-1} + a_6 Q_{i,t-1} + a_7 Size_{i,t-1} + a_8 Age_{i,t} + a_9 ROA_{i,t-1} + a_{10} Leverage_{i,t-1} \\
& + \sum Year + \sum Industry + \sum Year * Industry + \upsilon_i + \varepsilon_{i,t} \qquad (2.4)
\end{aligned}
$$

In columns 1 and 2 of Table 2.6, we report the fixed effects estimates using a static version of the investment expectation model in Eq. (2.4). The results show that the impact of free cash flow on abnormal investment is only significantly positive for the firms in Group 1 and Group 3. To further check robustness, in columns 3 and 4, we use the system GMM approach to estimate the dynamic version of Eq. (2.4), accounting for the possible endogeneity of the regressors, as well as for firm-specific and time-invariant heterogeneity. Once again the results confirm our hypotheses.[52, 53]

[51] $CF_{AIP,i,t}$ is calculated as ($CFO_{,i,t}$ - $I\_main_{,i,t}$) and represents cash flow generated from assets in place.

[52] Given that sales growth can be used to control for investment opportunities, we replace *Q* by sales growth in Eq. (2.4). The results were robust to making this change. For brevity, these results are not reported, but are available upon request.

[Insert Table 2.6]

2.5.2.2. Using a quantile estimator

To further test the robustness of our results, we estimate Eq. (2.2) using a quantile estimator. Specifically, we run separate regressions for the 25th, 50th and 75th quantiles of the distribution of $I^u\_new_{i,t}$, calculated separately for firms with negative and positive *FCF*. The results, which are reported in columns 1 to 6 of Table 2.7, are in line with our prior findings: we observe a positive and significant relationship between free cash flow and abnormal investment, stronger for the under-investing firms with negative FCF and the over-investing firms with positive *FCF*. The advantage of using this estimator is that it enables us to examine how free cash flow influences firms' abnormal investment for firms with different levels of abnormal investment.

Specifically, for under-investing firms, we observe a decreasing trend of the coefficients associated with $Dum_{FCF<0}$ when we move from the smallest quantile of abnormal investment (0.056) to the largest (0.012). This suggests that firms with free cash flow below their optimal level exhibit higher *FCF* sensitivities when they suffer from more under-investment.

[53] For the dynamic model, the *J*-tests reject the null that the over-identifying restrictions are valid. This could be due to the fact that the presence of intra-cluster correlation or heteroskedasticity causes standard statistics to over-reject the null (Arellano & Bond 1991; Hall & Horowitz 1996; Hoxby & Paserman 1998). However, since the *m(n)* tests do not indicate any serial correlation of the differenced residuals, we believe that our instruments and specification are generally acceptable.

For over-investing firms, we find evidence of an increasing trend for the coefficients associated with $Dum_{FCF>0}$ moving from the smallest quantile of abnormal investment (0.012) to the largest (0.07). This indicates that the more over-investment firms experience, the higher their *FCF* sensitivities. The *p*-values associated with the test for the equality of the free cash flow coefficients between firms with positive and negative *FCF* show that, with one exception (column 2), these differences are significant.[54] This confirms the robustness of our previous results.[55]

[Insert Table 2.7]

Bergstresser (2006) notes that the distinction between under-investment and over-investment based on Richardson (2006)'s approach might have some flaws, as ex-post over-investment (under-investment) may be suspected to follow ex-ante under-investment (over-investment) in a dynamic setting, which causes mean reverting properties. To take this problem into account, as a further robustness test, we define under- and over- investing firms as those firms with two consecutive years of under- and over- investment, respectively. The results, reported in columns 7 and 8 of Table 2.7, are once again consistent with our prior findings: significant differences in free cash flow sensitivities are found between firms facing negative and positive *FCF*, for both under- and over-investing firms.

[54] The insignificance of the Wald statistic for the equality of the coefficients in column 2 may be associated with the fact that neither the *FCF* coefficients are precisely determined.

[55] Additional evidence shows that that the sensitivities of under-investment to free cash flow for the 5th and 95th quantile regressions are 0.109 and 0.006, respectively; while those of over-investment are 0.006 and 0.266, respectively. We also find similar results using the 20th, 40th, 60th and 80th quantile regressions. These results are not reported for brevity, but are available upon request.

In summary, we have followed Richardson (2006) to construct measures of under- and over-investment and free cash flow, and found a positive and significant relationship between investment and free cash flow only for Group 1 firms (under-investing firms with negative *FCF*) and Group 3 firms (over-investing firms with positive *FCF*). We interpreted these findings as evidence in favor of financing constraints (FC) and agency costs (AC) hypotheses, respectively. We next dig deeper into these interpretations by analyzing these sensitivities for firms facing higher/lower degrees of financing constraints and agency costs, measured using a variety of different criteria.

2.5.3. Financial constraints, agency costs and the sensitivity of abnormal investment to *FCF*: further tests

2.5.3.1. The financing constraints (FC) hypothesis of under-investment

We now provide further tests of the financing constraints hypothesis of under-investment. To this end, we focus on under-investing observations.

2.5.3.1.1. Using the KZ and WW indexes to measure financing constraints

To further investigate the role of financial constraints on firms' investment behavior, we use two indexes to measure firm-specific levels of the constraints: the Kaplan and Zingales (*KZ*) index (Lamont *et al.* 2001) and the Whited and Wu (*WW*) index (Whited & Wu 2006).

Focusing on the former, we note that Kaplan & Zingales (1997) classify their sample of firms into five groups on the basis of their degree of financial constraints via qualitative information contained in the firms' annual reports, as well as quantitative information regarding management's statements on liquidity. Motivated by Kaplan & Zingales (1997), Lamont *et al.* (2001) perform an ordered Logit estimation of the categories of constraints on five financial ratios using the original *KZ* sample: cash flow (CF_t, net income + depreciation); dividends (DIV_t); cash and cash equivalents ($Cash_t$) deflated by beginning of year capital (K_{t-1}); Tobin's Q (Q_t, market value of equity +market value of net debt)/(total assets-net intangible assets)); and debt ($Debt_t$, the sum of the short-term and long-term debt) to total capital (TK_t, sum of debt and equity). We use the estimated coefficients that they obtain to construct the Kaplan and Zingales (*KZ*) index of financial constraints in the following way:

$$\begin{aligned} KZ = &-1.002 * CF_t / K_{t-1} + 0.283 * Q_t + 3.139 * Debt_t / TK_t \\ &-39.368 * \left(DIV_t / K_{t-1}\right) - 1.315 * Cash_t / K_{t-1} \end{aligned} \qquad (2.5)$$

A firm with a higher value of the *KZ* index can be intended to be more financially constrained.

An alternative index of constraints (the *WW* index), constructed by Whited and Wu (2006), is also used to measure for financial constraints in our study. Their index is constructed using the generalized method of moments (GMM) estimation of a structural investment model on COMPUSTAT quarterly data. Specifically, based on the Euler equation incorporating the shadow cost of scarce external finance, the *WW* index is a linear function of six observable firm characteristics: cash flow [CF_t/BA_{t-1}, (net income + depreciation)/beginning-of-year book assets]; a dividend indicator ($DIVPOS_t$, indicating positive dividends); long-term debt ($TLTD_t/CA_{t-1}$, long-term debt to total current assets); Tobin's Q (Q_t); size ($LNBA_t$, natural log of the book value of assets); firm real sales growth (SGR_t); and industry sales growth (ISG_t). We compute the *WW* index as follows, using the estimated coefficients from their specification:

$$\begin{aligned} WW = &-0.091 * CF_t / BA_{t-1} - 0.062 * DIVPOS_t + 0.021 * TLTD_t / CA_{t-1} \\ &-0.044 * LNTA_t - 0.035 * SG_t + 0.102 * ISG_t \end{aligned} \qquad (2.6)$$

Once again, a higher value of the *WW* index is representative of a higher level of financial constraints.

We then investigate whether the degree of financial constraints faced by firms matters for the free cash flow sensitivity of under- and over-investment. To this end, as in Almeida *et al.* (2004), we classify firms as facing relatively low, medium and high financial constraints in a given year if their *KZ* or *WW* indices in that year fall respectively in the bottom three, the middle four, and the top three deciles of the distribution of the indexes of all firms operating in the same industry they belong to.[56] In this way, we allow firms in our sample to transit among financial constraint categories each year. As a robustness check, we also use a 50% threshold.

Table 2.8 presents summary statistics of the two firm-specific indexes of financing constraints across the four groups of firms based on their abnormal investments and free cash

[56] It is worth mentioning that we do not mean that firms ranked in the top three deciles of the distribution of the *KZ* and *WW* indices are absolutely financially constrained, while firms in the bottom three deciles are absolutely financially unconstrained. Instead, we argue that those firms in the top three deciles are likely to face more severe financing constraints than those in the bottom three deciles.

flow. The higher these indexes, the higher the degree of financing constraints faced by the firms. We conduct statistical tests for equality of both sample means (t-test) and sample medians (Wilcoxon rank-sum test) across groups of firms.

[Insert Table 2.8]

According to the financial constraints (FC) hypothesis, firms are more likely to under-invest if they face a higher degree of financing constraints. To test this hypothesis, we compare the two indexes across under-investing firms in Group 1 and Group 2. We find that, regardless of whether we use the mean or the median, the level of financial constraints (measured using both the *KZ* and *WW* indices) for Group 1 (under-investing firms with negative *FCF*) is larger than that for Group 2 (under-investing firms with positive *FCF*). As can be seen from the *p*-values of both tests, the differences in the means and the median of the indicators are generally significant at the 5% level. Consistent with our Hypotheses 1, this suggests that differences in the financial constraints faced by firms are a key factor in distinguishing between the firms in Group 1 and Group 2. Thus, as discussed in the former section, financial constraints may contribute to the higher responsiveness of under-investment to negative free cash flow for the firms in Group 1.

Table 2.9 presents fixed effects estimates of Eq. (2.3), which intends to test the effects of free cash flow on under-investment for firms characterized by different degrees of financial constraints, calculated using the *KZ* index (columns 1 and 2) and the *WW* index (columns 3 and 4). In columns 1 and 3, under-investing firms are partitioned into three categories, based on terciles of the two indices, while in columns 2 and 4, they are partitioned into two categories, based on the median of the two indices.

[Insert Table 2.9]

Columns 1 and 3 reveal that for under-investing firms, the higher the *KZ* index or the *WW* index, the larger the sensitivities of investment to free cash flow. This suggests that sensitivities of abnormal investment to free cash flow tend to increase monotonically with the degree of external financial constraints faced by firms. Similar results are found in columns 2 and 4 when we use a 50% threshold. The *p*-values of the Wald tests reject the equality of the coefficients of free cash flow between more and less financially constrained groups. This supports our Hypotheses 1, according to which the more financial constraints under-investing firms face, the higher their responsiveness of abnormal investment to free cash flow.

2.5.3.1.2. Can conventional variables for financial constraints be used to explain the financing constraints (FC) hypothesis of under-investment?

In this section, we use different variables based on the *a priori* likelihood of being financially constrained to test our Hypothesis 1. If our hypothesis holds, we should expect a stronger relationship between under-investment and free cash flow for firms which are more likely to face financial constraints. Specifically, we focus on the *a priori* likelihood of being financially constrained based on firms' size (total real assets and number of employees) and dividend payout (ratio and indicator), which are commonly used in the literature to partition firms into financially constrained and unconstrained. Focusing on firm size, small firms might not have a sufficiently long track record, leading to increased asymmetric information. In addition, small firms are typically characterized by high idiosyncratic risk and high bankruptcy costs, which might exclude them from credit markets, or make their access to external finance more costly (Gertler & Gilchrist 1994; Beck *et al.* 2005; Clementi & Hopenhayn 2006; Guariglia 2008).

We measure firms' size by their total real assets and number of employees. Specifically, we define as small in a given year ($Small_{i,t}$=1) those firms whose total real assets or number of employees fall in the bottom three deciles of the distribution of the assets and number of employees of all firms operating in the same industry as that firms in that given year. Similarly, we define as medium-sized firm-years ($Medium_{i,t}$=1) those observations falling in the middle four deciles of the distribution, and as large firm-years ($Large_{i,t}$=1), those with total real assets or number of employees in the top three deciles of the distribution.

Columns 1 (where size is measured using total assets) and 2 (where the number of employees is used as a proxy for size) of Table 2.10 show a decreasing clear trend for the coefficients of free cash flow, moving from small, to medium sized, to large firms. The Wald tests show these differences in the *FCF* coefficients between large and small groups are significant at the 1% level. Hence, using firm size as a criterion of financial constraints also supports our Hypothesis 1.

[Insert Table 2.10]

Focusing on dividends, prior literature shows that low-dividend payout is also likely to reflect tighter financial constraints (Fazzari *et al.* 1988; Kaplan & Zingales 1997; Cleary 1999; Almeida *et al.* 2004; Almeida & Campello 2007). When firms are more susceptible to capital market imperfections, they are likely to cut or reduce dividend payout. Since low-dividend firms cannot generate enough internal funds or obtain enough external funds for their desired investments, they have to retain all low-cost internal finance, at the expense of paying dividends. We rank firms based on their dividend payout ratio, which is measured as the ratio of cash dividends to net income.[57] Low-dividend firm-years ($Low\_Div_{i,t}$ =1) are those, whose payout ratio in a given year falls in the bottom three deciles of the distribution of the corresponding ratio of all firms operating in the same industry they belong to in that year. Similarly, medium-dividend firm-years ($Medium\_Div_{i,t}$ =1) are those whose dividends fall in the middle four deciles of the distribution, and high-dividend firm-years ($High\_Div_{i,t}$ =1), those in the top three deciles of the distribution. In addition, we also proxy whether a firm has a propensity of being liquidity constrained in a given year according to its dividend payout status with a dummy variable ($Div\_yes_{i,t}$), which equals 1 if the firm has made any cash dividend payment in the year, and 0, otherwise. In all cases, we interact free cash flow with these dummies and examine the coefficients on the interaction terms in our abnormal investment regressions.

Columns 3 and 4 of Table 2.10 report the estimates after we categorize firm-years respectively based on their dividend payout ratio and dividend payout policy. The FCF coefficients for the under-investing firm-years who have low dividend payout ratio or do not pay any dividends are larger than those of observations with high dividend payout ratio or that pay dividends. This confirms once again our prediction that the sensitivity of investment to free cash flow increases in the degree of financial constraints encountered by under-investing firms. The differences between the coefficients for firms with high dividend payout ratio (paying dividends) and those with low dividend payout ratio (not paying dividends) are significant at the 1% level.

[57] The reason why we only consider cash dividends is that paying stock dividends in China may reflect firms' financial constraints.

In summary, the results we obtained using conventional variables as proxies for financial constraints are highly consistent with the previous results and our Hypothesis 1, which suggests that for under-investing firms, the sensitivities of investment to free cash flow increase with the firm's degree of financial constraints.

2.5.3.2. The agency costs (AC) hypothesis of over-investment

We now focus on testing the agency costs (AC) hypothesis of over-investment. To this end, we focus on over-investing observations.

2.5.3.2.1. Using the ratio of operating expenses to total assets and the ratio of other receivables to total assets to proxy for agency costs

Following the literature (Ang *et al.* 2000; Singh & Davidson III 2003; Henry 2010), we first use the ratio of operating expenses to total assets (*AC1*) to proxy for agency costs. This ratio measures the efficiency with which the firm's management controls operating costs, which include direct pay to the managers as well as perquisite consumption. This criterion focuses on the principal-agent problems, namely the conflicts between firm managers and shareholders. *AC1* can be seen as a measure of the extent to which firms are susceptible to agency problems. Generally, relatively higher ratios are associated with higher managerial discretion as well as agency misalignment.

Our second measure of agency costs emphasizes the conflict between controlling shareholder and minority investors, which is referred to as "tunneling". It has been argued that tunneling is highly widespread in emerging markets like China since most listed companies tend to have a concentrated ownership structure. In addition, corporate governance mechanisms and the legal system in China offer few options to protect minority shareholders from controlling shareholders (Liu & Lu 2007; Jiang *et al.* 2010). Following Jiang *et al.* (2010), we use the ratio of other receivables to total assets (*AC2*) to measure how likely controlling shareholders are of expropriating minority investors[58]. A higher value of *AC2* implies therefore a higher level of agency costs. Average other receivables in our sample constitute about 5% of total assets, and the maximum value of the ratio is around 60%, suggesting a high level of agency costs.

In order to investigate the extent to which agency costs matter for the sensitivities of under- or over- investment to free cash flow, we partition firms each year on the basis of the two agency costs ratios (*AC1* and *AC2*). Specifically, we classify a firm as facing relatively low, medium or high agency costs in a given year if its ratios in that year fall respectively in the bottom three, the medium four, or the top three deciles of the corresponding ratios of all firms operating in the same industry it belongs to. As an additional check, we also use a 50% threshold.

Table 2.11 presents summary statistics of two firm-specific indicators of agency costs after we categorize firms into the four groups based on their abnormal investments and free cash flow. The ratio of operating expenses to total assets (*AC1*) and the ratio of other

[58] According to Jiang *et al.* (2010), "during 1996-2006, tens of billions in RMB were siphoned [through inter-corporate loans] from hundreds of Chinese listed firms by controlling shareholders" (p.2). The authors explain that these inter-corporate loans are typically reported as "other receivables".

receivable scaled by total assets (*AC2*) are used to proxy for the two types of agency problems that firms face, which are in turn the conflicts between firm managers and shareholders and those between controlling shareholder and minority investors. As in Table 2.8, we conduct statistical tests for the equality of both sample means (t-test) and sample medians (the Wilcoxon rank-sum test).

[Insert Table 2.11]

Comparing Group 3 (over-investing firms with positive *FCF*) with Group 4 (over-investing firms with negative *FCF*), we observe that the level of agency costs (*AC1* or *AC2*) of the former group is larger than that of the latter group. All statistical tests indicate that the differences in the means and medians between the two groups are significant at the 1% level. These statistics are in line with the agency costs (AC) hypothesis, and hence with our Hypothesis 2, according to which firms endowed with excess free cash flow are likely to overinvest. The summary statistics demonstrate that the level of agency costs is a crucial factor in differentiating between the firms in Group 3 and those in Group 4.

To explore this issue further, Table 2.12 presents the fixed effects estimates of Eq. (2.3), aimed at testing the effects of changes in free cash flow on over-investment for firms characterized by different levels of agency costs. In columns 1 and 3, a firm is assumed to face more (less) agency problems in a given year if its *AC1* or *AC2* index lies in the top (bottom) three deciles of the distribution of the corresponding index for all firms belonging to its same industry in that year. In columns 2 and 4, we consider a firm to face more (less) agency costs if its *AC1* or *AC2* exceed (are below) the median value within its industry in a given year.

[Insert Table 2.12]

We observe that, with only one exception in column 3, the sensitivity of investment to free cash flow tends to increase monotonically with the degree of agency costs faced by firms.[59] The Wald tests generally reject the equality of the coefficients of free cash flow between high-agency-cost and low-agency-cost firms. This provides support for our Hypothesis 2, according to which for over-investing firms, higher agency costs are associated with a higher responsiveness of abnormal investment to free cash flow.

2.5.3.2.2. Can ownership structure be used to explain the agency costs (AC) hypothesis of over-investment?

To better understand the extent to which agency costs matter for the sensitivity of abnormal investment to free cash flow, in this section, we partition firms on the basis of their ownership structure. Following the literature, and especially Ang *et al.* (2000) and Jiang *et al.* (2010), we construct a series of ownership structure variables to proxy for the agency costs faced by firms. Our first measure is motivated by international evidence that agency costs may arise when the managerial interests are not in line with those of the firm's shareholders. Managerial ownership ($Shareholding\_CEO_{i,t}$) tends to relieve principal-agent problems between (outside) shareholders and managers. Thus, agency costs (arising from the conflict of interest between managers and shareholders) should be lower at firms managed by a

[59] Even in column 6, though, it is the firms characterized by high agency costs which exhibit the highest sensitivity of over-investment to free cash flow. Firms with low or medium agency costs display insignificant *FCF* coefficients.

shareholder.[60] In order to test whether this is the case, we construct a dummy variable $Insider_{i,t}$ ($Outsider_{i,t}$), which is equal to one if a firm is managed by a shareholder (outsider), and 0 otherwise. Specifically, if the top executives including CEO are holding any of their own shares, they will be considered as insiders. We then interact free cash flow with the $Insider_{i,t}$ and $Outsider_{i,t}$ dummies and examine the differences in the coefficients associated with the two interaction terms in our abnormal investment regressions.

The second measure focuses on the percentage of shares controlled by the largest shareholder ($Blockholder_{i,t}$). It has been argued that concentrated ownership is positively associated with firm's agency costs. As mentioned before, agency costs, arising from the conflict of interest between controlling shareholder and minority investors, may arise when controlling shareholder extract private benefits from minority shareholders (which is referred to as "tunneling"). The ability of the primary owner to expropriate minority investors is expected to increase with his/her ownership. When the interests of controlling shareholders are not aligned with those of other investors, there is in fact good reason to believe that the former may use their power to influence the firm's investment decisions to promote their interests at the expense of minority shareholders. Therefore, a high concentration of ownership at the firm level may indicates a strong incentive to tunnel and a high level of agency costs (Liu & Lu 2007). However, primary owners in China, often have rather large power to control the company's operation even by only holding a relatively low stake of

[60] This can be explained considering that inside managers may have more closely aligned interests with the firm's shareholders. Jensen and Meckling (1976) propose a hypothesis of convergence of interest between shareholders and managers and improvement of corporate performance as the managerial ownership increases. Kren and Kerr (1997), Ang *et al.* (2000), Singh and Davidson (2003), and McKnight and Weir (2009) also provide support for the argument that managerial ownership reduces agency costs.

shares, through pyramid structures and cross-holding among firms. When the primary owner's controlling right is greater than his/her ownership right, he/she tends to derive more benefits from tunneling activities. Thus, a lower incentive to tunnel, and lower agency costs are expected when the highest percentage of shares is held by the primary owner, with lower separation of voting rights and cash-flow rights (Jiang *et al.* 2010). Additionally, investors with a large ownership stake generally have a strong interest in the firm's profit maximization and have a higher incentive to oversee or monitor the manger. Hence, agency costs intended as the conflict between firm managers and shareholders, tend to decline with the ownership stake of controlling shareholders (Jensen & Meckling 1976; Ang *et al.* 2000). The ownership stake of the controlling shareholder has therefore an ambiguous effect on the overall agency costs faced by the firm.

Our next measure of agency costs is constructed to capture the intensity of competition between controlling shareholder. A distinct characteristic of Chinese listed firms is that the largest shareholder has dominant control over the firm, while the rest of largest owners have relatively small ownership. The risk that the controlling shareholder might expropriate minority investors or tunnel is likely to decrease when large shareholders other than the largest one are able to oversee or put pressure on the largest shareholder. This form of coalition or challenge can help to overcome the agency problems arising from tunneling. Additionally, large shareholders also have incentives to monitor the management, which reduces the principal-agent problems. In other words, these large shareholders might be able to fight for corporate control if the management is under-performing. Following (Liu & Lu 2007), we construct a Herfindahl-type index $Share2\_10_{i,t}$ $(Concentration_{i,t})$, which is the sum of squares of shareholding percentage of the second to the tenth largest shareholders. This index measures corporate control by the concentration of shares in the hands of top 10 shareholders excluding the largest shareholder.[61]

For the last two measures of firms' ownership structure, we construct the dummies $Low\_share_{i,t}$, $Medium\_share_{i,t}$, and $High\_share_{i,t}$, which are in turn equal to 1 if $Blockholder_{i,t}$ or $Share2\_10_{i,t}$ of firm *i* in year *t* lies respectively in the bottom three deciles, the middle four deciles, and the top three deciles of the distribution of the corresponding ratios of all firms operating in the same industry as firm *i* in year *t*, and 0 otherwise. We then interact these dummies with free cash flow and examine the coefficients of the interaction terms in our abnormal investment regressions.

The results are reported in Table 2.13. In column 1, we observe that a firm managed by an outsider has a significantly higher sensitivity of over-investment to free cash flow. This can be explained considering that outside managers may not have closely aligned interests with the firm's shareholders. Furthermore, managerial ownership is negatively associated with firm's principal-agent problems.[62] This is in line with our expectation that, for over-investing firms, agency problems between entrenched managers and shareholder contribute to higher sensitivities of over-investment to free cash flow.

[61] We find similar results using alternative indexes, such as, for instance, the sum of the shareholding percentage of the top 10 shareholders excluding the largest shareholder. Our results were also robust to using the ratio of the sum of the shareholding percentages from the second largest to the tenth largest shareholders to the shareholding percentage of the largest shareholder. The latter index measures the likelihood of the largest shareholder being challenged by other large shareholders. These results are not reported in this chapter for brevity.

[62] In our sample, there is separation between management and ownership. Only 33.6% of firm-years have managers who are also shareholders in their companies. It is worth noting that in our sample, managers only hold on average around 0.27% of their own shares. Relative low ownership stakes prevent managers from pursuing their own interests at the expense of firms, as they are supervised and controlled by the board, as well as by capital markets.

[Insert Table 2.13]

In column 2, we conduct a test using the shareholding from the largest shareholder (*Blockhoder)* as a proxy for agency costs. Observations are divided into large (top three deciles), medium (medium four deciles) and low (bottom three deciles) shareholding. Interestingly, we find that the coefficient associated with free cash flow is the largest for the medium shareholding category. This suggests that, the sensitivity of over-investment to *FCF* initially increases with the shares held by the largest shareholder, then decreases.[63] These differences between categories can be explained in part considering that, as previously discussed, there are arguments both in favor and against a positive relationship between controlling share ownership and agency problems. This finding is also in line with Jiang *et al.* (2010), according to which agency costs, indicated by tunneling (*AC2*) are highest when the largest shareholder owns a medium percentage (30%) of the firm's shares.

Lastly, we use ownership concentration (the sum of squares of shareholding percentage of top 10 shareholders excluding the largest shareholder, *Share2_10)* to test for the intensity of competition for controlling shareholder. Once again, observations are divided on the basis of deciles of this variable. Column 3 shows that smaller (around 0.03) and insignificant free cash flow coefficients exist for over-investing firms with medium or high *Share2_10,* compared with larger (0.13) and significant (at the 1%) coefficients for those with low *Share2_10.* These findings confirm that in countries without good shareholder protection such as China, other large shareholders, as potentials contestants, are able to effectively monitor and restrain the largest shareholder and managers, reducing in this way

[63] It should be noted, however, that *p*-values associated with the Wald tests cannot significantly reject the equality of the impact of free cash flow on investment between firms characterized by different percentages of shares owned by the largest shareholders.

the firm's agency costs, intended in terms of the principal-agent problems, as well as the expropriation of minority investors.

In summary, these findings are strongly aligned with the previous results and our Hypothesis 2: The sensitivity of abnormal investment to free cash flow rises with the degree of agency costs faced by over-investing firms.

2.5.4. Exploring firms' "ST" status and M&A behavior

In this section, we attempt to provide some further in-depth evidence on whether or not our financial constraints (FC) and agency costs (AC) hypotheses can be confirmed. We do this focusing on the "Special Treatment" ("ST") status and firms' expansion behavior through M&As.

2.5.4.1. "ST" status

Given the unique Chinese context, we use a Chinese-specific indicator called "Special Treatment (ST)", to study the impact of de-listing risks on the degrees of financial constraints and agency problems faced by firms. Since 1998, China's Stock exchanges implemented a "ST" (special statement) regulation in order to improve the corporate governance of listed firms, by increasing market transparency and warning and protecting investors, especially the small and medium-sized ones. When a firm has two consecutive annual losses, it is labeled as a "ST" firm and needs an internal audit report. Moreover, during the "ST" period, its stocks are constrained to a 5% daily up and down limit.[64] According to Jian & Wong (2010), a firm which faces high agency problems, and is particularly involved in tunneling activities is very likely to acquire "ST" status in the future. Thus, "ST" status can be regarded as a measure of agency costs. Moreover, given that "ST" firms are under pressure of being de-listed from the stock exchanges, "ST" status can also be linked to being financially constrained. We generate a dummy variable ST_i, which is equal to one ($ST_i=1$) if a firm has been issued a special treatment or a de-listing risk warning, and 0 otherwise. $Pre\_ST_{i,t}$ ($Post\_ST_{i,t}$) is a dummy variable for the pre- (post-) period of "ST", which equals one in the year before (after) a firm is labeled as a "ST", and zero otherwise. We then interact free cash flow with these dummies and examine the behavior of the coefficients associated with the interaction terms in our abnormal investment regressions.

Estimates of our abnormal investment equations differentiating firms into "ST" and "non-ST" groups are presented in columns 1 and 2 of Table 2.14. We observe that that "ST" firms exhibit higher sensitivities of abnormal investment to free cash flow than their "non_ST" counterparts. This finding applies both to under- and over- investing firms. In both cases, the Wald tests reject the equality of the coefficients between "ST" and "non_ST" firms. The likely explanation for this result is that "ST" firms generally face both higher financial constrained and agency problems.

[Insert Table 2.14]

Columns 3 and 4 of Table 2.14 further differentiate between the pre- and post- periods of "ST". Interestingly, we observe that firms in the post-ST period display a higher degree of

[64] See Appendix 2.3 for more details.

financial constraints and lower agency costs compared to those in the pre-ST period.[65] These findings suggest that firms that have poor corporate governance, indicated by most severe agency problems, are more likely to acquire "ST" status in the future. However, after firms are designated "ST", they are edgy to restore profitability in order to avoid being de-listed. As argued in Liu & Lu (2007), given the strong incentive to maintain the listed status, incumbent controlling shareholders, under the pressure from regulators and the markets tend to restructure the firm's business as well as its corporate governance. However, if the incumbent controlling shareholder is not able to force the firm's performance to turn around, under the encouragement from the government, a fierce contest over corporate control will be triggered. Typically, other large or potential shareholders may wish to take control of the firms by means of mergers and acquisitions or offering a better restructuring process. Consequently, the majority of "ST" firms have their controlling shareholders changed one or two years after being designated "ST". Yet, since these "ST" firms are rarely de-listed or go into actual bankruptcy, it is believed that improvements in firms' performance as well as governance (such as discipline of firm managers or protection for minority shareholders) are triggered after labeling a firm as "ST".

Focusing on under-investment, "ST" firms are generally relatively more financially constrained than "non-ST" firms both before and after the "ST" warning is issued. The "ST" announcement may play a signaling role to the markets and investors, and consequently, "ST" firms are likely to face more pressure from credit markets. This may explain why these firms display higher sensitivities of under-investment to free cash flow not only before, but also after they are designated "ST".

[65] *P*-values associated with the Wald tests only reject the equality of the impact of free cash flow on investment between firms in the pre- and post- ST periods for over-investing firms.

In summary, our results indicate that, on the one hand, acquiring "ST" status is associated with higher agency problems. Consequently, in order to avoid being de-listed from the exchanges, "ST" firms have strong incentives to improve their governance and restore profitability. On the other hand, our results also suggest that "ST" firms generally display financial difficulties both before and after the warning is issued.

2.5.4.2. Mergers & Acquisitions (M&As)

Next, we consider firms' M&A activity. Following the spirit of Jensen (1986), Harford (1999), and Malmendier & Tate (2008), conducting mergers can be seen as a signal for the existence of agency costs, as it may follow from managerial entrenchment or overconfidence. The intuition is straightforward: acquisitions are used by empire-building or overconfident CEOs or controlling shareholders to spend abundant internal resources for their own benefit. We define $Bidder_{i,t}$ as a dummy variable that takes the value of 1 if a firm becomes a bidder in the next fiscal year, and 0 otherwise. Similarly, $Bidder\_con_{i,t}$ is a dummy variable for frequent bidding firms, which takes the value of 1 if firms have more than one bidding in two consecutive years, and 0 otherwise. Once again, we interact free cash flow with these dummies and examine the coefficients on the interaction terms in our abnormal investment regressions.

Column 6 of Table 2.14 presents the results differentiating over-investing firms which become bidders in the next fiscal year and those who do not. As expected, the *FCF* coefficients are higher for the former. However, the difference in the sensitivities between the two groups is not statistically significant. As a further check, we define as agency problematic or aggressive those frequent acquirers, i.e. those firms that have more than one bidding activity in two consecutive years. In column 8, those frequent bidding firms have much higher coefficient (0.104) associated with free cash flow than other firms (0.046). The Wald test here rejects the equality of the estimates in the two sub-groups. In brief, our results suggest that frequent bidding increases the likelihood of agency problems faced by firms. Alternatively, the finding may suggest that firms with higher agency costs are more likely to engage in multiple acquisitions. Alternatively, the finding may suggest that firms with higher agency costs are more likely to engage in multiple acquisitions. This is consistent with Billett & Qian (2008), who show that frequent acquisitions are value-destructive. A possible explanation may be that due to hubris or entrenchment, managers or controlling shareholders rely on multiple acquisition transactions to pursue private benefits.

Turning to the under-investing firms, we observe similar sensitivities of investment to free cash flow between bidding and non-bidding firms: participating in M&As does not seem to affect firms' financial constraints status.[66]

2.5.5. Exploring other dimensions of firm heterogeneity

We next explore whether financial constraints and agency problems have different effects across firms which differ according to state/non-state ownership, location, and exporting status.

[66] Our results indicate that the difference in sensitivities of abnormal investment to free cash flow between bidding and non-bidding firms is restricted to firms with over-investment, which are more likely to experience higher agency problems, but not under-investing firms.

2.5.5.1. Estimating Eq. (2.3) differentiating firms into state/non-state owned

The literature finds substantial evidence of wide imbalances across various ownership categories in China (Allen *et al.* 2005). For example, firms from the state sector obtain the majority of domestic bank credit, while it is difficult for non-state firms to access external funding (Allen *et al.* 2005). However, firms from the non-state sectors have been expanding much faster than those from other sectors and contribute most to China's growth (Allen *et al.* 2007). Therefore, the variance in ownership structures plays a crucial role in determining the extent to which Chinese firms face financial constraints and agency problems (Ding *et al.* 2010; Poncet *et al.* 2010; Guariglia *et al.* 2011; Huang *et al.* 2011).

In order to evaluate the sensitivities of under- and over-investment to free cash flow for different types of Chinese firms, we initially distinguish the firms into two ownership categories according to their ultimate controlling shareholder: the SOE sector and the non-SOE sector. The former group includes all companies held by state-controlled entities, which constitute the majority of listed firms.[67] The non-state sector has non-state entities as controlling shareholder. Among these, there are six types of ownership groups: domestic private, foreign, collective, employees' union, non-profit organizations or institutes, and others.[68]

Columns 1 and 2 of Table 2.15 present estimates of Eq. (2.3) for sub-samples split based on ownership. Interestingly, for the under-investing group, there seem to be marginally significant differences in *FCF* sensitivities across firms owned by different agents: the

[67] SOEs constitute the majority of our sample firms (72.2%). This is why we only consider two ownership categories in our study, grouping all non-stated firms into one sector.

[68] Within the non-SOE sector, domestic private companies constitute 84% of the sample firms.

sensitivities of under-investment to free cash flow for state-owned enterprises are lower than those for non-SOEs (column 1). This suggests that state-controlled enterprises face less financial constraints compared with non-state-controlled firms. This result may be explained considering that SOEs have a duty to maintain social stability and achieve other political objectives. For this reason, they find it easier to obtain credit from state-owned banks (Boyreau-Debray 2003; Bai *et al.* 2006). This is in line with Allen *et al*. (2007), who point out that state-controlled firms take up the majority of loans, and with Guariglia *et al.* (2011), who show that the growth of SOEs is not affected by the availability of internal funds.

[Insert Table 2.15]

We also observe a positive *FCF* coefficient for over-investing state-controlled firms, but not for their non-state-controlled counterparts (column 2). This suggests that only listed firms, whose controlling shareholders are state entities, are likely to invest above their optimal levels and that state-controlled firms face higher agency problems than non-state-controlled firms. This finding is consistent with Firth *et al.* (2012), who show that government controlled listed firms tend to over-invest compared to privately controlled listed firms. Managers of SOEs are in fact more likely to undertake suboptimal projects in order to pursue private benefits or better career opportunities. The presence of soft budget constraints may also enhance the agency problems faced by Chinese SOEs (Chow *et al.* 2010). As they can always be bailed out by the government, these firms tend in fact to engage in excessive investment. Moreover, due to the fact that most of listed firms in China are carve-outs or spin-offs from former SOEs, the state shareholders have higher ownership stakes (control rights) compared to non-SOEs, thus they are likely to extract resources from these listed firms. Another possible explanation might be due to the fact firms with higher state ownership might have political and social objectives, which might not coincide with shareholders' interests. Particularly, the managers of SOEs, who are selected by the government, may have to sacrifice efficiency by being asked to increase employment or offer more social welfare to their employees, so as to avoid social instability, or to meet output growth targets to achieve political objectives (Shleifer & Vishny 1994; Qian 1996; Allen *et al.* 2005; Wei *et al.* 2005; Chen *et al.* 2011).[69]

In columns 3 and 5, we separate state-controlled enterprises into those controlled by local governments (e.g. town village enterprises) and those controlled by central agencies, using a relative small ownership sub-sample from 2003 to 2010. Recent studies show that a distinction should be made among SOEs affiliated with the central (SOECGs) or local (SOELGs) government (Chen *et al.* 2009a; Cheung *et al.* 2010; Jiang *et al.* 2010). We find that both SOEs affiliated with the central and local governments display lower sensitivities of under-investment to free cash flow compared those non-SOEs, suggesting that it is much easier for SOEs to access credit.

However, SOEs affiliated with the local governments display the highest sensitivity of over-investment to free cash flow. On the contrary, the sensitivity of over-investment to free cash flow for SOEs affiliated with the central government is poorly determined. The differences in the coefficients between different ownership groups are statistically significant. There are four possible explanations for the higher agency problems faced by firms affiliated with local governments or state asset management bureaus at the local government level. First, despite the fact that local governments manage state assets according to national law

[69] Political costs which come from political interference can be regarded as a form of agency costs as politicians can be seen as one of most important agents in the unique Chinese context.

and regulations, they have more freedom to make their own influencing policies. Second, it is more difficult for the press or central and judicial authorities to apply or enforce laws and regulations further away from the center of power, and hence local governments often act independently of the central government and are subject to higher corruption, and less likely of be prosecuted for misappropriation of state funds. Third, local governments have higher incentives to intervene and expand the firms that they control due to higher soft budget constraints: when they incur losses, additional financial assistance, cuts in taxes, and other compensations are generally offered by local governments to maintain their listing. Finally, SOELGs tend to have higher agency problems due to weaker supervision and management (Chen *et al.* 2009a; Cheung *et al.* 2010).

By contrast, SOECGs are controlled by the central government under the State-owned Assets Supervision and Administration Commission (SASAC). These companies are usually large and nation-wide, and operate in strategically vital sectors such as banking, energy, utilities, transportation etc., which matter for national economic development and social stability. Under the well-established policy of "grasp the large and let go of the small" (*Zhua Da Fang Xiao),* there is more strict supervision and monitoring for these firms from departments under the central government including the National Audit Office (NAO). Furthermore, the board of directors or general managers of firms controlled by the central government often have higher qualifications and abilities. They have greater incentives to perform well in their jobs to prevent them from endangering their chances of promotion to higher government echelons. This is indicated by the fact that many of these chairmen become vice ministers of the state. Therefore, central-government-controlled enterprises may face lower agency costs.

Our findings are in line with previous research by Chen *et al*. (2009a), according to which, SOELGs are less effective as controlling shareholders of listed firms than SOECGs due to the different objectives and degrees of monitoring they face. Chen *et al.* (2009a) also find that SOECGs actually perform better than listed non-SOEs. Our results are also consistent with Cheung *et al.* (2010), who point out that entities of local government are subject to expropriations through related party transactions, while the presence of central government ownership benefits shareholders; and with Jiang *et al.* (2010), who show that SOEs controlled by local governments are more likely to have tunneling problems than SOEs controlled by the central government.

2.5.5.2. Estimating Eq. (2.3) for different locations

Next, as in Guariglia *et al.* (2011), we divide our sample into two sub-groups: firms operating inside and outside the coastal regions.[70] The rationale for this classification is that China not only has a very large territory, but its regional economy is also less than fully integrated. Geographical divergence in China may have significant implications on regional resource allocations and economic development.[71] Thus, it is expected that regional variation does matter for firms' investment behavior as well as financial conditions and agency costs.

[70] Firms outside the coastal regions include the ones operating in central or western areas. See Appendix 2.1 for more details.

[71] During the transition period from a planned to an open market economy, the coastal regions benefited from the open-door policy and the coastal development strategy, which notably increased inter-regional imbalances. In order to reduce the imbalances, after the late 1990s, regional development policies such as "the western development strategy", "the northeast revival strategy", and "the rise of central China strategy" have been implemented by the Chinese government in order to speed up the development of central and western regions

Estimates for sub-samples split on the basis of location are presented in columns 5 and 6 of Table 2.15. We observe that the firms located in coastal regions have lower abnormal investment to free cash flow sensitivities compared with those in non-coastal regions. However, the differences in the sensitivities between the two groups are not statistically significant both for under-investing and over-investing firms. Our results are different from (Guariglia *et al.* 2011) who concludes that firms operating in coastal regions face higher financial constraints than those operating in central and western regions. The difference in findings may be due to our focus on Chinese listed firms rather than relative small non-listed firms operating in the manufacturing and mining sectors, or may be due to more recent data used in our research. Although firms in central and western areas may be favored by regional development policies, coastal regions have a more developed financial system. Our evidence shows that China may have evolved toward a more integrated economy.

2.5.5.3. Estimating Eq. (2.3) for exporters and non-exporters

We next split the firm-years into sub-samples based on whether or not they participate in export markets. As discussed in Campa & Shaver (2002b) and Greenaway *et al.* (2007), global engagement such as exporting generally improves firms' financial conditions.

The results, presented in column 7 of Table 2.15, show that the effect of free cash flow on under-investment is significantly smaller for exporters compared with non-exporters.

and reduce regional imbalance. Through such regional coordination, a substantial amount of state funds has been invested in these areas especially in infrastructure, energy, and natural resources projects (Chen 2008).

This finding is in line with Campa & Shaver (2002b), Greenaway *et al.* (2007), and Guariglia & Mateut (2006), suggesting that exporting relaxes the financial constraints faced by firms. There are several possible explanations for this finding. First, it is easier for exporters to access international finance, which allows them to diversify their financial resources and ease liquidity stress. Second, exporting can reduce the effects of negative domestic demand shocks.[72] Third, exporting can help firms relieve their financial constraints by stabilizing their sales, smoothing their income, and generating more internal funds. Fourth, exporters are more likely to be favored by Chinese authorities, and to benefit from policies such as export tax rebates (Ganesh-Kumar *et al.* 2001; Girma *et al.* 2004; Garcia-Vega & Guariglia 2011). [73]

Column 8 shows insignificant differences between the free cash flow sensitivities for over-investing exporters and non-exporters. This suggests that in the Chinese context, participating in exporting does not influence firms' degree of agency costs.

2.5.6. Split share structure reform

2.5.6.1. Background of China's split share structure reform

One of the major problems of China's stock markets after its establishment in 1990, was the split share structure characterizing it. This structure stemmed from the "politicization of privatization" ideology. In the early 1990s, the Chinese government allowed state-owned

[72] This relies on the assumption that business cycles and demand shocks are not perfectly correlated across countries.

[73] Alternatively, it might be the case that when firms face less financial constraints, they are more likely to engage in exporting activities.

enterprises to sell a small portion of ownership to private investors. This constituted the majority of tradable shares. Yet, the Chinese government still retained influence on these firms by making the majority (two thirds) of their shares non-tradable. These non-tradable shares were typically held by the government itself or government entities (Allen *et al.* 2007; Jiang *et al.* 2010; Li *et al.* 2011).[74, 75]

This split share structure hindered the quality of corporate governance and firms' performance for the following reasons. First, the lack of market trading enabled the non-tradable holders, who typically owned the majority of shares, to be indifferent to market performance. Thus, controlling shareholders were likely to expropriate minority shareholders (tradable holders). Second, a prominent feature of the split share structure was the "one-share, one-vote" scheme, in which the non-tradable shares were entitled the same voting and cash flow rights as tradable shares. The government or government entities were therefore able to appoint board members based on political and social objectives, and did not use incentive-based compensation to align the interests of managers with those of shareholders. Third, due to a lack of large number of owners responsible for the consequence of poor firms' performance and efficiency, the management of the firms with a split share structure was less likely to be monitored against opportunistic behavior, which could reduce firms' value. Hence, non-tradable shares were harmful to the corporate governance of the listed firms,

[74] Prior to the reform (in 2005), the ratio of the non-tradable shares to total shares was 62% (59% in our data sample). Restricted shares include state-owned shares and those owned by legal entities. Both of them are mainly held by central and local governments via their agencies or affiliated state-owned enterprises. The latter can be also held by private entities (Firth *et al.* 2006). However, in line with prior literature, in this study, we separate Chinese listed firms into SOEs and non-SOEs according to their ultimate controlling shareholders.

[75] Prior to the reform, non-tradable shares were only allowed to trade or auction under the authorities' approval and thus their trading price was far below than the stock price and was often set close the book value (Firth *et al.* 2006).

causing higher agency costs (Beltratti & Bortolotti 2007; Li *et al.* 2011) and conflict between the controlling (non-tradable) and minority (tradable) shareholders or outside investors.

In order to improve corporate governance and facilitate the privatization process, in May of 2005, the Chinese Securities Regulatory Commission's (CSRC) initiated the split share structure reform, by floating the non-tradable shares through the open markets. In order to make government-owned shares legally tradable, state shareholders were required to compensate tradable shareholders through a share conversion process. This effectively diluted the government-owned share portion, attenuating government-related agency costs.[76] By the end of 2007, 1,254 firms which constitute over 97% of the Chinese A-share market capitalization had completed the structure reform (Li *et al.* 2011).[77]

It has been shown that the impact of this reform on agency costs was pronounced among companies held by state-controlled entities or with higher state ownership, as it allowed restricted shares held mainly by state shareholders to become tradable, and enhanced the incentives of controlling state shareholders to monitor managers (Cumming *et al.* 2012; Hou *et al.* 2012). In addition, following the reform, equity-based compensation for executives or directors was allowed. In this way, their interests and wealth became aligned with stock return performance and decreased their conflicts of interest with outsider investors. Specifically, given higher incentives to boost their stock performance, controlling state shareholders needed to enhance investors' confidence and strengthen firms' corporate

[76] Generally, SOEs have a larger dominant/controlling state shareholder compared to non-SOEs, whose non-state controlling shareholding is relatively small. Larger control rights may increase blockholders' misconduct. However, following the reform, the controlling holding from the government dropped significantly, increasing monitoring of SOEs by other competing shareholders or institutions, and, consequently, reducing political interference from the state, and agency problems.

[77] In our data sample, 89% of the firms had started their structure reform by the end of 2010.

governance by disciplining management against opportunistic behavior and refraining from the expropriation of outsider investors.

On the other hand, the reform is expected to have a smaller influence on non-state-owned firms in terms of their agency costs for the following reasons. First, blockholders in these companies are relatively small compared with those in SOEs. They are therefore less likely to suffer from tunneling problems since they can be overseen by other competing shareholders. Second, controlling shareholders in non-SOEs are typically individuals or private entities or institutions, whose wealth is aligned with the movement of the stock prices. Third, non-SOEs investors normally have good education and are able to monitor management and run the company more efficiently. In order to maximize firms' value, these controlling shareholders are usually active improving corporate governance and likely to sit on the board to monitor managers. For these reasons, non-SOEs have been found to have lower agency problems compared with SOEs even before the reform (Qian 1996; Allen *et al.* 2005; Chen *et al.* 2011).[78]

2.5.6.2. Difference-in-difference analysis

The split share structure reform offers us a natural experiment to examine changes in agency costs through changes in the sensitivities of over-investment to free cash flow. Specifically, we hypothesize that the split share structure reform eases the agency costs faced by SOEs more than those faced by non-SOEs. In other words, we expect that the changes in the

[78] As mentioned in section 2.5.5.1, we also find that agency costs are higher for SOEs compared with non-SOEs.

sensitivities of over-investment to free cash flow following the reform to be significantly higher among state-controlled listed firms than non-state-controlled listed firms.

To examine the change in the sensitivities of abnormal investment to free cash flow before and after the reform, we use a difference-in-differences approach. This method offers a way to assess the effects of the introduction of the split share structure reform, which can be seen as an exogenous shock, on the sensitivity of under- or over-investment to free cash flow.

To test our hypothesis, we estimate the following regression:

$$I^{u}\_new_{i,t} = a_0 + a_1 FCF_{i,t} + a_2 FCF_{i,t} * Post + a_3 FCF_{i,t} * Treat + a_4 FCF_{i,t} * Treat * Post + \sum Year + \sum Industry + \upsilon_i + \varepsilon_{i,t} \tag{2.7}$$

where *Treat* is a dummy variable, which equals 1 if a firm has a state entity as its ultimate controlling shareholder, and zero otherwise. *Post* denotes a dummy for the post-reform time period: it equals one in the year of and the years after a firm announced the structure reform, and zero otherwise. The coefficient on *FCF*Post,* $\alpha_{2,}$ captures changes in the sensitivities of abnormal investment to free cash flow over time. The coefficient on *FCF*Treat,* $\alpha_{3,}$ captures the ownership effect on the sensitivities of investment to free cash flow prior to the reform. We expect this term to be positive because the agency problems for our treatment group (SOEs) are expected to be higher than those for the control group (non-SOEs). The coefficient of interest is that associated with the term *FCF*Treat*Post,* α_4 (the difference-in-differences effect). This term measures the change in the sensitivities of investment to free cash flow between SOEs and non-SOEs due to the reform. Naturally, this method removes biases in the sensitivity differences that could be the result from permanent differences between SOEs and non-SOEs, as well as biases from differences over time that could be the result of trends. According to our hypothesis, we expect this term to be negative, which means that the split share structure reform is associated with a decline of state-owned firms' agency problems (measured by the sensitivities of over-investment to free cash flow) compared to those of non-state-owned firms.

[Insert Table 2.16]

Column 1 of Table 2.16 shows the results focusing on over-investing firms. As expected, we observe that the coefficient on *FCF*Treat* is significantly positive, which suggests that, prior to the reform, state-controlled firms have higher agency problems than their non-state-controlled counterparts. The coefficient on the triple interaction term ($FCF_{i,t}$*Treat*Post*) is significantly negative (-0.11), which indicates that following the reform, the sensitivity of over-investment to free cash flow declined for the treatment group (SOEs) compared to non-SOEs. This finding can be explained considering that by eliminating the trading restriction on shares, the reform eased agency problems in SOEs in comparison with those of non-state-controlled firms. The magnitude of the coefficient of the triple interaction term is economically nontrivial: it is around 17% larger than the coefficient (α_3) measuring the difference in the coefficient of free cash flow between SOEs and non-SOEs prior the reform.

These results support our hypotheses that the reform reduced SOEs' agency costs, and are in line with Cumming *et al.* (2012) and Hou *et al.* (2011; 2012) who show that the split share structure reform significantly strengthened state-controlled listed firms' corporate governance in terms of improving their managerial accountability and share price informativeness, as well as the relationship between executive pay and stock market performance.

Still focusing on over-investing firms, column 2 of Table 2.16 further separates state-owned firms into those controlled by local and central governments, using a restricted sub-sample of data over the period 2003-2010. We classify non-SOEs as the control group and both SOEs affiliated with the central (SOECGs) and local (SOELGs) government as the treatment group. We find that the coefficient on $FCF*Treat_{(SOELG)}$ is significantly positive, which confirms that prior to the reform, SOEs affiliated with local governments had higher agency problems than non-SOEs. By contrast, The coefficient on $FCF*Treat_{(SOECG)}$ is negative but insignificant, which suggests that prior to the reform, there were no significant differences in the agency problems faced by SOEs affiliated with the central government and non-SOEs. In addition, we find that coefficients on the triple interaction terms are only significantly negative for SOEs affiliated with the local (SOELGs) government. This finding can be explained considering that lifting the trading restriction had a lower impact on SOECGs. Under the policy of "grasp the large and let go of the small", the Chinese government tried in fact to maintain central government control of SOECGs, which are more concerned with national interests. Thus, even though the shareholders in SOECGs were allowed to be free to trade, they were not willing to sell their stakes. Moreover, SOECGs may be less sensitive to the reform due to lower agency problems compared with other counterparts. Therefore, SOECGs benefited less form the split share structure reform in terms of agency costs. The finding is consistent with Chen *et al.* (2012), who show the reform-induced governance improvements were greater for Chinese firms with more severe governance problems prior to the reform.

Column 3 of Table 2.16 reports the result when we only focus on under-investing firms. We find significantly negative coefficient on *FCF*Treat*, which suggest that state-controlled firms faced lower financial constraints compared with non-state-controlled firms prior to the reform. However, based on the insignificant triple interaction term (*FCF*Treat*Post*) as well as (*FCF*Post)* term, we conclude that the split share structure reform did not have significant impact on the level of financial constraints faced by listed firms in China.

In summary, our results indicate that following the reform, there has been a drop in the sensitivities of abnormal investment to free cash flow, which was, however, restricted to over-investing firms (proxying for firms' agency costs). Furthermore, the fall in the sensitivities affected state-controlled firms, and more specifically, firms controlled by local governments, rather than their non-state-controlled counterparts. The most important appeal of our DID approach is to circumvent endogeneity issues. The exogenous policy reform was in fact expected to reduce agency costs for SOEs, decreasing their sensitivities of over-investment to free cash flow. Other competing alternative hypothesis could be related to over-investment (agency costs) only, to the split share structure reform only, or to state-controlled firms (particularly SOELGs) only, but not to all of these factors together. Finally, by providing comparison with a control group, this approach rules out time-invariant unobserved factors such as omitted investment opportunities.

2.6. Policy and managerial implications

Our findings provide a portrait of the nature and balance of financial constraints and agency problems in China, giving a picture of the extent to which the economy has suffered from efficiency losses due to both under- and over-investment. Two significant conclusions emerge from our main findings: On the one hand, the limited access to capital markets which characterizes many Chinese firms leads to significant under-investment. On the other hand, the weak corporate governance structures lead to managers or controlling shareholders to over-invest their free cash flow in projects with negative NPV.

Specifically, we have found that different types of ownership have different influences on the investment inefficiency of Chinese listed firms. First, under a state-dominated financial system, non-SOEs competing with dominant state-owned enterprises face higher financial constraints and have to depend more on their internal funds for their investment, which hinders their growth. Thus, for the sake of economic efficiency, an effective capital market (including banking and intermediation sectors) should be put in place to allocate financial resources in a more productive or market-based way.

Next, in addition to politically-motivated issues and a dominant share holding, SOEs, and especially those affiliated with local governments, tend to expropriate their positive free cash flow and invest above their optimal level, which is not in the best interests of minority shareholders. In order to improve firms' investment efficiency, further ownership transformation and a more transparent corporate disclosure in related party transaction (e.g. tunneling) would be beneficial. In addition, more effective supervision and legal protection including better law enforcement mechanisms for shareholders should be established to increase managerial incentives to maximize profits, reduce potential expropriation from controlling shareholders, and foster investment efficiency.

Our findings also provide insights about the value of some more targeted policies for the solution of investment inefficiency in China. First, the “ST” policy effectively gives a risk warning to outside investors by signaling the abnormal financial situation of listed firms. Our findings support the view that weak corporate governance and higher agency problems are likely to be reasons why firms experience financial distress. Thus, higher quality of information disclosure and democratic accountability should be promoted to improve investor protection rights. Second, relying on multiple acquisitions rather than managing own assets may not be a very efficient way to grow due to possible hubris or entrenchment issues. Third, export promotion policies may further ease Chinese listed firms’ financial constraints.

Last but not least, despite considerable progresses made to date, and despite the positive effects of the split share structure reform in reducing agency costs, we still find a high degree of both financing constraints and agency costs in the Chinese economy. Since China’s financial system is still dominated by under-developed state-owned banks, in order to sustain the rapid growth of the Chinese economy, especially in the private sector, more widespread access to credit markets should be a priority in order to increase firms’ investment efficiency. In the long run, the establishment of an effective credit-rating system and the development of equity finance could be a way to achieve this target.

In addition, considering that China’s listed firms are still dominated by state shareholders, a further reduction in state ownership may need to be carried out to reduce conflicts of interests among controlling shareholders and outside shareholders, and to increase the intensity of monitoring by other blockholders or independent institutions. This is particularly important at the local level. Imposing constraints or more restrictive regulations to local government bureaucrats to prevent them from making adverse decisions such as expropriation and misappropriation of funds, which ultimately lead to over-investment should therefore be on the political agenda. In addition, more market-based executive remuneration schemes should be offered to align the interests between managers and investors. Finally, a shake-up of the legal system aimed at improving the protection of property rights would also be beneficial.

2.7. Conclusions

Using a panel of Chinese listed firms, we provide evidence that both financial constraints and agency problems result in investment inefficiency. To this end, we test how financial constraints and agency costs affect the sensitivities of under- and over-investment to free cash flow, for firms with different characteristics. We find strong evidence of investment being positively and significantly associated with free cash flow for under-investing firms with negative free cash flow. This is consistent with the financing constraints hypothesis. We also find a significantly positive association between investment and free cash flow for over-investing firms with positive free cash flow, which is consistent with the agency costs hypothesis.

We also show some evidence that in the Chinese context various conventional variables like firm size and dividend payout ratio (policy) can be used to assess the degree of financial constraints faced by firms. We find a clear decreasing trend for the sensitivities of under-investment to free cash flow with firm size and dividend payout ratio. We subsequently study how the ownership structure of Chinese firms influences the degree of agency problems faced by firms. Specifically, first, we find that managerial ownership reduces Chinese listed firms' agency costs (measured as the sensitivities of over-investment to free cash flow). This can be explained considering that managers who own the firm are more likely to have closely aligned interests with shareholders. Second, the relationship between blockholder ownership and agency costs is not linear due to the offsetting effects of incentive alignment and entrenchment. It is firms with a medium percentage of shares owned by the largest shareholders which tend to face higher agency costs. Third, a higher ownership share of the top ten shareholders excluding the largest increases the intensity of competition and the efficiency of the monitoring of controlling shareholders, reducing firms' agency problems.

We next focus on the effects of firms' "ST" status on the degree of financing constraints and agency costs that they face. First, we find that "ST" firms generally have higher sensitivities of under-investment to free cash flow, suggesting they face higher credit constraints. Financial difficulties become worse once a firm's "ST" status is announced. Second, agency costs are significantly positively associated with the likelihood of being designated "ST". However, after being given "ST" status, under the pressures of being de-listed from the stock exchanges, firms are more likely to achieve improvements of governance and profitability, and we observe reduced sensitivities of over-investment to free cash flow. Furthermore, focusing on M&A activity, we find that frequent bidding positively affects the extent to which firms' over-investment depends on free cash flow, suggesting higher likelihood of agency problems. We argue that a possible reason for this may be due to hubris or entrenchment of managers or controlling shareholders, who rely on multiple acquisition transactions to pursue private benefits rather than managing assets to grow.

Our results also suggest that financial constraints and agency problems have different effects across firms which differ according to state/non-state ownership, as well as exporting status. Specifically, we find that non-SOEs are more subject to financing constraints than their state-owned counterparts, probably because of a "crowding out" effect. In contrast, state-owned firms face relatively few financial constraints due to the support they receive from the government and state-owned banks, as a consequence of their role in maintaining social stability and achieving political and economic objectives. In addition, SOEs affiliated with local governments face higher agency problems than their counterparts affiliated with the central government and non-SOEs. This may be explained by less effective management, supervision, and legal enforcement.

We also find that the divergence of the degrees of financial constraints and agency costs between coastal and interior regions is not significant, which may be due to regional development policies. Moreover, Chinese listed companies ease their financial constraints by engaging in exporting.

Finally, using a difference-in-differences (DID) method, we find that the exogenous split share structure reform, which took place in China in 2005, affected local-government-controlled enterprises more than other firms, by reducing their agency problems. Decreasing sensitivities of over-investment to free cash flow are in fact evident after 2005 for SOELGs.

The identification of financial constraints and agency problems as explanations for under- and over-investment suggests that in order to improve investment efficiency in China, both the financial and the legal system need to be reformed.

Appendix 2.1. Chinese provinces and the division of the Chinese territory in three broad regions

From an administrative viewpoint, China consists of 31 provincial units, which are divided into three categories: 22 provinces or *sheng*; 4 autonomous regions or *zizhiqu* (Xinjiang,Inner Mongolia, Tibet, Ningxia, and Guangxi); and 4 municipal cities or *zhixiashi*, under direct supervision of the central power (Shanghai, Tianjin, Beijing, and, since 1997, Chongqing).

According to the Chinese National Bureau of Statistics, the 31 provinces can be split into another three categories by means of geography: Coastal (Beijing, Fujian, Guangdong, Hainan, Hebei, Jiangsu, Liaoning, Shandong, Shanghai, Tianjin, and Zhejiang); Central (Chongqing, Anhui, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Jilin, and Shanxi); and Western (Gansu, Guangxi, Guizhou, Neimenggu, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, and Yunnan).

Appendix 2.2. Definitions of the variables used

Market value of assets**:** sum of market value of tradable stocks, book value of non-tradable stocks, and market value of net debt.

Tobin's Q**:** ratio of market value of assets to book value of total assets.

***Return on assets* (*ROA*):** ratio of net income to total assets.

Leverage**:** ratio of the sum of short-term and long-term debt to total assets.

Cash**:** ratio of the sum cash and cash equivalents to total assets.

Size**:** natural logarithm of total assets.

Age**:** number of years since listing.

Sales growth**:** rate of growth of real sales.

Payout ratio: ratio of cash dividend payments to net income

CAPEX**:** capital expenditures, i.e. cash paid to acquire and construct fixed assets, intangible assets and other long-term assets.

SalePPE**:** sale of property, plant and equipment, i.e. net cash received from disposals of fixed assets, intangible assets, and other long-term assets.

I_total**:** total investment, i.e. capital expenditure less receipts from sale of property, plant and equipment (*CAPEX – SalePPE*).

I_main.**:** investment to maintain existing assets in place (depreciation + amortization).

I_new**:** total investment less investment to maintain existing assets in place (*I_total - I_main.*).

$\boldsymbol{I^e}$***_new*****:** expected investment expenditure in new positive NPV projects.

$\boldsymbol{I^u}$***_new*****:** unexpected or abnormal investment expenditure.

CFO**:** Net cash flow from operating activities, i.e. difference between cash inflow from operating activities and cash outflow from operating activities.

$\boldsymbol{CF_{AIP}}$**:** cash flow generated from assets in place *(CFO - I_main.)*.

FCF**:** free cash flow (*CFO- I_main. -*I^e*_new)*.

A GDP deflator, which is obtained from National Bureau of Statistics of China, is used to convert all variables to real terms.

Appendix 2.3. Special treatment regulation in China's Stock Exchanges (rules governing the listing of shares on the Shanghai/Shenzhen Stock Exchanges)

Since 1998, the Chinese Securities Regulatory Commission's (CSRC) implemented the Special Treatment (ST) or the Particular Treatment (PT) regulation as a mechanism to signal the abnormal financial situation of listed companies and give a risk warning to investors.[79] The so-called "abnormal financial situation" refers to an unusual financial position, which exposes a firm to the risk of its shares being de-listed.

The Exchange is entitled to issue a special treatment condition (ST) on the stocks of listed companies which suffer from at least one of the following circumstances:

(1) The audited reports for the two most recent financial year reveal negative net income;
(2) The audited reports for the latest financial year show negative shareholders' equity (i.e. shareholders' equity is lower than registered capital);
(3) Based on the audit results for the most recent financial year, a disclaimer of opinion or adverse opinion by a Certified Public Accounting (CPA) firm is issued.

"ST" or "*ST" stocks operate under various trading and financial restrictions, which are:

(1) Putting "ST" or "*ST" in front of the names of their stocks to distinguish them to those of healthy firms;
(2) Their daily share movements are limited to 5% (10% for normal stocks);
(3) Their interim reports are required to be audited.

[79] According to Chinese Company Law, "ST" listed companies are the ones which have been making losses for two consecutive years, whereas, "PT" (particular treatment) firms are the ones which have three-consecutive-year losses. These "PT" firms are suspended from the exchanges and only allowed to be traded on Fridays, with a maximum of 5% limit to the previous Friday's close price. "PT" firms will be permanently terminated from the stock exchanges if they cannot make a turnaround within one year. The "PT" regulation was abolished on 1st of May 2005, and replaced with a "*ST" regulation.

After being issued a delisting risk warning, if the company successfully engages in major asset restructuring in accordance with the relevant regulations of the CSRC (China Securities Regulatory Commission), and if its principal business activities are back to normal and its net income (after deducting non-recurring gains and losses) becomes positive, the firm may apply to the exchange for lifting the special treatment (ST) or de-listing risk warning (*ST).

Firms which fail to disclose their annual or interim report or fail to turn around after being issued a de-listing risk warning, might be suspended or even permanently excluded from the stock exchanges.

Table 2.1
Structure of the unbalance panel

No. of obs. Per firm	No. of obs.	Percent	Cumulative
3	411	4.32%	4.32%
4	400	4.21%	8.53%
5	540	5.68%	14.21%
6	912	9.59%	23.80%
7	882	9.28%	33.08%
8	1,032	10.85%	43.93%
9	1,116	11.74%	55.67%
10	1,620	17.04%	72.71%
11	1,155	12.15%	84.85%
12	1,440	15.15%	100.00%
Total	9,508	100.00%	

Table 2.2
Distribution of the number of firm-year observations by year

Year	No. of obs.	Percent	Cumulative
1999	415	4.36%	4.36%
2000	521	5.48%	9.84%
2001	609	6.41%	16.25%
2002	667	7.02%	23.26%
2003	737	7.75%	31.02%
2004	793	8.34%	39.36%
2005	836	8.79%	48.15%
2006	851	8.95%	57.10%
2007	927	9.75%	66.85%
2008	1,081	11.37%	78.22%
2009	1,075	11.31%	89.52%
2010	996	10.48%	100.00%
Total	9,508	100.00%	

Table 2.3
Sample means and medians (in parentheses)

	G1	G2	G3	G4	Total	Diff (G1 vs. G3)
I_total	0.0283	0.0249	0.0859	0.1013	0.0529	0.00***
	(0.0238)	(0.0208)	(0.0774)	(0.0935)	(0.0383)	0.00***
I_new	0.0034	-0.0035	0.0586	0.0771	0.0267	0.00***
	(0.0012)	(-0.0035)	(0.0483)	(0.0687)	(0.0129)	0.00***
I^e*_new*	0.0305	0.0208	0.0183	0.0374	0.0267	0.00***
	(0.027)	(0.0186)	(0.0196)	(0.0368)	(0.0247)	0.00***
I^u*_new*	-0.0271	-0.0243	0.0403	0.0397	0.0000	0.00***
	(-0.0231)	(-0.0204)	(0.0261)	(0.0266)	(-0.0086)	0.00***
FCF	-0.0534	0.0509	0.0546	-0.0495	-0.0021	0.00***
	(-0.04)	(0.0396)	(0.0408)	(-0.0386)	(-0.0032)	0.00***
Cash	0.150	0.176	0.143	0.139	0.154	0.01**
	(0.127)	(0.147)	(0.124)	(0.122)	(0.131)	0.29
Q	1.606	1.737	1.772	1.644	1.683	0.00***
	(1.334)	(1.391)	(1.449)	(1.357)	(1.372)	0.00***
Size	20.56	20.59	20.57	20.68	20.59	0.82
	(20.48)	(20.47)	(20.49)	(20.57)	(20.50)	0.84
Age	8.10	9.20	9.34	8.04	8.64	0.00***
	(8)	(9)	(9)	(7)	(8)	0.00***
ROA	0.016	0.036	0.038	0.027	0.028	0.00***
	(0.024)	(0.036)	(0.038)	(0.03)	(0.031)	0.00***
Leverage	0.233	0.194	0.232	0.265	0.228	0.95
	(0.229)	(0.180)	(0.227)	(0.260)	(0.224)	0.80
Observations	3,120	2,657	1,884	1,847	9,508	

Notes: Firms are classified into four groups according their level of abnormal investment and *FCF* (free cash flow): Group1 (under-investing firms with negative *FCF*); Group 2 (under-investing firms with positive *FCF*); Group3 (over-investing firms with positive *FCF*); Group 4 (over-investing firms with negative *FCF*). Total investment ($I\_total_{i,t}$) is defined as capital expenditure less receipts from the sale of property, plant and equipment. *I_new* is total investment less investment to maintain existing assets in place. I^e*_new* represents the expected investment expenditure in new positive NPV projects. I^u*_new* represents the abnormal investment (under- or over- investment). *FCF* is free cash flow which is computed by subtracting the optimal level of cash flow from operating activities (*CFO*). *Cash* is the ratio of the sum of cash and cash equivalents to total assets. *Q* is the market-to-book ratio. *Size* is the natural logarithm of total assets. *Age* is the number of years elapsed since the firm listed. *ROA* is return on assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. All variable except *Size* and *Age* are expressed in percentage terms. All investment expenditure variables are scaled by total assets. All variables except *Age* are deflated using a GDP deflator. See Appendix 2.2 for complete definitions of all variables. *Diff* is the *p*-value associated with the t-test and the Wilcoxon rank-sum test for differences in means and equality of medians of corresponding variables between firms in Group 1 and those in Group 3. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.4
Dynamic model of investment expenditure

Dependent variable: $I\_new_{i,t}$	*(1)* *OLS (pooled)*	*(2)* *Fixed effects*	*(3)* *GMM_system*
$I\_new_{i,t-1}$	0.441***	0.254***	0.314***
	(0.013)	(0.010)	(0.049)
$Cash_{i,t-1}$	0.055***	0.113***	0.048*
	(0.006)	(0.006)	(0.028)
$Q_{i,t-1}$	0.003***	0.003***	-0.0001
	(0.001)	(0.001)	(0.002)
$Size_{i,t-1}$	0.003***	-0.004***	0.002
	(0.001)	(0.001)	(0.002)
$Age_{i,t}$	-0.001***	-0.001	-0.001***
	(0.000)	(0.003)	(0.000)
$ROA_{i,t-1}$	0.059***	0.039***	0.165***
	(0.017)	(0.007)	(0.043)
$Leverage_{i,t-1}$	0.003	-0.036***	-0.006
	(0.004)	(0.005)	(0.017)
Year-fixed effects	yes	yes	yes
Industry-fixed effects	yes	no	yes
(Year-fixed) (Industry-fixed) effects*	yes	yes	yes
R^2	0.32	0.47	
Adjusted R^2	0.31	0.38	
ρ		0.37	
F-value	26.84	12.89	10.59
Hansen J test (p-value)			0.18
m3 test (p-value)			0.45
Observations	9,508	9,508	9,508

Notes: Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. Adopting the method of Richardson (2006), the dependent variable is $I\_new_{i,t}$, the difference between I_{total} and $I_{main.}$. All variables except $Q_{i,t-1}$, $Size_{i,t-1}$ and $Age_{i,t}$ are scaled by total assets. For the pooled regression, standard errors (in parentheses) are asymptotically cluster-robust to heteroscedasticity and intra-cluster correlation is accounted for at the firm level. For the fixed effects regression, ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. For the system GMM regression, *m3* is a test for third-order serial correlation of the differenced residuals, asymptotically distributed as $N(0,1)$ under the null of no serial correlation. The Hansen *J* test of over-identifying restrictions is distributed as *Chi*-square under the null of instrument validity. We treat $I\_new_{i,t-1}$, $Cash_{i,t-1}$, $Q_{i,t-1}$, $Size_{i,t-1}$, $ROA_{i,t-1}$ and $Leverage_{i,t-1}$ as potentially endogenous variables; levels of these variables dated t-3 and further are used as instruments in the first-differenced equations and first-differences of these same variables lagged twice are used as additional instruments in the level equations. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.5
The effects of free cash flow on (under- and over-) investment

Dependent variable: $I^u\_new_{i,t}$	(1) Under_gmm	(2) Over_gmm	(3) Under_gmm	(4) Over_gmm	(5) Under_fe	(6) Over_fe	(7) Under_ols	(8) Over_ols
$Dum\_FCF_{>0}$	0.000	-0.001	-0.000	-0.003	0.001	0.000	0.001	-0.0001
	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)	(0.0019)
$FCF*Dum\_FCF_{<0}$	0.055***	0.002	0.054***	-0.034	0.030***	-0.020	0.072***	-0.0326
	(0.008)	(0.027)	(0.014)	(0.022)	(0.008)	(0.019)	(0.009)	(0.0212)
$FCF*Dum\_FCF_{>0}$	0.013	0.103***	0.002	0.108*	0.018*	0.043***	0.009	0.0460**
	(0.009)	(0.022)	(0.008)	(0.061)	(0.009)	(0.016)	(0.007)	(0.0222)
Firm-fixed effects	yes	yes	No	No	yes	yes	No	No
Year-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Industry-fixed effects	No	No	yes	yes	No	No	yes	yes
R^2	0.37	0.40	0.06	0.03	0.45	0.43	0.06	0.04
Adjusted R^2	0.19	0.13	0.05	0.03	0.27	0.19	0.06	0.03
ρ	0.39	0.36			0.44	0.42		
F-value	11.31	3.82	10.93	3.42	5.01	2.55	13.91	4.68
Diff	0.00***	0.00***	0.00***	0.03**	0.32	0.01***	0.00***	0.012**
Observations	5,777	3,731	5,777	3,731	5,266	4,242	5,716	3,792

Notes: The specifications were estimated using the fixed effects (column 1, 2, 5 and 6) and the pooled OLS (column 3, 4, 7 and 8) estimators. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated adopting the method of Richardson (2006), where under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$). *FCF* is computed by subtracting the optimal level of cash flow from cash flow from operating activities (*CFO*). $Dum\_FCF_{<0}$ is a dummy variable, which is equal to 1 in year t if a firm's free cash flow in that year is below its optimal level (*FCF<0*), and 0 otherwise. $Dum\_FCF_{>0}$ is a dummy variable, which is equal to 1 in year t if a firm's free cash flow in that year exceed its optimal level (*FCF>0*), and 0 otherwise. *Under_gmm* (*Over_gmm*), *Under_fe (Over_fe) and Under_ols* (*Over_ols*) refer to abnormal investment being obtained by estimating in Eq. (2.1) using the system GMM, the fixed effects and the pooled estimators, respectively (see Table 2.4). For the pooled regression, standard errors (in parentheses) are asymptotically cluster-robust to heteroscedasticity and intra-cluster correlation is accounted for at the firm level. For the fixed effects regression, ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. *Diff* is the *p*-values of the Wald statistics for the equality of the free cash flow coefficients for firms facing positive and negative *FCF*. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.6
The effects of free cash flow on (under- and over-) investment: using Bates (2005)'s definitions of unexpected investment and free cash flow

Dependent variable: $I^{u'}\_new_{i,t}$	*(1)* *Under_ fe*	*(2)* *Over_ fe*	*(3)* *Under_ gmm*	*(4)* *Over_ gmm*
$I^{u'}\_new_{i,t-1}$			0.452***	0.320***
			(0.040)	(0.049)
$Dum\_FCF'_{>0}$	-0.000	0.000	-0.002	0.003
	(0.001)	(0.002)	(0.003)	(0.005)
$FCF'*Dum\_FCF'_{<0}$	0.020**	0.028	0.184***	-0.025
	(0.008)	(0.027)	(0.045)	(0.084)
$FCF'*Dum\_FCF'_{>0}$	0.008	0.050**	-0.046	0.131*
	(0.009)	(0.023)	(0.050)	(0.077)
$Cash_{i,t-1}$	0.025***	0.092***	0.045*	0.114***
	(0.004)	(0.009)	(0.027)	(0.033)
$Q_{i,t-1}$	0.001	0.001	0.007***	-0.005
	(0.001)	(0.001)	(0.002)	(0.003)
$Size_{i,t-1}$	0.006***	-0.012***	0.001	0.003
	(0.001)	(0.002)	(0.002)	(0.003)
$Age_{i,t}$	-0.003***	0.008*	0.000**	0.000
	(0.001)	(0.004)	(0.000)	(0.000)
$ROA_{i,t-1}$	0.020***	0.074***	0.083***	0.061
	(0.003)	(0.020)	(0.029)	(0.054)
$Leverage_{i,t-1}$	-0.008***	-0.027***	0.004	0.019
	(0.003)	(0.009)	(0.012)	(0.022)
Year-fixed effects	yes	yes	yes	yes
Industry-fixed effects	No	No	yes	yes
(Year-fixed) (Industry-fixed)effects*	yes	yes	yes	yes
R^2	0.52	0.47		
Adjusted R^2	0.35	0.27		
P	0.64	0.76		
F-value	4.03	3.24	9.19	33.50
Hansen J test (p-value)			0.01**	0.00***
m3 test (p-value)			0.41	0.29
Diff	0.35	0.54	0.00***	0.17
Observations	4,792	4,716	3,951	3,711

Notes: The specifications were estimated using the fixed effects (column 1 and 2) and the system GMM (column 3 and 4) estimators. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. Adopting the method of Bates (2005), the dependent variable is $I^{u'}\_new_{i,t}$,the difference between a firm's new investment expenditure ($I\_new_{i,t}$) and that of the median firm in the industry (I_new_t) in a given year. Specifically, under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^{u'}\_new_{i,t}$). *FCF'* is calculated as the difference between the firm's cash flow ($CF_{AIP,i,t}$) and that of the median firm in the industry ($CF_{AIP,i.}$). $Dum\_FCF'_{<0}$ is a dummy variable, which is equal to 1 in a given year if a firm's $CF_{AIP,i,t}$ is below its optimal level (median industry's $CF_{AIP,i.}$), and 0 otherwise. $Dum\_FCF'_{>0}$ is a dummy variable, which is equal to 1 in a given year if a firm's $CF_{AIP,i,t}$ exceed its optimal level (median industry's $CF_{AIP,i.}$), and 0 otherwise. All variables except $Q_{i,t-1}$, $Size_{i,t-1}$ and $Age_{i,t}$ are scaled by total assets. For the system GMM regression, *m3* is a test for third-order serial correlation of the residuals in the differenced equations, asymptotically distributed as *N*(0,1) under the null of no serial correlation. The Hansen *J* test of over-identifying restrictions is distributed as *Chi*-square under the null of instrument validity. We treat $I^{u'}\_new_{i,t-1}$, *FCF'*, $Cash_{i,t-1}$, $Q_{i,t-1}$, $Size_{i,t-1}$, $ROA_{i,t-1}$ and $Leverage_{i,t-1}$ as potentially endogenous variables. Levels of these variables lagged 3 or longer are used as instruments in the first-differenced equations and first-differences of these same variables lagged 2 as additional instruments in the level equations. *Diff* is the *p*-values of the Wald statistics for the equality of the free cash flow coefficients for firms facing positive and negative *FCF'*. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.7
The effects of free cash flow on (under- and over-) investment: further tests

Dependent variable: $I^u\_new_{i,t}$	(1) Under_gmm 25th Quant	(2) Over_gmm 25th Quant	(3) Under_gmm 50th Quant	(4) Over_gmm 50th Quant	(5) Under_gmm 75th Quant	(6) Over_gmm 75th Quant	(7) Under_gmm Conti.	(8) Over_gmm Conti.
	Most under-investment —› Most over-investment							
$Dum\_FCF_{>0}$	-0.000	-0.000	0.001	-0.000	0.001	-0.001	0.002**	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.004)	(0.001)	(0.003)
$FCF*Dum\_FCF_{<0}$	0.056***	-0.009	0.033***	-0.036	0.012**	-0.050	0.035***	0.017
	(0.012)	(0.011)	(0.007)	(0.026)	(0.006)	(0.046)	(0.009)	(0.031)
$FCF*Dum\_FCF_{>0}$	0.002	0.012	0.001	0.034*	-0.004	0.072*	0.008	0.122***
	(0.014)	(0.009)	(0.008)	(0.021)	(0.007)	(0.040)	(0.009)	(0.025)
Firm-fixed effects	No	No	No	No	No	No	yes	yes
Year-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Industry-fixed effects	yes	yes	yes	yes	yes	yes	No	No
(Pseudo) R^2	0.04	0.01	0.04	0.02	0.03	0.02	0.39	0.42
Adjusted R^2							0.20	0.13
ρ							0.36	0.37
F-value							9.38	3.38
Diff	0.00***	0.15	0.00***	0.04**	0.09*	0.05**	0.03**	0.01***
Observations	5,777	3,731	5,777	3,731	5,777	3,731	4,537	3,043

Notes: The specifications were estimated using the quantile (columns 1 to 6) and fixed effects (columns 7 and 8) estimators. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated using the method of Richardson (2006), where in columns 1 to 6, under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$) and in columns 7 and 8, under- or over- investment are defined when firms have two consecutive under- or over- investment years. *FCF* is computed by subtracting the optimal level of cash flow from cash flow from operating activities (*CFO*). $Dum\_FCF_{<0}$ is a dummy variable, which is equal to 1 in year t if a firm's free cash flow in that year is below its optimal level (*FCF<0*), and 0 otherwise. $Dum\_FCF_{>0}$ is a dummy variable, which is equal to 1 in year t if a firm's free cash flow in that year exceed its optimal level (*FCF>0*), and 0 otherwise. For the quantile regression, we run separate regressions for the 25th, 50th, 75th quantiles of abnormal investment. For the fixed effects regression, we report ρ, which represents the proportion of the total error variance accounted for by unobserved heterogeneity. *Diff* is the *p*-values of the Wald statistics for the equality of the free cash flow coefficients for firms facing positive and negative *FCF*. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.8
Summary statistics of financial constrains (*KZ* and *WW* indexes) for under- and over- investing firms

	FC index	*Mean*	*St. Dev.*	*P25*	*P50*	*P75*	*N Obs*
G1	KZ	-2.513	6.718	-3.225	-0.48	0.865	3,120
Under_ $FCF_{<0}$	WW	-0.93	0.064	-0.974	-0.929	-0.882	3,120
G2	KZ	-2.895	7.166	-3.784	-0.796	0.706	2,656
Under_ $FCF_{>0}$	WW	-0.939	0.063	-0.983	-0.939	-0.89	2,657
Diff (G1 vs. G2)	KZ	0.04**		*Diff* (G1 vs. G2)	0.00***		
(Mean)	WW	0.00***		(Median)	0.00***		
G3	KZ	-1.703	5.006	-2.566	-0.315	0.942	1,884
Over_ $FCF_{>0}$	WW	-0.937	0.066	-0.983	-0.938	-0.886	1,883
G4	KZ	-2.257	5.894	-3.135	-0.643	0.791	1,847
Over_ $FCF_{<0}$	WW	-0.941	0.063	-0.985	-0.942	-0.895	1,847
Diff (G3 vs. G4)	KZ	0.00***		*Diff* (G3 vs. G4)	0.00***		
(Mean)	WW	0.03**		(Median)	0.03**		
Total	KZ	-2.41	6.406	-3.188	-0.584	0.827	9,507
	WW	-0.936	0.064	-0.981	-0.937	-0.887	9,507

Notes: KZ and *WW* represent the firm-specific levels of financial constraint: the Kaplan and Zingales (*KZ*) index of constraints (Lamont *et al.* 2001) and the Whited and Wu (*WW*) index of constraints (Whited & Wu 2006). Firms are classified into four groups according to the difference between the levels of investment and *FCF* (free cash flow) and their optimal levels: Group1 (under-investing firms with negative *FCF*); Group 2 (under-investing firms with positive *FCF*); Group 3 (over-investing firms with positive *FCF*); Group 4 (over-investing firms with negative *FCF*). *P25* (*50/75*) is the 25^{th} (50^{th}/75^{th}) percentile of the respective distribution. *Diff* is the *p*-value associated with the t-test and the Wilcoxon rank-sum test for differences in means and equality of medians of the financial constraints *KZ* (*WW*) index between groups of under-investing firms (Group 1 and Group 2) or between groups of over-investing firms (Group3 and Group4). *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.9

The sensitivity of under-investment to free cash flow accounting for financial constraints

Dependent variable: $I^u\_new_{i,t}$	*(1)* *KZ_under*	*(2)* *KZ_under*	*(3)* *WW_under*	*(4)* *WW_under*
$Medium\_FC_{(30\text{-}70)}$	-0.000		-0.003***	
	(0.001)		(0.001)	
$High\_FC_{(>70)}$	0.001		-0.002*	
	(0.001)		(0.001)	
$FCF^*\ Low\_FC_{(<30)}$	0.023***		0.017**	
	(0.007)		(0.007)	
$FCF^*\ Medium\_FC_{(30\text{-}70)}$	0.037***		0.027***	
	(0.006)		(0.006)	
$FCF^*\ High\_FC_{(>70)}$	0.052***		0.065***	
	(0.008)		(0.007)	
$High\_FC_{(<50)}$		0.001		-0.000
		(0.001)		(0.001)
$FCF^*\ Low\_FC_{(<50)}$		0.028***		0.026***
		(0.005)		(0.006)
$FCF^*\ High\_FC_{(>50)}$		0.045***		0.045***
		(0.006)		(0.006)
Firm-fixed effects	yes	Yes	yes	yes
Year-fixed effects	yes	Yes	yes	yes
R^2	0.37	0.37	0.37	0.37
Adjusted R^2	0.19	0.19	0.20	0.19
ρ	0.38	0.38	0.39	0.38
F-value	9.76	10.83	11.46	10.85
Diff	0.00***	0.04**	0.00***	0.01***
Observations	5,777	5,777	5,776	5,776

Notes: The specifications were estimated using the fixed effects estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated adopting the method of Richardson (2006), where under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$). *FCF* is computed by subtracting the optimal level of cash flow from cash flow from operating activities (*CFO*). *High_FC, Medium_FC* and *Low_FC* are dummy variables, equal to 1 in a given year if a firm faces high, medium, or low financial constraints, and 0 otherwise. In columns 1 and 3, we consider a firm to be financially constrained (unconstrained) if its *KZ* or *WW* index lies in the top (bottom) three deciles of the distribution of the corresponding variables for all firms belonging to the same industry in a given year. The remaining firm-years will be the ones, who face a medium level of financial constraints. In columns 2 and 4, a firm is considered to be financially constrained in a given year if its *KZ* or *WW* index exceeds the median value of the index calculated in the industry that the firm belongs to, and financially unconstrained otherwise. *Diff* is a test, distributed as *Chi*-square, for equality of the coefficients across various categories of firms. Specifically, we report *p*-values of the Wald statistics for the equality of the free cash flow coefficients associated with under-investment between financial constrained and unconstrained firm-years. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.10
The sensitivity of under- investment to free cash flow: distinguishing firm-years on the basis of conventional proxies for financial constraints

Dependent variable: $I^u\_new_{i,t}$	(1)	(2)	(3)	(4)
	Total Assets	*No. of Employees*	*Payout Ratio*	*Dividend Paying*
Medium_ FC$_{(30\text{-}70)}$	0.002*	0.002	-0.000	
	(0.001)	(0.001)	(0.001)	
Low_ FC$_{(>70)}$	0.006***	0.004***	-0.001	
	(0.001)	(0.001)	(0.001)	
FCF High_ FC*$_{(<30)}$	0.055***	0.058***	0.047***	
	(0.007)	(0.007)	(0.006)	
FCF Medium_ FC* $_{(30\text{-}70)}$	0.033***	0.026***	0.034***	
	(0.006)	(0.007)	(0.009)	
FCF Low_ FC* $_{(>70)}$	0.022***	0.027***	0.019**	
	(0.008)	(0.008)	(0.007)	
Div_yes				-0.001
				(0.001)
FCF Div_no*				0.047***
				(0.006)
FCF Div_yes*				0.025***
				(0.006)
Firm-fixed effects	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes
R^2	0.37	0.38	0.37	0.37
Adjusted R^2	0.20	0.20	0.20	0.19
ρ	0.39	0.39	0.39	0.38
F-value	11.03	10.82	9.78	11.07
Diff	0.00***	0.00***	0.00***	0.00***
Observations	5,777	5,514	5,716	5,777

Notes: The specifications were estimated using the fixed effects estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated adopting the method of Richardson (2006), where under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$). *FCF* is computed by subtracting the optimal level of cash flow from cash flow from operating activities (*CFO*). Based on different criteria: *Firm Size* (total assets or the number or employees), *Age, Payout Ratio, Dividend Payout Status*, we split firm-years into the following three groups: *High_FC, Medium_FC and Low_FC*, which are dummy variables, equal to 1 respectively if a firm is more likely to face the highest, medium and lowest financial constraints relatively to all firms operating in the same industry they belong to in a given year and 0 otherwise. In columns 1 to 3, we consider a firm to be financially constrained (unconstrained) if its *size* (total assets or the number or employees*), age,* and *payout ratio* lies in the bottom (top) three deciles of the distribution of the corresponding values of all firms belonging to the same industry each year. The remaining firm-years will be the ones, whose face medium level of financial constraints. In columns 4, we partition firms according to their dividend payout status, which equals 1 (*Div_yes*) if the firm is paying dividends in a given year, and 0 otherwise. *Diff* is a test, distributed as *Chi*-square, for equality of the coefficients across various categories of firms. Specifically, we report *p*-values of the Wald statistics for the equality of the free cash flow coefficients associated with under-investment between firm-years, who are more likely to face financial constraints and those, who are less likely to face financial constraints. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.11
Summary statistics of agency costs (*AC1* and *AC2*) for under- and over- investing firms

	FC index	*Mean*	*St. Dev.*	*P25*	*P50*	*P75*	*N Obs*
G1	*AC1*	0.523	0.398	0.248	0.416	0.679	3,120
*Under_* $FCF_{<0}$	*AC2*	0.057	0.080	0.010	0.026	0.071	3,120
G2	*AC1*	0.590	0.428	0.286	0.482	0.777	2,656
*Under_* $FCF_{>0}$	*AC2*	0.045	0.065	0.008	0.020	0.054	2,657
Diff (G1 vs. G2)	*AC1*	0.00***		*Diff* (G1 vs. G2)	0.00***		
(Mean)	*AC2*	0.00***		(Median)	0.00***		
G3	*AC1*	0.545	0.412	0.251	0.436	0.709	1,884
*Over_* $FCF_{>0}$	*AC2*	0.047	0.070	0.008	0.022	0.056	1,884
G4	*AC1*	0.477	0.349	0.235	0.386	0.612	1,847
*Over_* $FCF_{<0}$	*AC2*	0.041	0.059	0.007	0.019	0.050	1,847
Diff (G3 vs. G4)	*AC1*	0.00***		*Diff* (G3 vs. G4)	0.00***		
(Mean)	*AC2*	0.00***		(Median)	0.01***		
Total	*AC1*	0.537	0.402	0.255	0.431	0.699	9,507
	AC2	0.049	0.071	0.008	0.022	0.058	9,508

Notes: AC1 (operating expense scaled by total assets) and *AC2* (other receivable scaled by total assets) represent firm-specific levels of agency costs. Firms are classified into four groups according to the difference between the levels of their investment and *FCF* (free cash flow) and their optimal levels: Group1 (under-investing firms with negative *FCF*); Group 2 (under-investing firms with positive *FCF*); Group 3 (over-investing firms with positive *FCF*); Group 4 (over-investing firms with negative *FCF*). *P25* (*50/75*) is the 25^{th} ($50^{th}/75^{th}$) percentile of the distribution of the relevant variable. *Diff* is the *p*-value associated with the t-test and the Wilcoxon rank-sum test for differences in means and equality of medians of the firm-level agency costs *AC1* (*AC2*) between groups of under-investing firms (Group1 and Group2) or between groups of over-investing firms (Group3 and Group4). *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.12
The sensitivity of over-investment to free cash flow accounting for agency costs

Dependent variable: $I^u\_new_{i,t}$	*(1)* *AC1_over*	*(2)* *AC1_over*	*(3)* *AC2_over*	*(4)* *AC2_over*
Medium_ $AC_{(30-70)}$	-0.002		-0.006***	
	(0.002)		(0.002)	
High_ $AC_{(>70)}$	-0.009**		-0.013***	
	(0.003)		(0.003)	
FCF Low_ $AC_{(<30)}$*	0.020		0.036	
	(0.021)		(0.022)	
FCF Medium_ $AC_{(30-70)}$*	0.065***		0.026	
	(0.018)		(0.018)	
FCF High_ $AC_{(>70)}$*	0.076***		0.092***	
	(0.022)		(0.019)	
High_$AC_{(>50)}$		-0.005*		-0.012***
		(0.002)		(0.002)
FCF Low_$AC_{(<50)}$*		0.026		0.033**
		(0.016)		(0.016)
FCF High_ $AC_{(>50)}$*		0.080***		0.068***
		(0.016)		(0.016)
Firm-fixed effects	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes
R^2	0.40	0.40	0.41	0.41
Adjusted R^2	0.13	0.13	0.41	0.14
P	0.36	0.36	0.36	0.36
F-value	3.44	3.81	4.50	5.86
Diff	0.06*	0.02**	0.05**	0.11
Observations	3,731	3,731	3,731	3,731

Notes: The specifications were estimated using the fixed effects estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated using the method of Richardson (2006), where under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$). *FCF* is computed by subtracting the optimal level of cash flow from cash flow operating activities (*CFO*). *High_AC, Medium_AC or Low_AC* are dummy variables, equal to 1 in a given year if a firm faces the highest, medium, lowest agency costs in the same industry they belong to and 0 otherwise. In columns 1 and 3, we define a firm as facing high (low) agency costs in a given year if its *AC1* or *AC2* lies in the top (bottom) three deciles of the distribution of the corresponding variables of all firms operating in its same industry in that year. The remaining firm-years will be the ones with medium agency costs. As for columns 2 and 4, a firm is considered to face high (low) agency costs in a given year if its *AC1* or *AC2* exceeds (is below) the median value of the distribution of the corresponding variables of all firms operating in the same industry it belongs to in that year. *Diff* is a test, distributed as *Chi*-square, for equality of the coefficients across different categories of firms. Specifically, we report *p*-values of the Wald statistics for the equality of free cash flow associated with over-investment between sub-samples of firms characterized by high and low agency costs. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.13
The sensitivity of over-investment to free cash flow: distinguishing firm-years on the basis of ownership structure

Dependent variable: $I^u\_new_{i,t}$	*(1)* *Shareholding_CEO*	*(2)* *Blockholder*	*(3)* *Concentration*
Insider	-0.001		
	(0.002)		
FCF Outsider*	0.065***		
	(0.014)		
FCF Insider*	0.013		
	(0.022)		
Medium_ $Share_{(30-70)}$		0.001	0.001
		(0.003)	(0.003)
High_ Share $_{(>70)}$		0.002	-0.000
		(0.004)	(0.004)
FCF Low_ Share $L_{(<30)}$*		0.043**	0.134***
		(0.022)	(0.024)
FCF Medium_ Share $_{(30-70)}$*		0.084***	0.032
		(0.020)	(0.022)
FCF High_ Share $_{(>70)}$*		0.050**	0.036
		(0.023)	(0.028)
Firm-fixed effects	yes	yes	Yes
Year-fixed effects	yes	yes	Yes
R^2	0.40	0.43	0.45
Adjusted R^2	0.13	0.13	0.11
ρ	0.36	0.39	0.38
F-value	3.42	3.31	4.52
Diff(Low $_{VS}$ Medium)		0.17	0.00***
Diff (Medium $_{VS}$ High)		0.26	0.90
Diff (Low $_{VS}$ High)	0.04**	0.83	0.00***
Observations	3,721	3,332	2,834

Notes: The specifications were estimated using the fixed effects estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated adopting the method of Richardson (2006), where under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$). *FCF* is computed by subtracting the optimal level of cash flow from cash flow from operating activities (*CFO*). In the column labeled *Shareholding_CEO*, *Insider(Outsider)* is a dummy variable that takes the value of 1 if the firm CEO is (not) holding shares in his/her own company, and 0 otherwise. *Blockhoders* is the percentage of shares controlled by the largest shareholder. *High_Share (Low_Share)* is a dummy variable equal to 1 in a given year if the percentage of shares controlled by blockholders in a given firm lies in the top (bottom) three deciles of the distribution of *Blockhoders* of all firms operating in the same industry in that year. For the remaining firm-years, the dummy *Medium_Share* will be equal to 1. *Concentration* is a Herfindahl-type of index. *Share2_10*, is the sum of squares of shareholding percentages of the top 10 shareholders excluding the largest shareholder. *Low_share, Medium_share* and *High_share* refer in turn to dummy variables, equal to 1 if *Share2_10* lies in the bottom three deciles, the middle four deciles and the top three deciles of the distribution of *Share2_10* of all the firms operating in the same industry to which the firm belongs to, and 0 otherwise. *Diff* is a test, distributed as *Chi*-square, for equality of the coefficients across different categories of firms. Specifically, we report *p*-values of the Wald statistics for the equality of the free cash flow coefficients between the indicated groups. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.14
(Under- or over-) investment-free cash flow sensitivity: distinguish firm-years based on whether they become "ST" or bidders

Dependent variable: $I^u\_new_{i,t}$	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
	ST		*ST*		*Bidder*		*Bidder_con.*	
	Under	*Over*	*Under*	*Over*	*Under*	*Over*	*Under*	*Over*
ST(Bidder)					0.000	-0.000	0.001	-0.001
					(0.001)	(0.002)	(0.001)	(0.003)
FCF Non_ST(Bidder)$_1$*	0.029***	0.033**			0.034***	0.044***	0.036***	0.046***
	(0.005)	(0.014)			(0.005)	(0.013)	(0.004)	(0.012)
FCF ST(Bidder)$_2$*	0.052***	0.088***			0.046***	0.073***	0.032**	0.104***
	(0.007)	(0.020)			(0.009)	(0.022)	(0.014)	(0.034)
Pre_ST			0.004***	-0.005				
			(0.001)	(0.005)				
FCF Non_ST$_1$*			0.028***	0.033**				
			(0.005)	(0.014)				
FCF Pre_ST$_2$*			0.050***	0.131***				
			(0.010)	(0.028)				
FCF Post_ST$_3$*			0.061***	0.034				
			(0.010)	(0.029)				
Firm-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.37	0.40	0.37	0.40	0.37	0.40	0.37	0.40
Adjusted R^2	0.19	0.13	0.19	0.13	0.19	0.13	0.19	0.13
P	0.38	0.36	0.39	0.36	0.38	0.36	0.38	0.36
F-value	11.81	3.79	10.81	3.71	10.58	3.25	10.51	3.35
Diff ($1_{VS}2$)	0.00***	0.03**	0.06*	0.00***	0.20	0.27	0.78	0.10*
Diff ($2_{VS}3$)			0.44	0.02**				
Diff ($1_{VS}3$)			0.00***	0.98				

Observations	5,777	3,731	5,777	3,731	5,777	3,731	5,777	3,731

Notes: The specifications were estimated using the fixed effects estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated using the method of Richardson (2006), where under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$). *FCF* is computed by subtracting the optimal level of cash flow from operating cash flow (*CFO*). *ST* is a dummy variable that takes the value of 1 if a firm has been issued a special treatment or a de-listing risk warning, and 0 otherwise. *Pre_ST* (*Post_ST*) is a dummy variable, which equals one if a firm is in the pre- (post-) period of "ST", and 0 otherwise. *Bidder* is a dummy variable that takes the value of 1 if a firm becomes a bidder in the next fiscal year, and 0 otherwise. *Bidder_con* is a dummy variable that takes the value of 1 if a firm has been a bidder in two consecutive years, and 0 otherwise. *Diff* is a test, distributed as *Chi*-square, for equality of the coefficients across different categories of firms. Specifically, we report *p*-values of the Wald statistics for the equality of free cash flow between the indicated groups. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.15
The effects of free cash flow on (under- and over-) investment: distinguishing firms on the basis of other dimensions of firm heterogeneity specific to the Chinese context

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Dependent variable: $I^u\_new_{i,t}$	*Ownership*		*Ownership (2003-2010)*		*Region*		*Exporting*	
	Under	*Over*	*Under*	*Over*	*Under*	*Over*	*Under*	*Over*
Dum_CH	0.001	0.000			0.003	0.008	-0.000	-0.002
	(0.001)	(0.004)			(0.005)	(0.017)	(0.001)	(0.003)
FCF(1-Dum_CH)*	0.046***	0.023			0.038***	0.056***	0.039***	0.038**
	(0.007)	(0.021)			(0.007)	(0.018)	(0.006)	(0.019)
*FCF*Dum_CH*	0.032***	0.064***			0.035***	0.049***	0.020**	0.036
	(0.005)	(0.014)			(0.005)	(0.015)	(0.008)	(0.024)
$(SOE\_local)_2$			-0.003	-0.001				
			(0.002)	(0.006)				
$(Non\_SOE)_3$			-0.003	0.001				
			(0.003)	(0.007)				
FCF $(SOE\_Central)_1$*			0.037***	0.016				
			(0.012)	(0.035)				
FCF $(SOE\_local)_2$*			0.031***	0.104***				
			(0.007)	(0.020)				
FCF $(Non\_SOE)_3$*			0.053***	0.041*				
			(0.008)	(0.025)				
Firm-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Year-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.37	0.40	0.47	0.45	0.37	0.40	0.52	0.48
Adjusted R^2	0.19	0.13	0.26	0.11	0.19	0.13	0.31	0.12
ρ	0.38	0.36	0.50	0.38	0.39	0.37	0.57	0.40
F-value	10.71	3.35	10.89	4.01	10.49	3.18	10.05	1.96
Diff ($1_{VS}2$)	0.11	0.10*	0.65	0.03**	0.75	0.76	0.07*	0.94
Diff ($2_{VS}3$)			0.04**	0.05**				
Diff ($1_{VS}3$)			0.27	0.56				

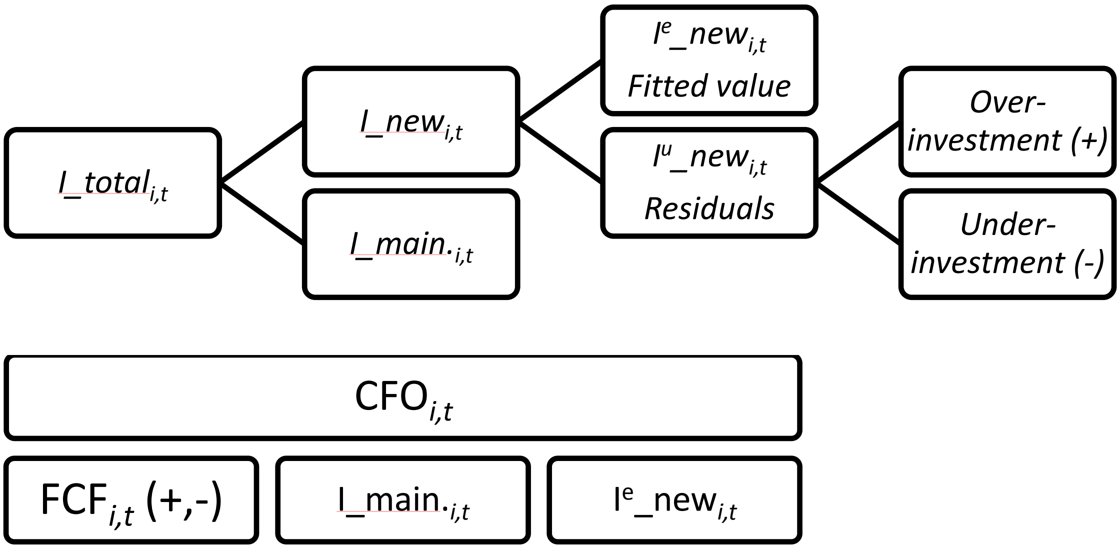
Observations	5,771	3,728	4,300	2,825	5,777	3,731	3,958	2,601

Notes: The specifications were estimated using the fixed effects estimator. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated using the method of Richardson (2006), where under-investing (over-investing) firms are characterized by positive (negative) abnormal investment ($I^u\_new_{i,t}$). *FCF* is computed by subtracting the optimal level of cash flow from cash flow from operating activities (*CFO*). *Dum_CH (Ownership)* is a dummy variable, which is equal to 1 in a given year if a firm is stated owned, and 0 otherwise. *Dum_CH (Region)* is a dummy variable, which is equal to 1 in a given year if a firm is located in the coastal regions of China, and 0 otherwise. *Dum_CH (Exporting)* is a dummy variable, which is equal to 1 if a firm participates in exporting in a given year and 0 otherwise. *SOE_central (SOE_local / non_SOE)* is a dummy variable, which is equal to 1 in a given year if a firm is a state-owned enterprise affiliated with the central government (a stated owned enterprise affiliated with local governments / a non-state-owned enterprise), and 0 otherwise. Due to the data availability, the results of different ownership structure in column 1 and 2 are based on a sub-sample from 2003 to 2010. *Diff* is a test, distributed as *Chi*-square, for equality of the coefficients across different groups of firms. Specifically, we report *p*-values of the Wald statistics for the equality of the free cash flow coefficients across sub-samples. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 2.16
The effects of the split share structure reform on the sensitivities of (under- and over-) investment to free cash flow

Dependent variable: $I^u\_new_{i,t}$	*(1)* *Over*	*(2)* *Over(2003-2010)*	*(3)* *Under*
FCF	-0.018	-0.011	0.054***
	(0.030)	(0.040)	(0.011)
*FCF*Post*	0.083**	0.081*	-0.017
	(0.041)	(0.048)	(0.015)
$FCF*Treat_{(SOE/SOELG)}$	0.097***	0.179***	-0.022*
	(0.035)	(0.050)	(0.013)
$FCF*Treat_{(SOE/SOELG)}*Post$	-0.114**	-0.199***	0.010
	(0.049)	(0.062)	(0.018)
$FCF*Treat_{(SOECG)}$		-0.066	
		(0.066)	
$FCF*Treat_{(SOECG)}*Post$		0.091	
		(0.085)	
Firm-fixed effects	yes	yes	Yes
Year-fixed effects	yes	yes	Yes
R^2	0.39	0.45	0.35
Adjusted R^2	0.13	0.12	0.19
ρ	0.35	0.37	0.36
F-value	3.63	4.99	9.48
Observations	3,509	2,636	5,487

Notes: The specifications were estimated using the fixed effects estimators. Test statistics and standard errors (in parentheses) of all variables in the regressions are asymptotically robust to heteroscedasticity. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is unexpected investment ($I^u\_new_{i,t}$) calculated adopting the method of Richardson (2006). *FCF* is computed by subtracting the optimal level of cash flow from cash flow from operating activities (*CFO*). *Treat* $_{(SOE)}$ is a dummy variable, which equals 1 if a firm has a state entity as its ultimate controlling shareholder, and zero otherwise. *Treat* $_{(SOELG/SOECG)\ )}$ is a dummy variable, which equals 1 if a firm is stated owned enterprise affiliated with the local/the central government in a given year, and zero otherwise. *Post* is equal to 1 in the year of and the years following the firm's announcement of the restricting reform, and zero otherwise. The triple term (*FCF*Treat*Post*) is aimed at capturing the difference-in-differences effect. Due to the data availability, the results in column 2 are based on a sub-sample covering the years 2003 to 2010.*, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.



Note: $I\_total_{i,t} = CAPEX_{i,t} - SalePPE_{i,t}$ (Capital expenditure- sale of property, plant, and equipment);

$I\_main._{i,t} = Depreciation_{i,t} + Amortization_{i,t}$;

$I\_new_{i,t} = I\_total_{i,t} - I\_main._{i,t}$;

$CFO_{i,t}$ = Net cash flow from operating activities;

$CF_{AIP,i,t}$ = Cash flow generated from assets in place;

$FCF_{i,t} = CF_{AIP,i,t} - I^e\_new_{i,t} = CFO_{i,t} - I\_main._{i,t} - I^e\_new_{i,t}$.

Fig. 2.1 Framework for the construction of (under- or over-) investment and free cash flow

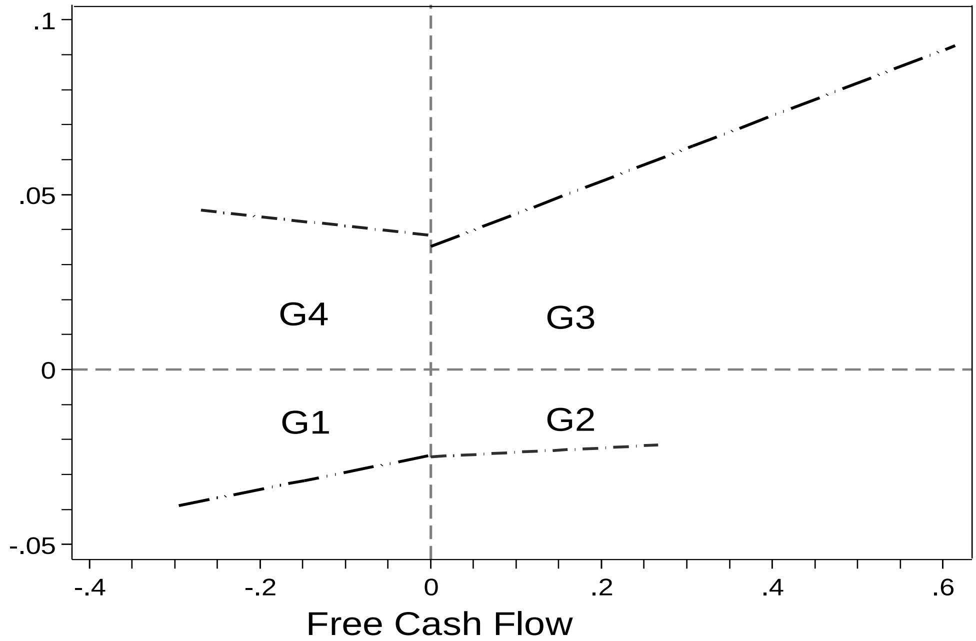


Fig. 2.2 Fitted values of the sensitivities of abnormal investment to free cash flow

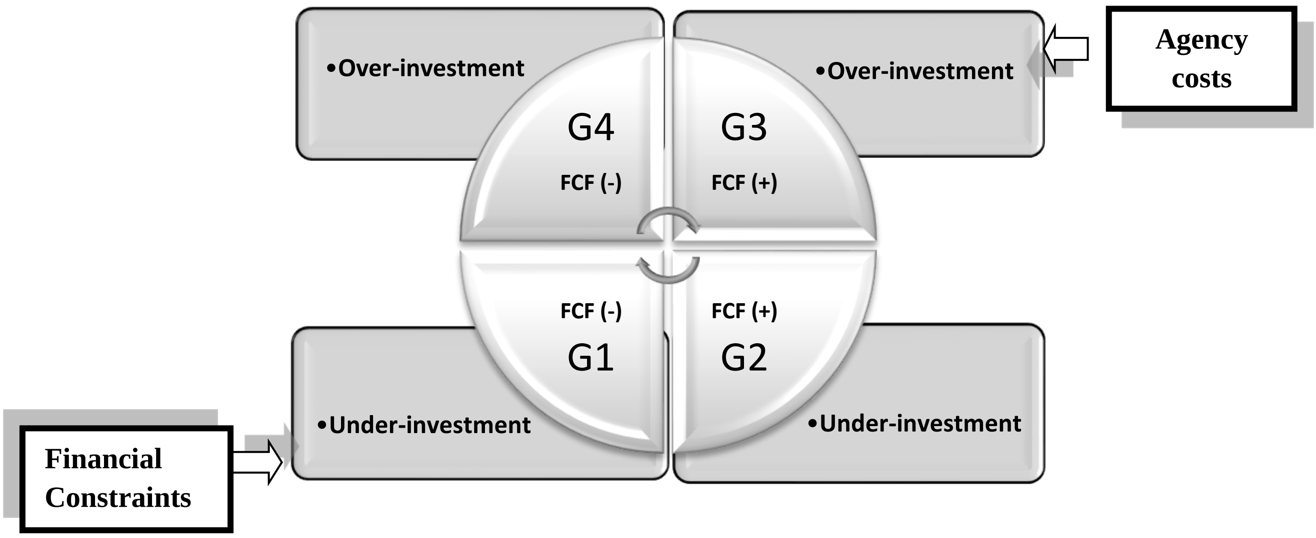


Fig. 2.3 Four groups of firms based on their abnormal investment and free cash flow (*FCF*)

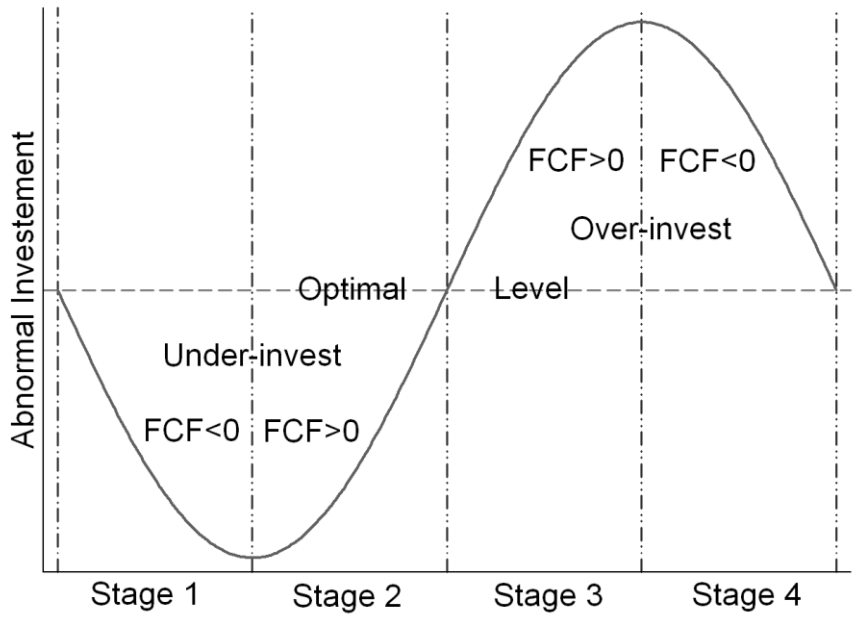


Fig. 2.4 Diagrams of four phases of firms' abnormal investment and free cash flow

Chapter 3

Adjustment behavior and value of corporate cash holdings:

The China experience

Using a large panel of Chinese listed firms over the period 1998-2010, we examine the behavior of corporate cash holdings. Consistent with the cost-benefit trade-off view, we document that Chinese firms tend to actively manage their cash balances towards a target level. We also observe a considerable heterogeneity in adjustment speeds of cash holdings across firms, due to the presence of different adjustment costs. Furthermore, the marginal value of cash is shown to decrease with larger cash holdings, and is lower for firms attempting acquisitions, and for state-owned enterprises. Finally, we observe that financially constrained firms tend to make better use of additional cash compared with firms that have easier access to capital markets.

3.1. Introduction

Cash and cash equivalents are an important source of finance for firms, especially in the presence of imperfect capital markets. A huge literature has investigated possible reasons why companies hold a considerable portion of their assets in the form of cash reserves. However, most of this literature focuses on US and European corporations. Yet, Chinese firms hold higher levels of cash reserves than firms in most countries, including developed ones, and the cash holdings of Chinese firms have been growing over the last decade at rates similar to those of US and European companies.[80] Understanding Chinese firms' cash holding behavior represents therefore an interesting research question.

Allen *et al.* (2007) point out that the malfunctioning financial system in China, which is mainly bank-based, hinders economic growth. According to Allen *et al.* (2012), the size of China's banking sector, in terms of total bank credit, represented 111% of its GDP in 2005. However bank credit issued to the non-state sector only represented 31% of GDP. This shows that non state-owned firms may find it difficult to obtain external finance from the banking sector. There is also abundant evidence showing that the role of China's stock markets in financing and allocating resources is limited, and size requirements generally prevent private enterprises from accessing equity markets (Allen *et al.* 2012).

Given the difficulties they face in accessing external finance, Chinese firms, and particularly the non-state ones rely on self-financing, which comprises retained earnings, cash

[80] Firms in emerging countries are found to hold more cash than those in developed countries, due to poor shareholder protection (Dittmar *et al.*, 2003). In our sample, which covers the period 1998-2010, the median level of cash holdings to total assets is 12.2%, much higher than overall median (6.2%) of the 45 countries analyzed by Dittmar *et al.* (2003). In addition, the average level of cash holdings in China almost doubled over our sample period (1998-2010).

reserves, and loans from family, friends and other investors. The average annual growth rate of self-funding in China was approximately 17.8% between 1994 and 2006, and self-funding reached $666.5 billion in 2006, which is almost twice the size as domestic bank loans ($364.8 billion) in the same year. Moreover, roughly 90% of total financing for individually owned companies depends on self-funding. Even for SOEs or quasi-state-owned companies, 45%-65% of total financing comes from self-funding (Allen *et al.* 2007).

A number of studies have found positive effects of internal funds on the investment and assets growth of Chinese firms (Chow & Fung 1998; Chow & Fung 2000; Guariglia *et al.* 2011). Due its relatively low costs, a sufficient level of internal finance (including cash reserves) provides Chinese firms with the ability to invest, despite the difficulties they face in accessing external finance. Consequently, unlike the US or European countries, where the financial system functions efficiently, cash holdings are likely to play a more crucial role in explaining firm behavior and, ultimately, economic growth in China. Yet, to the best of our knowledge, only a handful of studies have analyzed corporate cash holding decisions in China (Alles *et al*., 2012; Chen *et al*., 2012; Lian *et al.*, 2010; and Megginson & Wei, 2012).[81]

[81] It should be noted that Megginson and Wei's (2012) paper only focuses on the links between state ownership and the level and value of cash holdings. Chen *et al.* (2012), on the other hand, aim at explaining the decline in cash holdings and in the cash to cash flow sensitivities observed for Chinese firms after the split share reform. Our chapter is closer in spirit to Alles *et al.* (2012) and Lian *et al*. (2010). Yet, the former only look at the extent to which Chinese listed firms adjust their actual levels of cash towards a target level, without taking into account firm heterogeneity, whilst the latter also attempts to explain possible determinants of the adjustment speeds. Our work builds on these papers by presenting a more thorough analysis of firms' speeds of adjustment towards an optimal level of cash, by showing how these speeds of adjustment may be different for different types of firms, and by proposing a direct horse-race test of the target adjustment model against other alternative models. Finally, we also analyze the extent to which cash holdings affect firms' excess operating performance.

The aim of this study is to fill this gap in the literature by investigating Chinese firms' cash holding decisions and the effects of cash holdings on their value. Specifically, we address the following questions: What are the determinants of cash holdings for Chinese firms? Do Chinese firms have cash targets, and if so, how quickly do they adjust towards the targets? What factors affect their speeds of adjustment (SOAs) towards these targets? What value or benefits does a firm generate by holding more cash? Is the value of additional cash different across firms?

To this end, making use of a panel of listed companies over the period 1998-2010, we first test the time series properties of Chinese firms' cash holdings. We find that they display a tendency towards convergence, suggested by mean reversion. Second, following Opler *et al.* (1999) (hereafter OPSW), we examine different models of corporate cash holdings, and find substantial empirical support for the trade-off model. According to this model, firms assess the costs and benefits of holding cash and adjust their cash reserves to a target level.

Third, we account for the potentially dynamic nature of firms' cash holdings by estimating the speed of adjustment (SOA), i.e. the rate at which firms adjust their cash reserves towards the target.[82] We find imperfect adjustments of cash holdings: It takes the typical Chinese firm between 1.2 and 2.1 years to complete half of its required cash adjustment. This is slightly longer than what is observed for firms from the West, and can be explained by the higher adjustment costs faced by Chinese firms. Financing frictions may

[82] The static cash holding model used by Kim *et al.* (1998) and Opler *et al.* (1999) assumes that cash holdings are determined by a single period trade-off between the costs and benefits of holding liquid assets. However, the performance of the static trade-off model is weakened by not fully accounting for firms' adjustment costs and expectations. In contrast, the dynamic models of cash holdings developed by Ozkan & Ozkan (2004), Han & Qiu (2007), and Venkiteshwaran (2011) recognize a sluggish adjustment process of cash holdings due to adjustment frictions. In our empirical analysis, we therefore estimate firms' SOAs using a dynamic cash holdings model.

prevent firms from keeping their cash levels in line with the optimal level, and thus cause a dynamic adjustment of cash holdings. We also find that the SOAs of cash holdings are different for firms facing different adjustment costs. Particularly, firms with excess cash display higher adjustment speeds than their counterparts with a cash deficit. In other words, it is more costly for a firm to build up cash stocks than to deplete excess cash reserves. Additionally, higher adjustment speeds associated with a lower level of adjustment costs are accompanied by firm's active management of cash balances by firms through higher investment, dividend payments, and debt issuance.

Fourth, we adopt the method of Faulkender & Wang (2006) to examine how excess operating performance is affected by changes in cash holdings. We find that firms benefit from holding additional cash in terms of excess operating performance. However the marginal value of cash significantly drops as the level of (excess) cash increases. Furthermore, our study reveals that firms that attempt acquisitions or are state-owned display lower marginal value of cash holdings. Finally, we find that compared with constrained firms, financially healthy firms tend to exhibit a lower marginal value of additional cash holdings.

The remainder of this chapter proceeds as follows. In Section 3.2, we briefly review the theories of cash holdings and their empirical predictions. Section 3.3 illustrates the main features of our data and presents summary statistics. Section 3.4 describes our baseline specifications and empirical results. Section 3.5 concludes.

3.2. Theories of cash holdings and value implications

In the sub-sections that follow, we illustrate in turn the three main theories on the motives of corporate cash holdings, namely the trade-off theory, the financial hierarchy theory, and the free cash flow theory.

3.2.1. Theories of cash holdings

3.2.1.1. The trade-off theory of cash holdings

The trade-off theory, which has attracted significant empirical support (Opler *et al.* 1999; Keynes 2006; Lee & Powell 2011; Venkiteshwaran 2011), suggests that given the costs and benefits of holding liquid assets, firms tend to rebalance their cash holdings towards a target level which maximizes shareholder wealth.

The cost of holding cash is the opportunity cost of the capital invested in liquid assets, i.e. the lower return compared to other investments associated with a similar level of risk (Opler *et al.* 1999; Dittmar *et al.* 2003). As for the benefit of holding cash, it derives from two motives: the transaction cost motive and the precautionary motive. According to the former, firms benefit from holding cash to meet business transactions needs or unsynchronized expenses. Using cash enables them to make payments without liquidating assets. Consistent with this perspective, Mulligan (1997) argues that there exist economies of scale in cash holdings since it is more costly for small firms to access capital markets and raise external financing and it is more difficult for these firms to sell non-core assets to raise cash in periods of financial distress. Similarly, one would also expect firms with more volatile cash flow to hold cash to mitigate the consequences of unexpected earnings shortfalls.

According to the precautionary motive, liquid assets can be used as a buffer to meet unexpected shocks, enabling firms to avoid the cost premium they would have to pay if they had to access capital markets. The precautionary motive also suggests that in the presence of asymmetric information problems, firms hold cash to avoid the costs of forgoing positive net present value (NPV) projects when other sources of finance become either too expensive or not available. This motive is likely to be more relevant for firms with better investment opportunities.

The trade-off view suggests that firms have incentives to actively offset deviations from their optimal cash levels. However, adjustment costs may prevent them from immediately rebalancing towards their target level, since they need to trade-off the adjustment costs against the costs of operating with suboptimal cash levels. The speed with which firms adjust their cash holdings depends on the adjustment costs they face. With zero adjustment costs, firms should always stick to their optimal cash ratios. If adjustment costs are infinite, one would expect that there is no reversion of cash changes.

Focusing on empirical evidence, Opler *et al.* (1999) find evidence that US firms with better growth opportunities, greater cash flow uncertainty, and restricted access to external capital tend to hold more cash, which supports the static trade-off theory. Almeida *et al.* (2004) find a relation between the degree of financial constraints that firms face and their propensity to save cash out of cash flow. Han & Qiu (2007) find a significantly positive responsiveness of cash holdings to cash flow volatility for financially constrained firms. Both studies support the precautionary motive for holding cash, suggesting that when firms are constrained by capital market imperfections, they tend to adjust their levels of cash holdings to trade-off current against future investments. This intertemporal trade-off allows financially constrained firms to save more cash reserves by decreasing current investment in response to increased future cash flow uncertainty. Bates *et al.* (2009) point out that, on average, US firms dramatically increased their cash holdings from 1980 through 2006. Their empirical study shows that this increase can be explained by the change in firm characteristics over the sample period. In particular, they observe that firms display higher R&D expenditures and cash flow volatility over time, which implies they are characterized by a higher degree of uncertainty. Their findings therefore suggest that firms tend to hold more cash for precautionary reasons.

Focusing on Chinese listed firms, Alles *at al.* (2012) and Lian *et al.* (2010) find support for the trade-off theory of cash holdings. The latter also show that adjustment from above the target is faster than from below, and that adjustment speeds are negatively related to firm size, but positively related to the deviation from the target level. Furthermore, they note that the adjustment to target is mainly undertaken through internal finance, rather than through dividend payments or leverage. Finally, they show that the adjustment behavior can be explained by precautionary saving stemming from financing constraints. We build on these papers by presenting a more thorough analysis of firms' speeds of adjustment towards an optimal level of cash, by showing how these speeds of adjustment may be different for different types of firms, and by proposing a direct horse-race test of the target adjustment model against the financial hierarchy and the cash flow models, which we discuss below.

3.2.1.2. The financial hierarchy theory of cash holdings

Myers & Majluf (1984) propose a pecking order model, according to which, in a world characterized by imperfect capital markets, firms use first of all retained earnings to finance themselves, then debt, and then equity as a last resort. This theory suggests that when a firm has a low level of cash flow relative to investment, it will use stockpiled cash holdings before seeking for costly external financing. Hence, holding a considerable amount of cash can reduce the costs of raising funds externally, and serve stockholders' interests. According to this theory, one would expect that faced with a rise in internal funds, the firm would accumulate cash and repay its debt when it is due; while if a firm faces a deficit of internal funds, it is more likely to deplete cash reserves and further raise debt. Generally, cash can be seen as negative debt. In brief, a firm's level of cash holdings would rise and fall with its profitability (Opler *et al.* 1999). In contrast with the trade-off theory, this theory does not give rise to an optimal cash holding level.

As suggest by de Haan & Hinloopen (2003), who analyze a sample of Dutch firms from 1984 to 1997, the determinants of incremental financing choice can be explained by both the financial hierarchy theory and the static trade-off theory. In particular, based on ordered probit models for a possible set of financing hierarchies, they find that Dutch firms generally follow the rule predicted by the theory according to which internal finance is favored over external finance. Focusing on EMU countries, Ferreira & Vilela (2004) find a positive impact of cash flow and investment opportunities on cash holdings, which provides support for the financial hierarchy theory. D'Mello *et al.* (2008) examine the determinants of cash allocation decisions around spin-offs for a sample of US listed firms between 1985 and 2000. They find that consistent with the pecking order theory, the excess cash ratio is positively related to concurrent profitability. Using a large panel of 17,165 Italian unlisted firms between 1996 and 2005, Bigelli & Sánchez-Vidal (2012) examine cash holdings and its determinants in Italian private firms and also find evidence supportive of the financial hierarchy theory.

3.2.1.3. The free cash flow theory of cash holdings

The free cash flow theory suggests that managers might not always have the same interests as shareholders due to empire-building or entrenchment motives. Specifically, managers might have incentives to stockpile cash as reserves to pursue their own objectives. Holding excess cash gives them in fact more flexibility to operate their companies, even at the expense of shareholders. As for the financial hierarchy theory, the free cash flow theory does not predict an optimal level of corporate liquidity.

By examining a small sample of firms with a cash windfall, Blanchard *et al.* (1994) find that in order to secure their positions and firms' long-run survival, managers re-invest the cash windfall inside the firm or invest it in value-destroying projects rather than returning it to shareholders. Dittmar *et al.* (2003) show that there are significantly higher cash reserves in countries with poor shareholder protection. Similarly, Dittmar & Mahrt-Smith (2007) find that poorly governed firms have lower marginal value of cash holdings and have a worse operating performance associated with excess cash. These findings are consistent with the predictions of the free cash flow theory. Additionally, accumulating excess cash may decrease market discipline. For example, Harford (1999) documents that firms which are holding excess cash are likely to make value-decreasing acquisitions, while they are less likely to be a takeover target. In short, without valuable investment opportunities, the agency costs of managerial discretion may lead firms to use their excess cash to finance unprofitable projects rather than to pay dividends to shareholders, which decreases the additional value of cash holdings.

Based on the discussion on these motives of cash holdings, we will assess the extent to which the cash holdings of Chinese firms can be explained by these theories. Initially, we will test for the presence of a cash target. Should we find evidence for the existence of such a target, we will investigate what is the adjustment speed with which firms rebalance their cash ratio towards the optimal level in the presence of adjustment costs.

3.2.2. Value implications of holding cash

As mentioned above, cash holdings serve two main purposes: the transaction costs motive and the precautionary motive. Thus, cash holdings can be enormously valuable when other internal and external funds are insufficient to finance firms' investment and other activities. However, cash holdings can also be converted into private benefits at lower costs compared to other types of assets (Myers & Rajan 1998). To reconcile these contradictory predictions, a number of papers investigate the valuation effect of cash holdings. Among these, Faulkender & Wang (2006) show that the value of liquidity is higher for US firms with lower cash holdings, lower leverage, and higher financial constraints. Additionally, firms that distribute cash via dividends have lower marginal value of cash holdings than the ones that repurchase shares. Pinkowitz *et al.* (2006) find a lower value of cash holdings in countries with poor investor protection, which is supportive of the importance of the agency theory. Similarly, Dittmar & Mahrt-Smith (2007) and Harford *et al.* (2008) investigate the impact of corporate governance on the value of cash holdings. The former find that poor governance can significantly reduce the value of cash holdings as well as the operating performance associated with excess cash. The latter point out that the value of excess cash is lower for firms with low insider ownership. Bates *et al.* (2009) provide evidence that the increase in cash holdings observed for US industrial firms between 1980 and 2004 did not cause a decrease in the value of cash over time, which suggests that the increases in cash holdings cannot be explained by agency problems. By investigating cash holdings for a sample of Chinese privatized firms from 1993 to 2007, Megginson & Wei (2012) find that state ownership has a negative effect on the marginal value of cash, which is consistent with the soft-budget constraint theory[83].

We build on this literature by investigating the extent to which the marginal value of cash varies with: (1) the level of the firm's cash position, (2) whether or not the firm engages in Mergers & Acquisitions (M&As) in the next year, (3) the degree of financial constraints the firm is like to face, (4) the firm's ownership structure. The intuition behind these conjectures is as follows:

(1) Firms with a low level of cash holdings are more likely to benefit from an extra dollar of cash since cash reserves can increase their ability to invest without accessing costly external capital markets. These firms are more likely to face higher transaction and liquidity costs compared with firms with high cash balances. Thus, cash-poor firms rely more on cash reserves to fund their investments and short-term liabilities and to avoid potentially forgoing

[83] In the presence of soft budget constraints, state-owned enterprises are expected to be bailed out or rescued when they suffer from chronic losses or financial problems.

their positive net present value (NPV) projects. Consequently, the marginal value of cash is expected to decline as cash holdings rise.

(2) The payoff in terms of marginal value of cash is likely to be lower for firms attempting acquisitions in the next year because of the agency conflicts over resources between owners and managers. For the sake of reducing their personal undiversified risk and increasing the scale and scope of operating assets in their hands, managers may in fact prefer spending cash rather than paying it out to the shareholders. Acquisitions can be seen as a primary way for managers to spend cash. Therefore, the value of holding cash is expected to be lower for firms who are going to engage in acquisitions in the following year.

(3) According to the costly external financing view, the marginal value of cash tends to increase with the level of financial constraints that firms face. That is, when firms face financial constraints, they find it more difficult to access to capital markets, and are thus more likely to face higher costs of raising external funds. Cash reserves allow these firms to bypass the cost premium to undertake positive net present value (NPV) projects. Therefore, we expect an extra dollar of cash to be more valuable for financially constrained firms.

(4) It is well documented that state-owned firms in China are favored by domestic banks and typically experience soft budget constraints due to social and political reasons (Allen *et al.* 2007). Therefore, state-owned enterprises (SOEs) are less likely to face financial constraints than their non-state-owned (non-SOEs) counterparts (Bai *et al.* 2006; Allen *et al.* 2007; Guariglia *et al.* 2011). Hence, we expect a rise in cash holdings to be associated with a lower value enhancement for state-controlled enterprises.

3.3. Data and Descriptive Statistics

3.3.1. The dataset

We use the universe of listed Chinese firms that issue A-shares on either the Shanghai Stock Exchange (SHSE) or the Shenzhen Stock Exchange (SZSE) during the period 1998-2010, obtained from the China Stock Market Trading Database (CSMAR) and China Economic Research Service Centre (CCER) [84]. Following the literature, we exclude firms in the financial sector. Furthermore, to minimize the potential influence of outliers, we winsorize observations in the one percent tails for the regression variables. Finally, we drop all firms with less than three years of consecutive observations. All variables are deflated using the gross domestic product (GDP) deflator (National Bureau of Statistics of China).

We consider the information on acquisition deals announced between January 1, 1999 and December 31, 2011 for our listed Chinese companies on the Thomson Financial SDC Mergers and Acquisitions Database. Both successful and unsuccessful deals are taken into consideration.

Our final unbalanced panel consists of 15,349 firm-year observations representing 1,478 listed firms. The number of firm-year observations of each firm varies between three and thirteen, with number of observations varying from a minimum of 708 in 1998 to a maximum of 1,478 in 2008.[85]

[84] The cash flow statement in the databases is not available until 1998.

[85] See Tables 1 and 2 for details about the structure of our sample. Fewer than 50 percent of firms have the full 13-year observations. Our panel is unbalanced, allowing for both entry and exit. This can be seen as evidence of dynamism and may reduce potential selection and survivor bias.

3.3.2. Descriptive statistics

Table 3.3 presents descriptive statistics for the main variables used in the study. We observe that the average cash flow to assets ratio is 4.7%; the average capital expenditure to assets ratio, 5.8%; the average leverage ratio, 23.2%; and average cash flow volatility, 8.7%. These figures are largely consistent with those reported for US firms by Opler *et al.* (1999) and Venkiteshwaran (2011); for EMU and UK firms, by Ferreira & Vilela (2004) and Ozkan & Ozkan (2004); and for Chinese firms, by Alles *et al.* (2012). Additionally, Table 3.3 shows that on average, the return on assets (*ROA*) is 2.3% and Tobin's *Q* is greater than one (1.75).[86]

[Insert Table 3.3]

Furthermore, we observe that the mean level of cash holdings to total assets in our sample is approximately 14.7%. This is comparable to the ratios observed for US and UK firms[87]. However, the median cash-to-assets ratio is 12.1%, higher than the median ratios observed in the West, which range between 3% for Canadian firms to 9% for French firms (Opler *et al.* 1999; Ozkan & Ozkan 2004; Dittmar & Mahrt-Smith 2007; Harford *et al.* 2008; Riddick & Whited 2009; Venkiteshwaran 2011). Chinese firms also hold a relatively higher median percentage of cash reserves than most of the developed countries analyzed by Dittmar

[86] The shares of listed firms in China can be either tradable or non-tradable. Following the literature (Chen *et al.* 2011; Huang *et al.* 2011), we calculate Tobin's *Q* as the sum of the market value of tradable stocks, the book value of non-tradable stocks, and the market value of net debt, divided by the book value of total assets. The results were similar when tradable stock price is used to calculate as the market value of non-tradable stocks. For brevity, these results are not reported, but are available upon request.

[87] Corresponding ratios for US firms are in fact 18.0% according to Dittmar & Mahrt-Smith (2007), 14.8% according to Harford *et al.* (2008), 8.1% according to Kim *et al.* (1998), 14.5% according to Opler *et al.* (1999), and 19% according to Venkiteshwaran (2011). The corresponding ratio for UK firms is 9.9% (Ozkan & Ozkan, 2004).

et al. (2003) and Riddick & Whited (2009), for which the median cash to assets ratio is 6.3% and 6.2%, respectively.[88] It is interesting to point out that Japan has similar mean and median cash to assets ratios as China (16.4% and 13.9%, respectively). In addition, our descriptive statistics reveal that the average cash level (14.7%) is higher than the sum of average cash flow (4.7%) and capital expenditures (5.8%). Cash holdings constitute therefore a non-trivial percentage of total assets of Chinese firms. This may be due to the higher costs associated with raising external credit in China (Allen *et al.* 2005), which may lead Chinese firms to rely more on internal finance than firms in other countries.

The lower part of Table 3.3 provides summary statistics for the cash-to-assets ratio by year. It reveals that average (median) cash holdings range from 9.8% (7.9%) in 1998 to 17.2% (14.3%) in 2010. This suggests that during the sample period, the level of cash holdings in China almost doubled.[89] Additionally, in line with Chen *et al.* (2012), we observe a trough of cash holdings in 2005 and 2006.[90] Chen *et al.* (2012) attribute the reduction in cash holdings to an improvement in Chinese firms' corporate governance and a relaxing in the financial constraints following the 2005 split structure reform.[91] The noticeable increasing

[88] The cash-to-assets ratios for developed countries like the US, UK, Germany and France is more right-skewed than the ratios for Chinese firms in our sample.

[89] To better understand this trend, we regressed firms' cash holdings on a constant and a firm-specific time trend using the fixed-effects estimator. The estimated coefficient on the time trend was found to be positive and significant (slope = 0.1% per year; t-statistic= 4.90). This suggests the existence of a 0.1 percentage point per year increase in the tendency of firms to accumulate cash.

[90] It should be noted, however, that contrary to us, Chen *et al.* (2012) report value of cash and cash equivalents divided by non-cash assets.

[91] The split structure reform was launched in May 2005 by the Chinese Securities Regulatory Commission's (CSRC) in order to float the non-tradable shares through the open market. Prior to the reform, the majority of shares of listed firms in China was not tradable and typically held by the government itself or government entities. The reform substantially released market frictions and had a positive impact on firms' governance (Allen *et al.* 2007; Jiang *et al.* 2010; Li *et al.* 2011; Hou *et al.* 2012).

trend in cash holdings from 2007 onwards may be due to the financial crisis, which made it more difficult for firms in China to access credit.

To examine whether the increase in cash applies equally to different types of firms, we partition our sample into small and large firms, on the one hand; and firms with low and high Tobin's *Q*, on the other. Specifically, we define as small/large (characterized by a low/high Tobin *Q*) in a given year those firms whose total real assets (market-to-book ratio) fall below/above the median value of the corresponding variable of all firms operating in the same industry. Fig. 3.1 illustrates the evolution over time of the median cash ratios across small and large firms, and across firm with low and high Tobin's *Q*. We can see that the increases in cash have similar patterns across sub-samples, which suggests that the increase in cash holdings is driven by neither firm size nor Tobin's *Q*. Additionally, we do not observe obvious differences in the cash ratios between large and small firms. However, cash to assets ratios are slightly higher for firms with higher Tobin's *Q*, which may due to the fact firm with higher *Q* hold more cash in order to respond to better investment opportunities.[92]

[Insert Fig 3.1]

[92] Unreported *p*-values associated with tests for equality of both sample means (t-test) and sample medians (Wilcoxon rank-sum test) show significant differences in the cash ratios across firms with low and high Tobin's *Q*.

3.4. Evaluation of the results

3.4.1. Determinants of cash holdings

In this section, we examine whether the level of cash holdings (measured by the ratio of cash and cash equivalents to total assets) can be explained by firms' characteristics. Following Opler *et al.* (1999), the explanatory variables that we use as determinants of cash holdings are motivated by the transaction and precautionary motives. We also add acquisitions and ownership dummies as acquisition expenditures may be seen as a substitute to capital expenditures, and the ownership structure is a unique feature in the Chinese context. Our model of optimal cash holdings (*Cash**) is therefore given by the following equation:

$$Cash^*_{i,t} = a + \sum_k \beta X_{k,it} = a + b_1 Q_{i,t} + b_2 Size_{i,t} + b_3 CF_{i,t} + b_4 NWC_{i,t} + b_5 CAPEX_{i,t} + b_6 Leverage_{i,t} + b_7 Div_{Dum\,i,t} + b_8 Var_{CF\,j,t} + b_9 Ownership_{i,t} + b_9 AC1_{i,t} + \sum Year + \sum Industry + \sum Province + v_i + \varepsilon_{i,t} \quad (3.1)$$

where the subscript *i* indexes firms; *j* indexes industries; and *t*, years (*t*=1998-2010). $X_{k,it}$ is a vector of the explanatory variables that affect the costs and benefits of holding cash. These variables are the following:

- *Q* (Tobin's *Q*), i.e. the firm's market-to-book ratio. Firms with more profitable investment opportunities are more likely to hold more cash, since the opportunity cost of cash shortfalls is larger for these firms. Therefore, liquid assets are expected to increase with Tobin's *Q*.
- *Firm size*, defined as the natural logarithm of the firm's total assets. This variable is expected to have a negative sign due to economies of scale in cash management

(Miller & Orr 1966). Small firms have incentives to maintain higher cash reserves to avoid substantial fixed costs of raising funds.

- *Cash flow*, defined as the ratio of the sum of net profit and depreciation to total assets. We expect to observe a positive relation between cash flow and cash holdings since firms with more funds available have the means to accumulate more liquid assets.
- *NWC (non-cash NWC)*, defined as the ratio of net working capital (working capital minus cash holdings) to total assets. *NWC* can be seen as a substitute for cash, thus firms with more *NWC* should hold less cash.
- *CAPEX* represents the ratio of capital expenditures to total assets. Capital expenditures could increase the firm's net worth as well as debt capacity. Thus, firms with higher capital expenditures are less risky and likely to have easier access to capital markets. Additionally, firms can manage their cash balances through investment in response to unexpected shocks. Therefore, one would expect firms that invest more to accumulate less cash.
- *Leverage*, defined as the ratio of its short-term and long-term debt to total assets. We expect to observe a negative relation between cash holdings and leverage. When firms are facing surplus internal funds, they may in fact save cash and reduce leverage. Similarly, when internal funds drop, firms may cut their cash holdings and obtain more leverage. Additionally, high leverage may prove the firm was successful at obtaining loans from banks. Therefore, firms with high leverage may face a lower need to hold liquid assets.

- *Div_Dum* is a dividend payout dummy equal to one if the firm pays cash dividends, and 0 otherwise.[93] We expect this dividend dummy (*Div_Dum*) to have a positive effect on cash holdings due to the fact that dividend-paying firms tend to hold more cash to manage dividend payments in a situation of shortage of liquid assets. A positive relation could also be due to the fact that cash-rich firms are more likely to pay dividends.[94]
- *Var_CF* is a measure of the volatility of cash flow, measured at the industry level. For a given industry *j* in a given year *t*, it is measured as the mean of the standard deviations of the cash flow to assets ratios of all firms operating in that industry in year *t*. According to the precautionary motive, a firm's individual cash holdings are expected to react positively to industry cash flow risk.
- *Ownership,* is a dummy variable, that takes the value of 1 if a firm is state-owned in a given year, and 0 otherwise.[95] Given the soft budget constraints characterizing them, state-owned enterprises (SOEs) are likely to face a lower degree of financial constraints, thus we expect them to hold less cash than their non-state owned counterparts.
- *AC1* is a dummy variable equal to 1 in a given year if a firm attempts acquisitions in the next fiscal year, and 0 otherwise. According to Harford (1999), substantial cash

[93] Cash dividends are more likely to affect the level of cash holdings, compared to stock dividends.

[94] However, the relationship between cash holdings and dividend payment could also be negative since paying dividends signals to the markets that the firm is less risky, which provides it with better access to external financing, and with a lower need to hold cash.

[95] We differentiate firms into SOEs and non-SOE groups according to their ultimate controlling shareholder: The SOE sector is made up of state-controlled entities. The non-state sector, in which non-state entities are the controlling shareholders, comprises six types of ownership categories: domestic private, foreign, collective, employees' union, non-profit organizations or institutes, and others. The majority of firm-years in our sample (70.2%) belong to the state sector. Moreover, 83% of the firm-years in the non-state sector of our sample are domestic private firms.

holdings increase the likelihood of attempting acquisitions. Hence, we would expect to observe a positive relation between cash holdings and the chance of undertaking acquisitions.

Eq. (3.1) also incorporates time dummies ($\sum Year$), which account for the possible effects of business cycles, as well as the impact of change in interest rates. Industry dummies ($\sum Industry$) are included to capture the industry fixed-effects associated with firms' cash holdings.[96] Finally, provincial dummies ($\sum province$) are added to account for uneven development across different provinces.[97]

The error term in Eq. (3.1) consists of two components: ν_i, a firm-specific component, embracing any time-invariant firm characteristic which might influence firms' cash holdings, as well as any time-invariant component of the measurement error which may affect any variable in our regression; and $\varepsilon_{i,t}$, which represents an idiosyncratic component. The fitted values of Eq. (3.1) can be interpreted as a proxy for optimal cash holdings. We estimate excess cash as the difference between real cash holdings and optimal levels.

[96] According to the industry classification taken from the China Securities Regulatory Commission (CSRC), firms in China's listed sector are assigned to one of the following twelve industrial sectors: Farming, forestry, animal husbandry & fishing; Mining; Manufacturing; Utilities; Construction; Transportation & warehouse; Information technology; Wholesale & retailing; Real estate; Social services; Communications & cultural; Conglomerates; Finance & insurance. Following previous literature, we exclude the Finance & insurance sector from our study.

[96] It should be noted that because of collinearity, industry dummies ($\sum Industries$) cannot be included in the equations when the fixed- effects estimator is used. The same argument applies to the industry-level measure of cash flow volatility (*VAR_CF*).

[97] There are 31 provinces in China: Coastal provinces (Beijing, Fujian, Guangdong, Hainan, Hebei, Jiangsu, Liaoning, Shandong, Shanghai, Tianjin, and Zhejiang); Central provinces (Chongqing, Anhui, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Jilin, and Shanxi); and Western provinces (Gansu, Guangxi, Guizhou, Neimenggu, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, and Yunnan).

Table 3.4 provides the pooled OLS, Fama-MacBeth, and fixed-effects estimates of Eq. (3.1). Column 1 reports the pooled OLS estimates of cash holdings with cluster-robust standard errors, which control for arbitrary heteroscedasticity and intra-cluster correlation. We observe that cash holdings rise significantly with cash flow and industry-level cash flow volatility, and are positively related to the dummy indicating whether a firm pays dividends. In addition, cash holdings decrease significantly with net working capital, capital expenditures, and leverage. According to the adjusted R-square, the model is able to explain around 24% of the variation in firms' cash holdings. However, the OLS pooled estimator fails to account for unobserved firm-specific heterogeneity in a panel data set.

[Insert Table 3.4]

Column 2 presents the estimates obtained using the two-step Fama-MacBeth estimator (Fama & MacBeth 1973). In the first step, a cross-sectional regression is estimated for each time period. In the second step, the cross-sectional estimates are averaged across time to obtain final estimates. With this approach, a time series of cross-sectional estimates are effectively able to correct for general serial correlation in the residuals in the panel. The coefficient estimates are very similar in sign and magnitude to the ones obtained with OLS. Nonetheless, the Fama-MacBeth estimator also fails to properly account for the data's panel characteristics.

Columns 3 to 5 reports therefore fixed-effects estimates, which exploit more directly the panel features of the dataset, by eliminating the effect of time-invariant firm characteristics. Columns 4 and 5 differ from column 3 as they are based on slightly different dependent variables, namely the ratio of cash to net assets in column 4, and the log of this same ratio, in column 5. These additional estimates are presented for robustness. The ρ

coefficients reported in columns 3 to 5 suggest that between 59% and 63% of the total error variance can be captured by unobserved heterogeneity. In addition, focusing on column 3, we observe that the market to book ratio, size, cash flow, and the dummies indicating whether a firm pays dividends or attempts acquisitions all have positive and significant coefficients. Net working capital, capital expenditures, leverage, and the SOEs dummy, on the other hand, have negative and precisely determined coefficients. The estimates, obtained in columns 4 and 5, all based on a fixed-effects estimator, are similar to those in column 3.

Generally, the estimated coefficients reported in Table 3.4, which suggest that firms with better investment opportunities, more cash flow, and a higher volatility of cash flow are more likely to hold more cash, are consistent with the transaction cost and precautionary motives of the trade-off theory, as well as with the pecking order theory. In line with the trade-off theory, firms with a lager investment opportunity set or a more volatile cash flow (which indicates a higher industry-level risk) are in fact more likely to hold more cash for precautionary reasons. In addition, the pecking order theory predicts that firms with more cash flow hoard more cash. To give some economic interpretation to the cash flow coefficients, in column 3, a rise in cash flow from the 25th percentile to the 75th percentile leads to an increase of 0.9% in cash holdings.[98] In other words, the point estimate (0.162) suggests that the elasticity of cash holdings to a change in cash flow, evaluated at sample means is 0.052.[99]

Our results also provide evidence that changes in net working capital, capital expenditures and leverage all have a negative impact on cash holdings. In the case of net

[98] This number (0.009) is calculated as (0.085-0.030)*0.162.

[99] Considering that the mean of *Cash* is 0.147 and the mean of *CF* is 0.047, 0.052 is obtained from the following calculation: 0.162*0.047/0.147.

working capital, this can be explained considering that net working capital can be used as a substitute for cash, which is consistent with the trade-off theory. Additionally, according to the pecking order theory, firms prefer to use internal finance to fund their investment projects. Hence, firms with more capital expenditures will hoard less cash. Alternative reasons might be that investment projects can increase firms' marketable collateral, as well as their net worth, enlarging debt capacity and inducing a decline in demand for cash. Coming to leverage, its negative and precisely determined sign is consistent with the trade-off theory, according to which, on the one hand, firms might use cash reserves to reduce debt overhang (Bates *et al.* 2009; Riddick & Whited 2009), whilst on the other, high leverage shows a firm's ability to obtain loans, which may lead to holding less cash in hand.

We also find a positive relationship between firm size and cash holdings in columns 3 to 5, which contradicts the view that there exist economies of scale to hold cash. One way to interpret this result is that small Chinese firms hold lower cash balances may be that according to the financial hierarchy theory, these firms are less profitable.[100] However, when we lag all our independent variables except for *AC1* in the Eq. (1) (not reported here) to alleviate the simultaneity issue[101] (Polk & Sapienza 2009; Duchin et al. 2010). We find that the coefficient on firm size become negative and significant and the coefficients on the other variables in the model are virtually identical. Finally, the coefficients on the dummy variables indicating whether a firm pays dividends, attempts acquisitions, or is state-owned are in line with the hypothesized signs. Cash-rich firms are in fact more likely to pay dividends.

[100] In unreported results, we find that the profitability of large firms is significantly greater than that of small firms, regardless of whether we focus on sample means (t-test) or sample medians (Wilcoxon rank-sum test). Specifically, as in Fig. 3.1, we split our sample into small/large firms if a firm's *size* (measured by total assets) falls below/above the median value of all firms operating in the same industry. We find that large firms have higher return-on assets (*ROA*, 0.036) and cash flow (*CF*, 0.061) than small firms (*ROA*, 0.009; *CF*, 0.033).

[101] Some variables in the Eq. (1) may be endogenous and the model thus may suffer from reverse-causality problems.

Moreover, if a firm is going to take over other companies in the near future, it is much more likely to accumulate more cash for the payment. Furthermore, based on the results from Allen *et al.* (2007) and Guariglia *et al.* (2011), state-controlled enterprises face less financial constraints compared with non-state-controlled firms. For this reason, it is possibly easier for them to raise funds externally, which makes it unnecessary to hold costly cash balances.

In summary, the coefficient associated with the variables Tobin's *Q*, *NWC*, *Leverage*, and *Var_CF* are consistent with the trade-off theory, while those associated with *Cash flow* and *CAPEX* can better be explained by the pecking order theory.

3.4.2. The adjustment behavior of cash holding levels

3.4.2.1. The targeting behavior of cash holdings

We begin our analysis by investigating whether firms tend to revert cash holdings to their target levels. To this end, following Opler *et al.* (1999), we first test the mean reversion properties of cash holdings by estimating a first-order autoregressive model of the changes in the cash ratio for each firm in our sample, as outlined in the following equation:

$$\Delta(Cash)_t = \alpha + \beta\Delta(Cash)_{t-1} + \varepsilon_{i,t} \tag{3.2}$$

where Δ indicates a first-difference from one period to the next, and $Cash$ is the ratio of cash and cash equivalents to total assets. $\varepsilon_{i,t}$, is assumed to be an independent and identically distributed disturbance with zero mean.

Fig. 3.2 illustrates the distribution of the autoregressive coefficient (β) obtained from Eq. (3.2).[102] The figure shows that the distribution is bell-shaped with a negative centerline. The median and mean of the coefficients (β) are -0.179 and -0.165, respectively, suggesting that cash holdings are mean reverting. Instead of running separate regressions for each firm, we next run pooled OLS estimates of Eq. (3.2) with cluster-robust standard errors for the full sample of firms.[103] The estimated coefficient (β) is found to be -0.166 (*t-stat*= -14.50, R^2=0.03). Once again, the fact that the absolute value of the coefficients (β) is less than 1 suggests that cash balances display mean reverting properties. This finding is consistent with Opler *et al.* (1999) and Venkiteshwaran (2011).[104]

[Insert Fig 3.2]

3.4.2.2. Adjustment to target cash holdings

We next investigate whether firms in our sample adjust their cash balances towards the target level over time. To test whether this is the case, we first sort firms into quintiles in each year based on their previous year's cash positions. In Panel A of Fig. 3.3, the horizontal axis goes

[102] To ensure we have a sufficient number of observations in each cross-sectional regression, following Opler *et al.* (1999), we drop all firms with less than five years of observations during the period 1998-2010. The chart is based on 1,363 firms, which corresponds to 14,711 firm-year observations.

[103] The cluster-robust standard errors allow for valid inference under heteroskedasticity and autocorrelation in linear panel-data models, especially in large data sets (Born & Breitung 2012).

[104] Based on a test by Wooldridge (2002), we find serial correlation in the idiosyncratic errors of Eq.(2) model, which might bias the standard errors and cause inefficient estimates. To correct autocorrelation, we fit fixed-effects model with AR(1) or AR(2) or AR(3) disturbances, given the estimated value of firms' half-life of cash rebalancing in this study is between 1.2 and 2.1 years. We find the estimated coefficient (β) remain significant and negative (between -1 and 0), even we include more lags of the change in cash in the right-hand side of Eq.(2).

from cash-poor (3.15% cash/TA) to cash-rich (31.86% cash/TA) firms, from left to right. The vertical axis describes the subsequent year's changes in cash holdings, which reflects the firm's explicit effort to adjust its cash ratio toward a target level. It appears that cash-poor firms tend to increase the mean (median) cash levels by 2.7% (0.9%) in the following year, while cash-rich firms are inclined to reduce the mean (median) cash ratios by 4.8% (4.2%) in the subsequent year, which is consistent with convergence. This evidence confirms that firms exhibit mean reversion in their cash holdings.

[Insert Fig 3.3]

Panel B of Fig. 3.3 examines whether the subsequent year's changes in cash holdings are affected by firms' deviations from their cash target levels. To do so, we partition firms into quintiles in each year on the basis of the difference between their real cash holdings and their optimal cash levels obtained from the estimation of the OPSW model in Equation (1) (*Cash-Cash**). The horizontal axis, from left to right, indicates that the firms in the first quintile have the highest cash deficit (-8.63%), while firms in the last quintile have the highest excess cash holdings (10.23%). Accordingly, the former raise their cash ratios by an average (median) of 4.7% (2.5%), and the latter reduce their balances by an average (median) of 6.2% (5.6%) in the following year. The evidence in Panel B reflects the firms' unambiguous tendency to correct their deviations from the optimal levels. In other words, firms with excess cash or a deficit of cash have an inclination to actively rebalance their deviations towards the optimal level. Firms that are either cash-rich or cash-deficient adjust therefore their cash ratios to offset the gap.[105]

[105] The mean reversion of cash holdings is not in line with the financial hierarchy theory, according to which the time-series properties of changes in cash should be determined by the availability of firms' internal resource.

It should also be noted that the adjustments illustrated in both Panels of Fig. 3.3 are asymmetric. Specifically, firms with higher deviations from their target levels, i.e. those in the first quintile (characterized by a lower level or a deficit of cash holdings) and in the last quintile (characterized by a higher level or an excess of cash holdings) tend to adjust their cash holdings more aggressively than firms in the median quintiles. Moreover, the average or median adjustment is more pronounced for cash-rich firms in comparison with cash-poor ones, which may be due to asymmetric adjustment costs. This can be explained considering that it is more costly for firms with lower cash balances to build their cash reserves or deviate from the targets, than it is for cash-rich firms to spend cash or deviate from the targets. Cash-poor firms are in fact more likely to be financially constrained (Dittmar & Duchin 2010). A similar asymmetric adjustment is also reported for US manufacturing firms by Venkiteshwaran (2011), and for Chinese listed companies in Lian *et al.* (2010).

3.4.3. Targeting behavior vs. financial hierarchy

As discussed in last section, firms exhibit a tendency of cash convergence towards a target level, which can be explained by the trade-off theory. However, according to the financial hierarchy theory, adjustments of firms' cash holdings are simply a consequence of changes in internal resources. According to this view, firms do not actively manage their cash balances, thus there is no optimal level of cash holdings. To directly distinguish between these two alternative views, following Opler *et al.* (1999) and Venkiteshwaran (2011), we construct a "financing deficit" variable to proxy the flow of funds, and we then examine whether the financing deficit can be used to explain changes in cash holdings.[106] If the financial hierarchy behavior prevails over the trade-off theory, we would expect the financing deficit to wipe out the effects of the deviation from optimal cash levels $\left(Cash^{*}_{i,t+1} - Cash_{i,t}\right)$ in a partial adjustment model of the following type:

$$Cash_{i,t+1} - Cash_{i,t} = \alpha + \varphi\left(Cash^{*}_{i,t+1} - Cash_{i,t}\right) + FINDEF_{i,t} + $$

$$+ \sum Year + \sum Industry + \sum Province + v_i + \varepsilon_{i,t} \qquad (3.3)$$

where $Cash$ is the ratio of cash and cash equivalents to total assets, *Cash** is the estimated target cash holdings, *FINDEF* is the firm's financial deficit, and φ is the speed of adjustment (SOA)[107], which measures how fast firms adjust their cash holdings towards the optimal level. SOA is expected to be greater than zero if firms exhibit mean reversion, and smaller than 1 if their adjustment is imperfect.[108]

Table 3.5 presents the fixed-effects estimates from the partial adjustment model in Eq. (3.3).[109] In columns 1 to 4, a variant of Eq. (3.3) which excludes the financial deficit variable is estimated. In column 1, the firm's target cash holdings (*Cash**) are measured as the average cash holdings over the last three years. In column 2, *Cash** is given by the fitted values from Eq. (3.1) estimated using the OLS pooled estimator. In column 3 and 4, they are obtained likewise, except for the fact that Eq. (3.1) is estimated using the Fama-MacBeth and

[106] The financing deficit variable is defined as follows: (dividend payments + investment + changes in net working capital – operating cash flow) / total assets. Note that it is computed before financing to measure the fund shortage in each year, which helps us avoid estimating an identity.

[107] Literately, the SOA refers to the percentage change between the initial cash level and the target.

[108] If $\varphi = 0$, there is no adjustment of the firm's cash holdings towards its target during each time period. If $\varphi = 1$, the adjustment towards the target is perfect.

[109] The results were similar using the pooled OLS estimator with cluster-robust standard errors, as in Opler *et al.* (1999). For brevity, these results are not reported, but are available upon request.

the fixed-effects estimators, respectively. In all four regressions, the adjustment coefficients are significant at the 1% level. The speeds of adjustment are respectively 0.483, 0.574, 0.578, and 0.581. To give some economic interpretation, we calculate firms' half-lives of cash rebalancing, defined as the time necessary to cover half of the deviation from the initial cash level to the target level. The values are 1.435, 1.208, 1.198, and 1.194 years, respectively, which imply an imperfect adjustment of cash. Our finding are similar to those reported in Opler *et al.* (1999) and Venkiteshwaran (2011), who also find support for the target adjustment model.

[Insert Table 3.5]

In column 5 of Table 3.5, we examine whether the firm's financial deficit ($FINDEF$) is able to explain the variation in cash holdings. The results indicate that the coefficient associated with *FINDEF* is positive and precisely determined. However, the point estimate of *FINDEF* evaluated at sample means is only 0.042, indicating that the elasticity of a change of cash holdings reacting to a change in *FINDEF* is only around 3% of the elasticity of a change in the deviation $\left(Cash^*_{i,t+1} - Cash_{i,t}\right)$ observed in column 4.[110] This suggests that the change in cash holdings that follows a percentage change in the deviation $\left(Cash^*_{i,t+1} - Cash_{i,t}\right)$ is around 30 times larger than the one that follows the same percentage change in *FINDEF*. In addition, the R^2 of the financial hierarchy model (0.03) in column 5 is smaller than the ones in the trade-off model (which range from 0.13 to 0.30).

[110] Note that the mean of *FINDEF* is 0.000769 and the mean of $\left(Cash^*_{i,t+1} - Cash_{i,t}\right)$ is -0.00179. Thus, the ratio between the elasticity of *ΔCash* to *FINDEF* and the elasticity of *ΔCash* to $\left(Cash^*_{i,t+1} - Cash_{i,t}\right)$ is given by (0.042*0.000769)/(0.581*0.00179)=0.031.

In columns 6 to 9, we include the deviation $\left(Cash^*_{i,t+1} - Cash_{i,t}\right)$and the financing deficit (*FINDEF)* in the same regression. The coefficients on the former are similar to what we obtained when we only included the deviation variable, while the coefficients on the latter are no longer significant. Moreover, we do not observe any increases in the R^2 in column 6 to 9, compared with columns 1 to 4. The reason is probably that the deviation $\left(Cash^*_{i,t+1} - Cash_{i,t}\right)$has more explanatory power in cash rebalancing than the flow of funds deficit (*FINDEF)*, destroying therefore the significance of the latter.

Lastly, in columns 10 to 13, we estimate an augmented version of Eq. (3.3), whereby *Cash** is measured in four different ways, and which includes an interaction term between the financing deficit (*FINDEF)* and a dummy variable (*Above target*), which equals to one if the firm's cash is above its target level (reflecting excess cash holdings), and 0 otherwise. The motivation for including this interaction term comes from agency considerations, according to which excess cash may lead to free cash flow problems due to the entrenchment of management. As suggested by the agency theory of cash holdings, managers tend to accumulate cash if the firm is making profit. However, even if the firm faces a cash flow deficit, entrenched managers might make efforts to keep a certain level of cash holdings in order to protect their own interests. Therefore, if the free cash flow theory holds, we should observe that the financing deficit (*FINDEF)* better explains cash rebalancing for firms with excess cash. The results in columns 10 to 13 show this interaction term is not statistically significant (with one exception in column 10).[111] This can be seen as evidence against the free cash flow theory.

[111] If the free cash flow theory were to hold, we would expect a positive coefficient on the interaction term (*FINDEF *Above target*). However, given the unexpected sign on the interaction term, the small values of R^2 and *F*, and the relatively small sample size due to the calculation of the target level of cash holdings as the

Overall, our results in Table 3.5 provide strong support for the fact that cash holdings in China can best be explained by a trade-off model rather than by the financial hierarchy theory or the free cash flow theory. This is in line with most of the findings from US and European firms (Kim *et al.* 1998; Opler *et al.* 1999; Ozkan & Ozkan 2004; Lee & Powell 2011; Venkiteshwaran 2011).

3.4.4. Dynamic adjustment models of cash holdings

In a frictionless world, firms should never deviate from their optimal cash holdings. However, adjustment costs hinder the immediate rebalancing of cash towards the desired target level. Adjustment costs can be seen as costs of building up cash reserves making use of internal or external finance, and costs of depleting cash reserves by investing or paying dividends to shareholders. In order to further study the properties of the SOA of cash, following Venkiteshwaran (2011), we estimate a dynamic model, which allows for systematic changes in the determinants of optimal cash levels, and considers a partial adjustment process for the firm's cash holdings within each time period. Our model takes the following form:

$$Cash_{i,t+1} - Cash_{i,t} = \alpha + \varphi\left(Cash^{*}_{i,t+1} - Cash_{i,t}\right)$$

$$+\sum Year + \sum Industry + \sum Province + v_i + \varepsilon_{i,t} \qquad (3.4)$$

We rearrange Eq. (3.4) as follows:

average cash holdings over the last three years, it is likely that the model in column 10 is misspecified. It should also be noted that the estimated value of firms' half-life of cash rebalancing (0.021 year) is unconvincing.

$$Cash_{i,t+1} = \alpha + (1-\varphi)Cash_{i,t} + \varphi Cash_{i,t+1}^{*}$$

$$+\sum Year + \sum Industry + \sum Province + v_i + \varepsilon_{i,t} \qquad (3.5)$$

We then allow the target level of cash holdings to be determined by firm characteristics as follows:

$$Cash_{i,t+1}^{*} = \alpha + \sum_{k}(\beta\varphi)X_{k,it} + \sum Year + \sum Industry + \sum Province + v_i + \varepsilon_{i,t} \quad (3.6)$$

where $X_{k,it}$ is a vector of firm characteristics.

Substituting Eq. (3.6) into Eq. (3.5), leads to the following equation:

$$Cash_{i,t+1} = \alpha + (1-\varphi)Cash_{i,t} + \sum_{k}(\beta\varphi)X_{k,it}$$

$$+\sum Year + \sum Industry + \sum Province + v_i + \varepsilon_{i,t} \qquad (3.7)$$

This dynamic adjustment model in Eq. (3.7) implies that:

1) Firms aim at closing the deviation between actual ($Cash_{i,t}$) and desired cash-holding levels ($\beta X_{k,it}$). Eventually, they are able to make sure their actual cash levels converge to the target ($\beta X_{k,it}$).
2) The speed of adjustment (SOA) is given by subtracting the estimated coefficient on the lagged dependent variable $Cash_{i,t}$ from 1.

3) The long-run effect of the firm characteristics on cash holdings can be obtained by dividing the estimated coefficient on $X_{k,it}$ by φ.

As it is dynamic, we estimate Eq. (3.7) using the system Generalized Method of Moments (GMM) estimator developed by Arellano & Bover (1995) and Blundell & Bond (1998). The advantage of this approach is to not only enable us to account for the dynamic nature of cash rebalancing[112], but also to control for the possible endogeneity of the regressors.[113] Specifically, the system GMM estimates the equation in both first-differences and levels. It employs lagged values of the regressors as instruments in the first-differenced equation, and makes use of first-differences of the relevant regressors as additional instruments in the levels equation. This estimator has been shown to dramatically improve the precision and efficiency of the estimates compared with the simple first-difference GMM estimator (Blundell *et al.* 2001).

In order to assess the validity of instruments and the correct specification of the model, we employ two criteria. The first is the *Hansen (J)* test for over-identifying restrictions, which is asymptotically distributed as a *Chi*-square with degrees of freedom equal to the number of instruments less number of parameters.

The second criterion is the *m(n)* tests for the n^{th} order serial correlation of the differenced residuals. Under the null hypothesis of no n^{th}-order serial correlation of the differenced residuals, the test asymptotically follows a standard normal distribution. If the

[112] In a dynamic setting, the lagged dependent variable may lead to serial correlation of the error term. Moreover, the fact that the lagged dependent variable is as stochastic as the dependent variable may also cause biased and inconsistent estimates (Maeshiro 1996; 1999).

[113] As pointed by Acharya *et al.* (2007), variables like investment, leverage and dividends, may be jointly determined with cash. In addition, the variables that affect cash holdings are also likely to affect some of the regressors, such as leverage, growth opportunities and liquidity (Opler *et al.* 1999).

m(n) test shows the presence of autocorrelation of order *n*, the instruments need to be restricted to lags of at least *n*+1. In our case, because the *m2* test rejects the null hypothesis of no second-order serial correlation in the differenced residuals, we use levels of the endogenous variables lagged *n*+3 and deeper as instruments in the first-differenced equations, and first-differences of the endogenous variables lagged twice as additional instruments in the levels equations (Baum 2006; Roodman 2006). A rejection of the null hypothesis of either the *Hansen (J)* test or the *m(n)* test may be due to either poor specification of the model or instrument invalidity.

We also estimate Eq. (3.7) using the pooled OLS (OLS) and the fixed-effects (Fe) estimators for comparison. The coefficient on the lagged dependent variable obtained from the pooled OLS estimator will be upwards biased in a dynamic panel setting, while the coefficient on the lagged dependent variable obtained from the fixed-effects (Fe) estimator will be downwards biased in a dynamic panel model. If our GMM coefficients on the lagged dependent variable is correctly estimated, the value should lie between the estimates obtained from the pooled OLS and the fixed-effects (Fe) estimators (Bond *et al.* 2001). Table 3.6 reports the results of the different estimates of our dynamic model of cash holdings outlined in Eq. (3.7).[114]

[Insert Table 3.6]

Column 1 presents the results obtained using our preferred system GMM estimator (Arellano & Bover, 1995; Blundell & Bond, 1998). We treat all regressors as endogenous and use their lags as instruments. The estimated coefficient on the lagged depended variable is significant and positive (0.609), suggesting that the speed of adjustment is 0.391 (=1-0.609)

[114] *Var_CF* is dropped in the fixed-effects regressions because of collinearity.

and the half-life, 1.773 years (=Ln2/ (1-0.609)). The estimated coefficient for the adjustment speed of Chinese firms (0.391) is slightly lower than that found for US firms (0.566) (Venkiteshwaran 2011) and for UK firms (0.605) (Ozkan & Ozkan 2004), which were both obtained using a similar estimation methodology.[115] A possible explanation for the relatively low value of Chinese firms' adjustment speed may be that the significant information asymmetries, high liquidity risk, and frictions that characterize the Chinese economy lead to higher adjustment costs, which prevent firms from quickly rebalancing their cash reserves towards the target level.[116] The results also indicate imperfect adjustment, as firms only close 39.1% of the gap between current and optimal cash level within one year. In addition, we find that investment opportunities (*Tobin'Q*) and cash flow have a positive impact on cash holdings, whereas leverage affects cash holdings negatively. The Hansen (*J*) test and the *m(3)* test do not reject the null hypothesis of instrument validity and/or model specification, suggesting that the instruments based on the system GMM regression are valid.

We also estimate Eq. (3.7) using the pooled OLS estimator based on cluster-robust standard errors (column 2), and the fixed-effects estimator (column 3). We can see that the estimated coefficients on the lagged depended variable are 0.669 and 0.420, respectively. As predicted, the system GMM estimate (0.609) lies between the fixed-effects estimate (lower bound) and the pooled OLS estimate (upper bound). The speeds of adjustment obtained from the pooled OLS estimator and the fixed-effects estimator are 0.331 and 0.580, respectively.

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[115] Our speeds of adjustment are slightly lower than those reported in Alles *et al.* (2012), also for Chinese listed companies. The differences could be due to the fact that our sample is larger and slightly more recent than theirs, and to the fact that our specifications are not identical.

[116] The value of the half-life (1.77 years) is greater than that found for US firms (1.22 year) by Venkiteshwaran (2011). It is also greater than that observed for UK firms (1.15 year), as reported in Ozkan & Ozkan (2004).

They indicate that, on average, a Chinese firm completes half of its cash adjustment in a period ranging between 1.195 and 2.094 years.

In summary, the estimates in Table 3.6 suggest that whatever the estimator used, given an optimal level of cash holdings, firms tend to actively rebalance their cash holdings towards the target. This finding is in line with the trade-off theory. However, there are lags in the adjustment to the target, which may be due to adjustment costs.[117] We next analyze how adjustment costs might affect SOAs.

[117] This imperfect adjustment might be explained by the pecking order theory, according to which the changes in cash holdings rise and fall with firm's profitability. This theory suggests that firms do not have an optimal level of cash, and therefore do not actively manage their cash reserves. However, the evidence according to which firms rebalance their deviations from the optimal target levels, which we found in the previous section; and the evidence according to which firms intentionally actively manage their cash holdings, that we find in the next section contradict this explanation.

3.4.5. Adjustment costs, active management of cash and the speed of cash adjustment

3.4.5.1. Adjustment costs and the speed of cash adjustment (SOA)

The estimates of the partial adjustment model reported in the previous section suggest that, in line with the trade-off theory, Chinese listed firms have a target cash ratio towards which they actively manage their cash. Yet, we also find that the cash rebalancing is imperfect. In order to understand why this is the case, we investigate whether, as suggested by Dittmar & Duchin (2010), adjustment costs play a role. Trading off the adjustment costs against the costs of operating with suboptimal cash levels may lead firms to only rebalance their cash stocks partially. Furthermore, different firms may face different adjustment costs, and hence, exhibit different and imperfect SOAs. To shed more light on the role of adjustment costs, in this section, we first examine the cross-sectional variation in SOAs, focusing on firms with different levels of excess cash, which are likely to be associated with different levels of adjustment costs[118]. Next, we investigate whether firms exhibit different SOAs because they manage their cash reserves differently, namely through different cash management policies, dividend payout, investment, and debt, which are all associated with different levels of adjustment costs. According to the trade-off theory, active management of cash should be associated with lower adjustment costs and a higher adjustment speed.

In column 1 of Table 3.7, we examine whether the SOAs vary with the extent to which firms' cash holdings deviate from their target levels. We would expect SOAs to be lower for firms with a cash deficit, as these firms are likely to face high adjustment costs due to the presence of financial frictions. To test whether this is the case, we partition firms into

[118] Firms with high excess cash are likely to face lower adjustment costs than firms with low excess cash, as it is more costly for firms to build up cash reserves to close the cash deficit than to deplete their excess cash reserves.

groups with relatively low, medium, and high levels of excess cash (*Cash-Cash**) as predicted by the OPSW model with fixed-effects described in section 3.4.1. Specifically, we define as firms with low excess cash in a given year (*Dum_low*=1) those firms whose excess cash falls in the bottom third of the distribution of the excess cash of all firms operating in the same industry in that given year. Similarly, we define as firm-years with medium excess cash (*Dum_medium*=1) those observations falling in the middle third of the distribution, and as firm-years with high excess cash (*Dum_High*=1), those with excess cash in the top third of the distribution. We find that the SOA of cash tends to increase monotonically with the levels of excess cash. In particular, we observe that firms with high excess cash display much higher speeds of adjustment (0.354=1-0.646) compared with firms that face low excess cash (0.172=1-0.828). The Wald tests reject the equality of the coefficients on the lagged dependent variable between high-excess-cash and low-excess-cash firms at the 1% level. This finding can be explained considering that it may be more costly for firms to build up cash reserves to close the cash deficit than to deplete their excess cash reserves. It is consistent with the pattern observed in Fig. 3.3, according to which cash-rich firms have faster adjustment in the following year compared with cash-poor firms. It is also in line with Lian *et al.* (2010) who find that the downward SOA of Chinese firms with excess cash is significantly higher than the upward SOA when firms face a cash deficit. This result is inconsistent with the agency view of cash holdings, according to which firms with less excess cash reserves are likely to be well-governed firms, and might be inclined to rebalance their cash levels towards the optimal levels faster, while firms with excess cash should display lower downward adjustment speeds due to entrenchment motives (Dittmar & Duchin 2010).

In column 2 of Table 3.7, we use the industry median level of cash in a given year to measure firms' target cash levels. We then define as firms with low excess cash in a given year (*Dum_low*=1) and firms with high excess cash (*Dum_High*=1), respectively those firms whose levels of cash are below or above the median value of the distribution of the cash levels of all firms operating in the same industry in that given year. The results reveal that firms with excess cash above the industry median display much higher SOAs (0.469=1-0.531) compared with firms below the industry median (0.271=1-0.729). The Wald tests reject the equality of the estimates in the two sub-groups of firms. We therefore conclude that the presence of adjustment costs might slow down the speed of cash adjustment for firms with a cash deficit compared with those with excess cash.

[Insert Table 3.7]

3.4.5.2. Active management of cash and the speed of cash adjustment (SOA)

According to the trade-off theory, if firms face lower adjustment costs of cash, they are more likely to actively adjust their cash holdings through different activities, such as investment, dividend payments, and debt issuance. In this section, we further examine the extent to which Chinese firms actively adjust cash towards a target level and display different SOAs when facing different adjustment costs.[119] Following Dittmar & Duchin (2010), we conjecture that firms that actively manage their cash holdings have higher speeds of adjustment due to lower adjustment costs, and estimate the change in unexpected (excess) cash as follows:

$$XCash_{i,t} - XCash_{i,t-1} = (Cash_{i,t} - Cash^*_{i,t}) - (Cash_{i,t-1} - Cash^*_{i,t-1}) \qquad (3.8)$$

[119] It should be noted that the most significant difference between the trade-off view and other theories is that, according to the former, firms actively manage their cash holdings towards the optimal level. Therefore, the investigation of active cash management can be used to differentiate between underlying theories of cash holdings.

where *Cash* is the ratio of cash and cash equivalents to total assets, *Cash** is the target cash holding, and *Xcash* is the unexpected (excess) cash holding predicted by the OPSW model with fixed-effects discussed in section 3.4.1. Rearranging Eq. (3.8) yields:

$$XCash_{i,t} - XCash_{i,t-1} = (Cash_{i,t} - Cash_{i,t-1}) - (Cash^{*}_{i,t} - Cash^{*}_{i,t-1}) \qquad (3.9a)$$

We next define the following variables:

$$Active_{i,t} = abs\left(\frac{Cash_{i,t} - Cash_{i,t-1}}{XCash_{i,t} - XCash_{i,t-1}}\right) \qquad (3.9b)$$

$$Passive_{i,t} = abs\left(\frac{Cash^{*}_{i,t} - Cash^{*}_{i,t-1}}{XCash_{i,t} - XCash_{i,t-1}}\right) \qquad (3.9c)$$

$Active$ measures the percentage of the change in unexpected cash holdings attributable to the change in the real cash ratio, while $Passive$ measures the percentage of the change in unexpected cash holdings due to the change in the target cash ratio.

Based on Eq. (3.9b) and Eq. (3.9c), we construct a dummy variable $Dum\_Active_{i,t}$,which is equal to one if $Active_{i,t} > Passive_{i,t}$, and 0 otherwise. This indicates whether a firm actively manages its cash holdings. Around 72% of the firm-years in our sample belong to the *Active* group. This suggests that the majority of our Chinese firms tend to actively adjust their cash reserves. Column 3 of Table 3.7 reports the difference in SOAs of cash for sub-groups of firms sorted on the basis of *Dum_Active*. As expected, firms that actively manage their cash holdings have higher speeds of cash adjustment (0.423=1-0.577) compared with passive firms (0.266=1-0.734). The *p*-value associated with the Wald tests show the difference in the SOAs between the two sub-groups is statistically significant. In short, this finding suggests that changes in real cash ratios contribute more to firms' cash rebalancing than changes in implied target ratios. This is in line with Dittmar & Duchin (2010), who argue that firms that actively manage their cash levels have higher speeds of adjustments due to the lower levels of adjustment costs.

Next, we consider three additional ways through which firm might actively adjust their cash holdings, namely by paying cash dividends, investing, and using debt finance. Specifically, in column 4 of Table 3.7, we initially partition firms according to their dividend payout status. To this end, we construct a dummy (*Div_Dum*), which equals 1 if the firm is paying cash dividends in a given year, and 0 otherwise. In columns 5 and 6, we split firms respectively on the basis of their investment, defined as capital expenditures scaled by total assets and their debt ratios, measured by the ratio of their total (short- and long-term) debt to total assets. We classify a firm as having relatively low (*Dum_low*=1), medium (*Dum_medium*=1), or high (*Dum_high*=1) level of investment or debt ratio in a given year if its investment or debt ratio in that year falls respectively in the bottom, the medium, or the top third of the corresponding ratios of all firms operating in the same industry it belongs to. The results reported in columns 4 to 6 show that the SOA of firms that pay cash dividends, make substantial investments, and issue significant debt finance are 0.419, 0.464 and 0.462 respectively, much higher than the ones of those who do not pay dividends (0.314), make small investment (0.376), and issue little debt finance (0.304). The *p*-values associated with the test for the equality of the coefficients of the lagged dependent variable between firms that pay or do not pay dividends (column 4), and display high and low of investment (column 5) and debt (column 6), show that, with one exception (column 6, where the significance level is 20%), these differences are statistically significant at conventional levels. These findings suggest that if firms actively manage their cash ratios towards the target level through dividend payments, investment, or debt finance, they display higher SOAs of cash, which are probably associated with lower adjustment costs. Our findings are consistent with the evidence in Dittmar & Duchin (2010).

In summary, the results in Table 3.7 are in line with the trade-off theory: there exists an optimal cash level towards which firms actively adjust their cash holdings. However, due to adjustment costs, this adjustment is not perfect. This explains the asymmetric SOAs we observe across different types of firms.

3.4.6. The marginal value of cash holdings

3.4.6.1. Measure of the marginal value of cash holdings

The evidence we found thus far is supportive of a trade-off behavior in cash holdings. In particular, we observe that Chinese firms have target cash levels and actively correct any deviation from their targets in the presence of adjustment costs.

We next examine the extent to which firm performance (value) is affected by adjustments of cash holdings. To this end, following Faulkender & Wang (2006), we initially estimate the following regression: [120]

[120] Given an less-developed stock market, stock prices in China provide little information on firms' future operating performance (Wang *et al.* 2009). Thus, contrary to Faulkender & Wang (2006), we use the return on assets (*ROA*) instead of stock returns models to measure Chinese firms' value. It should also be noted that because we estimate Eq. (3.10) using a fixed-effects estimator, industry dummies are not included.

$$ROA_{i,t} - ROA^B_{i,t}$$
$$= a + b_1\Delta Cash_{i,t} + b_2\Delta E_{i,t} + b_3\Delta NA_{i,t} + b_4\Delta INT_{i,t} + b_5\Delta DIV_{i,t}$$
$$+ b_6 Cash_{i,t-1} + b_7 Leverage_{i,t} + b_8 Ownership_{i,t} + b_9 AC_{i,t+1}$$
$$+ b_{10} Cash_{i,t-1} * \Delta Cash_{i,t} + b_{11} Ownership_{i,t} * \Delta Cash_{i,t} + b_{12} AC_{i,t+1}$$
$$* \Delta Cash_{i,t} + \sum Year + \sum Province + \nu_i + \varepsilon_{i,t} \qquad (3.10)$$

where the term Δ indicates a first-difference from one period to the next; the subscript *i* indexes firms; and *t*, years (*t*=1998-2010).

The left hand side in the regression is the excess operating performance ($ROA - ROA^B$), where *ROA* is the return on assets, and ROA^B is the benchmark return on assets constructed as 25 Fama & French (1993) size and book-to-market portfolios. Specifically, in each year, we partition firms into 25 portfolios on the basis of size (total assets) interacted with the book-to-market ratio to control for risk-related factors that may affect firm performance (value).[121] Firm *i*'s benchmark *ROA* in year *t* is a value-weighted *ROA* based on total assets within the portfolio to which firm *i* belongs in that year.[122]

The right hand side in the regression comprises a vector of explanatory variables that affect firms' performance (value). Among these, *Cash* is the sum of cash and cash equivalents; *E* is earnings before extraordinary items; *NA* is net total assets (total assets minus cash holdings); *INT* is interest expense; *DIV* is cash dividends; *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *Ownership* is a dummy variable, which is

[121] Firms in different size and book-to-market portfolios may have different *ROAs*.

[122] We find similar results using the industry median level of *ROA* in a given year to measure the benchmark return on assets (ROA^B). In order words, our results were robust to defining the excess operating performance ($ROA - ROA^B$) in a given year as the difference between the firm's *ROA* and its industry median level. These results are not reported for brevity, but are available upon request.

equal to 1 in a given year if a firm is state-owned, and 0 otherwise. *AC1* is a dummy variable, which is equal to 1 in a given year if the firm attempts acquisitions in the next fiscal year, and 0 otherwise. Additionally, as discussed in Section 3.2.2, in order to capture differential effects on the marginal value of cash holdings, we interact the change in the value of cash ($\Delta Cash$) with: (1) the level of the firm's cash holdings ($Cash$), (2) the firm's ownership structure (*Ownership)*, (3) whether or not the firm engages in Mergers & Acquisitions (M&As) in the next year (*AC1)*. We estimate the regression by controlling for year, province and firm fixed-effects. Apart from dummy variables, all independent variables are scaled by total assets.

3.4.6.2. Value regression specification of changes in cash

Table 3.8 presents the key results from the estimation of Eq. (3.10) obtained using the fixed-effects estimator. In column 1, we present the estimates of a simplified version of the equation, with no interactions. Consistent with Faulkender & Wang (2006), we find that firm value is significantly higher for firms with higher changes in cash, earnings, net total assets, and dividend payments, as well as for firms with a higher cash level in the past year, a lower change in interest expenses, lower leverage, and firms who are non-state-owned and who attempt acquisitions in the next period. All the coefficients are statistically significant at conventional levels.

The fact that firms' changes in cash reserves are positively related to excess operating performance suggests that adjustments in cash holdings do not hinder firm performance. The point estimate (0.092) indicates that the elasticity of $ROA - ROA^B$ with respect to a change in cash holdings, evaluated at sample means is 1.19.[123] This suggests that a 10 % increase in $\Delta Cash$ leads to a 11.9% rise in $ROA - ROA^B$. The significant and positive marginal value of cash also provides support for the precautionary motive of the trade-off theory, according to which liquidity enhances firm value by offering a buffer to avoid potential underinvestment and by enabling the firm to hedge against risk.[124] The adjusted R^2 suggests that 44% of the total variance of $ROA - ROA^B$ can be explained by our model.

[Insert Table 3.8]

In column 2, we introduce the change in cash interacted with the level of cash ($Cash_{i,t-1}*\Delta Cash_{i,t}$).The coefficient estimate for the interaction term is -0.073 and is significantly different from zero at the 10% level. To give some economic intuition, the coefficient suggests that a 0.130 change in the level of cash (i.e. a shift from the first to the third quartile of the cash distribution) leads to a drop of 1% (-0.01=0.130 *-0.073) in $(ROA - ROA^B)/\Delta Cash$. In other words, keeping other factors constant, a firm with cash level at the first quartile of the distribution of our sample (0.068) has a 10% higher marginal value of cash, than a firm with cash level at the third quartile of the distribution (0.198).[125] This finding is consistent with Faulkender & Wang (2006) and suggests that the marginal value of cash is decreasing in the level of cash reserves. A possible reason why firms with lower cash reserves benefit more from an increase in cash holdings is that these firms either face higher

[123] This elasticity is defined as the ratio of the change in excess operating performance ($ROA - ROA^{B)}$ for a relative change in $\Delta Cash$. Considering that the mean of $ROA - ROA^B$is 0.00039 and the mean of $\Delta Cash$ is 0.00505, it is given by 1.19=0.092* (0.00505/0.00039).

[124] It is noteworthy that if the agency theory prevailed, we would observe the opposite, i.e. an insignificant coefficient for the marginal value of cash, as excess cash may lead to the free cash flow problems due to empire-building or entrenchment of management.

[125] This number (10%) is calculated as ((0.107-0.073*0.068)/(0.107-0.073*0.198)).

transaction and liquidity costs, or are more likely to have to forgo positive net present value (NPV) projects when their liquid assets are not sufficient. Thus, cash-poor firms value more their internal finance including their cash reserves, and for this reason, every additional RMB of cash they hold has a higher value. In contrast, for firms holding higher levels of cash, the costs of a further increase in liquid assets may outweigh the benefits, due for instance to factors such as higher rates of corporate tax and free cash flow problems.

Our next specification, reported in column 3, includes the change in cash interacted with the dummy variables *Ownership* and *AC1* as additional regressors. The aim of this specification is to investigate the extent to which the marginal value of cash differs between SOEs and non-SOEs, and between firms involved in acquisitions and other firms. The coefficients on both interaction terms are negative and significant at the 5% level. Given the mean level of cash of 0.147 in our sample, the marginal value of cash for non-SOEs, not involved in M&As (0.130=0.142-0.083*0.147) is around 1.4 (0.130/0.055-1) times higher than that of SOEs which attempt acquisitions in the next fiscal year (0.055=0.142-0.083*0.147-0.043-0.032). The finding regarding the ownership structure is consistent with the presence of financial constraints. The value of additional cash is more likely to be higher for non-state owned firms, who face more financial constraints, since cash reserves can be used as internal finance and can prevent these firms from forgoing positive NPV projects (Faulkender & Wang 2006).[126] In China, non-state-controlled firms are more likely to face more financial constraints compared with SOEs since state-ownership is favored in terms of access to credit from state-owned banks (Bai *et al.* 2006; Allen *et al.* 2007; Poncet *et al.*

[126] According to the financial constraints hypothesis proposed by Fazzari *et al.*(1988), cash flow and investment are positively related due to financing constraints. In other words, internal finance including cash reserves is more valuable for financially constrained firms, who cannot access external finance to fund their investment.

2010; Guariglia *et al.* 2011). SOEs typically experience soft budget constraints (SBC) as they need to maintain social stability and achieve not only economic, but also political objectives. Our finding is consistent with Megginson & Wei (2012) who find that both the level and the marginal values of cash reserves for Chinese firms are negatively associated with state ownership. They attribute this negative relationship to the soft budget constraints intrinsically associated with state ownership.[127]

Firms, who attempt acquisitions in the next period, may have lower marginal operating value of cash, as a result of their holding excess cash to fund the acquisition.[128] Jensen (1986) suggests that in the presence of large free cash flows, acquisitions are a crucial way by which managers reduce their personal undiversified risk and build their empires, which may induce them to make bad investment decisions or undertake unprofitable or value-damaging mergers, especially in the absence of good investment opportunities. From this point of view, acquisitions are likely to destroy the value of excessive cash flow. Our finding is in line with Harford (1999), who observe a decrease in value for acquirer firm with excess cash, as reflected in the subsequent poor operating performance, and with Oler (2008), according to which the levels of internal finance held by acquirer firms are significantly negatively related with their performance measured in terms of post-acquisition returns on net operating assets (RNOA).[129]

[127] In unreported results, we find that SOEs actually hold less cash than non-SOEs, suggesting that the level of cash holdings is not the reason why SOEs have a lower marginal value of cash.

[128] Acquiring firms may raise additional debt or they may implement a stock swap transaction in acquisitions. However, the majority of acquisitions deals in China are financed only by cash (61.4%) whereas only 5.7% of bidders consider pure stock offers.

[129] Acquiring firms may raise additional debt or implement a stock swap transaction to finance their acquisitions instead of using their available cash reserves. However, according to our data, the majority of

3.4.6.3. Value regression specification of excess cash

In the previous section, we have examined the value of the realized change in firms' cash holdings. However, the realized change in cash may include both expected and unexpected changes. The portion that explains the excess operating performance $ROA - ROA^B$ is more likely to be the unexpected change rather than the expected one. In this section, we use three alternative measures of the excess (unexpected) cash to conduct a further check for the marginal value of cash. In particular, we provide estimates of Eq. (3.10) whereby the realized changes in cash holdings are replaced by changes in excess cash holdings.

Following Faulkender & Wang (2006), we initially construct excess cash as the difference between the realized change and the benchmark (expected) change in cash, whereby the latter is measured as a value-weighted change in cash in each year, based on total assets, within each of the 25 Fama & French (1993) size and book-to-market portfolios. Specifically, the benchmark change in cash at year *t* is the change in cash of the portfolio to which firm *i* belongs to in that year. Estimates of Eq. (3.10) based on this measure of excess cash are reported in column 4 of Table 3.8.

Next, we use two models taken from Almeida *et al.* (2004) to predict the benchmark (expected) change in cash, controlling for industry and province fixed-effects in each year. The most general of these two models can be written as:

$$\Delta Cash^*_{i,t} = a + b_1 Q_{i,t} + b_2 Size_{i,t} + b_3 CF_{i,t} + b_4 \Delta NWC_{i,t} + b_5 CAPEX_{i,t} + b_6 \Delta ShortDebt_{i,t} + \sum Industry + \sum Province + \varepsilon_{i,t} \quad (3.11)$$

acquisition deals in China are financed only by cash (61.4%) whereas only 5.7% of bidders consider pure stock offers.

where the term *Δ* indicates a first difference from one period to the next. *Cash* is the sum of cash and cash equivalents; *Size* is the natural logarithm of real total assets; *CF* is real cash flow; NWC is net working capital (working capital minus cash holdings); *CAPEX* is capital expenditures; *ShortDebt* is short-term debt to total assets. All variables except for *Q* and Size are scaled by total assets. The subscript *i* indexes firms; and *t*, years (*t*=1998-2010).

Using the OLS estimator, we estimate Eq. (3.11) in each year. The fitted values of Eq. (3.11) can be interpreted as a proxy for the expected change in cash in that year . The difference between the realized change and the expected change in cash is then computed and interpreted as the unexpected change in cash.

In column 5 of Table 3.8, following Almeida *et al.* (2004), we use a relatively parsimonious version of Eq. (3.11) to predict the expected change in cash in which *ΔCash* is a function of *Q*, size and cash flow only. In column 6, we add *ΔNWC*, *CAPEX* and *ΔShortDebt* as additional variables to predict the expected change in cash.

The results based on excess cash from columns 4 to 6 of Table 3.8 are nearly identical to those obtained using the realized change in firms' cash. In short, our finding according to which the marginal operating value of cash is lower for firms who have a higher level of cash reserves, are controlled by the state, or attempt acquisitions are robust to focusing on excess (unexpected) cash holdings.

3.4.7. Financing constraints (FC) and marginal value of cash holdings

We next provide a direct test for whether the marginal value of cash is higher for firms that face higher financial constraints. The intuition for this difference between financially constrained and financially unconstrained firms is that given the higher cost to raise external funds that they face, the former have to rely more on internal finance including cash reserves in order to invest. As a consequence, additional cash reserves should be more valuable for firms that face higher financial constraints, and the sensitivity of $ROA - ROA^B$ to a change in cash should be higher for these firms.

To check our conjecture, we use different criteria to proxy for the degree of financial constraints faced by firms. Initially, we split firms on the basis of their *a priori* likelihood of being financially constrained, based on size (measured by total real assets and number of employees) and dividend payout. The rationale for these classifications is that small firms are more subject to short track records and typically have lower net worth and collateral values. Thus, they may face more severe asymmetric information in credit markets. Under these circumstances, it may be more difficult or expensive for small firms to obtain external financing (Gertler & Gilchrist 1994; Beck *et al.* 2005; Clementi & Hopenhayn 2006; Guariglia 2008). Similarly, financially constrained firms are likely to cut or reduce dividend payout (Fazzari *et al.* 1988; Kaplan & Zingales 1997; Cleary 1999; Almeida *et al.* 2004; Almeida & Campello 2007). This may be explained considering that these firms' desired investment is likely to exceed the internal finance they generate and the external funds they can obtain. Hence, financially constrained firms are unlikely to have sufficient funds to distribute as dividends. In each year, we classify as financially constrained (unconstrained) firm-years that fall in the bottom (top) one third of the distribution of total assets and number of employees of all firms operating in the same industry. The remaining firm-years will be the ones with medium financial constraints. Similarly, a firm is considered as financially constrained (unconstrained) if it does not pay (pays) cash dividends in a given year.[130]

Second, we construct two additional indexes of firm-specific levels of financial constraints (the *KZ* index and *WW* index) initially proposed by Kaplan and Zingales (1997) and Whited and Wu (2006). Following Lamont *et al.* (2001), we first construct the *KZ* index, which is a function of five observable firm characteristics: cash flow (CF_t: net income + depreciation), dividends (DIV_t); cash and cash equivalents ($Cash_t$) deflated by beginning of year capital (K_{t-1}); Tobin's Q [Q_t: (market value of equity +market value of net debt)/(total assets-net intangible assets)]; and the ratio of debt ($Debt_t$: sum of short-term and long-term debt) to total capital (TK_t: sum of debt and equity), and can be expressed as follows:

$$\begin{aligned} KZ = & -1.002 * CF_t / K_{t-1} + 0.283 * Q_t + 3.139 * Debt_t / TK_t \\ & -39.368 * \left(DIV_t / K_{t-1} \right) - 1.315 * Cash_t / K_{t-1} \end{aligned} \qquad (3.12)$$

Following Whited and Wu (2006), we next construct the *WW* index which is a linear function of six variables: cash flow [CF_t/BA_{t-1}: (net income + depreciation)/beginning-of-year book assets]; a dividend indicator ($DIVPOS_t$, indicating positive dividends); the long-term debt to current assets ratio ($TLTD_t/CA_{t-1}$: long-term debt to total current assets); Tobin's Q (Q_t); size ($LNBA_t$: natural log of the book value of assets); firm real sales growth (SGR_t); and industry sales growth (ISG_t):

[130] The reason why we only consider cash dividends is that paying stock dividends in China may reflect firms' financial constraints.

$$WW = -0.091 * CF_t / BA_{t-1} - 0.062 * DIVPOS_t + 0.021 * TLTD_t / CA_{t-1} \\ -0.044 * LNTA_t - 0.035 * SG_t + 0.102 * ISG_t \quad (3.13)$$

We then separate firms into financially constrained (unconstrained) categories based on the *KZ* and *WW* indices, whereby a firm with a higher level of the *KZ* or *WW* index is considered to be more financially constrained. As in Almeida *et al.* (2004), we assign firms into groups of low, medium and high financial constraints in a given year if their *KZ* or *WW* index falls respectively in the bottom, middle and top one third of the distribution of the index of all firms operating in the same industry they belong to in that year.

Lastly, given the unique Chinese context, we categorize firms based on a Chinese-specific indicator called "Special Treatment (ST)". In order to improve market transparency and offer a risk warning to investors, since 1998, China's Stock exchanges launched a "ST" (special statement) procedure. Under the regulation, once a firm has suffered two consecutive annual losses, it will be labeled as a "ST" firm: it will need an internal audit report and its daily share movements will be limited to 5%. After being issued a delisting risk warning (ST), firms are given the pressure of being de-listed from the stock exchanges. Thus firms with "ST" status can be seen as facing financial constraints. We therefore categorize firms as being financially constrained (unconstrained) if they have (have not) been issued a special treatment or a de-listing risk warning.

Table 3.9 shows the difference in the marginal operating performance of cash across firms with different degree of financial constraints. Based on the different criteria we mentioned before, *High_FC, Medium_FC* and *Low_FC*, are dummy variables, equal to 1 respectively if a firm is more likely to face high, medium and low financial constraints, relatively to all firms operating in the same industry they belong to in a given year, and 0 otherwise. In all cases, we interact the change in cash with these dummies and examine the coefficients associated with the interaction terms.[131] As expected, whatever the criterion used, we can see that the coefficient associated with a change in cash is significantly larger for firms that face higher financial constraints.[132] In addition, the *p*-values associated with the Wald tests show the differences of the changes in cash coefficients under all criteria between constrained and unconstrained firms are significant at the 1% level.

[Insert Table 3.9]

[131] We find similar results using the change in excess cash interacted with dummies related to financing constraints. These results are not reported for brevity, but are available upon request.

[132] We can also see that the coefficients associated with a change in cash tend to increase monotonically with the degree of external financial constraints faced by firms under the criteria of firm size (total real assets and number of employees) and the *KZ* and *WW* indices.

3.5. Conclusions

In this chapter, we investigate corporate cash holdings for a panel of Chinese listed firms during the period 1998-2010. We find evidence of mean reversion of cash holdings. Following Opler et al. (1999), we then test different theories of corporate cash holdings and find that, in line with most of the findings from US and European firms (Kim *et al.* 1998; Opler *et al.* 1999; Ozkan & Ozkan 2004; Lee & Powell 2011; Venkiteshwaran 2011), firms in China behave consistently with the trade-off view. We also find evidence of imperfect and continuous rebalancing of cash holdings, with average annual adjustment speed ranging from 0.331 to 0.580, suggesting that Chinese firms rebalance their cash holdings more slowly than firms from the West, probably due to relatively higher adjustment costs. The values of the adjustment speeds also indicate that the typical Chinese listed firm completes half of its required cash adjustment in a period between 1.2 and 2.1 years, which is longer than the corresponding period found for US and European firms. In addition, we find cross-sectional variation in the speed of adjustment. Particularly, firms with a higher level of excess cash have higher adjustment speeds. This is because these firms are likely to face lower adjustment costs than their cash-poor counterparts. Our results also show that firms display higher speeds of cash adjustment, when they tend to actively manage their cash balances through investment, dividend payments, and debt issuance, which are all associated with lower adjustment costs.

To explore the consequence of active management of cash holdings, we then test how excess operating performance is affected by a change in cash holdings. We find that Chinese firms benefit from retaining additional cash. However, greater (excess) cash levels significantly reduce the performance of additional cash holdings. Additionally, firms that attempt acquisitions or are state-owned display a lower marginal value of cash. Finally, our results are consistent with the view according to which additional cash is more valuable for those firms that face a higher degree of financing constraints.

Our findings suggest that Chinese firms actively manage their cash levels based on the costs and benefits of holding cash. However, relatively high adjustment costs affect the overall adjustment process, and could cause an inefficient use of cash and hence a reduction in firms' investment and growth. Policies aimed at reducing these costs would benefit the economy.

In addition, for constrained non-state-owned firms, cash accumulation relieves the stress of the restricted access to credit and prevents these firms from forgoing positive net present value projects. Given the relatively higher degree of financial constraints that non-SOEs face and the greater marginal value of cash that they have, it may be sensible for these firms to keep sufficiently high levels of liquidity.

Table 3.1
Structure of the unbalanced panel

No. of obs. per firm	No. of obs.	Percent	Cumulative
3	354	2.31%	2.31%
4	284	1.85%	4.16%
5	105	0.68%	4.84%
6	714	4.65%	9.49%
7	574	3.74%	13.23%
8	568	3.7%	16.93%
9	774	5.04%	21.98%
10	1,450	9.45%	31.42%
11	1,243	8.1%	39.52%
12	1,860	12.12%	51.64%
13	7,423	48.36%	100%
Total	15,349	100%	

Table 3.2
Distribution of the number of firm-year observations by year

Year	No. of obs.	Percent	Cumulative
1998	708	4.61%	4.61%
1999	812	5.29%	9.9%
2000	912	5.94%	15.84%
2001	1,042	6.79%	22.63%
2002	1,115	7.26%	29.9%
2003	1,177	7.67%	37.57%
2004	1,233	8.03%	45.6%
2005	1,320	8.6%	54.2%
2006	1,325	8.63%	62.83%
2007	1,370	8.93%	71.76%
2008	1,478	9.63%	81.39%
2009	1,471	9.58%	90.97%
2010	1,386	9.03%	100%
Total	15,349	100%	

Table 3.3
Description of variables

variable	mean	p25	p50	p75	N
Cash	0.147	0.068	0.121	0.198	15,349
ΔCash	0.005	-0.033	0.003	0.044	15,349
Tobin	1.750	1.120	1.394	1.932	15,348
Size	20.46	19.75	20.36	21.08	15,349
CF	0.047	0.030	0.054	0.085	15,248
ROA	0.023	0.010	0.032	0.059	15,348
CAPEX	0.058	0.013	0.038	0.082	15,277
Leverage	0.232	0.108	0.220	0.333	15,309
NWC	-0.062	-0.174	-0.041	0.088	15,349
ΔE	0.006	-0.015	0.004	0.024	13,764
ΔNA	0.028	-0.051	0.043	0.139	13,765
Var_CF	0.087	0.078	0.078	0.095	15,349
ΔINT	0.002	-0.005	0.002	0.010	13,764
Cash-to-assets ratios (Cash) by year					
1998	0.098	0.04	0.079	0.134	708
1999	0.115	0.048	0.096	0.161	812
2000	0.136	0.064	0.111	0.187	912
2001	0.164	0.081	0.138	0.224	1,042
2002	0.154	0.076	0.131	0.213	1,115
2003	0.151	0.075	0.127	0.203	1,177
2004	0.143	0.069	0.118	0.194	1,233
2005	0.138	0.06	0.112	0.186	1,320
2006	0.135	0.062	0.112	0.183	1,325
2007	0.144	0.065	0.119	0.193	1,370
2008	0.150	0.071	0.125	0.2	1,478
2009	0.169	0.083	0.142	0.226	1,471
2010	0.172	0.087	0.143	0.234	1,386

Notes: P25 (*50/75*) is the 25^{th} (50^{th}/75^{th}) percentile of the respective distribution. *Cash* (*Cash-to-assets ratio)* is the ratio of the sum of cash and cash equivalents to total assets. *ΔCash* is the ratio of the change in cash and cash equivalents from year *t-1* to *t* to total assets. *Tobin (Q)* is the market-to-book ratio. *Size* is the natural logarithm of total assets. *CF* is the ratio of the sum of net profit and depreciation to total assets. *ROA* is the return on assets. *CAPEX* is defined as the ratio of capital expenditures to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *NWC (non-cash NWC)* is the ratio of net working capital (working capital minus cash holdings) to total assets. *ΔNA* is the ratio of the change in net total assets (total assets minus cash holdings) from year *t-1* to *t* to total assets. *ΔE* is the ratio of the change in earnings before extraordinary items from year *t-1* to *t* to total assets. *Var_CF* is the mean of the standard deviation of the cash flow to total assets ratios of firms in a given industry. *ΔINT* is the ratio of the change in the interest expenses from year *t-1* to *t* to total assets. All variables are deflated using a GDP deflator.

Table 3.4
Cash holdings regressions

	(1)	(2)	(3)	(4)	(5)
Dependent variable	*OLS*	*Fama-MacBeth*	*FE*	*FE*	*FE*
	Cash/ Total Assets$_t$	*Cash/ Total Assets$_t$*	*Cash/ Total Assets$_t$*	*Cash/ Net Assets$_t$*	*Ln (Cash/ Net Assets)$_t$*
Tobin$_t$	0.002	0.005	0.002***	0.005***	0.021**
	(1.00)	(1.49)	(2.60)	(2.84)	(2.29)
Size$_t$	-0.003	-0.003	0.018***	0.029***	0.198***
	(-1.57)	(-1.32)	(10.84)	(9.34)	(12.07)
CF$_t$	0.171***	0.186***	0.162***	0.257***	2.190***
	(11.45)	(11.53)	(17.04)	(14.71)	(23.42)
NWC$_t$	-0.059***	-0.067***	-0.097***	-0.188***	-0.490***
	(-7.54)	(-11.11)	(-22.19)	(-23.40)	(-11.41)
CAPEX$_t$	-0.113***	-0.122***	-0.055***	-0.137***	0.172
	(-5.72)	(-6.67)	(-4.10)	(-5.58)	(1.31)
Leverage$_t$	-0.209***	-0.200***	-0.183***	-0.322***	-1.431***
	(-17.14)	(-21.99)	(-26.72)	(-25.68)	(-21.36)
Div_Dum$_t$	0.029***	0.028***	0.013***	0.020***	0.129***
	(11.55)	(8.81)	(7.72)	(6.45)	(7.69)
Var_CF$_t$	1.135**	1.143***			
	(2.16)	(3.61)			
SOEs$_t$	-0.007**	-0.004	-0.009***	-0.016***	-0.056**
	(-2.00)	(-1.24)	(-3.30)	(-3.21)	(-2.17)
AC1$_{t+1}$	0.002	0.001	0.005***	0.008**	0.058***
	(0.99)	(0.27)	(2.94)	(2.41)	(3.17)
Observations	15132	15132	15132	15132	15131
R^2	0.24	0.25	0.14	0.12	0.15
Adjusted R^2	0.24		0.04	0.02	0.05
ρ			0.62	0.63	0.59
F-value	25.77	535.69	45.60	38.65	50.49

Notes: The specifications were estimated using the pooled OLS (column 1), the Fama-MacBeth (column 2), and the fixed-effects (column 3, 4 and 5) estimators. Time, industry, and province dummies were included in columns 1 and 2. For the fixed-effects (column 3, 4 and 5) estimates, we only include time and province dummies. The dependent variable is: *Cash/Total Assets* (column 1, 2 and 3), *Cash/ Net Assets*, (column 4), and *Ln (Cash/Net Assets)* (column 5). *Tobin (Q)* is the market-to-book ratio. *Size* is the natural logarithm of total assets. *CF* is the ratio of the sum of net profit and depreciation to total assets. *NWC (non-cash NWC)* is the ratio of net working capital (working capital minus cash holdings) to total assets. *CAPEX* is defined as the ratio of capital expenditures to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *Div_Dum* is a dummy variable, which equals 1 if the firm has made any cash dividend payment in the year, and 0 otherwise. *Var_CF* is the mean of the standard deviations of the cash flow to total assets ratios of all firms in a given industry. *SOEs*, is a dummy variable, that takes the value of 1 if a firm is state-owned in a given year, and 0 otherwise. *AC1* is a dummy variable, which is equal to 1 in a given year if a firm attempts acquisitions in the next fiscal year, and 0 otherwise. For the pooled regression, t-statistics (in parentheses) are asymptotically cluster-robust to heteroscedasticity, and intra-cluster correlation is accounted for at the firm level. For the Fama-MacBeth specifications, the estimated coefficients are given by the average of the ones obtained from annual cross-sectional regressions. For the fixed-effects regression, ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 3.5
Testing various cash holding theories

Dependent variable $Cash_{t+1}$ *-* $Cash_t$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Mean target adjustment	0.483***					0.484***				32.843***			
	(32.71)					(31.20)				(13.68)			
Predicted target adjustment		0.574***					0.578***				0.579***		
		(65.19)					(59.43)				(59.36)		
Fama-MacBeth target adjustment			0.578***					0.589***				0.589***	
			(68.17)					(62.44)				(62.37)	
Fixed-effects target adjustment				0.581***					0.591***				0.592***
				(67.02)					(61.44)				(61.41)
Pecking order					0.042***	-0.002	0.005	-0.000	0.005	5.363***	0.007	0.001	0.010*
					(9.04)	(-0.39)	(1.17)	(-0.10)	(1.30)	(5.05)	(1.20)	(0.10)	(1.71)
*Pecking order*Above target*										-6.109***	-0.004	-0.002	-0.009
										(-4.15)	(-0.50)	(-0.26)	(-1.12)
Observations	10,632	13,594	13,594	13,594	12,144	10,593	12,052	12,052	12,052	10,593	12,052	12,052	12,052
Half_Life	1.435	1.208	1.198	1.194		1.431	1.199	1.177	1.173	0.021	1.198	1.177	1.172
R^2	0.13	0.28	0.30	0.29	0.03	0.13	0.28	0.29	0.29	0.03	0.28	0.29	0.29
Adjusted R^2	-0.02	0.19	0.21	0.20	-0.11	-0.02	0.17	0.19	0.18	-0.12	0.17	0.19	0.18
ρ	0.29	0.38	0.38	0.25	0.27	0.29	0.42	0.44	0.33	0.09	0.42	0.44	0.33
F-value	37.49	120.03	130.49	126.37	9.20	36.18	104.81	114.77	111.41	8.33	102.12	111.82	108.58

Notes: All specifications were estimated using the fixed-effects estimator. Time and province dummies were included in all specifications. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The dependent variable is given by the difference between the cash/total assets ratio at time t+1 and the corresponding ratio at time t. The target adjustment is the difference between the estimated target cash holdings at t+1 and the realized level of cash holdings at t. Following Opler *et al.* (1999), we use three different approaches to estimate the levels of target cash holdings. *Mean target* represents the average cash holdings over the last three years. *Predicted target* is given in each year by the fitted values from the OPSW model estimated using a pooled *OLS* estimator. *Fama-MacBeth target* is given in each year by the fitted values from the OPSW model estimated using the two-step *Fama-MacBeth* estimator. *Fixed-effects target adjustment* is given by the predicted values from the OPSW model estimated using the fixed-effects estimator. *Pecking order* is the firm's financial deficit *(FINDEF)*, which is measured as follows: (dividend payments + investment + changes in net working capital – operating cash flow) / total assets. *Pecking order*Above target* is an interaction term between the financing deficit (*FINDEF*) and a dummy variable (*Above target*), which is equal to one if the deviation from optimal cash levels $\left(Cash^*_{i,t+1} - Cash_{i,t}\right)$ is negative and 0 otherwise. *Half-life* is the time necessary to cover half of the deviation from the initial cash level to the target level. t-statistics are in parentheses. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively

Table 3.6
Dynamic models of cash holdings

Dependent variable	(1)	(2)	(3)
$Cash_{t+1}$	*GMM*	*OLS*	*FE*
$Cash_t$	0.609***	0.669***	0.420***
	(20.94)	(63.94)	(49.41)
$Tobin_t$	0.007**	0.007***	0.006***
	(2.37)	(5.89)	(5.73)
$Size_t$	0.002	-0.001	-0.013***
	(0.50)	(-0.63)	(-7.54)
CF_t	0.079**	0.038***	0.055***
	(2.09)	(3.48)	(5.79)
NWC_t	0.001	0.002	0.007*
	(0.10)	(0.41)	(1.66)
$CAPEX_t$	0.003	-0.071***	-0.056***
	(0.05)	(-6.33)	(-4.35)
$Leverage_t$	-0.071***	-0.049***	-0.041***
	(-2.98)	(-8.48)	(-5.91)
Div_Dum_t	-0.009	0.002	0.002
	(-1.29)	(1.04)	(1.22)
Var_CF_t	0.755*	0.542**	
	(1.66)	(2.09)	
$SOEs_t$	0.001	0.002	-0.001
	(0.16)	(1.02)	(-0.45)
$AC1_{t+1}$	0.006	-0.005***	-0.004**
	(0.65)	(-2.69)	(-2.39)
N	13594	13594	13594
Adjustment Speed	0.391	0.331	0.580
Half_Life	1.773	2.097	1.195
R^2		0.56	0.24
Adjusted R^2		0.56	0.14
ρ			0.44
F-value	64.91	157.80	78.00
Hansen J test (p-value)	0.15		
m3 test (p-value)	0.57		

Notes: The specifications were estimated using the system GMM (column 1), the fixed-effects (column 2), and the pooled OLS (column 3) estimators. Time, industry, and province dummies were included in all specifications apart from the fixed-effects estimates in column 2 (which include time and province dummies only). The dependent variable in all regressions is the level of cash holdings (the ratio of the sum of cash and cash equivalents to total assets*)* at *t+1*. *Tobin (Q)* is the market-to-book ratio. *Size* is the natural logarithm of total assets. *CF* is the ratio of the sum of net profit and depreciation to total assets. *NWC (non-cash NWC)* is the ratio of net working capital (working capital minus cash holdings) to total assets. *CAPEX* is defined as the ratio of capital expenditures to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *Div_Dum* is a dummy variable, which equals 1 if the firm has made any cash dividend payment in the year, and 0 otherwise. *Var_CF* is the mean of the standard deviations of the cash flow over total assets ratios of all firms in a given industry. *SOEs*, is a dummy variable, that takes the value of 1 if a firm is state-owned in a given year, and 0 otherwise. *AC1* is a dummy variable, which is equal to 1 in a given year if the firm attempted acquisitions in the next fiscal year, and 0 otherwise. For the system *GMM* regression, *m3* is a test for third-order serial correlation of the differenced residuals, asymptotically distributed as *N*(0,1) under the null of no serial correlation. The Hansen *J* test of over-identifying restrictions is distributed as *Chi*-square under the null of instrument validity. We treat $Cash_t$, $Tobin_t$, $Size_t$, CF_t, NWC_t, $CAPEX_t$, $Leverage_t$, Div_Dum_t, $SOEs_t$ and $AC1_{t+1}$ as potentially endogenous variables. Levels of these variables dated *t-3* and further are used as instruments in the first-differenced equations, and the first-differences of these same variables lagged twice are used as additional instruments in the levels equations. For the pooled regression, t-statistics (in parentheses) are asymptotically cluster-robust to heteroscedasticity and intra-cluster correlation is accounted for at the firm level. For the fixed-effects regression, ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. *Half-life* is the time necessary to cover half of the deviation from the initial cash level to the target level. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 3.7
Dynamic models of cash holdings

Dependent variable $Cash_{t+1}$	(1) *Xcash*	(2) *Xcash'*	(3) *Active*	(4) *DIV*	(5) *Investment*	(6) *Debt*
$Dum\_low_{t*}Cash_t$	0.828***	0.729***	0.734***	0.686***	0.624***	0.696***
	(10.99)	(7.49)	(13.82)	(19.62)	(14.97)	(19.31)
$Dum\_medium_{t*}Cash_t$	0.787***				0.636***	0.622***
	(12.03)				(14.19)	(13.04)
$Dum\_high_{t*}Cash_t$	0.646***	0.531***	0.577***	0.581***	0.534***	0.538***
	(12.78)	(12.39)	(17.49)	(17.13)	(10.10)	(10.90)
$Tobin_t$	0.005**	0.005**	0.004	0.004*	0.005**	0.004**
	(2.13)	(2.20)	(1.63)	(1.69)	(2.33)	(2.07)
$Size_t$	0.002	-0.001	-0.001	-0.001	-0.001	0.000
	(0.70)	(-0.41)	(-0.32)	(-0.27)	(-0.32)	(0.04)
CF_t	0.065**	0.073**	0.081**	0.077**	0.073**	0.070**
	(2.05)	(2.25)	(2.42)	(2.29)	(2.40)	(2.23)
NWC_t	-0.006	-0.006	-0.014	-0.005	-0.004	0.002
	(-0.57)	(-0.49)	(-1.13)	(-0.42)	(-0.34)	(0.19)
$CAPEX_t$	0.033	0.009	0.020	-0.025	-0.091	-0.042
	(0.64)	(0.17)	(0.38)	(-0.46)	(-1.11)	(-0.87)
$Leverage_t$	-0.065***	-0.072***	-0.087***	-0.078***	-0.081***	-0.078**
	(-3.29)	(-3.73)	(-4.29)	(-3.74)	(-4.27)	(-2.51)
Div_Dum_t	-0.017***	-0.008	-0.005	0.012	-0.002	-0.004
	(-3.14)	(-1.44)	(-0.90)	(1.29)	(-0.32)	(-0.74)
Var_CF_t	1.878**	2.566**	1.453	2.507**	2.341**	1.480
	(2.02)	(2.45)	(1.47)	(2.22)	(2.35)	(1.61)
SOE_t	0.001	0.000	-0.001	0.000	0.000	0.000

	(0.29)	(0.07)	(-0.33)	(0.11)	(0.06)	(0.14)
$AC1_t$	0.005	0.008	0.007	0.008	0.002	0.003
	(0.74)	(1.02)	(0.93)	(0.93)	(0.30)	(0.45)
$Dum1_t$	0.002	0.042***	0.022**		0.005	0.015
	(0.16)	(3.46)	(2.12)		(0.44)	(1.17)
Dum2t	0.007				0.026*	0.027*
	(0.62)				(1.71)	(1.76)
N	13,594	13,594	11,947	13,594	13,594	13,594
F-value	76.34	64.51	62.67	63.63	58.27	65.80
Hansen J test (p-value)	0.21	0.13	0.13	0.36	0.46	0.23
m3 test (p-value)	0.42	0.44	0.27	0.58	0.54	0.54
Diff (Low vs High)	0.01***	0.04**	0.02**	0.04**	0.20	0.01***

Notes: All specifications were estimated using the system GMM estimator. Time, industry and province dummies were included in all specifications. The dependent variable in all regressions is the level of cash holdings (the ratio of the sum of cash and cash equivalents to total assets*). Tobin (Q)* is the market-to-book ratio. *Size* is the natural logarithm of total assets. *CF* is the ratio of the sum of net profit and depreciation to total assets. *NWC (non-cash NWC)* is the ratio of net working capital (working capital minus cash holdings) to total assets. *CAPEX* is defined as the ratio of capital expenditures to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *Div_Dum* is a dummy variable, which equals 1 if the firm has made any cash dividend payment in the year, and 0 otherwise. *Var_CF* is the mean of the standard deviations of the cash flow over total assets ratios of all firms in a given industry. *SOEs* is a dummy variable, that takes the value of 1 if a firm is state-owned in a given year, and 0 otherwise. *AC1* is a dummy variable, which is equal to 1 in a given year if a firm attempted acquisitions in the next fiscal year, and 0 otherwise. In the columns labelled *Xcash*, *Investment*, and *Debt, Dum_low (Dum_high)* is a dummy variable in turn equal to 1 in a given year if the firm's excess cash, capital expenditures, and leverage ratio respectively lie in the bottom (top) one third of the distribution of the corresponding variables of all firms operating in the same industry in that year, and 0 otherwise. For the remaining firm-years, the dummy *Dum_medium* will be equal to 1. In the columns labelled *Xcash', Active,* and *Div*, *Dum_high (Dum_low)* is a dummy variable, which is in turn equal to 1 in a given year if the firm has a levels of cash ratio below (above) the median value of the distribution of the cash ratios of all firms operating in the same industry in that given year, is (not) actively managing its cash holdings, and is paying (no) dividends, respectively, and 0 otherwise. We treat $Tobin_t$, $Size_t$, CF_t, NWC_t, $CAPEX_t$, $Leverage_t$, Div_Dum_t, OEs_t, $AC1_{t+1}$ as well as all the interaction terms with $Cash_t$ as potentially endogenous variables. Levels of these variables dated *t-3* and further are used as instruments in the first-differenced equations, and first-differences of these same variables lagged twice are used as additional instruments in the levels equations. *Diff* is a test for equality of the coefficients across various categories of firms distributed as *Chi*-square. Specifically, we report *p*-values of the Wald statistics for the equality of the cash coefficients between firm-years in group (*Dum_high)* and group *(Dum_low)*. *t*-statistics are in parentheses. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 3.8

Regressions of *ROA-ROA^B* on changes in firm cash holdings

Dependent variable ROA_t - ROA^B_t	(1) *Cash(1)*	(2) *Cash(2)*	(3) *Cash(3)*	(4) *xCash*	(5) *ACW(1)*	(6) *ACW(2)*
$\Delta Cash_t$	0.092***	0.107***	0.142***	0.145***	0.137***	0.137***
	(14.53)	(9.95)	(10.43)	(10.50)	(9.82)	(9.82)
ΔE_t	0.342***	0.342***	0.342***	0.342***	0.343***	0.343***
	(73.83)	(73.75)	(73.63)	(73.62)	(73.85)	(73.85)
ΔNA_t	0.097***	0.097***	0.097***	0.097***	0.097***	0.097***
	(38.29)	(37.92)	(37.98)	(38.38)	(38.13)	(38.13)
ΔINT_t	-0.315***	-0.314***	-0.314***	-0.315***	-0.313***	-0.313***
	(-11.76)	(-11.72)	(-11.73)	(-11.77)	(-11.70)	(-11.70)
ΔDIV_t	0.168**	0.168**	0.164**	0.166**	0.175**	0.175**
	(2.19)	(2.19)	(2.14)	(2.16)	(2.28)	(2.28)
$Cash_{t-1}$	0.066***	0.065***	0.066***	0.069***	0.063***	0.063***
	(9.44)	(9.33)	(9.37)	(9.85)	(8.93)	(8.93)
$Leverage_t$	-0.174***	-0.173***	-0.173***	-0.172***	-0.174***	-0.174***
	(-39.31)	(-39.14)	(-39.02)	(-38.93)	(-39.36)	(-39.36)
SOE_t	-0.005***	-0.005***	-0.005**	-0.005**	-0.005***	-0.005***
	(-2.62)	(-2.61)	(-2.48)	(-2.45)	(-2.68)	(-2.68)
$AC1_t$	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.23)	(2.23)	(2.51)	(2.35)	(2.39)	(2.39)
$Cash_{t-1*}\ \Delta Cash_t$		-0.073*	-0.083*	-0.072*	-0.083*	-0.083*
		(-1.70)	(-1.92)	(-1.61)	(-1.86)	(-1.86)
$SOE_t * \Delta Cash_t$			-0.043***	-0.038***	-0.038***	-0.038***
			(-3.77)	(-3.17)	(-3.17)	(-3.17)
$AC1_{t+1*}\ \Delta Cash_t$			-0.032**	-0.027*	-0.033**	-0.033**
			(-2.19)	(-1.78)	(-2.14)	(-2.14)
Observations	13,716	13,716	13,716	13,716	13,716	13,716
R^2	0.51	0.51	0.51	0.51	0.51	0.51

Adjusted R^2	0.44	0.44	0.44	0.44	0.44	0.44
ρ	0.45	0.45	0.46	0.45	0.46	0.46
F-value	269.99	264.35	254.08	255.51	253.39	253.39

Notes: All specifications were estimated using the fixed-effects estimator. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. Time and province dummies were included in all specifications. The dependent variable is the excess operating performance ($ROA - ROA^B$), where *ROA* is the return on assets and ROA^B is the benchmark return on assets constructed as 25 Fama & French (1993) size and book-to market portfolios. In columns 1 to 3, *ΔCash* is the ratio of the change in cash and cash equivalents (*Cash*) from year *t-1* to *t* to total assets. In columns 4 to 6, *ΔCash* is the ratio of the change in *excess cash* from year *t-1* to *t* to total assets (see Section 3.4.6.3 for more details). *ΔE* is the ratio of the change in earnings before extraordinary items from year *t-1* to *t* to total assets. *ΔNA* is the ratio of the change in net total assets (total assets minus cash holdings) from year *t-1* to *t* to total assets. *ΔINT* is the ratio of the change in interest expense from year *t-1* to *t* to total assets. *ΔDIV* is the ratio of the change in cash dividends from year *t-1* to *t* to total assets. *Cash* is the ratio of the sum of cash and cash equivalents to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *SOE* is a dummy variable, that takes the value of 1 if a firm is state-owned in a given year, and 0 otherwise. *AC1* is a dummy variable, which is equal to 1 in a given year if a firm attempted acquisitions in the next fiscal year, and 0 otherwise. *t*-statistics are in parentheses. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table 3.9
Regressions of *ROA-ROA*^{B} on changes in firm cash holdings differentiating firms into financially constrained and unconstrained

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
ROA_t - ROA^B_t	*Total Assets*	*No. of Employees*	*DIV*	*KZ*	*WW*	*ST*
$\Delta Cash_t$*$High\_FC_t$	0.143***	0.104***	0.133***	0.217***	0.173***	0.157***
	(15.04)	(11.11)	(16.33)	(17.40)	(18.02)	(17.09)
$\Delta Cash_t$*$Medium\_FC_t$	0.086***	0.097***		0.070***	0.059***	
	(8.62)	(9.29)		(6.46)	(5.76)	
$\Delta Cash_t$*Low_FC_t	0.031***	0.065***	0.043***	0.048***	0.023**	0.047***
	(2.88)	(5.71)	(4.89)	(5.64)	(2.23)	(5.98)
ΔE_t	0.341***	0.345***	0.340***	0.337***	0.339***	0.338***
	(73.38)	(72.13)	(73.22)	(72.17)	(72.48)	(72.77)
ΔNA_t	0.098***	0.098***	0.096***	0.095***	0.098***	0.095***
	(38.63)	(37.80)	(37.94)	(37.17)	(38.63)	(37.57)
ΔINT_t	-0.313***	-0.317***	-0.312***	-0.307***	-0.293***	-0.312***
	(-11.70)	(-11.52)	(-11.69)	(-11.50)	(-10.96)	(-11.71)
ΔDIV_t	0.175**	0.165**	0.171**	0.161**	0.165**	0.174**
	(2.29)	(2.12)	(2.24)	(2.10)	(2.18)	(2.28)
$Cash_{t-1}$	0.068***	0.064***	0.065***	0.069***	0.064***	0.066***
	(9.77)	(8.79)	(9.38)	(9.88)	(9.22)	(9.41)
$Leverage_t$	-0.172***	-0.176***	-0.172***	-0.174***	-0.173***	-0.171***
	(-39.02)	(-38.61)	(-38.98)	(-39.27)	(-39.21)	(-38.66)
SOE_t	-0.005***	-0.005**	-0.005***	-0.006***	-0.006***	-0.006***
	(-2.61)	(-2.46)	(-2.68)	(-2.78)	(-3.22)	(-2.79)
$AC1_{t+1}$	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**
	(2.27)	(2.27)	(2.22)	(2.11)	(2.08)	(2.28)
Observations	13,716	13,181	13,716	13,635	13,602	13,716
R^2	0.51	0.51	0.51	0.51	0.51	0.51
Adjusted R^2	0.44	0.44	0.44	0.45	0.45	0.45

ρ	0.46	0.48	0.46	0.44	0.45	0.45
F-value	261.29	250.81	266.78	261.26	269.26	268.11
Diff (Low VS High)	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***

Notes: All specifications were estimated using the fixed-effects estimator. *ρ* represents the proportion of the total error variance accounted for by unobserved heterogeneity. Time and province dummies were included in all specifications. The dependent variable is the excess operating performance $ROA\text{-}ROA^B$, where *ROA* is the return on assets and ROA^B is the benchmark return on assets constructed as 25 Fama & French (1993) size and book-to market portfolios. *ΔCash* is the ratio of the change in cash and cash equivalents from year *t-1* to *t* to total assets. *ΔE* is the ratio of the change in earnings before extraordinary items from year *t-1* to *t* to total assets. *ΔNA* is the ratio of the change in net total assets (total assets minus cash holdings) from year *t-1* to *t* to total assets. *ΔINT* is the ratio of the change in interest expense from year *t-1* to *t* to total assets. *ΔDIV* is the ratio of the change in cash dividends from year *t-1* to *t* to total assets. *Cash* is the ratio of the sum of cash and cash equivalents to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *SOEs* is a dummy variable, that takes the value of 1 if a firm is state-owned in a given year, and 0 otherwise. *AC1* is a dummy variable, which is equal to 1 in a given year if a firm attempted acquisitions in the next fiscal year, and 0 otherwise. Based on the following different criteria: *Firm Size* (total assets or number or employees), *Dividend Payout Status*, the *KZ* index, the *WW* index, and a Chinese-specific indicator (*ST*), we split firm-years into the following three groups: *High_FC*, *Medium_FC*, and *Low_FC*, which are dummy variables equal to 1 respectively if a firm is more likely to face high, medium, and low financial constraints, relatively to all firms operating in the same industry they belong to in a given year, and 0 otherwise. Specifically, in columns 1 and 2, we consider a firm to be financially constrained (unconstrained) if its *size* (measured by total assets or number or employees) lies in the bottom (top) one third of the distribution of the corresponding values of all firms belonging to the same industry each year. The remaining firm-years will be the ones, who face a medium level of financial constraints. In columns 3, we categorize firm-years according to their dividend payout status. In particular, we consider a firm as financially constrained (unconstrained) if it is not paying (paying) dividends in a given year. In columns 4 and 5, we consider a firm to be financially constrained (unconstrained) if its *KZ* or *WW* index lies in the top (bottom) one third of the distribution of the corresponding variables for all firms belonging to the same industry in a given year. The remaining firm-years will be the ones, who face a medium level of financial constraints. In column 6, we partition firm-years into financially constrained (unconstrained) if they have (have not) been issued a special treatment or a de-listing risk warning (*ST*). *Diff* is a test for equality of the coefficients across various categories of firms distributed as *Chi*-square. Specifically, we report *p*-values of the Wald statistics for the equality of the coefficients on changes in cash between firm-years, who are more and less likely to face financial constraints. *t*-statistics are in parentheses. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

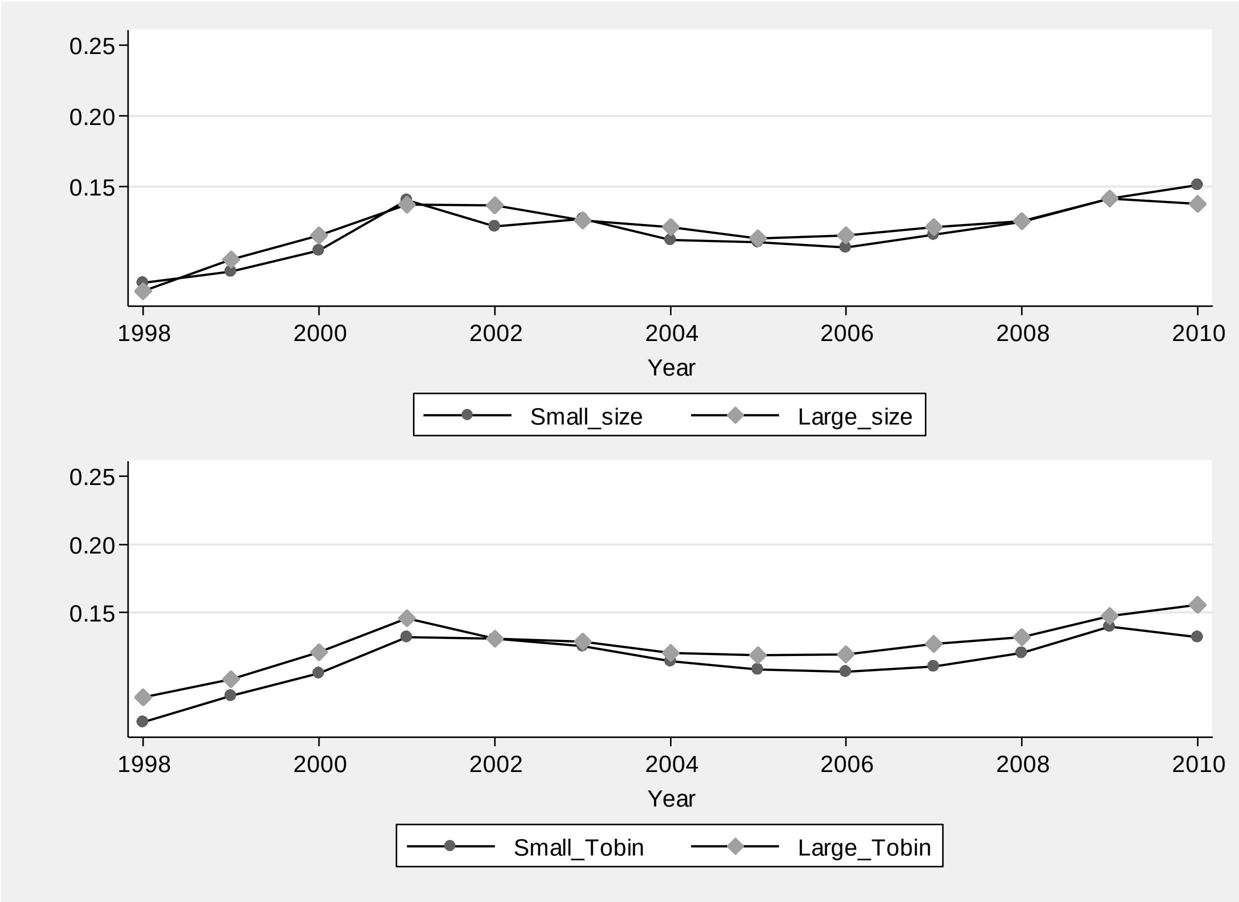

Fig. 3.1 Median cash-to-assets across firm size and Tobin's *Q*

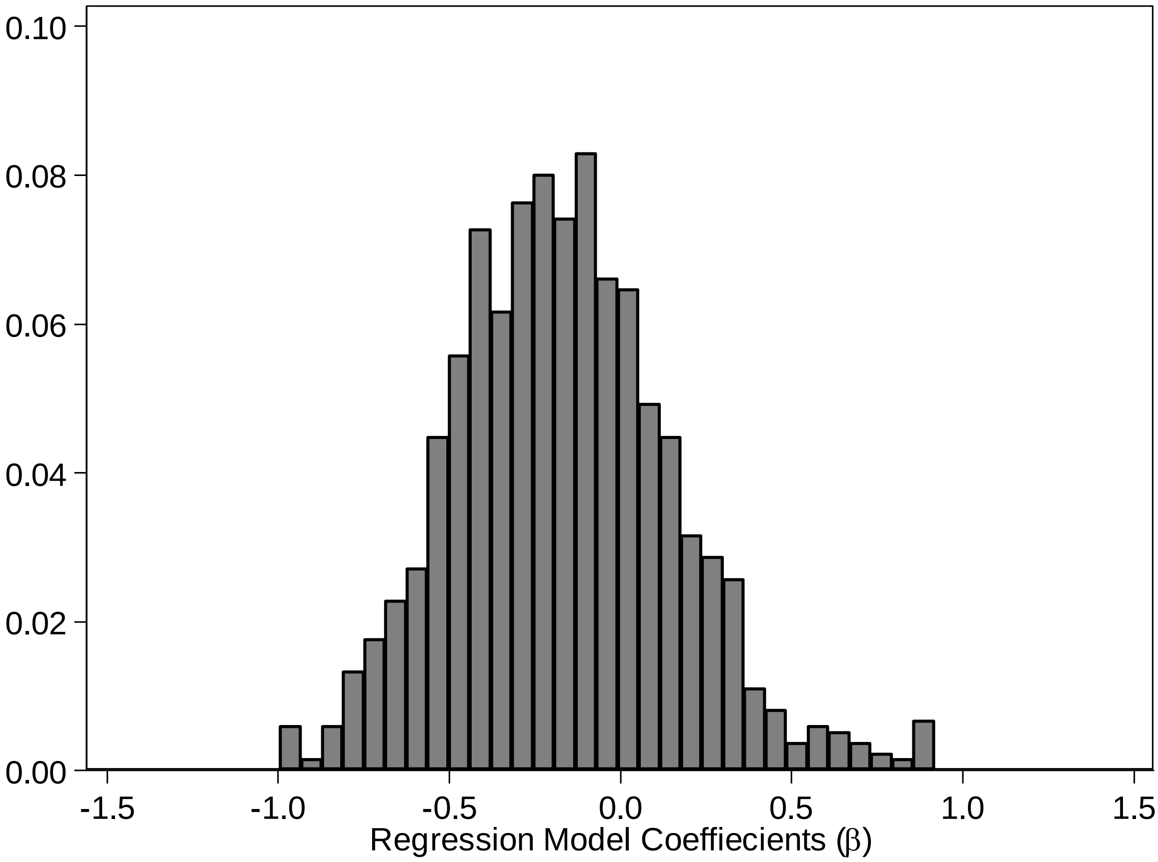

Fig. 3.2 Distribution of coefficients on lagged change in cash-to-assets

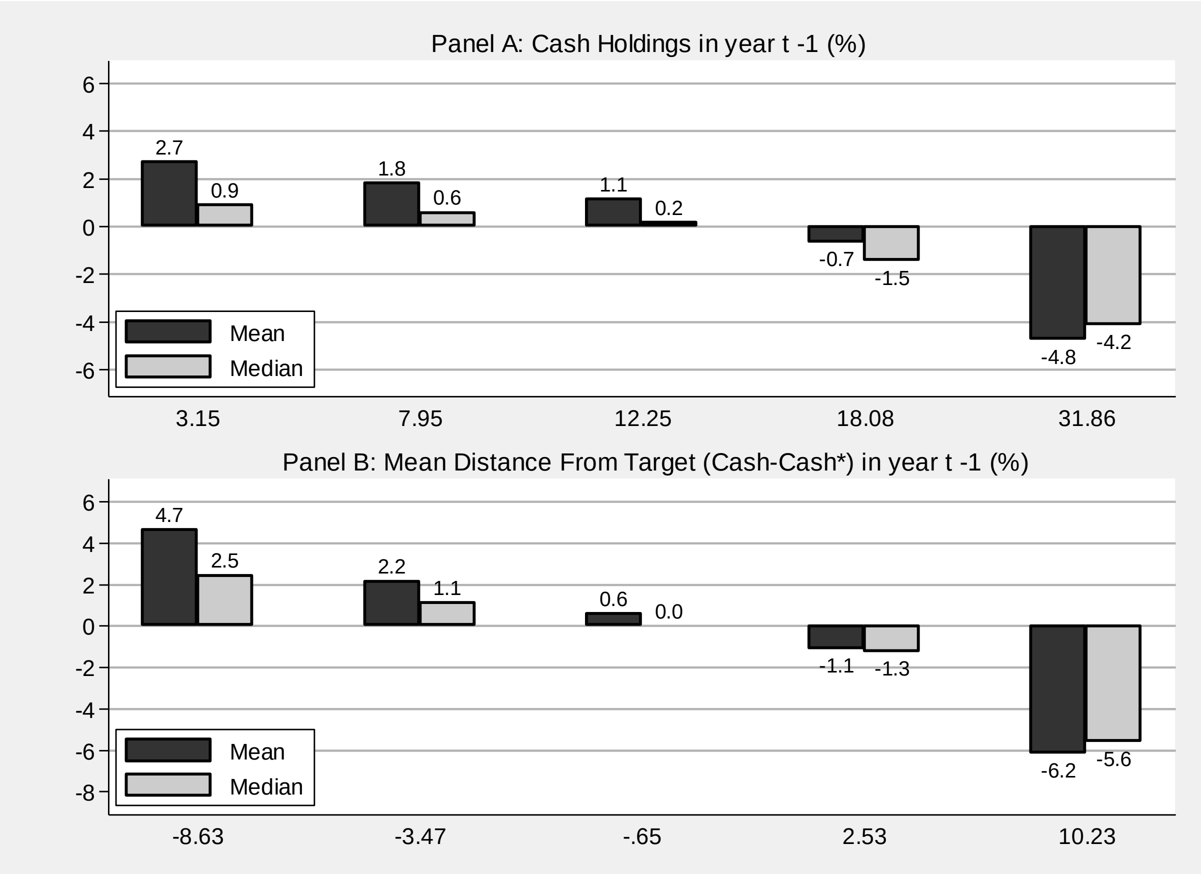

Fig. 3.3 Subsequent year’s change in cash holdings

Chapter 4

Corporate liquidity and acquisitions: The China experience

Using a panel of Chinese listed firms over the period 1998-2011, we examine the extent to which corporate liquidity impacts firms' acquisition decisions, method of payment choices, and consequent performance following mergers. Our findings support the free-cash-flow motive of acquisitions: cash-rich firms are more likely to attempt acquisitions. Furthermore, it is found that tunneling contributes to the agency costs of free cash flow. Finally, given the higher opportunity cost of cash they face, financially constrained firms with higher growth prospects tend not to use cash payments in acquisitions. This finding is consistent with the under-performance of cash acquisitions in both the short-and long-terms.

4.1. Introduction

The gradual establishment and development of China's capital markets and the impact of globalization have fuelled a phenomenally roaring pace of merger and acquisitions (M&As).[133] Given high growth rates and large amounts of cash generated by Chinese firms, strategic mergers including inward and outward M&A investments offer Chinese firms opportunities for seeking further economies of scale or other synergies, enhancing their competition advantage, and entering global markets. Additionally, M&As have become easier in the light of the relaxation of obstacles to their approval process, and of the constantly evolving regulatory and taxation framework surrounding them.

It is also worth mentioning that state-owned enterprises (SOEs) have been restructuring their state-owned assets through M&As. On the one hand, SOEs in strategically relevant sectors such as basic materials, energy, utilities, telecommunications, aerospace and defense have been encouraged to form global conglomerates. On the other hand, some SOEs have been required to reduce their equity to generate efficiency improvements and increase competitiveness, which offers opportunities of market entry for other potential investors (Devonshire-Ellis *et al.* 2011). As a result, China's M&A transactions including domestic consolidation, as well as outward and inward takeovers have significantly increased over the years (see Table 4.1). According to the 2012 M&A outlook of Bloomberg, China has engaged in 158 billion US dollars' worth of takeover deals in 2011. This represents a moderate 9% increase from the 145 billion US dollars announced in 2010 (Bloomberg 2012).

[133] China's accession to the World Trade Organization (WTO) in 2001 encouraged Chinese enterprises to restructure and consolidate through M&As, in order to defend themselves from the influx of strong foreign competitors or to expand their business territories overseas.

In this study, we investigate the effect of corporate liquidity on acquisitions. Our results suggest that the agency costs of free cash flow play an important role in determining firms' M&A strategy in China. Additionally, liquidity risk and frictions based on informational asymmetries can explain both payment choices and performance following acquisitions.

Theories that focus on corporate liquidity and the costs of cash holdings can help to answer the question of what drives acquisitions. From a micro perspective, the existence of capital market imperfections (CMI) contributes to financial frictions, and firms face a cost premium on external finance. Under these circumstances, it is suggested that firms prefer using internal finance like cash or retained earnings to external financing such as bank loans, debt, and equity (Myers 1984). In particular, compared to their financially healthy counterparts, financially constrained firms value their cash holdings more, since liquidity allows them to invest without having to access new costly debt or equity (Faulkender & Wang 2006). Thus, corporate liquidity should play a crucial role on investment decisions, including acquisitions. Particularly, liquidity allows firms to make acquisitions, as it can be used directly as a measure of payment or can be used to meet interest payments on debt finance. It follows that an increase in corporate liquidity should enhance firms' acquisition activities. In line with this argument, Shleifer & Vishny (1992) note that high corporate liquidity has driven merger waves in the last century. The authors argue that when cash flows are high, sellers should be more willing to sell their assets since higher cash flows bring the prices offered close to the firms' fundamental values. Using a large panel of European acquisitions, Erel et al. (2014) point out that a reduction in the level of cash holdings, sensitivity of cash to cash flow, and sensitivity of investment to cash flow can be observed on target firms subsequent to being acquired. Based on these findings, the authors suggest financing improvement could potentially be a key factor leading to M&As.

According to the neoclassical hypothesis, industry assets can be restructured via mergers, in response to technological, regulatory or supply shocks, provided that sufficient capital liquidity is available. Harford (2005) argues that economic motivation and high macro-level capital liquidity generate a large number of merger deals in time. Similarly, Eisfeldt & Rampini (2006) observation that procyclical capital liquidity goes hand in hand with capital reallocation among firms, suggesting that liquidity is a critical key for industry shocks to generate merger waves.

In addition, consistent with the agency costs theory, the free cash flow hypothesis (Jensen 1986) may also explain why firms with high liquidity are more likely to engage in takeovers. A high liquidity offers managers the incentive to make self-interested and entrenched decisions on low-benefit projects or acquisitions. Hanson (1992) finds evidence that acquiring firms with large free cash flow undertake low-benefit acquisitions. Harford (1999) finds a positive relation between cash-richness and the likelihood of a bid. His results also suggest that the cash-richness effect is being driven by the greater likelihood of agency conflicts between management and shareholders, indicated by low managerial ownership. In line with the agency costs of free cash flow explanation for acquisitions, there is a negative market reaction for acquiring firms with excess cash, due to the expectation of poor future performance. Oler (2008) also finds that the level of cash flow of the acquirer firms is significantly negatively related with their performance in terms of post-acquisition returns on net operating assets (RNOA).

Yet, M&As represent a quick way to spend excess cash, which may limit the discretion of management and relieve the agency problems of free cash flow. According to Myers & Majluf (1984) and Smith & Kim (1994), mergers can create value by reducing resource misallocations, e.g. combining the resources of cash-surplus firms with firms without sufficient financial slack. Considering that high free cash flow can be seen as evidence of mismatching between growth prospects and resources, Hanson (1992) states that higher target returns can be observed when firms have excess cash flow, which can be attributed to takeovers reducing agency costs.

Despite the extensive studies that rationalize the liquidity reason of the occurrence of mergers and acquisitions, only a small amount of research has paid attention to the motives behind China's takeovers. Given the substantial increase in M&As characterizing the country, the Chinese case represents an ideal laboratory to further our understanding of the motives behind acquisitions and other aspects of merger policies. Our work contributes to existing literature in the following ways. First, it analyzes the interactions between corporate liquidity and M&As in the Chinese context. To the best of our knowledge, these interactions have not been investigated in previous literature. It is, however, important to analyze them, as they can help to assess the extent to which acquiring firms can benefit from acquisitions. Second, we investigate whether takeovers in China are driven by free-cash-flow. This will enable us to assess whether the agency-costs explanation of mergers proposed in the West (Jensen 1986; Hanson 1992; Smith & Kim 1994; Harford 1999; Oler 2008) is also valid in the Chinese case. Third, we analyze method-of-payment choices in acquisitions to assess the role played by the opportunity costs of cash holdings and capital constraints.

Overall, our study provides a portrait of the nature and implications of M&As in China, and sheds light on how liquidity affects firms' acquisition decisions, method of payment choices, and post-merger performance. We provide support for the free cash flow hypothesis according to which cash-rich Chinese firms tend to make use of their excess cash to take over other firms. The agency costs of free cash flow explanation is further tested by separating firms based on whether they are subject to tunneling. We find that the role of cash manifests itself more for firms with greater likelihood of tunneling. Next, given the impact of the opportunity cost of cash, we find that greater growth prospects, reflected by a higher Tobin's *Q*, reduce a bidder's willingness to use cash payments in acquisitions. We also find that this effect depends on the level of financial constraints that the firm faces. Specifically, only constrained acquirers display a significantly negative sensitivity of using cash as a payment method to growth opportunities (market-to-book ratio), while no significant relation is found for financially healthy acquirers.

Further tests indicate that cash acquisitions underperform stock ones. We find that the abnormal announcement returns are worse for cash bidders, which is consistent with the explanation that given the lower opportunity costs of cash holdings, financially healthy firms with few growth prospects are more likely to use excess cash as payment to undertake value-losing M&A deals. Taking a longer term perspective, we also observe a decrease in average performance after acquisitions financed in cash, which once again supports the opportunity cost of cash hypothesis for acquisitions by firms with excess cash.

The remainder of this paper is organized as follows. Section 4.2 provides a review of related research and develops our four hypotheses. In section 4.3, we describe the main features of our data and present summary statistics. Section 4.4 presents our main empirical analysis. Section 4.5 concludes.

4.2. Theoretical background and hypotheses development

4.2.1. Agency costs of free cash flow

Due to information asymmetries, liquid assets can protect firms from the costs associated with capital market imperfections. According to Keynes (2006) , holding a sufficient amount of liquid assets allows firms to undertake valuable projects once they occur. However, liquidity may also give management flexibility to pursue its own objectives. The free cash flow hypothesis advanced by Jensen (1986) suggests that managers endowed with free cash flow are likely to expand their firms even beyond the optimal size or undertake unprofitable projects. Given the fact that excessive cash can be seen as hoarded free cash flow, excess cash reserves can lead to agency conflicts over the disposal of cash. In the light of these considerations, it should be noted that M&As are a quick way to spend cash rather than paying it out to their shareholders. Thus, when a firm accumulates more than its normal level of cash, the firm is more likely to engage in takeovers (Harford 1999). Based on the above logic, we propose our first hypothesis:

H_1: cash-rich firms are more likely to attempt acquisitions.

Tunneling refers to the appropriation of firm assets and the expropriation of minority investors by controlling shareholders or mangers for personal gain. According to Liu & Lu (2007) and Jiang *et al.* (2010), tunneling is rather widespread among Chinese listed firms due to the their unique concentrated ownership structure and the share segmentation system[134], and to weak corporate governance mechanisms and public enforcement. As a result, the controlling shareholders/management of tunneling firms may make self-interested and

[134] Before the 2005 split share structure reform, the shares of listed firms in China could be either tradable or non-tradable.

entrenched decisions, and even conduct unprofitable projects. M&As or related party transactions between Chinese listed firms may provide direct opportunities for controlling shareholders, management and/or local governments to direct assets or profits out of firms, helping them achieve their personal or political benefits.[135]

We suggest that an acquisition decision in China is unlikely to be motivated by purely economic considerations. First, in China, most publicly-listed companies are carve-outs or spin-offs from large stated-owned enterprises, formed through the divestment of less profitable or unrelated subsidiary businesses. These listed firms are strongly dependent on their parent firms, as they typically share personnel, capital, and assets (Liu & Lu 2007). As a result, the former often need to provide resources for their inefficient parents. In some cases, the listed firms may be asked to take over the poor-performing assets or shares of their parent firms or purchase the assets or shares at higher price (than the real value), particularly when these listed firms experience high profitability or hold excess cash in hand.

Second, the management of the listed SOEs is often appointed by the government. In order to support loss-making small and medium-sized enterprises (SMEs), achieve political objectives, avoid unemployment, and maintain social stability, the management of these listed firms with high profitability or excess liquidity may be required by the government to absorb the SMEs, and engage in administrative restructuring plans to turn around their performances. Especially, when local governments face large fiscal deficits, or when unemployment is high, they may have higher incentives to interfere in the M&A deals of firms affiliated with them.

[135] A related party transaction is defined as any transaction such as asset acquisitions, asset sales, equity transfers, loan guarantees, accounts receivable, etc. between listed subsidiaries and their affiliated parent companies (controlling shareholders). These transactions may give direct opportunities for controlling shareholders to extract cash from their related listed firms through tunneling (Djankov *et al.* 2008) .

Third, controlling shareholders or local governors have a high level of motivation to quickly build empires and/or to stimulate regional economic growth through M&As, which may not maximize shareholders' wealth, but increase the resources and power in their hands and give them the chance to stand out in the political competition for their career promotion.

In summary, tunneling may be a motivation behind acquisition activities in China, as controlling shareholders and management may use M&As as opportunities to spend excess cash for their private benefits instead of paying it out to their shareholders. We therefore propose our second hypothesis:

H_{II}: Cash-rich firms subject to tunneling are more likely to make acquisitions.

4.2.2. Opportunity cost of cash

Substantial empirical evidence has documented the precautionary motive for cash holdings (Opler *et al.* 1999; Han & Qiu 2007; Bates *et al.* 2009). Ex ante cash reserves prevent firms' underinvestment ex post in the event of unexpected earnings shortfalls or costly external finance. Especially, when high-*Q* "glamour" firms have difficulties in accessing external capital due to asymmetric information, liquidity management can play an important role. In line with these arguments, Almeida *et al.* (2004) argue that financially constrained firms have a greater propensity to save cash out of cash flow. Furthermore, Faulkender & Wang (2006) find that firms with higher financial constraints benefit more from holding cash than their financially healthier counterparts. In addition, the level of financial frictions is found to have a large bearing on firms' investment decisions and financial management (Fazzari *et al.* 1988; Harford 1999).

As a particular type of investment, M&A activities should also be strongly influenced by financial frictions. Acquiring firms face a choice of payment between cash and stock. According to the opportunity cost of cash hypothesis (Alshwer *et al.* 2011), when external finance is either too expensive or not available, financially constrained bidders with high growth opportunities face higher opportunity costs of cash holdings, and prefer therefore to save more cash to avoid the costs of forgoing positive net present value (NPV) projects in the future. Therefore, constrained bidders with higher investment opportunities are more likely to use stock to finance their M&A deals. On the contrary, unconstrained bidders do not have strong preference for the method of takeover payment, because they can easily raise external finance for their future projects and meet unexpected shocks.

Our third hypothesis examines the effect of financing constraints on the sensitivity of the method of payment in acquisitions to firms' investment opportunities. Based on the argument above, it takes the following form:

H_{III}: The sensitivity of cash payment decisions to growth opportunities (Tobin's Q) is significantly negative for financially constrained bidders, but is insignificant for unconstrained bidders.

Based on the opportunity cost of cash hypothesis (Alshwer *et al.* 2011) that we mentioned earlier, acquiring firms prefer to use cash in acquisitions when they face a lower opportunity cost of cash. Therefore, we should expect that cash-acquiring firms are more likely to waste cash on acquisitions, which may result in underperformance. Our fourth hypothesis is therefore aimed at testing whether cash payments have a negative effect on market reaction and post-merger operating performance in China. This hypothesis can be stated as follows:

H_{IV}: Cash-financed acquirers perform significantly worse than stock-financed acquirers. Specifically, compared to the latter, the former exhibits lower short-run abnormal returns. Additionally, cash acquisitions experience decreasing operating performance from the pre- to the post-merger period.

4.3. Data and Descriptive Statistics

4.3.1. The dataset

To test our hypotheses, we construct a sample of firms that issue A-shares on either the Shanghai Stock Exchange (SHSE) or the Shenzhen Stock Exchange (SZSE) during the period 1998-2011. The data is taken from the China Stock Market Trading Database (CSMAR) and the China Economic Research Service Centre (CCER)[136]. Following the literature, we exclude firms in the financial sector, due to their different measurements of liquidity, and their dissimilar operating, investing, and financing activities. We further winsorize observations in the one percent tails for the regression variables to minimize the potential influence of outliers. Finally, we drop all firms with less than three years of consecutive observations. All variables are deflated using the gross domestic product (GDP) deflator (National Bureau of Statistics of China).

In addition, our sample includes all Chinese acquisitions announced between January 1, 1998 and December 31, 2011, taken from the Thomson Financial (SDC) Mergers and Acquisitions Database. Acquiring firms are Chinese public firms listed on either the Shanghai Stock Exchange or the Shenzhen Stock Exchange. Both successful and unsuccessful deals are taken into consideration.

Table 4.1 provides a breakdown of non-bidders and bidders by year, differentiated by methods of payment. Our final unbalanced panel consists of 16,288 firm-year observations representing 1,601 listed firms. The number of firm-year observations of each firm varies between three and thirteen, with number of observations varying from a minimum of 705 in

[136] The cash flow statement in the databases is not available until 1998.

1998 to a maximum of 1,407 in 2009. This sample includes 971 unique acquirers making 2,033 deals.[137] As shown in Table 4.1, there is a clear increasing trend of the number of M&As in our sample period. In addition, the majority of our acquiring firms (61.4%) use cash as payment in acquisitions, whereas only 5.7% of bidders consider stock offers.[138]

[Insert Table 4.1]

4.3.2. Summary statistics

Table 4.2 presents means and median of key variables for the overall sample and provides a comparison of these descriptive statistics based on whether or not a firm is engaged in acquisitions[139]. We also conduct statistical tests for equality of the means (t-test) and sample medians (Wilcoxon rank-sum test) of each variable across bidders and non-bidders. All variables are defined in Appendix 4.1. As one would expect, we observe that acquiring firms are larger than their non-acquiring counterparts, regardless of whether size is measured in terms of assets or number of employees. *P*-values associated with tests for equality of both sample means (t-test) and sample medians (Wilcoxon rank-sum test) show that the differences are significant at the 1% level.

[137] See Table 4.1 for more details about the structure of our sample. Given the unbalanced nature of our panel, which allows for both entry and exit, potential selection and survivor bias can be eased.

[138] The split share structure of China's stock markets led to difficulties in valuing firms' stocks, particularly for non-tradable shares. For this reason, pure stock-for-stock was not a popular payment method before the mid-2000s. As seen from Table 4.1, over 98% of stock acquisitions took place after the 2005 split share reform. Moreover, the category of *Mixed PYMT* in our study refers to all methods of payment different from all-cash or all-stock. They include acquisitions made with mixed payments (e.g. of cash and stock), debt-arrangement and asset swaps.

[139] To this end, the statistics are differentiated across bidders and non-bidders.

[Insert Table 4.2]

Furthermore, we focus on a series of variables that measure firms' operating and market performance, namely, return on assets *(ROA)*, *sales growth*, stock return *(Return)*, investment expenditure *(CAPEX)*, price-earnings ratio *(PE)*, and cash flow *(CF)*. We can see that acquiring firms typically have significantly better performance than non-bidders. In addition, the table shows that bidders generally appear to have slightly lower Tobin's *Q* than non-bidders. These findings suggests that M&As may allow acquiring firms with better performance but low investment opportunities to expand. In terms of riskiness measured in terms of cash flow volatility (*Var_CF)*, we observe that acquiring firms display higher volatility than non-bidders, indicating that bidders are more risky.

We do not see a significant mean difference in *collateral* (the ratio of tangible assets to total assets) between bidder and non-bidders. However, on average bidders exhibit slightly higher *leverage* (0.244) than non-bidders (0.231). With regard to liquidity variables [*Cash*, *ΔCash, net working capital (NWC)],* bidders do not always display higher liquidity ratios compared to non-bidders. In fact, bidders display a much lower *NWC* (-0.083) compared to non-bidder (-0.058). The higher leverage and lower liquidity shown by bidders might be due to the fact that they need to increase leverage and spend liquidity to engage in acquisitions.[140] In terms of financial constraints, we find that acquiring firms typically face less financially

[140] In unreported results, we find that the liquidity of bidding firms is significantly greater than that of non-bidders in the year prior to acquisitions. This confirms our explanation that bidders spend a large amount of cash in acquisitions.

constraints compared to non-bidders, regardless of whether we use the *KZ* or the *WW* index to measure financial constraints.[141]

Regarding our measures of incentive for tunneling, following Jiang *et al.* (2010), we use the ratio of other receivables to total assets (*OREC*)[142], and the separation of the blockholder's controlling right (C) and her/his ownership right (O) (*DIF_Blockholders*)[143] to proxy how likely Chinese firms are subject to tunneling or expropriation from controlling shareholders.[144] We observe that 51.4% of the bidders in our sample exhibit a divergence between the blockhead's controlling ownership and cash-flow ownership (*DIF_Blockhoders*), which is significantly larger than the corresponding value observed for non-bidders (46.8%). However, bidders do not display a higher ratio of other receivables to total assets (*OREC*) compared to non-bidders (the corresponding ratios are 0.045 and 0.066, respectively). This suggests that acquisitions are not solely fuelled by tunneling.

The table also shows that bidders are more likely to pay dividends (*Payout*). This suggests that bidders might also distribute cash via dividends to reduce the agency costs of

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[141] With only one exception for the *t*-test of the *KZ* index, all other statistical tests indicate that the differences in the means and medians between bidders and non-bidders are significant at the 1% level. See Appendix 4.1 for details on how the *KZ* or *WW* indices are constructed.

[142] As evidence, a survey of 130 listed Chinese firms conducted by the Shanghai-based Shenying and Wanguo Securities Co., Ltd. finds that on average the controlling shareholders owe their listed companies 40 millions of US dollars in the form of accounts receivable or parent borrowing (Liu & Lu 2007). In addition, Jiang *et al.* (2010) claim that "during 1996-2006, tens of billions in RMB were siphoned [through inter-corporate loans] from hundreds of Chinese listed firms by controlling shareholders" (p.2). The authors explain that these inter-corporate loans can be found in the balance sheets of the majority of listed firms in China and are typically reported as "Other Receivables".

[143]According to Claessens *et al.* (2002), Lemmon & Lins (2003), and Jiang *et al.* (2010), the separation of cash flow and control tend to give blockhoders effective control on the firms by only holding a relatively low proportion of shares, via pyramid structures and cross-holding among firms. The probability and danger of the exploitation of minority shareholders by the controlling shareholder (called "tunneling") is high if these two agents do not have the same interest.

[144] See Appendix 4.1 for the details on how *OREC and DIF_Blockholders* are constructed.

the free cash flow. Finally, CEOs in bidder companies are less likely to hold shares in their own company compared to non-bidders. [145] Given that managerial ownership (*Shareholding_CEO*) aligns the managers' interests with the firm's shareholders, managers in bidder firms with less managerial ownership are more likely than managers in non-bidder companies to make entrenched decisions on value-decreasing acquisitions.

[145] *P*-values associated with both the t-test and the Wilcoxon rank-sum test reject the equality of the mean and median of the variables *Payout* and *Shareholding_CEO* across bidders and non-bidders.

4.4. Empirical analysis

4.4.1. Predicting the probability of being a bidder

Following Harford (1999), we study whether there is a link between firms characteristics and acquisition decisions. In particular, we investigate whether high cash reserves are associated with a higher chance to attempt acquisitions. To this end, we estimate the following model whereby the dependent variable is coded as one if the firm announces a bid in year t+1, and zero otherwise:

$$\Pr(Bidder = 1)_{i,t+1} = a + \sum_k \beta X_{k,it} = a + b_1 Xcash_{i,t} + b_2 Return_{i,t} + b_3 Q_{i,t} + b_4 ROA_{i,t} + b_5 Sales\ growth_{i,t} + b_6 NWC_{i,t} + b_7 Leverage_{i,t} + b_8 PE_{i,t} + b_9 Size_{i,t} + b_{10} Sharehoding\_CEO_{i,t} + b_{11} Blockholders_{i,t} + b_{12} SOEs_{i,t} + b_{13} Return_{i,t} * Q_{i,t} + b_{14} ROA_{i,t} * Q_{i,t} + \sum Year + \sum Industry + \sum Province + \nu_i + \varepsilon_{i,t} \quad (4.1)$$

The subscript *i* indexes firms; and *t*, years (*t*=1998-2011). $X_{k,it}$ is a vector of explanatory variables that affect firms' acquisition decisions. It includes firm financial characteristics and corporate control variables, based on prior work by Harford (1999). Our primary variable of interest is unexpected (excess) cash (*Xcash),* defined as the difference between real cash holdings and optimal levels predicted by the Opler *et al*. (1999, hereafter OPSW) model.[146] *Return* is the annual stock returns; *Tobin (Q)*, the market-to-book ratio; *ROA*, the return on assets; *Sales growth*, the annual rate of growth of real sales; *NWC*, the ratio of net working capital (working capital minus cash holdings) to total assets; *Leverage*, the ratio of the sum of short- and long-term debt to total assets; *PE,* the price-to-earnings ratio; *Size*, the natural

[146] We control for the widely different optimal levels of cash holdings across companies by introducing excess cash. See Appendix 4.2 for details on how excess cash is calculated.

logarithm of total assets. *Shareholding_CEO* is a dummy variable that takes the value of 1 if the firm CEO is holding shares in his/her own company, and 0 otherwise. *Blockholders* is the percentage of shares controlled by the largest shareholder. *SOEs* is a dummy variable, that takes the value of 1 if the firm is state-owned in a given year, and 0 otherwise.

Eq. (4.1) also incorporates time dummies ($\sum Year$), which account for the possible effects of business cycles, as well as the impact of change in interest and exchange rates.[147] Industry dummies ($\sum Industry$) are included to capture industry fixed effects.[148] Finally, provincial dummies ($\sum province$) are added to account for uneven development across regions.[149]

The error term in Eq. (4.1) consists of two components: ν_i, a firm-specific component, embracing any time-invariant firm characteristics which might influence firms' acquisitions strategies, as well as any time-invariant component of the measurement error which may affect any variable in our regression; and $\varepsilon_{i,t}$, which represents an idiosyncratic component.

[147] Year dummies can be also used to account for exogenous shocks potentially associated with firms' acquisitions decisions, e.g. the 2005 split share reform, the 2005 Chinese exchange rate system reform, The financial crisis of 2007–2008.

[148] According to the industry classification taken from the China Securities Regulatory Commission (CSRC), firms in China's listed sector are assigned to one of the following twelve industrial sectors: Farming, forestry, animal husbandry & fishing; Mining; Manufacturing; Utilities; Construction; Transportation & warehouse; Information technology; Wholesale & retailing; Real estate; Social services; Communications & cultural; Conglomerates; Finance & insurance. Following previous literature, we exclude the Finance & insurance sector from our study.

[149] There are 31 provinces in China: Coastal provinces (Beijing, Fujian, Guangdong, Hainan, Hebei, Jiangsu, Liaoning, Shandong, Shanghai, Tianjin, and Zhejiang); Central provinces (Chongqing, Anhui, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Jilin, and Shanxi); and Western provinces (Gansu, Guangxi, Guizhou, Neimenggu, Ningxia, Qinghai, Shaanxi, Sichuan, Xinjiang, and Yunnan).

Given the discrete and limited nature of the dependent variable, Eq. (4.1) is estimated using the random-effects panel Probit estimator[150]. The results of the Probit estimation are given in columns 1 to 5 of Table 4.3. In columns 1 and 2, we use *Return* to proxy for firms' real performance, while firms' real performance is measured by the *ROA* in columns 3 and 4. In column 5, we include both *Return* and *ROA*. The ρ coefficient reported in all specifications shows the relative importance of the unobserved effect: it suggests that around 13% of the total error variance can be captured by unobserved heterogeneity. As predicted by our Hypothesis I, cash-rich firms are more likely to attempt acquisitions: all specifications in Table 4.3 show in fact that the probability of being a bidder increases with the level of excess cash held (*Xcash*). This finding is consistent with what Harford (1999) and Opler *et al.* (1999) found for US firms.

The positive relation between cash position and M&A decisions can be alternatively explained by the financial constraints hypothesis, according to which capital market imperfections may force firms to save to fund large capital expenditures, such as M&As. According to Harford (1999), the distinguishing between the free cash flow and financial constraints hypotheses require identification of firms with excess cash holdings. Once firms have accumulated a large amount of excess cash than they need for their good investment opportunities, the positive relation is more likely to reflect the agency conflicts over the disposition of the cash reserves. A baseline model of cash holdings used in this study is allowed us to identify whether a firm is cash-rich or not. In addition, under the financial constraints hypothesis, firms who are engaging in M&As are no more likely to experience

[150] To check robustness, we also estimate Eq. (4.1) using a conditional fixed-effects Logit model, which does not require the crucial assumption that firm-specific unobserved effects must be independent of the regressors. However, a drawback of the fixed-effects Logit estimator is that all the firms for whom the dependent variable is constant over the sample period are dropped in estimation. In our case, around 4,000 observations out of 14,500 were dropped. The estimates based on the conditional Logit estimator were similar to those obtained with the random-effects Probit model. For brevity, these results are not reported, but are available upon request.

lower value of cash holdings. However, in related work, Guariglia & Junhong (2014) find that a decrease in operating value of cash for acquirer firm with excess cash.

[Insert Table 4.3]

In columns 2 and 4, we separately introduce firms' stock returns (*Return*) and operating performance (*ROA*), respectively, interacted with the level of *Tobin' Q* (*Return*Tobin* and *ROA*Tobin*). In particular, in column 4, we find that the coefficient estimate for the interaction term (*ROA*Tobin*) is -0.375 and is significantly different from zero at the 1% level. This suggests that the probability of being a bidder decreases when firms have higher operating performance (*ROA*) as well as valuable investment opportunities (*Tobin's Q*). In other words, the relation between the likelihood to make acquisitions and *Tobin's Q* (*ROA*) is weaker for firms with higher *ROA* (*Tobin's Q*). The reason might be that when a firm has both high growth opportunities and a high operating capacity, it does not need to rely on external investments like M&As to grow and expand, as expanding via acquisitions is more likely to face a higher cost in price paid for the acquired assets as well as integration expenses (Margsiri *et al.* 2008). In addition, there is a relatively high uncertainty about the synergies created by the acquisitions. Margsiri *et al.* (2008) find that no internal growh opportunies can push acquisitions occuring sooner, which creates inefficiency. Therefore, investing internally in positive net present value (NPV) projects can be seen as a better choice than making acquisitions. It is noteworthy that the coefficient associated with the interaction term (*Return*Tobin*) is poorly determined in column 2. This can be explained considering that stock returns might not be as good as *ROA* to proxy for firms' real performance in the Chinese context.

The results from column 1 to 5 also show that the coefficients on *Return*, *ROA* and *Size*, have positive and significant signs, which suggests that lager firms with higher stock market returns and operating performance (*ROA*) are more likely to make acquisitions. These findings are in line with Roll (1986) and Harford (1999), and support the hubris theory that takeover deals can be promoted by firms' better performances and returns. Due to acquirer managers' hubris, excessive arrogance, and myopia, a higher firm profitability may lead managers with discretion to make self-interested and entrenched decisions on acquisitions, and to diversity their personal portfolios and increase the scale and scope of operating assets in their hands (Moeller *et al.* 2004).

As for the corporate control variables, our results provide evidence that *Shareholding_CEO* and *Blockholders* have a negative impact on the probability of being a bidder. This can be explained as follows. First, when the firm CEO holds shares in his/her own company *(Shareholding_CEO)*, this may reduce the agency costs faced by the firm since managerial ownership may help to align managers' interests with those of the firm's shareholders.[151] Thus, managers who hold shares in their own company may be less likely to make acquisitions due to personal interests. Second, the variable *Blockholders* is measured as the percentage share holdings of the primary owner. A large ownership stake held by the blockholders tends to lower the separation of voting rights and cash-flow rights, which may lower the tendency of managers to engage in takeovers for tunneling reasons (Jiang *et al.* 2010). Moreover, a relatively large stake may give the primary owners more incentive to oversee or monitor the managers, alleviating therefore agency costs stemming from a conflict of interest between firm managers and shareholders (Jensen & Meckling 1976; Ang *et al.* 2000). Alternatively, controlling owners with a relatively large stake might be reluctant

[151] Alternatively, it may be the case that managers decide to forgo M&As, as financing them by means of a stock swap would dilute their stake in the company by a too large extent.

to lose the control of their firms by engaging in acquisitions. Therefore, firms characterized by a high ownership stake of controlling shareholders may be more cautious in making investment through M&As.

Last, our result shows that non-SOEs are more active in takeovers than SOEs[152]. This can be explained considering that even though they are more financially constrained (Allen *et al.* 2005; Bai *et al.* 2006; Allen *et al.* 2007; Guariglia *et al.* 2011), firms from the non-state sector have achieved much faster growth than their state-owned enterprises counterparts (Allen *et al.* 2007), which gives the former more motivation to expand and increase their market share through M&As.[153]

4.4.2. Are cash-rich firms subject to tunneling more likely to make acquisitions?

We next provide tests of our hypothesis II. In particular, in columns 6 and 7 of Table 4.3, we investigate a particular scenario of takeover motivation, in which controlling shareholders tunnel excess cash through M&A transactions.

Following Jiang *et al.* (2010), we use the ratio of other receivables to total assets (*OREC*) to proxy how likely primary shareholders are of expropriating resources from minority investors. The "Other Receivables" account is commonly used by Chinese listed firms to record transactions with related parties rather than the sales and purchases of goods and services. The vague definition of "Other Receivables" as well as the low level of

[152] We split the firms into two ownership categories according to their ultimate controlling shareholder: the SOE sector and the non-SOE sector. Non-SOEs have non-state entities as the controlling shareholder. These can be domestic private, foreign, collective, employees' unions, non-profit organizations or institutes, and others.

[153] In recent years, many non-SOEs have been encouraged to participate in the SOE reform through M&As.

disclosure requirements make manipulation possible. This account is therefore frequently used to cover up tunneling (Li 2010). According to Jiang *et al.* (2010), tens of thousands of inter-corporate loans borrowed by controlling shareholders are classified as "Other Receivables" on the balance sheets of Chinese listed firms, and represent a larger portion of total assets of the company. In our sample, other receivables constitute about 5% on average, and up to around 60% of total assets, confirming that the tunneling problem in China is significant. We expect that the larger the size of "Other Receivables" in the balance sheet, the more likely the firm is to resort to tunneling. Specifically, we classify a firm as subject to tunneling in a given year if its *OREC* in that year falls in the top three deciles of the distribution of the *OREC* of all firms operating in the same industry it belongs to. The remaining firm-years will be considered less subject to tunneling.[154]

As an additional check, we also use the separation of the blockholder's controlling right (C) and her/his ownership right (O) as another proxy for the firm's tunneling incentives. In particular, we construct the dummy variable *DIF_Blockholders*, which takes value one if the firm's blockholder's controlling right exceeds its cash-flow ownership in a given year, suggesting the presence of tunneling, and zero otherwise. According to Claessens *et al.* (2002), Lemmon & Lins (2003), and Jiang *et al.* (2010), the incentives of tunneling are greater when a firm has implemented mechanisms of separating cash flow and control. This can be explained considering that blockhoders tend to have exceedingly effective control on the firms, and are able to derive more benefits from tunneling activities by only holding a relatively low stake of shares, through pyramid structures and cross-holding among firms. We therefore classify a firm as (not) subject to tunneling in a given year if the blockhoder's

[154] Similar results were obtained when using a 50% threshold. For brevity, these results are not reported, but are available upon request.

controlling right (C) is (not) greater than his/her ownership right (O), i.e. if *DIF_Blockholders* is equal to one.

Columns 6 and 7 of Table 4.3 present an analysis of the impact of tunneling on making acquisition decisions by including an interaction term between excess cash (*Xcash*) and the dummy variable (*Tunneling*), which partition firms into groups with relatively high and low likelihood of tunneling based on *OREC* and *DIF_Blockholders,* respectively. We find that the excess cash coefficients are only significantly positive for the firms with greater likelihood of tunneling, regardless of whether we use *OREC* or the *DIF_Blockholders* to proxy for the degree of expropriation. The results support our Hypothesis II, according to which Chinese firms tend to take advantage of acquisitions to tunnel cash to their controlling shareholders.

In Table 4.4, we compare the average percentage of firms conducting acquisition activities across groups of firms that are more or less likely to tunnel. We observe that for the firms with higher likelihood of tunneling (e.g. those firms with a high ratio of other receivables to total assets, or with blockholder's cash-flow ownership lower than the controlling ownership), the average proportion of becoming bidders is higher for the *High-Xcash* group than one for *the Low-Xcash* group.[155] Both the t-test and the Wilcoxon rank-sum test indicate that the differences in the means and medians between the two groups are significant. Conversely, for the firms with low *OREC* or with blockholder's cash-flow ownership approximately equal to the controlling ownership, the average proportion of becoming bidders for *High-Xcash group* is only slightly larger than that for *Low- Xcash* group. All statistical tests cannot reject the equality in the means and medians between the

[155] We classify firms into high (low) *Xcash* group in a given year if their *Xcash* (excess cash) is above (below) zero.

two groups. Hence, the findings here once again confirm our Hypothesis II, according to which high excess cash may lead firms subject to tunneling to engage in takeover activities.

[Insert Table 4.4]

4.4.3. The choice of payment method

4.4.3.1. The determinants of method of payment

In order to test our Hypothesis IV, in this section, we initially provide an analysis of the method of payment. Following Martin (1996) and Faccio & Masulis (2005), our model of the determinants of the method of payment is given by the following equation:

$$\begin{aligned}
&\Pr(Paid\ by\ cash\ \ or\ stock)_{i,t+1} \\
&= \ a + \sum_{k} \beta X_{k,it} \\
&= a + b_1 Q_{i,t} + b_2 cash_{i,t} + b_3 CF_{i,t} + b_4 Leverage_{i,t} + b_5 Size_{i,t} + b_6 Collateral_{i,t} \\
&+ b_7 Blockholders_{i,t} + b_8 Runup_stock_{i,t} + b_9 Sigma_stock_{i,t} + b_{10} Sharehoding_CEO_{i,t} \\
&+ b_{11} SOEs_{i,t} + b_{12} Experience_{i,t} + b_{13} Public_deals_{i,t} + b_{14} Runup_market_{i,t} + b_{15} Size_ratio_{i,t} \\
&+ b_{16} Unfriendly_{i,t} + b_{17} Diversifying_{i,t} + b_{18} Completed_{i,t} + \sum Year + \sum Industry \\
&+ \sum Province + \nu_i + \varepsilon_{i,t} \qquad (4.2)
\end{aligned}$$

where the subscript *i* indexes firms; and *t*, years (*t*=1998-2011). The dependent variable is the bidder's payment choice. Explanatory variables comprises bidder and deal-specific attributes. Specifically, we measure the bidder's financial, operational and corporate conditions with *Tobin (Q)*, the market-to-book ratio; *Cash* (the ratio of the sum of cash and cash equivalents to total assets)[156]; *CF* (the ratio of the sum of net profit and depreciation to total assets); *Leverage* (the ratio of the sum of short- and long-term debt to total assets); *Size* (the natural logarithm of total assets); *Collateral* (the ratio of tangible assets to total assets); *Blockholders* (the percentage of shares controlled by the largest shareholder); *Runup_stock* (the cumulative daily stock price returns of the bidder over the period beginning 205 days and ending 6 days prior to the announcement date); *Sigma_stock* (the standard deviation of the bidding firms' daily returns over the period beginning 205 days and ending 6 days prior to the announcement date); *Runup_market* (the cumulative daily Shanghai and Shenzhen value-weighted stock returns over the period beginning 205 days and ending 6 days prior to the deal announcement); *Shareholding_CEO* (a dummy variable that takes the value of 1 if the firm CEO is holding shares in his/her own company, and 0 otherwise); *SOEs* (a dummy variable, that takes the value of 1 if the firm is state-owned in a given year, and 0 otherwise); and *Experienced* (a dummy variable, which takes the value of 1 if the bidder has announced at least 3 takeover bids over the five years period prior to the deal announcement, and 0 otherwise).

We measure a deal's attributes with *Public_deals* (a dummy variable, that takes the value of 1 for acquisitions of public firms, and 0 otherwise); *Size_ratio* (the ratio of the transaction value divided by the bidder's market value 4 weeks prior to the announcement);

[156] We obtain similar results using excess cash (*Xcash*) instead of the realized level of cash (*Cash*) to control for bidders' liquidity conditions, neither of which is significant. The results based on *Xcash* are not reported for brevity, but are available upon request.

Unfriendly (a dummy variable, which takes the value of 1 if the deal is not defined as friendly by Thomson Financial SDC, and 0 otherwise); *Diversifying* (a dummy variable which takes the value of 1 if the bidder was not in the same industry as the target as measured using the bidder's and the target's first 2-digits of the primary SIC code, and 0 otherwise); and *Completed* (a dummy variable, which takes the value of 1 if the transactions were completed, and 0 otherwise). We also include time dummies ($\sum$*Year*), Industry dummies ($\sum$*Industry*), and provincial dummies ($\sum$*province*).

Our estimates of Eq. (4.2) are reported in Table 4.5. Specifically, in column 1 and 3, the dependent variable is one if the deal is financed only by cash in year t+1, and zero otherwise. The model is therefore estimated using a Probit estimator. The remaining of specifications are estimated using an ordered Probit estimator, as the dependent variable takes value of 1 if the acquisition is stock-financed, 2 if it is mixed-financed, and 3 if it is cash-financed in year t+1.[157] We also estimate all regressions by accounting for clustering, which takes into account the intraclass correlation within the same firm.

It is noteworthy that if poor financial or corporate conditions, which play a crucial role on payment considerations actually also prevent some potential bidders from taking part in acquisition activity, then we may understate the importance of the determinants of the choice of payment method. To control for this self-selection bias, we implement the Heckman's (1976, 1979) two-step procedure and report the results in columns 3 to 9. In the first stage, based on Eq. (4.1), we estimate a selection (Probit) model for the possibility of making a bid for each firm-year. We then calculate the inverse Mill's ratio for each observation. In the second stage, we include the inverse Mill's ratio in the second-step

[157] Because our data does not always provide full information of the actual percentage of payment in acquisitions, we estimate Probit and ordered Probit models, which allows us to focus on the qualitative decision of payment choice.

equations to correct for a potential selection problem in our sample. As suggested by Heckman (1976, 1979), if the inverse Mill's ratio does not have a significant sign, then we can confirm that the self-selection bias does not have a significant impact on the second-stage equations of payment consideration. We find insignificant inverse Mill's ratios in Table 4.5. Hence, we do not reject the null hypothesis of independence of the second-stage equations from the selection equations, suggesting that self-selection bias is not a serious issue for our estimates.

We observe that the bidder's stock valuation (*Tobin's Q*) has a significant and negative coefficient in all specifications (columns 1 to 4), suggesting that better investment prospects are associated with a lower likelihood of cash payments. The finding is in line with Jung *et al.* (1996) and Martin (1996), who explain that firms with better investment opportunities tend to use stock payments to avoid under-investment costs associated with financing cash acquisitions by debt. Debt financing requires management to pay it back with future cash flows, which might in turn increase the difficulty for bidders with valuable growth opportunities to finance their future investment projects. In addition, this finding is also consistent with the opportunity cost of cash hypothesis, according to which acquiring firms with higher investment opportunities would rather not spend cash in acquisitions since they face higher opportunity costs.[158]

[Insert Table 4.5]

[158] The underlying alternative explanation can be that a higher Tobin's Q might pick up stock over-valuation (or a high stock varluation), which may cause stock to be used to in the deal transactions. However, if this is the case, given that *Runup_stock* is more likely to reflect stock over-valuation, we should find that acquiring firms with *Runup_stock* are also more likely to use stock as payment in acquisitions. In contrast, we find that the insignificant relation between Runup_stock and methods of payment.

In addition, the coefficient associated with cash flow (*CF)* is positive and significant in column 1 and 4, which is consistent with the free cash flow hypothesis (Jensen 1986), according to which higher amounts of cash flow may increase the likelihood of cash payments in acquisitions. We also find that the probability of choosing cash payments is positively related to the dummy variable (*Experienced*), which implies that those bidders who have conducted multiple takeover deals prefer to use cash, probably due to the higher liquidity at their disposal.[159] Next, we find a significant and negative sign for the variable (*SOEs*), suggesting that state-owned firms are more likely to use non-cash payments compared with non-SOEs. A possible explanation may be that SOE mergers via administrative transfers or connected transactions between one government agency and another can take place under the command of the government with non-cash payments, even no payment (Kam *et al.* 2008).[160] On the contrary, non-SOEs are more likely to engage in acquisitions in relatively more competitive sectors for the synergy reason. Due to the serious asymmetric information in China and the relatively high valuation signaled by them, cash payments increase the probability of acceptance by the targets with decent prospects. Hence, non-SOEs are generally more likely to use cash payments in acquisitions than SOEs.

Turning to the deal's characteristics, consistent with Faccio & Lang (2002), Harford *et al.* (2009) and Karampatsas *et al.* (2014), we find that the variables regarding target's

[159] Due to hubris or entrenchment, multiple acquisitions may be used by management to spend excess liquidity, which destroy firms' value (Billett & Qian 2008; Black *et al.* 2013). The negative announcement effect for bidders who have conducted multiple takeover deals shown in section 4.4.4.1.2 confirms the hubris conjecture.

[160] Under the administrative decisions of state or local governments, some listed SOEs may undertake restructuring plans and take over other firms, in order to achieve greater economies of scale and improve productivity (Bai *et al.* 2008). Moreover, if listed SOEs themselves are making losses or face financial distress, their controlling shareholders (the government) may conduct connected transactions and absorb other high-quality assets from their connected parties, such as the affiliated firms, to prop up their listed firms to avoid a delisting or default (Peng *et al.* 2011)

listing status (*Public_deals)* have negative and significant coefficients in all specifications, suggesting that in deals where unlisted targets are involved, a greater use of cash is made, while stock payments are more attractive for bidders of listed targets. This can be explained considering that private sellers should be more likely to accept cash as a method of payment due to their consumption and liquidity needs. In addition, stock acquisitions of unlisted targets with a concentrated ownership structure potentially create a large rival blockholder for bidder dominant shareholders, which can be a corporate control threat for the bidders.

The relative size of the deal (*Size_ratio*) has a significantly negative effect on cash payments, which is in line with Hansen (1987), Faccio & Masulis (2005), Alshwer *et al.* (2011) and Karampatsas *et al.* (2014). The fact that the probability of a stock offer increase with the size of the target relative to that of the bidder supports the asymmetric information prediction that large deals may lead to information asymmetry with regard to the target's market value. Given stock's contingent-pricing mechanism, the rise of the information asymmetry therefor increases the incentives of acquiring firms to use stock payments. Furthermore, the reason why there is a significantly negative effect of *Size_ratio* on cash payments can be the lack of sufficient cash resources to finance an acquisition with a relatively large deal size.

The attitude indicator for the deals defined as unfriendly (*Unfriendly*) has a positive and significant coefficient in the cash payment regression. This result is consistent with unfriendly bidder preference for cash financing to quickly close the deal, thus deterring other competing bidders and aggressive defenses against hostile takeovers (Linn & Switzer 2001; Faccio & Masulis 2005; Alshwer *et al.* 2011). Fishman (1989) documents that unlike the value of stock payments, which is contingent upon the profitablity of the acquistion, a cash offer facilitates a more rapid deal completion, since the seller does not make the accept/reject decision based on the future cash flows of the acquired target. In contrast, stock payments will lower the speed of takeover process due to security registration and the requirements of approval by the bidder's shareholders. Furthermore, using stock lowers the likelihood of acceptance since a stock offer is presumed to have a low value (Gilson & Black 1986; Fishman 1989).

4.4.3.2. Financial constraints and method of payment

In order to test our hypothesis III, we investigate whether the opportunity costs of cash holdings, as measured by the sensitivity of cash payment decisions to growth opportunities (*Tobin's Q*), is higher for firms that face higher financial constraints. Specifically, we include an interaction term between *Tobin's Q* and the dummy variable, which partition firms into groups with relatively high and low levels of financial constraints. The results of this test are presented in columns 5 to 9 of Table 4.5.

Based on existing literature, we use five different criteria to proxy the level of financial constraints that bidders face. The first criterion is size, whereby it is assumed that small firms usually do not have sufficient net worth and collateral values, as well as a sufficiently long track record compared with large firms. Thus, the former will be more vulnerable to asymmetric information in credit markets and should face more difficulty in obtaining external financing (Gertler & Gilchrist 1994; Beck *et al.* 2005; Clementi & Hopenhayn 2006; Guariglia 2008).

Second, we construct the *KZ* index and *WW* indexes to proxy for firm-specific levels of financial constraints, following Kaplan and Zingales (1997) and Whited and Wu

(2006).[161] Basically, a firm is more likely to be financially constrained if it has a higher level of the *KZ* or *WW* index.

Third, prior literature documents that financially constrained firms tend to cut or reduce dividend payout to finance their desired investment and projects or cover their debt obligations (Fazzari *et al.* 1988; Kaplan & Zingales 1997; Cleary 1999; Almeida *et al.* 2004; Almeida & Campello 2007). We therefore expect firms that pay no dividends to face higher capital market imperfections.

Following this literature, we classify firms as facing a relatively high (low) level of financial constraints in a given year, first, if their size (measured by total real assets or number of employees) falls in the bottom three deciles (the top seven deciles) of the distribution of the assets and number of employees of all firms operating in the same industry as that firms in that given year (column 5 and 6); if their *KZ* or *WW* indices in that year fall respectively in the top three deciles (the bottom seven deciles) of the distribution of the indexes of all firms operating in the same industry they belong to in that given year (column 7 and 8); if the firm has not (has) made any cash dividend payment in the year (column 9).[162,163]

As shown in columns 5 to 9 of Table 4.5, we find that in the regressions for cash payment decisions, the coefficient associated with *Tobin's Q* is only significantly negative for the firms who face higher levels of financial constraints, irrespective of the financial

[161] See Appendix 4.1 for details on how the *KZ* and *WW* indices are constructed.

[162] The reason why we use a relatively small (30%) threshold to classify firms as facing relatively low and high financial constraints is that a large portion of acquiring firms is characterized by large size, and may consequently be less affected by capital market imperfections.

[163] The reason why we only consider cash dividends is that paying stock dividends in China may reflect firms' financial constraints.

constraints criterion used. This suggests that financially constrained bidders with higher stock valuation (*Tobin's Q*) are more likely to save cash and use stock to pay for the acquisitions. This finding is in line with the opportunity cost of cash hypothesis (Alshwer *et al.* 2011): financially constrained acquirers with better investment opportunities value cash more than their financially healthier counterparts. Therefore, since holding more cash gives more financial flexibility and avoids the high opportunity cost of forgoing positive net present value (NPV) projects, these firms are more reluctant to distribute cash and prefer to use stock as payment to finance the deals. In contrast, firms with greater access to financial markets may not have strong preference for payment methods in acquisitions, since it is not difficult for them to fund their current or future investments using debt or equity.

In Table 4.6, as a further test of our Hypothesis III, we provide descriptive statistics of the means of payment used by the bidding firms. Based on firms' financial conditions and *Tobin's Q*, we partition firm-years into 4 sub-groups: Group1 (financially constrained firms with low *Q*), Group 2 (financially constrained firms with high *Q*), Group 3 (financially unconstrained firms with low *Q*), and Group 4 (financially unconstrained firms with high *Q*).[164] We then calculate the average proportion of 100% cash payment across the four sub-samples.[165] We observe that on the one hand, for the financially constrained group, the average percentage of cash transactions for the low *Q* group is much higher than the one for high *Q* group, for all five criteria used to define financial constraints. The statistical tests from three of the criteria indicate that the differences in the means and medians between the two groups are significant at the 5% level.

[164] We classify a firm into high (low) *Q* group in a given year if its *Tobin's Q* is above (below) the median value of the *Q* of all firms operating in the same industry in a given year.

[165] Similar results were obtained when cash payments are defined as payments such that over 50% of the overall value of the payment is cash. For brevity, these results are not reported, but are available upon request.

On the other hand, we cannot find significant differences of the average proportion of cash payment between high and low *Q* groups for financially unconstrained firms. These statistics suggest that relatively financially constrained bidders with high investment opportunities are reluctant to use cash to finance their acquisitions. This finding is also in line with the opportunity cost of cash hypothesis (Alshwer *et al.* 2011), in which financial constraints increase the opportunity cost of holding cash.

[Insert Table 4.6]

4.4.4. The valuation effects of takeovers

4.4.4.1. Short-run analysis

4.4.4.1.1. Abnormal returns for different methods of payment

In this section, we use traditional short-window event studies to investigate stock market reactions across different methods of payment. Table 4.7 displays bidders' cumulative abnormal returns (*CARs*) within the three-day (t=-1, +1) and five-day (t=-2, +2) windows of a merger announcement between 1998 and 2011.[166] In line with Chi *et al.* (2011), Zhou *et al*. (2012) and Black *et al*. (2013), for all bids, the cumulative abnormal returns over a three-day and five-day event window are statistically significant and positive, taking values of 1.21 and 1.40 percent, respectively. Significant and positive abnormal returns suggest that Chinese stock markets react positively to the announcements of bidding. This could be due to the fact that although acquisitions are more likely to destroy value, they may be less wasteful than

[166] See Appendix 4.1 for the details on how bidders' (cumulative) abnormal returns are constructed.

investing internally in loss-making projects, especially when the acquirers have substantial cash flows and few growth opportunities. Alternatively, Chi *et al.* (2011) attribute the positive announcement returns to the low M&A competition in China.

[Insert Table 4.7]

When we partition the bidders (n=2033) on the basis of their methods of payment, we see that stock bidders generate the most significant and largest abnormal returns, regardless of the event windows used (*CAR3*=8.87%, *CAR5*=10.76%, n=115). Bidders with mixed payments follow (*CAR3*=0.94%, *CAR5*=1.25%, n=669), and cash bidders are last (*CAR3*=0.65%, *CAR5*=0.62%, n=1249).[167]

In short, the results show that the market has different perceptions of acquisitions depending on the methods of payment used.[168] The lowest announcement returns are associated with cash payments, which is in line with the findings from Black *et al*. (2013) in the Chinese economy, as well as with our Hypothesis IV. We attribute this to the fact that, due to the lower opportunity costs of cash, cash-acquiring firms are more likely to waste cash on unprofitable acquisitions. Other factors may also contribute to this finding. First, bidders have a greater probability to offer high acquisition premiums for cash transactions. Given the high degree of information asymmetry prevalent in the Chinese stock market, cash payments are more likely to be accepted by target firms only if cash offers are attractive or exceed their true value. Second, when stock payments are used in takeover transactions, taxes are deferred

[167] Both the t-test and the Wilcoxon rank-sum test indicate that the differences in the means and medians between cash and stock acquisitions are significant.

[168] The finding that the market reacts more positively to mergers paid in stock is in contrast to most of the evidence found in the West (Travlos 1987; Andrade *et al.* 2001). According to the market-timing theory, stock payments are in fact preferred by overvalued acquiring firms, which conveys negative information and thus leads to negative abnormal announcement returns.

until the stock is sold. However, cash payments may face immediate capital gains tax implications. Thus, the tax-deferred option in stock may be valued more by the market. Third, given that the finance literature (Fishman 1989; Faccio & Masulis 2005) has argued that safer deals (lower risk and hence lower expected returns) are better suited to finance by means of cash; risky deals should be financed by means of stock, as stock financing allows to share the benefits/risks of a deal with target shareholders Thus, the market is likely to react favorably more to the announcements of stock transactions.

In addition, Fig.4.1 presents the plot of the average acquirer cumulative abnormal return (*CAAR*) for the bidding firms in the event window (t=−30, +30). We find that during the event window, the *CAAR* starts to decline, and hit the trough in around day -12. This is then followed by a picking up until day +5, and a decline between day +5 and +30. It is astounding that the most sizeable *CAAR* increase occurs around the announcement day between day -5 and +5.

[Insert Fig. 4.1]

For comparison, Fig. 4.2 reveals the *CAAR* for the bidding firms in the event window (t=−30, +30) by different methods of payment. Specifically, Panel A, B and C report the average acquirer cumulative abnormal returns for all stock deals, mixed deals and all cash deals, respectively. Panel A of Fig. 4.2 show postive price reactions for the stock acquisiton annoncement. There is a significant increase between days -5 and +5. The *CAAR* is relatively flat prior to and following this period. Panle B also show postive price reactions for the acquisiton annoncements with the mixed payments. However, we find that the *CAAR* starts falling after day +2 in Panel B. Furthermore, these postive reations for the annoncement with the mixed payments are much smaller (0 - 1.25%), compred with those of the stock deals (0 -

23%). For the cash acquisitons in Panel C, the *CAAR* is alomost negative and less than those of acquisiton annoncement with stock and mixed payments. Over the event window, the *CAAR* starts to drift down to around -0.75% in day -12, and then reserve the direction until day +2. Thereafter, during the post announcement period between days +2 and +30 , the CAAR decreases considerably .

[Insert Fig. 4.2]

Combined, the results in Fig. 4.1 and 4.2 suggest that infoarmtion about M&As starts to leak to the market before the offictial annoucment (in around day -10). In addition, the lowest *CAAR* is associated with cash payments, while the market reaction is the most positive for stock announcements. Interestingly, although we observe an increase in stock prices (t=−12, +2), when cash acquisitions are announced, the *CAAR* for cash payments is almost negative over the event window (t=−30, +30), except for the period around the announcement (t=-2, +2), which is entirely consistent with our Hypothesis IV, according to which cash-acquiring firms are more like to suffer from lower opportunity costs of cash.[169]

4.4.4.1.2. Cross-sectional regression analysis of bidders' CARs

We next re-investigate the relationship between methods of payment and bidder abnormal returns using a multivariate OLS regression analysis with robust standard errors (the Huber/White/sandwich estimator of variance). Following Faccio & Masulis (2005), Golubov *et al.* (2012) and Black *et al*. (2013), our baseline regression model is:

[169] The fact that the positive price reaction around the M&A announcement day even for cash acquisitions is also consistent with the finding that we find positive *CAR3* and *CAR5* for cash bidders.

$$CAR_{i,t} = a + \sum_{k} \beta X_{k,it}$$

$$= a + b_1 Payment\_cash_{i,t} + b_2 \Delta cash_{i,t} + b_3 Cash_{i,t} + b_4 Q_{i,t} + b_5 CF_{i,t} + b_6 Leverage_{i,t}$$

$$+ b_7 Size_{i,t} + b_8 Collateral_{i,t} + b_9 Blockholders_{i,t} + b_{10} Runup\_stock_{i,t} + b_{11} Sigma\_stock_{i,t}$$

$$+ b_{12} Sharehoding\_CEO_{i,t} + b_{13} SOEs_{i,t} + b_{14} Experience_{i,t} + b_{15} Public\_deals_{i,t}$$

$$+ b_{16} Runup\_Market_{i,t} + b_{17} Size_{ratio} + b_{18} Unfriendly_{i,t} + b_{19} Diversifying_{i,t}$$

$$+ b_{20} Completed_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \qquad (4.3)$$

where the independent variables are bidder, target and deal specific factors, which include the payment dummy (*Payment_cash*), changes in cash holdings (*ΔCash*), cash holdings (*Cash*), *Tobin's Q (Q),* cash flow (*CF),* market leverage (*Leverage),* firm size (*Size),* collateral (*Collateral),* the percentage of shares controlled by the largest shareholder (*Blockholders),* stock performance prior the announcement (*Runup_stock),* risk prior the announcement (*Sigma_stock*), market performance (*Runup_marke),* an indicator of CEO sharehoding (*Shareholding_CEO),* a state ownership dummy (*SOEs),* an indicator of experienced bidder (*Experienced)*, indicators of targets' listing status (*Public_deals*), the relative size of the deal (*Size_ratio),* an indicator of acquisition attitude (*Unfriendly),* an indicator of whether the bidder's and target's industries coincide *(Diversifying)*, and an indicator of deal completion (*Completed).*[170] In all specifications, we also incorporate year (∑*Year)* and industry fixed effects (∑*Industry*).[171]

[170] See Appendix 4.1 for the details on the variable definition.

[171] We do not include province dummies in Eq. (4.3) because some of the dummies take on the value 1 for all observations in a cluster, and 0 otherwise (a singleton indicator). This causes singular outer-product-of-gradients (OPG) variance matrices in computing the robust standard errors, which therefore makes it impossible to compute an overall model *F*-statistic. When we use a standard OLS setting instead of the robust setting to estimate Eq. (4.3), this problem does not arise, and province dummies can be included. These results, which were very similar to those reported in Table 4.8 are not reported, but are available upon request.

Table 4.8 presents the results of this analysis, which is based on the Heckman two-stage procedure to control for the self-selection bias. Specifically, as in section 4.4.3.1, we calculate the inverse Mill's ratio for each observation based on a selection (Probit) model (Eq. (4.1)) for the probability of making a bid. We then include the inverse Mill's ratios in the OLS regressions of the bidders' CARs (Eq. (4.3)) to correct for a potential self-selection problem in our sample. The dependent variable in the regression is *CAR5* in columns 1 and 3 and *CAR3* in column 2 and 4, respectively. As shown in column 1 and 2, after controlling for various bidder and deal characteristics, we find that the coefficient on *Payment_cash* is negative and statistically significant at the 5% level, which is in line with our Hypothesis IV and with the opportunity cost of cash hypothesis. Keeping other factors constant, the magnitude of the coefficient in column 1 suggests that the use of cash payments in acquisition is associated with a 1.0% decrease in *CAR5*.

[Insert Table 4.8]

Focusing on the other control variables, we first find a significantly negative coefficient on cash flow (*CF*), which is consistent with the free cash flow hypothesis (Jensen 1986), according to which firms with large free cash flow are more likely to conduct value-destroying acquisitions. Second, the stock price run-up (*Runup_stock*) also has a negative effect on abnormal returns. Rosen (2006) and Golubov *et al.* (2012) obtain a similar result. The negative coefficient on *Runup_stock* may be due to hubris: recent success may lead to incorrect business decision making, as managers affected by hubris may think they have better information about the target value than the market, and believe that the deal can create value in the long run. Therefore, these managers may tend to offer excessively high premiums for the targets. The market may perceive this situation, which may cause a reverse reaction to the premerger performance.[172] Third, the coefficients on the dummy variables (*SOEs* and *Experienced*) are significantly negative, which suggests that state-owned firms and firms that make many acquisitions are more likely to undertake low-benefit M&A deals. The former can be explained considering that even though acquiring firms from the state sector might enjoy favorable financial and political support due to government intervention (Zhou *et al.* 2012), the non-economic motivation (e.g. tunneling) may lead to the misallocation of firms' resources. In other words, non-market mechanisms of the acquisitions conducted by SOEs may have limited influence on the synergy achievement. The latter can be explained by the fact that hubris and over-confidence developed from past acquisitions may lead to value-losing deals, which is consistent with Billett & Qian (2008) and Black *et al*. (2013). Fourth, the announcement returns increase in the relative size of the deal, which is consistent with findings reported for Chinese listed firms by Zhou *et al*. (2012) and Black *et al*. (2013), and for US firms by Asquith *et al.* (1983) and Moeller (2004). This may be explained considering that a larger relative size of the deal can have a greater effect on the bidder as the larger the relative deal size, the more significant the addition to the bidder will be (Asquith *et al.* 1983).[173] Fifth, the indicator of deal completion *(Completed)* has a positive and significant effect on the bidder's returns. This can be explained considering that the completion of the deal may intensify the positive market reactions to the merger announcement. Moreover, successful bidders may have more capable management or may operate in a less regulatory and competitive environment compared with unsuccessful ones.

[172] Alternatively the negative coefficient on *Runup_stock* can be explained by the market-timing theory, according to which acquiring firms may take advantage of the temporary overvalued stocks to make acquisitions, which induces stock payments (Shleifer & Vishny 2003; Rhodes-Kropf & Viswanathan 2004). However, we can circumvent this explanation considering that, in Section 4.4.3.1, we did not find that acquiring firms with *Runup_stock* are more likely to use stock as payment in acquisitions.

[173] For example, assume that there are two potential takeover targets for which the rates of net present values accruing to the bidding firm are the same (e.g. 15% of the target firm's equity value). If the size of one target is twenty times that of the other, one should observe that the abnormal return, which is produced by acquiring the larger deal is 20 times that produced by acquiring the smaller deal.

Hence, the market may predict successful deals by giving higher positive returns upon announcement.[174]

In addition, we find that the announcement returns (*CAR3* and *CAR5*) are significantly positively associated with changes in cash holdings (*ΔCash*). For instance, the point estimate (0.051) in column 1 indicates that the elasticity of *CAR5* with respect to a change in cash holdings, evaluated at sample means is 0.028.[175] One way to interpret this result is that a 10 % increase in *ΔCash* leads to a 0.28% rise in *CAR5*.

In columns 3 and 4, we introduce the change in cash interacted with the level of cash (*ΔCash*Cash).* The motivation for including this interaction term is to estimate the effect of changes in the value of cash for different levels of cash. If the opportunity cost of cash theory holds, we should observe that the interaction term (*ΔCash*Cash)* has a negative effect on bidder returns: as firms' cash levels improve, their marginal value of cash should decrease significantly. The coefficient estimates on the interaction term are -0.401 and -0.360 for *CAR5* and *CAR3*, respectively, and are generally statistically significant at least at the 10% level. To give some economic intuition to these coefficients, a change in the level of cash of 0.120 (i.e. a shift from the first to the third quartile of the cash distribution) corresponds to a drop of 4.8% (0.120 *-0.401) in *CAR5/ΔCash,* and a drop of 4.3% (0.120 *-0.360) in

[174] By using a natural experiment of comparing abnormal returns between unsuccessful and successful stock bidders, Savor and Lu (2014) find that successful stock bidders significantly outperform unsuccessful ones. This finding supports the market-timing theory. The authors find that successful stock-financed mergers benefit long-term shareholders. In contrast, unsuccessful stock-financed mergers continue performing poorly even after the announcements of bid termination, particularly for richly priced stock bidders. The difference of abnormal returns between unsuccessful and successful stock bidders captures the market-timing benefits between the market and fundamental value of their equity. However, most of our evidence in this chapter does not support the market-timing theory.

[175] The elasticity of the change of cash holdings is defined as the ratio of the cumulative abnormal returns *CAR5* for a relative change in *ΔCash*. Considering that the mean of *CAR5* is 0.0146 and the mean of *ΔCash* is 0. 008, this elasticity is given by 0.028=0.051* 0.008/(0.0146).

CAR3/ΔCash. In other words, the magnitude of the coefficient suggests that, *ceteris paribus,* a bidder with cash level at the first quartile of the distribution of our sample (0.073) is around 1.6 times (0.193/0.073-1) better in terms of marginal announcement returns of cash, than a firm with cash level at the third quartile of the distribution (0.193). This finding is consistent with the opportunity cost of cash hypothesis, according to which bidders with more cash reserves on hand are more likely to face lower opportunity costs of cash. They may invest their large cash reserves on negative net present value (NPV) projects or acquisitions due to other interests, and for this reason, every additional RMB of cash they hold on hand has a lower value. Therefore, for acquirers who are holding higher levels of cash, the market tends to react less positively to a further increase in their liquid assets, compared to those with less cash reserves.

It is noteworthy that the coefficients associated with our control variables are consistently signed across specifications. The inverse Mills ratios are insignificant in all regressions, suggesting that basically unobservable characteristics in the choice of engaging in acquisition activities are unrelated to bidders' announcement returns. Hence, we can conclude that there is no effect of self-selection bias. Additionally, the regressions' *Adjusted* R^2 indicates that around 10% of the variance in measured data can be explained by the model.

In summary, we can conclude that, the results regarding abnormal announcement returns support our Hypothesis IV, according to which stock bidders experience more positive reactions than cash bidders.

4.4.4.2. Long-run analysis

4.4.4.2.1. The time record of annual operating performance

In last section, we found that cash-financed mergers have lower abnormal announcement returns than stock-financed mergers, suggesting that the market anticipates weaker future performance for the former. In order to provide greater insights into the relationship between a firm's participation in acquisitions and long-run performance, Table 4.9 presents the change in operating performance for bidders characterized by different methods of payment. First, following Healy *et al.* (1992), Harford (1999) and Linn & Switzer (2001), we use the return-on-assets (*ROA*) and cash flow performance (*CF*) to measure firms' operating performance [176]. According to Barber & Lyon (1996), in order to assess operating performance of corporations following major events or decisions, it is important to design a test which controls for firms with similar pre-merger performance.[177] To this end, first, in Panels A and B of Table 4.9, following Heron & Lie (2002), we analyze firms' operating performance relative to the median performance of firms in the same industry. Specifically, industry-adjusted operating performance (*industry-adjusted ROA*, and *industry-adjusted CF)* are constructed as the difference between a firm's operating performance (*CF* or *ROA*) and that of the median firm in the same industry in a given year. Second, in the spirit of Rau & Vermaelen (1998) and Harford (1999), in Panels C and D, we match sample firms to control

[176] Cash flow performance (*CF*) is defined as the ratio of the sum of net profit and depreciation to total assets.

[177] Barber & Lyon (1996) find that in an event study of operating performance, a test statistics is consistent and well specified only when sample firms are matched to appropriate benchmarks to control for abnormal firm performance prior to the event. The inferences based on the levels of performance over time are more likely to be misspecified. For instance, if an industry has experienced abnormal growth in *CF* during a certain time period, it is highly likely that the sample firms in this industry experience a similar growth in *CF*. Assume that a firm in this industry engages in an acquisition during the period, if we calculate the change of the firm's real performance due to the merger event without an appropriate benchmark (e.g. an industry benchmark), this firm would appear to have an inflated change of operating performance.

for size and cash levels. Specifically, performance-adjusted operating performance (*performance-adjusted ROA,* and *performance-adjusted CF)* is constructed by subtracting the median performance of the firms in the same portfolio from the firm's operating performance.[178] These performance-matched methods allow us to make a direct comparison between the operating performance of firms with similar pre-event performance that engage in acquisitions and those that do not. It therefore helps us to provide better inference about how merger deals impact bidders' operating performance.

In Panels A to D of Table 4.9, we report mean and median values of *adjusted-ROA* and *adjusted-CF* from year -2 to year +2 relative to the year of the acquisition announcement. The results show that for the total sample, after taking into account both industry effects or after controlling for firms' size and cash levels, Chinese bidders generally experience a positive improvement before they tend to take over other firms (i.e. from year -2 to year -1). Regardless of whether we use *adjusted-CF* or *adjusted-ROA,* this is then followed by underperformance in the post-acquisition period from year +1 to year +2. Furthermore, we find that the mean and median changes from year -1 to year +2 in adjusted operating performance are negative (-0.004 to -0.005 for *adjusted-ROA* and -0.001 to -0.003 for *adjusted-CF*). P-values associated with tests for both the t-test and the Wilcoxon rank-sum test show that these mean and median changes from year -1 to year +2 are statistically significant, with the exception of the mean changes in *adjusted-ROA* (*t-statistics*, 0.12 and 0.17).

[Insert Table 4.9]

[178] Following Fama & French (1993), in each year, we partition firms into 25 portfolios on the basis of size (total assets) interacted with the cash ratio to control for abnormal firm characteristics prior to the event.

To check whether operating performance can be affected by methods of payment, we break the bidders down into three subsamples: *Stock only*, *Mixed Payment,* and *Cash only*. We find that the pre-acquisition operating performance is higher for bidders in cash-financed deals compared with those in stock-financed deals, regardless of whether we use *adjusted-ROA* or *adjusted-CF*. However, cash acquisitions underperform stock ones in the post-acquisition periods. It is interesting to note that only cash-financed deals show an increasing pre-acquisition performance, followed by a decreasing post-acquisition performance. This might be due the fact that cash deals constitute the majority of the whole sample. Both the t-test and the Wilcoxon rank-sum test significantly reject the null hypothesis that the mean and median differences in adjusted performance before and after acquisitions (from year -1 to year +2) equal zero at the 1% level. These findings can be interpreted in the light of the opportunity cost of cash hypothesis, according to which, due to a lack of investment opportunities, cash bidders with better operating performance prior to the takeover face lower opportunity costs of cash holdings and tend to use M&As as one way of spending excess cash.

On the contrary, we find that there is an increasing adjusted performance from year -1 to year +2 for stock-financed deals. This suggests that stock acquisition may improve bidders' operating performance, which is consistent with the previous finding that stock offer generates higher announcement returns. These findings are consistent with the conclusion drawn from (Boateng & Bi 2010), who focusing on Chinese listed firms, find that cash-financed acquirers perform better prior to the acquisitions, but experience worse post-acquisition performance, while stock-financed acquirers have negative pre-acquisition performance, followed by significant positive post-acquisition abnormal returns.

Put together, acquisitions in China generally tend to underperform in the long run.[179] Particularly, for cash-acquiring firms, good performance prior to the bid allows them to accumulate substantial cash, which may benefit firm liquidity conditions and management discretion. Given the lower costs of cash holdings, the managers may then execute low-return mergers for their private interests. From this point of view, cash-financed acquiring firms are more likely to experience good performance before the mergers. However, their performance decreases on average after mergers. This finding confirms the underperformance of cash deals compared with stock deals in terms of abnormal announcement returns.

4.4.4.2.2. Regression of industry-adjusted operating performance before and after the merger

To confirm our previous finding of a performance drop after cash acquisition, we follow Harford (1999) and use OLS regressions to see if there is a change in operating performance of acquiring firms after mergers for deals financed in different ways. Our baseline regression model is as follows:

$$Post-merger\ Adj.ROA\ (CF) = b_0 + \ b_1 Pre-merger\ Adj.ROA\ (CF) + \ e_i \qquad (4.4)$$

The dependent variable is the post-merger-operating performance of the bidder in year +1 (or from year +1 to year +2). Independent variables are the pre-merger-operating performance of the bidder in year -1 (or from year -2 to year -1). As in the previous section, we measure operating performance using industry-adjusted return-on-assets (*industry-*

[179] The long-term under-performance of cash acquisitions is in contrast to the asymmetric information explanations proposed by most US and UK studies, according to which stock payments are preferred by overvalued bidders when purchasing target firms characterized by relative undervaluation. Stock payments are widely interpreted as a negative signal and tend to shift part of the (possible negative) future returns to the new shareholders. In contrast, when bidders have favorable private information about high value for the target (potential synergies), they would use cash to preempt potential competing bidders. Cash payments signal positive information. Hence, on average, stock-financed mergers will underperform cash-financed ones in the long-run. (Fishman 1989; Loughran & Anand 1997; Linn & Switzer 2001; Abhyankar *et al.* 2005).

adjusted ROA) and industry-adjusted cash flow (*industry-adjusted CF*). The results are reported respectively in panels A and B of Table 4.10. We then use performance-adjusted return-on-assets (*performance-adjusted ROA*) and performance-adjusted cash flow (*performance-adjusted CF*), and report the results respectively in panels C and D. The coefficient b_1 captures the continuation of pre-merger operating performance for bidding firms. The coefficient b_0 captures any improvement of abnormal operating performance from the pre- to post- merger period. The results in Table 4.10 show that for all of bidders, the b_0 coefficients in the regressions of both *adjusted-ROA* and *adjusted-CF* are significantly negative at the 1% level. Furthermore, when the regression is performed separately based on the methods of payment, we observe that the coefficients b_0 are no longer significantly negative for stock-financed deals, but still negative and significant for the cash-financed deals.

[Insert Table 4.10]

These findings suggest that cash financed M&A deals tend to underperform in terms of operating performance from the pre- to the post-merger period. This is consistent with the opportunity cost of cash hypothesis, according to which bidders using cash as a method of payment face lower opportunity costs of cash. Therefore, they are likely to spend their cash on value-decreasing deals.

Overall, the tests in this section support our Hypothesis VI, according to which cash-financed acquires perform significantly worse than stock-financed acquirers. They also tell a consistent story that firms with more financial flexibility and lower investment opportunities are more likely to consider cash payments in acquisition and subsequently have worse performance in terms of announcement returns and long-run operating performance.

4.5. Conclusions

In this paper, we investigate the nature of M&As in China during the period 1998-2011, focusing on the role of corporate liquidity. We develop a set of hypotheses to empirically test the links between firms' financial conditions and their acquisition behavior, as well as the performance following mergers. First, consistent with the free cash flow hypothesis (Jensen 1986), we find that cash-rich firms are more likely to attempt acquisitions than their cash-poor counterparts. Acquisitions can therefore be seen as one way by which firms spend excess cash instead of paying it out to shareholders. Further, we find evidence that high *Q* firms with greater operating performance (*ROA*) are less likely to attempt acquisitions, implying that good-operating firms with higher growth opportunities do not rely on external investment like M&As to spend their excess cash.

Second, we find that greater excess cash reserves may lead firms that are subject to tunneling to engage in takeover activities, suggesting that Chinese firms are likely to use M&As as a channel to expropriate cash through tunneling. In other words, tunneling is likely to amplify free-cash-flow-driven takeovers.

Third, after controlling for all other determinants of the method of payment, we find that firms with greater growth opportunities, reflected by higher stock valuation (Tobin's *Q*), are less likely to use cash as a method of payment. This effect manifests itself mainly for constrained firms and depends on the level of financial constraints that the firm faces. This finding is in line the opportunity cost of cash hypothesis (Alshwer *et al.* 2011), according to which cash comes at a cost for constrained bidders, especially those with valuable growth opportunities. Hence, these bidders are reluctant to use cash to finance acquisitions.

Finally, we find that cash acquisitions underperform stock acquisitions, since the former are more likely to be value-destroying, due to lower opportunity costs of cash holdings. Specifically, we find that cash acquisitions generate worse announcement abnormal returns compared with stock acquisitions. Under-performance of cash acquisition also comes along with a significant post-merger drop in operating performance.

Our study is in line with the free-cash-flow motive of acquisitions, especially for those firms subject to tunneling. Given the relatively high financial capacity which characterizes some Chinese firms due to their high growth rates and ability to generate large amounts of internal funds (Guariglia *et al.* 2011), it is essential for these cash-rich firms to find more efficient and sensible ways to use their liquid assets to pursue expansion opportunities. To maximize shareholders' value, synergy should play a more important role in M&A decision-making. The ongoing reform should reduce the agency costs associated with acquisitions, improve corporate transparency in M&A transactions, and protect the interests of minority shareholders by increasing the intensity of monitoring by other blockholders or independent institutions, aligning the interests between managers and investors, and disclosing connected transactions (e.g. tunneling).

We also find that the lower opportunity costs of cash can drive Chinese acquiring firms to make cash-financed acquisitions, which leads to under-performance. Given that cash is an important resource for firms operating in imperfect capital markets, a cautious approach on how to use cash more efficiently should be promoted. A thorough evaluation of investment projects, as well as a sophisticated regulation and supervision of corporate profit distribution, and a more market-oriented allocation of resources would therefore benefit the economy.

Appendix 4.1. Definitions of the variables used

Blockholders	Percentage of shares controlled by the largest shareholder.
CAR3, CAR5: cumulative abnormal returns:	*CAR3* and *CAR5* are the cumulative abnormal returns in the 3-day (-1,+1) and 5-day (-2,+2) event windows, respectively, where 0 is the announcement. Cumulative abnormal returns are calculated using the market model with the market model parameters estimated over the period beginning 240 days and ending 41 days prior to the deal announcement for different day event windows around the announcement (day 0).
Cash	Ratio of the sum cash and cash equivalents to total assets.
Cash flow	Ratio of the sum of net profit and depreciation to total assets
Collateral	Ratio of tangible assets to total assets.
Completed	Dummy variable equal to one if the transactions were completed, and zero otherwise.
DIF_Blockholders	Dummy variable equal to one if the firm's blockholder's controlling ownership exceeds its cash-flow ownership in a given year, and zero otherwise.
Diversifying	Dummy variable equal to one if the bidder is not in the same industry as the target as measured using the bidder's and the target's first 2-digits of primary SIC code, and zero otherwise.
Employee	Number of employees.
KZ index	Following Lamont *et al.* (2001), the Kaplan and Zingales (*KZ*) index of constraints is a linear function of five variables. Specifically: $KZ_t=-1.002*CF_t/K_{t-1}+0.283*Q_t+3.139*Debt_t/TK_t-39.368*(DIV_t/K_{t-1})-1.315*Cash_t/K_{t-1}$

	where CF_t is cash flow (net income + depreciation); Q_t is Tobin's Q; $Debt_t$ is the sum of short-term and long-term debt; DIV_t is dividends; $Cash_t$ is cash and cash equivalents; K_t is capital; TK_t is total capital (sum of debt and equity).
Leverage	Ratio of the sum of short-term and long-term debt to total assets.
Market value of assets	Sum of market value of tradable stocks, book value of non-tradable stocks, and market value of net debt.
Method of payment: Cash Only, Mixed PYMT, Payment_cash, Stock Only	*Cash Only:* dummy variable equal to one if the payment is pure cash, and zero otherwise. *Mixed PYMT:* dummy variable equal to one if the payment is neither all-cash nor all stock, and zero otherwise. *Payment_cash*: dummy variable equal to one if the payment is mainly cash (>50%), and zero otherwise. *Stock Only*: dummy variable equal to one if the payment is pure stock, and zero otherwise.
NWC	Ratio of net working capital (working capital minus cash holdings) to total assets.
OREC	Ratio of other receivables to total assets.
Payout	Dummy variable equal to one if the firm the firm pays dividends in a given year, and zero otherwise.
Public_deals	Dummy variable equal to one if the target is a listed firm, and zero otherwise.
PE (price-to-earnings ratio)	Ratio of market value per share to earnings per share.
Runup_stock	Cumulative daily stock price returns of the bidder over the period beginning 205 days and ending 6 days prior to the announcement date.
Runup_market	Cumulative daily Shanghai and Shenzhen value-weighted stock returns over the period beginning 205 days and ending 6 days prior to the deal announcement

Return on assets (ROA)	Ratio of net income to total assets.
Sigma_stock	Standard deviation of the bidding firm's daily returns over the period beginning 205 days and ending 6 days prior to the announcement date.
Sales growth	Rate of growth of real sales.
Size	Natural logarithm of total assets.
Size_ratio	Ratio of transaction value divided by the bidder's market value 4 weeks prior to the announcement
Shareholding_CEO	Dummy variable equal to one if the firm's top executives (including the CEO) are holding shares in their own company, and zero otherwise.
SOEs	Dummy variable equal to one if the firm is state-owned in a given year, and zero otherwise.
Unfriendly	Dummy variable equal to one if the deal is not defined as friendly by Thomson Financial SDC, and zero otherwise.
Tobin's Q	Ratio of market value of assets to book value of total assets.[180]
Var_CF	Mean of the standard deviations of cash flow over total assets for firms in the same industry.
WW index	Derived from Whited and Wu (2006), the *WW* index is a linear function based on six financial variables. Specifically: WW_t=-0.091*CF_t/BA_{t-1}-0.062*$Payout_t$+0.021*$TLTD_t/CA_{t-1}$-0.044*$LNBA_t$-0.035*SGR_t+0.102*ISG_t where CF_t is cash flow (net income + depreciation) BA_t is book assets]; $Payout_t$ is a dummy indicating positive dividends); $TLTD_t$ is long-term debt; CA_t is total current assets; Q_t is Tobin's Q;

[180] The shares of listed firms in China can be either tradable or non-tradable. Following the literature (Chen *et al.* 2011; Huang *et al.* 2011), we calculate Tobin's *Q* as the sum of the market value of tradable stocks, the book value of non-tradable stocks, and the market value of net debt, divided by the book value of total assets. The results were similar when tradable stock price is used to calculate as the market value of non-tradable stocks.

$LNBA_t$ is the natural log of the book value of assets; SGR_t is firm real sales growth; ISG_t is industry sales growth.

All variables (with the exception of dummy variables) are deflated using a GDP deflator, which is obtained from National Bureau of Statistics of China.

Appendix 4.2. Measure of excess cash

Excess cash is used to assess whether there is a relationship between cash-richness and acquisition decisions. Following Opler *et al.* (1999), excess cash is computed by subtracting the optimal level of cash holdings from cash and cash equivalents (*Cash*). Specifically, in the OPSW model, cash holdings are assumed to be a function of *Tobin's Q* (defined as the firm's market-to-book ratio); *Firm size* (defined as the natural logarithm of the firm's total assets); *Cash flow* (defined as the ratio of the sum of net profit and depreciation to total assets); *NWC (*defined as the ratio of net working capital to total assets); *CAPEX* (defined as the ratio of capital expenditures to total assets); *Leverage* (defined as the ratio of its short-term and long-term debt to total assets); *Div_Dum* (a dividend payout dummy set to one if the firm pays dividends, and 0 otherwise); *Var_CF* (the mean of the standard deviations of cash flow over total assets for firms in the same industry). As ownership is likely to be important in the Chinese context, we also include a dummy variable for state ownership, namely *SOEs*, which is a dummy variable, that takes the value of 1 if the firm is state owned in a given year, and 0 otherwise.[181]

For firm *i* in year *t*, the model of cash holdings is therefore given by the following equation:

$$\begin{aligned}\mathrm{Cash}^{*}_{i,t} = {} & a + \textstyle\sum_k \beta X_{k,it} = a + b_1 Q_{i,t} + b_2 \mathrm{Size}_{i,t} + b_3 \mathrm{CF}_{i,t} + b_4 \mathrm{NWC}_{i,t} + b_5 \mathrm{CAPEX}_{i,t} + \\ & b_6 \mathrm{Leverage}_{i,t} + b_7 \mathrm{Div\_Dum}_{i,t} + b_8 \mathrm{Var\_CF}_{i,t} + b_9 \mathrm{SOEs}_{i,t} + \textstyle\sum \mathrm{Year} + \\ & \textstyle\sum \mathrm{Province} + \nu_i + \varepsilon_{i,t} \qquad (4.5)\end{aligned}$$

$X_{k,it}$ is the vector of the explanatory variables that affect the costs and benefits of cash holdings. Eq. (4.5) also incorporates time dummies (∑*Year*), and provincial dummies (∑*province*), which account for year and regional fixed effects associated with firms' cash holdings.[182]

The regression is estimated using the fixed effects estimator, which accounts for unobserved firm-specific heterogeneity.[183] The fitted values of Eq. (4.1) can be interpreted as

[181] State-owned enterprises (SOEs) are less likely to face financial constraints. Therefore, according to the precautionary motive, one should expect SOEs to hold less cash than their non-state-owned counterparts.

[182] It should be noted that because of collinearity, industry dummies (∑*Industries*) cannot be included in the equations when the fixed-effects estimator is used.

[183] We also estimate Eq. (4.5) cross-sectionally in each year during the sample period. This allows the determinants of cash holdings to vary from year to year. The results remain substantially the same.

a proxy for the optimal level of cash holdings. We measure excess cash (*Xcash*) as the difference between the actual values of cash holdings and the fitted values derived from Eq. (4.5).

Table 4.1
Distribution of the number of M&A deals in China by year

Year	Non-Bidders	Bidders	Stock Only	Mixed PYMT	Cash Only	Completed	Total No.	Bidder Perc.
1998	697	8	0	5	3	6	705	1.13%
1999	793	20	0	13	7	6	813	2.46%
2000	894	17	0	9	8	11	911	1.87%
2001	1,021	17	0	9	8	7	1,038	1.64%
2002	1,030	76	2	48	26	36	1,106	6.87%
2003	1,000	146	0	66	80	66	1,146	12.74%
2004	991	198	0	71	127	57	1,189	16.65%
2005	1,154	138	0	50	88	41	1,292	10.68%
2006	1,135	135	4	48	83	39	1,270	10.63%
2007	1,085	221	11	51	159	63	1,306	16.92%
2008	1,108	264	21	72	171	78	1,372	19.24%
2009	1,160	247	31	59	157	89	1,407	17.56%
2010	1,071	277	26	92	159	59	1,348	20.55%
2011	1,116	269	20	76	173	57	1,385	19.42%
Total	14,255	2,033	115	669	1,249	615	16,288	12.48%

Notes: This table reports the time-series distribution of the number of observations. *Bidders* represents the firms who were announcing a bid in a given year. *Non-Bidders* represents the firms who were not announcing a bid in a given year. *Stock Only* includes deals that were financed only by stock. *Cash Only* includes deals that were financed only by cash. *Mixed PYMT* consists of those deals whose payments were not solely completely through stock or cash. *Completed* represents the deals whose transactions were completed. *Total No.* represents the total number of observations in a given year.

Table 4.2
Summary statistics

	Non-Bidders		Bidders		All		Diff.	Diff.
	mean	median	mean	median	mean	median	Mean	Medium
Size	20.391	20.301	20.864	20.808	20.459	20.365	0.00***	0.00***
Employee	3496	1709	6226	1996	3904	1732	0.00***	0.00***
ROA	0.021	0.032	0.029	0.031	0.022	0.032	0.00***	0.00***
sales growth	0.178	0.092	0.244	0.135	0.187	0.098	0.00***	0.00***
Return	0.329	0.014	0.522	0.069	0.356	0.021	0.00***	0.00***
CAPEX	0.057	0.037	0.061	0.045	0.058	0.038	0.00***	0.00***
PE	92.43	40.07	80.02	36.39	90.64	39.56	0.00***	0.00***
CF	0.046	0.054	0.053	0.053	0.047	0.054	0.00***	0.52
Var_CF	0.538	0.084	0.608	0.084	0.548	0.084	0.05**	0.32
Tobin	1.751	1.404	1.746	1.328	1.75	1.394	0.86	0.00***
Collateral	0.304	0.279	0.300	0.267	0.303	0.277	0.30	0.10*
leverage	0.231	0.217	0.244	0.239	0.233	0.220	0.00***	0.00***
Cash	0.147	0.121	0.146	0.125	0.146	0.121	0.77	0.05**
ΔCash	0.004	0.002	0.008	0.006	0.005	0.003	0.07*	0.02**
NWC	-0.058	-0.034	-0.083	-0.078	-0.062	-0.041	0.00***	0.00***
KZ	-1.984	-0.099	-2.73	-0.082	-2.096	-0.096	0.00***	0.57
WW	-0.927	-0.927	-0.953	-0.955	-0.931	-0.931	0.00***	0.00***
OREC	0.066	0.026	0.045	0.019	0.063	0.025	0.00***	0.00***
Blockholders	0.400	0.382	0.376	0.361	0.397	0.378	0.00***	0.00***
Payout	48.80%		54.50%		49.60%		0.00***	
Shareholding_CEO	33.90%		26.00%		32.80%		0.00***	
DIF_Blockholders	46.80%		51.40%		47.70%		0.00***	
SOEs	71.10%		64.70%		70.20%		0.00***	

Notes: Firms that are flagged as *bidders (non-bidders)* are those who were (not) announcing a bid in a given year. *Size* is the natural logarithm of total assets. *Employee* is the number of employees. *ROA* is return on assets. *Sales growth* is the annual rate of growth of real sales. *Return* is the annual stock returns. *CAPEX* is defined as the ratio of capital expenditures to total assets. *PE* is the price-to-earnings ratio. *CF* is the ratio of the sum of net profit and depreciation to total assets. *Var_CF* is the mean of the standard deviations of the cash flow over total assets for firms in a given industry. *Tobin (Q)* is the market-to-book ratio. *Collateral* is the ratio of tangible assets to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *Cash* (*Cash-to-assets ratios)* is the ratio of the sum of cash and cash equivalents to total assets. *ΔCash* is the ratio of the annual change in *Cash* to total assets. *NWC* is the ratio of net working capital (working capital minus cash holdings) to total assets. *KZ* and *WW* represent firm-specific levels of financial constraints: the Kaplan and Zingales (*KZ*) index of constraints (Lamont *et al.* 2001) and the Whited and Wu (*WW*) index of constraints (Whited & Wu 2006). *OREC* is the ratio of other receivables scaled by total assets. *Blockholders* is the percentage of shares controlled by the largest shareholder. *Payout* is a dummy variable that take the value of one if the firm is paying dividends in a given year, and 0 otherwise. *Shareholding_CEO* is a dummy variable that takes the value of one if the firm's CEO is holding shares in his/her own company, and 0 otherwise. *DIF_Blockholders* is a dummy variable that takes the value of one if the firm's blockholder's cash-flow ownership is lower than the controlling ownership in a given year, and 0 otherwise. *SOEs* is a dummy variable, that takes the value of 1 if the firm is state-owned in a given year, and 0 otherwise. For the last four dummy variables (*Payout, Shareholding_CEO, DIF_Blockholders, SOEs*) we present the percentage of firms that take value of one in the sample. All variables (with the exception of the dummies) are deflated using a GDP deflator. *Diff. Mean and Diff. Medium* are the *p*-values associated with the t-test and the Wilcoxon rank-sum test for equality of means and equality of medians of corresponding variables between bidders and non-bidders. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4.3
Predicting bidders using a Probit model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Xcash	0.596***	0.596***	0.568***	0.561***	0.580***		
	(2.86)	(2.86)	(2.74)	(2.71)	(2.78)		
*Xcash*Tunneling*						1.390***	0.631*
						(3.46)	(1.75)
Xcash(1-Tunneling)*						0.268	0.074
						(1.08)	(0.20)
Return	0.070***	0.071**			0.067***	0.066***	0.061**
	(3.62)	(2.30)			(3.45)	(3.41)	(2.55)
Tobin	0.002	0.003	0.009	0.021	0.011	0.011	0.010
	(0.13)	(0.13)	(0.50)	(1.13)	(0.57)	(0.56)	(0.41)
*Return*Tobin*		-0.000					
		(-0.05)					
ROA			0.453**	1.393***	1.239***	1.247***	0.943**
			(2.07)	(4.05)	(3.58)	(3.60)	(2.32)
*ROA*Tobin*				-0.375***	-0.361***	-0.365***	-0.216
				(-3.64)	(-3.49)	(-3.53)	(-1.62)
Sales growth	-0.008	-0.008	-0.006	-0.010	-0.019	-0.020	-0.014
	(-0.33)	(-0.33)	(-0.24)	(-0.42)	(-0.76)	(-0.80)	(-0.46)
NWC	0.098	0.099	0.038	0.063	0.098	0.094	0.105
	(1.18)	(1.19)	(0.47)	(0.76)	(1.15)	(1.10)	(1.04)
Leverage	0.098	0.098	0.132	0.155	0.167	0.155	0.217
	(0.84)	(0.84)	(1.11)	(1.30)	(1.39)	(1.29)	(1.51)
PE	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.29)	(-0.29)	(-0.35)	(-0.35)	(-0.32)	(-0.32)	(-0.82)
Size	0.200***	0.200***	0.189***	0.191***	0.196***	0.195***	0.184***
	(10.60)	(10.59)	(9.96)	(10.05)	(10.21)	(10.14)	(8.19)

Shareholding_CEO	-0.125***	-0.125***	-0.130***	-0.132***	-0.129***	-0.130***	-0.127***
	(-3.53)	(-3.53)	(-3.67)	(-3.71)	(-3.63)	(-3.65)	(-2.97)
Blockholders	-0.478***	-0.478***	-0.470***	-0.484***	-0.500***	-0.503***	-0.528***
	(-4.25)	(-4.25)	(-4.18)	(-4.30)	(-4.44)	(-4.46)	(-3.93)
SOEs	-0.145***	-0.145***	-0.139***	-0.137***	-0.141***	-0.142***	-0.195***
	(-3.80)	(-3.80)	(-3.64)	(-3.58)	(-3.68)	(-3.71)	(-4.37)
N	14,593	14,593	14,629	14,629	14,593	14,593	9,204
P	0.13	0.13	0.13	0.13	0.13	0.13	0.15
chi2	873.68	873.68	862.47	872.41	884.36	889.15	349.30

Notes: The specifications were estimated using the random-effects panel Probit estimator. The dependent variable in all regressions is equal to one if the firm announces a bid in year t+1, and zero otherwise. *Xcash* is the unexpected (excess) cash holdings predicted by the OPSW model estimated with the fixed effects estimator. *Return* is the annual stock returns. *Tobin (Q)* is the market-to-book ratio. *ROA* is return on assets. *Sales growth* is the annual rate of growth of real sales. *NWC* is the ratio of net working capital (working capital minus cash holdings) to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *PE* is the price-to-earnings ratio. *Size* is the natural logarithm of total assets. *Shareholding_CEO* is a dummy variable that takes the value of 1 if the firm's CEO is holding shares in his/her own company, and 0 otherwise. *Blockholders* is the percentage of shares controlled by the largest shareholder. *SOEs* is a dummy variable, that takes the value of 1 if the firm is state-owned in a given year, and 0 otherwise. *Tunneling* is a dummy variable that takes the value of 1 if the firm is more likely to tunnel, and 0 otherwise. In column 6, we consider a firm subject to tunneling if its ratio of other receivables scaled by total assets lies in the top three deciles of the distribution of the corresponding values of all firms belonging to the same industry each year, and 0 otherwise. In column 7, we consider a firm subject to tunneling if its blockholder's cash-flow ownership is lower than the controlling ownership in a given year, and 0 otherwise. Time, industry and province dummies were included in all specifications. ρ represents the proportion of the total error variance accounted for by unobserved heterogeneity. The *Z*-statistics are in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4.4
Excess cash and tunneling

Constraints criteria	Low-Xcash	High-Xcash	Diff. Mean	Dif. Medum
OREC				
High_Tunneling	14.7%	19.0%	0.00***	0.00***
Low_Tunneling	15.9%	16.2%	0.65	0.65
DIF_Blockholders				
High_Tunneling	20.1%	22.4%	0.06*	0.06*
Low_Tunneling	17.9%	18.3%	0.73	0.73

Notes: The table presents the average proportion of bidders between high and low *Xcash* groups. *Xcash* is the unexpected (excess) cash holdings predicted by the OPSW model estimated with the fixed effects estimator. A firm is considered to be in the high (low) *Xcash* group in a given year if its *Xcash* is above (below) zero. *High_Tunneling* (*Low_Tunneling*) are dummy variables, equal to 1 if the firm is more (less) likely to tunnel, and 0 otherwise. According to the first criterion, we consider a firm subject to tunneling if its ratio of other receivables scaled by total assets lies in the top three deciles of the distribution of the corresponding values of all firms belonging to the same industry each year. The remaining firm-years will be classified as less likely to tunnel. According to the second criterion, we consider a firm subject to tunneling if its blockholder's cash-flow ownership is lower than the controlling ownership in a given year. The remaining firm-years will be classified as less likely to tunnel. *Diff. Mean* and *Diff. Medium* are the *p*-values associated with the t-test and the Wilcoxon rank-sum test for equality of means and equality of medians of the average proportion of cash payment between high and low *Xcash* groups. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4.5
Determinants of the method of payment taking financial constraints into consideration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Probit	Oprobit	Probit	Oprobit	Oprobit	Oprobit	Oprobit	Oprobit	Oprobit
					Total Assets	No. of Employees	KZ	WW	Dividend Paying
Tobin	-0.097**	-0.067*	-0.094**	-0.076*					
	(-2.35)	(-1.79)	(-2.20)	(-1.91)					
*High_FC*Tobin*					-0.126***	-0.110**	-0.088*	-0.128***	-0.099**
					(-2.84)	(-2.44)	(-1.96)	(-2.69)	(-2.21)
*Low_FC*Tobin*					-0.028	-0.061	-0.070	-0.043	-0.058
					(-0.58)	(-1.44)	(-1.64)	(-0.95)	(-1.35)
Cash	-0.350	-0.270	-0.391	-0.388	-0.501	-0.380	-0.484	-0.510	-0.446
	(-0.88)	(-0.73)	(-0.94)	(-1.02)	(-1.30)	(-0.98)	(-1.25)	(-1.30)	(-1.16)
CF	0.955	1.288**	1.002	1.327**	1.011*	1.281**	1.311**	0.902	1.156**
	(1.55)	(2.47)	(1.56)	(2.51)	(1.86)	(2.40)	(2.45)	(1.59)	(2.11)
Leverage	-0.409	-0.284	-0.390	-0.296	-0.384	-0.340	-0.280	-0.351	-0.308
	(-1.59)	(-1.22)	(-1.43)	(-1.20)	(-1.53)	(-1.35)	(-1.12)	(-1.42)	(-1.26)
Size	0.025	0.055	0.031	0.049	-0.033	0.021	0.038	-0.025	0.022
	(0.63)	(1.42)	(0.29)	(0.50)	(-0.32)	(0.21)	(0.39)	(-0.24)	(0.21)
Collateral	-0.232	-0.216	-0.246	-0.235	-0.188	-0.187	-0.232	-0.190	-0.223
	(-0.90)	(-0.91)	(-0.95)	(-0.99)	(-0.79)	(-0.78)	(-0.97)	(-0.80)	(-0.94)
Blockholders	0.071	-0.031	0.061	-0.010	0.121	-0.079	-0.045	0.113	0.023
	(0.31)	(-0.14)	(0.18)	(-0.03)	(0.38)	(-0.25)	(-0.14)	(0.35)	(0.07)
Runup_stock	-0.010	-0.001	-0.002	0.011	0.010	0.037	0.012	0.011	0.011
	(-0.09)	(-0.01)	(-0.02)	(0.11)	(0.10)	(0.34)	(0.11)	(0.10)	(0.11)
Sigma_stock	-0.569	2.639	0.457	4.783	4.669	5.599	5.304	4.475	5.052
	(-0.10)	(0.41)	(0.07)	(0.75)	(0.73)	(0.85)	(0.82)	(0.70)	(0.79)
Runup_market	-0.138	-0.181	-0.121	-0.181	-0.174	-0.203	-0.172	-0.180	-0.180
	(-0.79)	(-1.08)	(-0.69)	(-1.07)	(-1.03)	(-1.19)	(-1.02)	(-1.07)	(-1.07)

Shareholding_CEO	0.037	0.033	0.030	0.044	0.062	0.029	0.047	0.067	0.052
	(0.46)	(0.45)	(0.29)	(0.46)	(0.64)	(0.30)	(0.49)	(0.70)	(0.54)
SOEs	-0.206***	-0.176**	-0.214**	-0.179*	-0.150	-0.185*	-0.177*	-0.147	-0.166*
	(-2.62)	(-2.41)	(-2.02)	(-1.86)	(-1.54)	(-1.89)	(-1.84)	(-1.51)	(-1.71)
Experienced	0.311**	0.308**	0.297**	0.296**	0.313**	0.325**	0.301**	0.301**	0.299**
	(2.54)	(2.52)	(2.44)	(2.43)	(2.56)	(2.54)	(2.46)	(2.46)	(2.45)
Public_deals	-0.745***	-0.645***	-0.735***	-0.636***	-0.630***	-0.625***	-0.626***	-0.637***	-0.637***
	(-3.19)	(-3.11)	(-3.14)	(-3.02)	(-2.99)	(-2.93)	(-2.94)	(-3.03)	(-3.02)
Size_ratio	-1.545***	-1.364***	-1.509***	-1.429***	-1.422***	-1.460***	-1.494***	-1.411***	-1.425***
	(-3.90)	(-7.08)	(-3.86)	(-6.98)	(-7.00)	(-6.74)	(-6.83)	(-6.94)	(-6.97)
Unfriendly	0.244***	0.229***	0.242***	0.226***	0.229***	0.243***	0.223***	0.227***	0.226***
	(2.90)	(2.88)	(2.86)	(2.82)	(2.85)	(3.00)	(2.77)	(2.83)	(2.82)
Diversifying	-0.111	-0.043	-0.106	-0.049	-0.047	-0.058	-0.042	-0.046	-0.047
	(-1.60)	(-0.63)	(-1.53)	(-0.72)	(-0.70)	(-0.85)	(-0.62)	(-0.68)	(-0.70)
Completed	-0.080	-0.100	-0.086	-0.108	-0.105	-0.131*	-0.119	-0.105	-0.106
	(-1.05)	(-1.37)	(-1.12)	(-1.47)	(-1.42)	(-1.75)	(-1.61)	(-1.42)	(-1.44)
Inverse Mills Ratio			0.048	-0.026	-0.274	-0.035	-0.054	-0.312	-0.145
			(0.08)	(-0.05)	(-0.48)	(-0.06)	(-0.10)	(-0.54)	(-0.25)
N	1,658	1,659	1,645	1,646	1,646	1,607	1,641	1,646	1,646
Pseudo R2	0.12	0.12	0.122	0.12	0.12	0.12	0.12	0.12	0.12
chi2	210.66	1487.78	210.94	844.01	857.34	1476.50	1487.22	855.18	847.71

Notes: The specifications in columns 1 and 3 were estimated using the pooled Probit estimator. The dependent variable is one if the deal was financed only by cash in year t+1, and zero otherwise. The rest of the specifications were estimated using the ordered Probit estimator. The dependent variable take a value of 1 for all stock deals, 2 for mixed deals, 3 for all cash deals in year t+1. *Tobin (Q)* is the market-to-book ratio. *Cash* is the ratio of the sum of cash and cash equivalents to total assets. *CF* is the ratio of the sum of net profit and depreciation to total assets. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *Size* is the natural logarithm of total assets. *Collateral* is the ratio of tangible assets to total assets. *Blockholders* is the percentage of shares controlled by the largest shareholder. *Runup_stock* is the cumulative daily stork price returns of the bidder over the period beginning 205 days and ending 6 days prior to the announcement date. *Sigma_stock* is the standard deviation of bidding firms' daily returns over the period beginning 205 days and ending 6 days prior to the announcement date. *Runup_market* is the cumulative daily Shanghai and Shenzhen value-weighted stock returns over the period beginning 205 days and ending 6 days prior to the deal announcement. *Shareholding_CEO* is a dummy variable that takes the value of 1 if the firm's CEO is holding shares in his/her own company, and 0 otherwise. *SOEs* is a dummy variable, that takes the value of 1 if the firm is state-owned in a given year, and 0 otherwise. *Experienced* is a dummy variable, which takes the value of 1 if the bidder had announced at least 3 takeover bids over the five years period prior to the deal announcement, and 0 otherwise. *Public_deals* is a dummy variable, which takes the value of 1 if the target is a listed firm, and 0 otherwise. *Size_ratio* is the ratio of transaction value divided by the bidder's market value 4 weeks prior to the announcement. *Unfriendly* is a dummy variable, which takes the value of 1 if the deal is not defined as friendly by Thomson Financial SDC, and 0 otherwise. *Diversifying* is a dummy variable, which takes the value of 1 if the bidder was not in the same industry as the target as measured using the bidder's and the target's first 2-digits of primary SIC code. *Completed* is a dummy variable, which takes the value of 1 if the transactions were completed, and 0 otherwise. In columns 5 to 9, we includes an interaction term between *Tobin's Q* and the dummy variable, which partition firms into groups with relatively high and low levels of financial constraints (*High_FC*, and *Low_FC)*. Specifically, in columns 5 and 6, we consider a firm to be financially constrained (unconstrained) if its size (measured by total assets or number or employees) lies in the bottom three deciles (the top seven deciles) of the distribution of the corresponding values of all firms belonging to the same industry each year. In columns 7 and 8, we consider a firm to be financially constrained (unconstrained) if its *KZ* or *WW* index falls in the top three deciles (the bottom seven deciles) of the distribution of the corresponding values of all firms belonging to the same industry each year. In columns 9, we categorize firm-years according to their dividend payout status. In particular, we consider a firm to be financially constrained (unconstrained) if it is not paying (paying) dividends in a given year. The *Z*-statistics (in parentheses) are based on standard errors, which are corrected for clustering. Time, industry and province dummies were included in all specifications. Apart from column 1 and 2, we use the Heckman's two-stage approach by introducing *Inverse Mills Ratio* into each regression to take account of the self-selection bias. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively

Table 4.6
Choice of the method of payment taking growth opportunities (Tobin's *Q*) and financial constraints into account

Constraints criterion	Low *Q*	High *Q*	Dif. Mean	Dif. Medium
Size (Real assets)				
High_FC	51.6%	46.5%	0.31	0.31
Low_FC	62.7%	62.7%	0.99	0.99
Size (Employees)				
High_FC	59.0%	50.0%	0.03**	0.03**
Low_FC	62.8%	60.1%	0.26	0.26
KZ				
High_FC	56.3%	47.7%	0.02**	0.02**
Low_FC	64.2%	60.2%	0.08*	0.08*
WW				
High_FC	48.6%	45.7%	0.53	0.53
Low_FC	63.7%	62.9%	0.71	0.71
Payout				
High_FC	58.5%	49.5%	0.00***	0.00***
Low_FC	63.8%	63.1%	0.79	0.79

Notes: The table presents the average proportion of cash payment between high and low *Q* groups for the groups based on different levels of financial constraints. A firm is considered to be in the high (Low) *Q* group in a given year if its *Tobin's Q* lies above (below) the median value in the industry to which the firm belongs. *High_FC, and Low_FC,* which are dummy variables, equal to 1 respectively if the firm is more likely to face high and low financial constraints relatively to all firms operating in the same industry they belong to in a given year, and 0 otherwise. With the first two criteria, we consider a firm to be financially constrained if its *size* (measured by total assets or number or employees*)* lies in the bottom three deciles of the distribution of the corresponding values of all firms belonging to the same industry each year. The remaining firm-years will be classified as facing a low level of financial constraints. For the *KZ* and *WW* indexes, we consider a firm to be financially constrained if its *KZ* or *WW* index lies in the top three deciles of the distribution of the corresponding variables for all firms belonging to the same industry in a given year. Again, the remaining firm-years will classified as facing low financial constraints. For the last criterion (*Payout*), we partition firms according to their dividend payout status, which equals 1 if the firm is paying dividends in a given year, and 0 otherwise. *Dif. Mean and Dif. Medium* is the *p*-value associated with the t-test and the Wilcoxon rank-sum test for equality of means and equality of medians of the average proportion of cash payment between high and low *Q* groups. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4.7
Cumulative abnormal returns by methods of payment between January 1998 and December 2011

	Stock only	Mixed PYMT	Cash only	All Bidders	Dif. Mean	Dif. Medium
CAR3	8.87%***	0.94%***	0.65%***	1.21%***		
P-Value	(0.000)	(0.000)	(0.000)	(0.000)	0.00***	0.00***
N	115	669	1,249	2,033		
CAR5	10.76%***	1.25%***	0.62%***	1.40%***		
P-Value	(0.000)	(0.000)	(0.002)	(0.000)	0.00***	0.00***
N	115	669	1,249	2,033		

Notes: Cumulative abnormal returns are calculated using the market model with parameters estimated over the period beginning 240 days and ending 41 days prior to the deal announcement for different day event windows around the announcement (day 0). *CAR3* and *CAR5* are the cumulative abnormal returns in the 3-day (-1, +1) and 5-day (-2, +2) event windows, respectively, where 0 is the announcement. *Stock Only* includes deals that were financed only by stock. *Cash Only* includes deals that were financed only by cash. *Mixed PYMT* consists in the deals whose payments were not solely completely through stock or cash. *Diff. Mean* and *Diff. Medium* are the *p*-values associated with the t-test and the Wilcoxon rank-sum test for equality of means and equality of medians of the cumulative abnormal returns between cash and stock acquisitions. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4.8
Short-run cumulative abnormal returns of bidders

	(1) CAR5	(2) CAR3	(3) CAR5	(4) CAR3
Payment_cash	-0.010**	-0.007**	-0.010**	-0.007**
	(-2.29)	(-2.06)	(-2.25)	(-2.01)
ΔCash	0.051**	0.037*	0.133**	0.103**
	(2.01)	(1.84)	(2.57)	(2.51)
Cash			0.024	0.037*
			(0.86)	(1.70)
ΔCash Cash*			-0.401*	-0.360**
			(-1.96)	(-2.05)
Tobin	0.003	0.002	0.004	0.002
	(1.02)	(0.66)	(1.12)	(0.85)
CF	-0.102**	-0.066**	-0.114***	-0.077**
	(-2.47)	(-2.19)	(-2.76)	(-2.57)
Leverage	-0.001	-0.001	-0.001	0.002
	(-0.09)	(-0.04)	(-0.04)	(0.15)
Size	0.000	-0.002	-0.000	-0.001
	(0.01)	(-0.56)	(-0.04)	(-0.47)
Collateral	0.014	-0.000	0.018	0.007
	(0.99)	(-0.01)	(1.28)	(0.62)
Blockholders	0.012	0.006	0.013	0.006
	(0.84)	(0.53)	(0.87)	(0.51)
Runup_stock	-0.021***	-0.011*	-0.020***	-0.011*
	(-2.63)	(-1.93)	(-2.60)	(-1.84)
Sigma_stock	-0.460	-0.190	-0.458	-0.173
	(-1.20)	(-0.63)	(-1.19)	(-0.57)
Runup_market	0.010	0.005	0.009	0.005
	(0.90)	(0.59)	(0.85)	(0.58)
Shareholding_CEO	-0.000	-0.001	-0.001	-0.002
	(-0.11)	(-0.33)	(-0.21)	(-0.44)
SOEs	-0.012**	-0.008**	-0.012**	-0.008**
	(-2.35)	(-2.05)	(-2.40)	(-2.16)
Experienced	-0.014**	-0.006	-0.014**	-0.006
	(-2.12)	(-1.10)	(-2.11)	(-1.10)
Public_deals	0.019	0.018	0.014	0.017
	(0.97)	(1.24)	(0.72)	(1.16)
Size_ratio	0.074***	0.050***	0.075***	0.051***
	(4.50)	(4.02)	(4.55)	(4.09)
Unfriendly	0.001	0.001	0.001	0.002
	(0.25)	(0.40)	(0.24)	(0.51)
Diversifying	0.001	-0.002	0.001	-0.002
	(0.34)	(-0.49)	(0.23)	(-0.54)
Completed	0.011**	0.011***	0.011**	0.011***
	(2.30)	(2.94)	(2.31)	(2.99)
Inverse Mills Ratio	0.004	-0.001	0.004	0.001
	(0.21)	(-0.05)	(0.22)	(0.10)
N	1,646	1,646	1,646	1,646
Adjusted R2	0.11	0.09	0.11	0.09
F-value	3.32	3.05	3.32	3.06

Notes: The table presents results of the cross-sectional OLS regressions for the cumulative abnormal returns in the 3-days (columns 2 and 4) and 5-days event (columns 1 and 3) window. The dependent variable are cumulative abnormal returns, which are calculated using the market model with the market model parameters estimated over the period beginning 240 days and ending 41 days prior to the deal announcement for different day event windows around the announcement (day 0). *Payment_cash* is a dummy variable that take the value of one if the deal was financed mainly through cash (>50%), and 0 otherwise. *Cash* is the ratio of the sum of cash and cash equivalents to total assets. *ΔCash* is the ratio of the annual change in *Cash* to total assets. *Tobin (Q)* is the market-to-book ratio. *Leverage* is the ratio of the sum of short- and long-term debt to total assets. *Size* is the natural logarithm of total assets. *Collateral* is the ratio of tangible assets to total assets. *Blockholders* is the percentage of shares controlled by the largest shareholder. *Runup_stock* is cumulative daily stock price returns of the bidder over the period beginning 205 days and ending 6 days prior to the announcement date. *Sigma_stock* is the standard deviation of bidding firms' daily returns over the period beginning 205 days and ending 6 days prior to the announcement date. *Runup_market* is the cumulative daily Shanghai and Shenzhen value-weighted stock returns over the period beginning 205 days and ending 6 days prior to the deal announcement. *Shareholding_CEO* is a dummy variable that takes the value of 1 if the firm's CEO is holding shares in his/her own company, and 0 otherwise. *SOEs* is a dummy variable, that takes the value of 1 if the firm is state-owned in a given year, and 0 otherwise. *Experienced* is a dummy variable, which takes the value of 1 if the bidder had announced at least 3 takeover bids over the five years period prior to the deal announcement, and 0 otherwise. *Public_deals* is a dummy variable, which takes the value of 1 if the target is a listed firm, and 0 otherwise. *Size_ratio* is the ratio of transaction value divided by the bidder's market value 4 weeks prior to the announcement. *Unfriendly* is a dummy variable, which takes the value of 1 if the deal is not defined as friendly by Thomson Financial SDC, and 0 otherwise. *Diversifying* is a dummy variable, which takes the value of 1 if the bidder was not in the same industry as the target as measured using the bidder's and the target's first 2-digits of primary SIC code. *Completed* is a dummy variable, which takes the value of 1 if the transactions were completed, and 0 otherwise. For all specifications, we use the Heckman's two-stage approach by introducing *Inverse Mills Ratio* into each regression to take account of the self-selection bias. The *t*-statistics (in parentheses) are based on standard errors, which are asymptotically robust to heteroscedasticity. Time dummies and industry dummies were included in all specifications. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4.9
Changes in industry-adjusted operating performance

Panel A: (*industry-adjusted ROA*, control group of firms based on industry)

Adjusted-ROA	Stock Only			Mixed PYMT			Cash Only			All Bidders		
Year	mean	median	N	mean	median	N	mean	median	N	mean	median	N
Year (-2)	-0.026	0.016	223	0.027	0.028	764	0.033	0.034	1,425	0.026	0.031	2,412
Year (-1)	0.005	0.020	210	0.026	0.030	791	0.037	0.036	1,455	0.031	0.033	2,456
Year (0)	0.005	0.024	187	0.027	0.029	731	0.034	0.033	1,292	0.029	0.031	2,210
Year (1)	0.029	0.033	158	0.023	0.030	630	0.027	0.032	1,119	0.026	0.031	1,907
Year (2)	0.040	0.036	109	0.024	0.030	564	0.025	0.030	926	0.026	0.030	1,599
D(-1/2)	0.035	0.015		-0.001	0.000		-0.012	-0.006		-0.005	-0.003	
t-test/Sign-ranks	0.04**	0.06*		0.86	0.23		0.00***	0.00***		0.12	0.00***	

Panel B: (*industry-adjusted CF*, control group of firms based on industry)

Adjusted-CF	Stock Only			Mixed PYMT			Cash Only			All Bidders		
Year	mean	median	N	mean	median	N	mean	median	N	mean	median	N
Year (-2)	-0.052	-0.013	221	-0.003	0.000	760	0.003	0.003	1,415	-0.004	0.001	2,396
Year (-1)	-0.027	-0.008	207	-0.006	0.001	781	0.005	0.004	1,446	-0.002	0.002	2,434
Year (0)	-0.027	-0.008	185	-0.005	0.001	726	0.002	0.002	1,283	-0.003	0.001	2,194
Year(1)	-0.007	-0.003	156	-0.007	0.001	630	-0.004	0.000	1,111	-0.005	0.001	1,897
Year (2)	-0.002	-0.003	107	-0.007	0.000	561	-0.006	0.000	921	-0.006	0.000	1,589
D(-1/2)	0.025	0.004		-0.001	-0.001		-0.011	-0.004		-0.005	-0.002	
t-test/Sign-ranks	0.12	0.22		0.67	0.12		0.00***	0.00***		0.06***	0.00***	

Panel C: (*performance-adjusted ROA*, control group of firms based on size and cash levels)

Adjusted-ROA	Stock Only			Mixed PYMT			Cash Only			All Bidders		
Year	mean	median	N	mean	median	N	mean	median	N	mean	median	N
Year (-2)	-0.048	-0.007	223	-0.002	0.000	764	0.003	0.002	1425	-0.003	0.000	2412
Year (-1)	-0.024	-0.01	210	-0.005	0.000	791	0.005	0.003	1455	0.000	0.001	2456
Year (0)	-0.024	-0.006	187	-0.004	0.000	731	0.002	0.001	1292	-0.002	0.000	2210

Year (1)	-0.002	0.003	158	-0.006	0.001	630	-0.004	0.000	1119	-0.004	0.000	1907
Year (2)	0.007	0.003	109	-0.005	0.000	564	-0.006	-0.001	926	-0.005	0.000	1599
D(-1/2)	0.031	0.013		0.000	0.000		-0.011	-0.004		-0.005	-0.001	
t-test/Sign-ranks	0.06*	0.08*		0.92	0.42		0.00***	0.00***		0.17	0.00***	

Panel D: (*performance-adjusted CF,* control group of firms based on size and cash levels)

Adjusted-CF		Stock Only			Mixed PYMT				Cash Only		All Bidders	
Year	mean	median	N	mean	Year	mean	median	N	mean	Year	mean	median
Year (-2)	-0.044	-0.008	221	0.000	0.000	760	0.004	0.000	1415	-0.002	0.000	2396
Year (-1)	-0.022	-0.009	207	-0.003	0.000	781	0.005	0.002	1446	0.000	0.000	2434
Year (0)	-0.023	-0.01	185	-0.003	0.000	726	0.003	0.000	1283	-0.001	0.000	2194
Year (1)	-0.004	0.000	156	-0.005	0.000	630	-0.003	-0.001	1111	-0.003	0.000	1897
Year (2)	0.001	-0.003	107	-0.004	0.000	561	-0.005	-0.002	921	-0.004	-0.001	1589
D(-1/2)	0.023	0.006		-0.001	0.000		-0.010	-0.004		-0.004	-0.001	
t-test/Sign-ranks	0.12	0.24		0.68	0.09*		0.00***	0.00***		0.00***	0.00***	

Notes: The table presents annual mean and median values of adjusted return-on-assets (*adjusted-ROA*) in panels A and C and adjusted cash flow (*adjusted-CF*) in panels B and D, from year -2 to year +2 relative to the year of acquisition. In Panels A and B, adjusted operating performance (*industry-adjusted ROA or CF*) is measured by the difference between a firm's *ROA* (*CF*) and that of the median firm in the industry in a given year. In Panels C and D, adjusted operating performance (*performance-adjusted ROA or CF*) is constructed by subtracting the benchmark performance (the median performance of the firms in the same portfolio) from the firm's operating performance in each year, where the benchmark performance is constructed as 25 portfolios on the basis of size (total assets) interacted with the cash ratio (Fama & French 1993). D (-1/2) is the change of adjusted operating performance from year -1 to year +2. We provide the t-test and the Wilcoxon signed-ranks test for differences in means and medians of adjusted operating performance from year -1 to year +2. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4.10
Regressions of industry-adjusted operating performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Stock Only		Mixed PYMT		Cash Only		All Bidders	
Panel A: (*industry-adjusted ROA*, control group of firms based on industry)								
	ROA_1Y	ROA_2Y	ROA_1Y	ROA_2Y	ROA_1Y	ROA_2Y	ROA_1Y	ROA_2Y
Intercept	-0.002	0.011	-0.008**	-0.013**	-0.005**	-0.014***	-0.005***	-0.010***
	(-0.23)	-0.9	(-2.44)	(-2.41)	(-2.44)	(-3.31)	(-2.88)	(-3.19)
Premerger_ROA	0.01	0.028	0.202**	0.273***	0.303***	0.386***	0.191***	0.255***
	-0.12	-0.32	-2.34	-3.92	-5.52	-6.32	-4.48	-5.84
N	152	102	579	474	1,063	829	1,794	1,405
Adjusted R^2	-0.01	-0.01	0.03	0.06	0.06	0.10	0.03	0.06
F-value	0.01	0.10	5.47	15.33	30.46	39.96	20.06	34.08
Panel B: (*industry-adjusted CF*, control group of firms based on industry)								
	CF_1Y	CF_2Y	CF_1Y	CF_2Y	CF_1Y	CF_2Y	CF_1Y	CF_2Y
Intercept	-0.003	0.001	-0.007**	-0.014**	-0.005**	-0.014***	-0.005***	-0.011***
	(-0.44)	-0.07	(-2.38)	(-2.49)	(-2.58)	(-3.34)	(-3.01)	(-3.40)
Pre-merger_CF	0.008	0.016	0.235***	0.312***	0.337***	0.419***	0.220***	0.294***
	-0.09	-0.18	-2.72	-4.36	-6.12	-7.36	-5.16	-6.92
N	148	96	571	467	1,051	817	1,770	1,380
Adjusted R^2	-0.01	-0.01	0.05	0.08	0.09	0.14	0.05	0.08
F-value	0.01	0.03	7.40	19.05	37.49	54.10	26.59	47.90
Panel C: (*performance-adjusted ROA* control group of firms based on size and cash level)								
	ROA_1Y	ROA_2Y	ROA_1Y	ROA_2Y	ROA_1Y	ROA_2Y	ROA_1Y	ROA_2Y
Intercept	0.001	0.014	-0.006**	-0.012**	-0.005**	-0.014***	-0.004***	-0.010***
	-0.22	-1.27	(-2.10)	(-2.18)	(-2.55)	(-3.63)	(-2.68)	(-3.23)
Pre-merger_ROA	0.006	0.003	0.179**	0.233***	0.272***	0.367***	0.171***	0.228***
	-0.08	-0.04	-2.19	-3.38	-4.65	-5.49	-4.12	-5.16
N	152	102	579	474	1,063	829	1,794	1,405

Adjusted R^2	-0.01	-0.01	0.03	0.05	0.05	0.09	0.03	0.05
F-value	0.01	0.00	4.80	11.44	21.66	30.16	16.94	26.67
Panel D: (*performance-adjusted CF*, control group of firms based on size and cash level)								
	CF_1Y	CF_2Y	CF_1Y	CF_2Y	CF_1Y	CF_2Y	CF_1Y	CF_2Y
Intercept	0	0.007	-0.005*	-0.012**	-0.005**	-0.013***	-0.004**	-0.009***
	(-0.02)	-0.57	(-1.75)	(-2.14)	(-2.33)	(-3.28)	(-2.33)	(-3.03)
Pre-merger_CF	0.01	0.01	0.233***	0.286***	0.324***	0.417***	0.217***	0.286***
	-0.12	-0.12	-2.82	-4.13	-5.63	-6.79	-5.15	-6.71
N	148	96	571	467	1,051	817	1,770	1,380
Adjusted R2	-0.01	-0.01	0.05	0.07	0.08	0.14	0.05	0.08
F-value	0.01	0.01	7.94	17.02	31.74	46.17	26.51	45.05

Notes: The table presents the results of an OLS regression of the effect of bidding on the adjusted operating performance. The dependent variable is the post-merger adjusted operating performance of the bidder in year +1 (or from year +1 to year+2). Pre-merger performance is the adjusted operating performance of the bidder in year -1 (or from year -2 to year-1). In Panels A and B, adjusted operating performance (*industry-adjusted ROA or CF*) is measured by the difference between a firm's *ROA* (*CF*) and that of the median firm in the industry in a given year. In Panels C and D, adjusted operating performance (*performance-adjusted ROA or CF*) is constructed by subtracting the benchmark performance (the median performance of the firms in the same portfolio) from the firm's operating performance in each year, where the benchmark performance is constructed as 25 portfolios on the basis of size (total assets) interacted with the cash ratio (Fama & French 1993). The *t*-statistics (in parentheses) are based on standard errors, which are asymptotically robust to heteroscedasticity. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

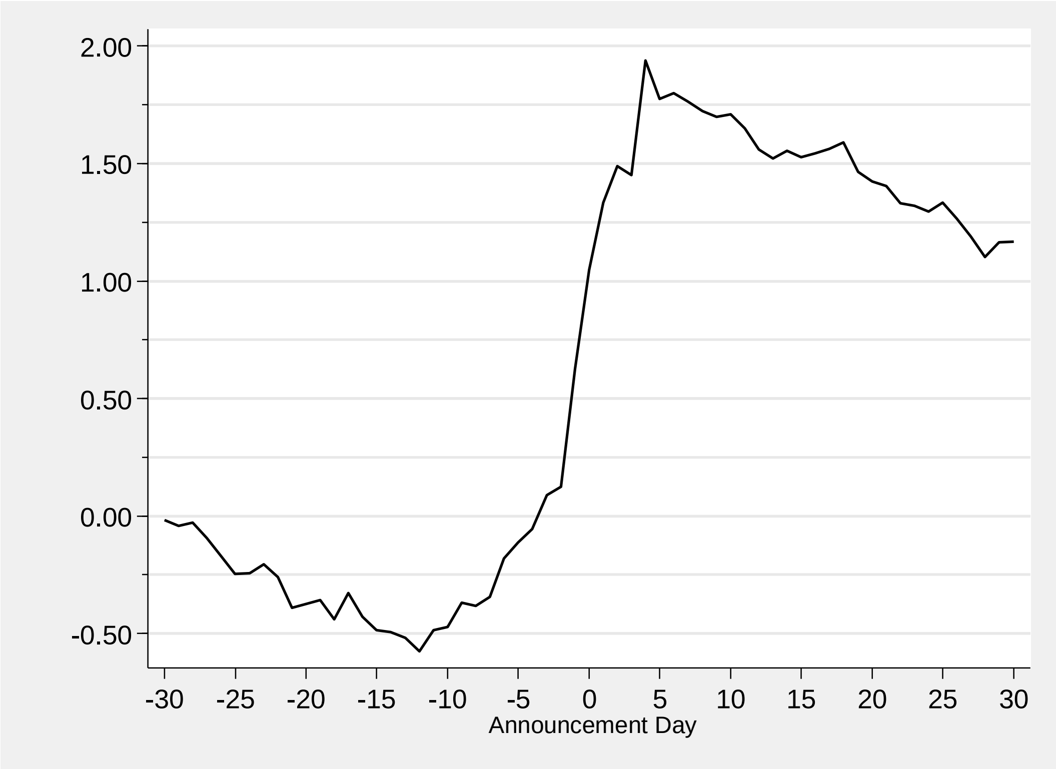

Fig. 4.1 Acquirer cumulative average abnormal return (-30, +30)

This figure shows the average cumulative abnormal return (*CAAR*) for the bidding firms in the (-30, +30) event window between January 1998 and December 2011, where 0 is the announcement. The abnormal returns are calculated as the differences between the realised returns and the market model benchmark returns with the parameters estimated over the period beginning 240 days and ending 41 days prior to the deal announcement.

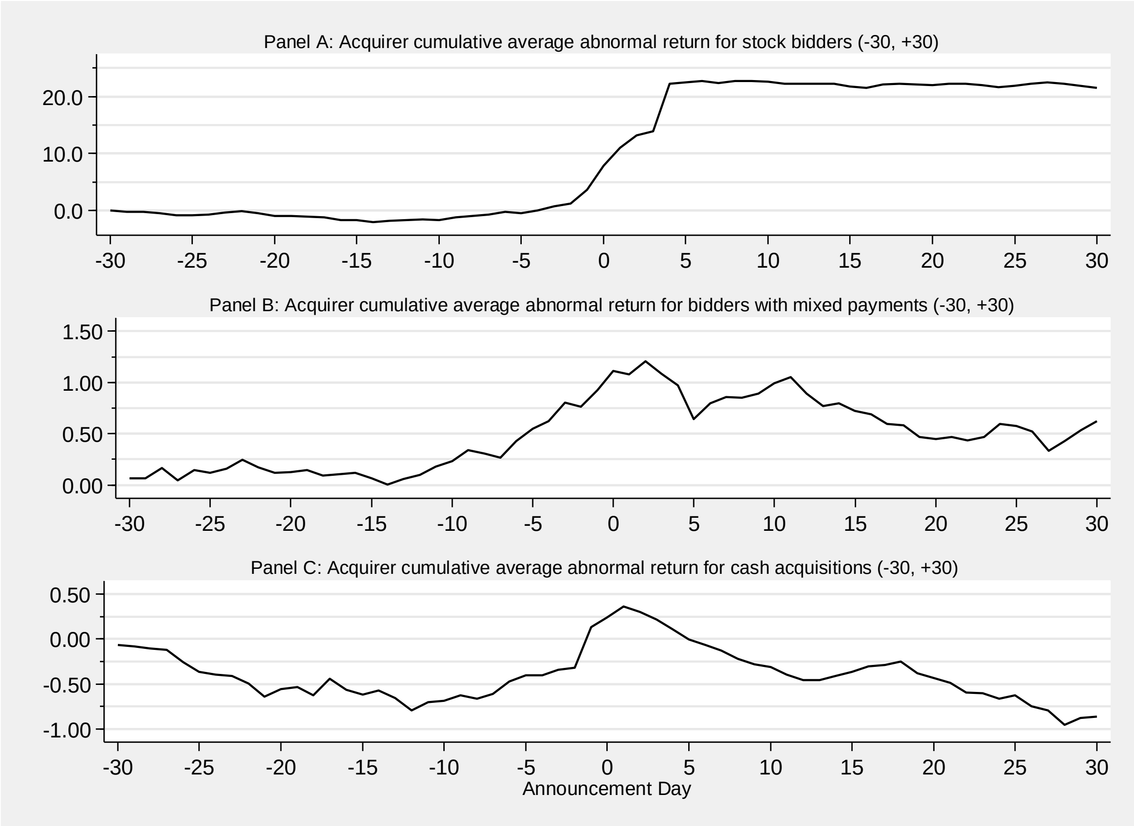

Fig. 4.2 Acquirer cumulative average abnormal returns (-30, +30) across methods of payment

This figure shows the average cumulative abnormal returns (*CAARs*) for the bidding firms in the (-30, +30) event window across methods of payment between January 1998 and December 2011, where 0 is the announcement. The abnormal returns are calculated as the differences between the realised returns and the market model benchmark returns with the parameters estimated over the period beginning 240 days and ending 41 days prior to the deal announcement. Panel A, B and C report the average acquirer cumulative abnormal returns for all stock deals, mixed deals and all cash deals, respectively.

Chapter 5

Conclusions, implications and suggestions for future research

5.1. Summary of main findings

The main objective of this thesis is to investigate the extent to which firms' behavior can be influenced by their financial status. In particular, we focus on listed Chinese firms' fixed capital investment, cash holdings, and acquisition behavior, which represent three key corporate activities. Our study contributes to the related literature in the Chinese context by employing a panel of Chinese listed firms during the period 1998-2011.

5.1.1. Chapter 2

In chapter 2, we study for the first time the extent to which investment inefficiency, which takes the form of under- and over- investment (i.e. abnormal investment) can be induced by financial constraints, agency problems, or a combination of both. Instead of using sensitivities of investment to cash flow, we focus on the relationship between abnormal investment and free cash flow. We find strong evidence of investment being positively and significantly associated with free cash flow for under-investing firms with negative free cash flow. This is consistent with the financing constraints hypothesis. We also find a significantly positive association between investment and free cash flow for over-investing firms with positive free cash flow, which is consistent with the agency costs hypothesis. These findings are important as they enable us to distinguish the financing constraints and agency problems arguments, which are both likely to play an important role in the Chinese context.

We also find a clear declining trend of the sensitivities of under-investment to free cash flow with firm size and their dividend payout ratios. This suggests that various conventional variables like firm size and the dividend payout ratio (policy) can be used to assess the degree of financial constraints faced by Chinese firms. We therefore argue that small firms and firms who cannot pay dividends are more susceptible to capital market imperfections.

We find lower sensitivities of over-investment to free cash flow for firms with managerial ownership and a higher intensity of competition between controlling shareholders. This can be explained by the closely aligned interests between managers and shareholders and the more efficient monitoring of controlling shareholders, which both reduce the agency problems faced by Chinese firms. We also document that the relationship between blockholder ownership and agency costs is not linear, which is probably due to the offsetting effects of incentive alignment and entrenchment.

Furthermore, we find that higher sensitivities of under-investment to free cash flow are observed for firms with “Special Treatment” (“ST”) status. This implies that “ST” firms generally face higher credit constraints, especially once the “ST” status is announced. Moreover, “ST” firms display higher sensitivities of over-investment to free cash flow, suggesting they are also more likely to face higher agency costs. However, after being given “ST” status, under the pressures of being de-listed from the stock exchanges, these firms exhibit significantly reduced agency costs, given by lower sensitivities of over-investment to free cash flow. Additionally, we demonstrate that frequent bidders tend to display higher sensitivities of over-investment to free cash flow, due to higher agency problems related to hubris or entrenchment of managers or controlling shareholders.

We further extend our analysis to look at the effects of ownership structure. We find that non-SOEs appear to be more financially constrained than their state-owned counterparts, probably due to a “crowding out” effect. On the contrary, state-owned firms (and in particular those affiliated with local governments, SOELGs) face higher agency problems, which may be due to less effective management, supervision, and legal enforcement. We also find that Chinese listed companies are able to alleviate their financial constraints by engaging in exporting.

Finally, using a difference-in-differences (DID) method to circumvent endogeneity issues, we find that the 2005 exogenous split share structure reform affected local-government-controlled enterprises (SOELGs) more than other firms, by reducing their agency problems. There is in fact evidence of shrinking sensitivities of over-investment to free cash flow after 2005 for SOELGs.

5.1.2. Chapter 3

In chapter 3, we investigate the extent to which the behavior of corporate cash holdings can be explained by the presence of adjustment costs. We provide support for the trade-off view of cash holdings, according to which Chinese firms tend to actively adjust their cash reserves towards an optimal level. However, given the impact of adjustment costs on cash policy, it is clear that this adjustment is imperfect but continuous. On average, the annual adjustment speed of Chinese firms lies between 0.331 and 0.580. In other words, the typical Chinese listed firm completes half of its required cash adjustment in a period between 1.2 and 2.1 years. This suggests that Chinese firms rebalance their cash holdings more slowly than firms from the West, which is probably due to relatively higher adjustment costs.

Second, we use a dynamic framework to provide insights into the cross-sectional variation in firms' speeds of adjustment. Specifically, when firms face a cash deficit, it takes longer for them to rebalance their cash levels, as they confront higher costs of adjustment. In addition, our results show that firms are able to increase their speeds of cash adjustment by actively managing their cash balances through investment, dividend payments, and debt issuance.

Next, we find that although firms benefit from greater cash balances, the marginal value of cash holdings drops when the level of cash holdings increases. The results in this chapter also suggest that the marginal value of cash is lower for firms making acquisitions in the next year and firms who are controlled by the state. Finally, our results show a stronger association between cash holdings and value for financially constrained firms than unconstrained firms. This implies that additional cash is more valuable for constrained firms, since cash accumulation can prevent them from bypassing value-increasing projects.

5.1.3. Chapter 4

In chapter 4, we investigate the extent to which corporate liquidity conditions affect Chinese firms' takeover engagement, method of payment, and the performance that follows the takeover. We find that cash-richness is an important factor driving acquisitions in the Chinese context. This is consistent with the free cash flow hypothesis (Jensen 1986). Furthermore, our results also show that firms characterized by a high Tobin's *Q* and greater operating performance (*ROA*) appear to be less likely to engage in acquisitions, suggesting that these firms do not rely on external investment like M&As to spend their excess cash. Put together, acquisitions can therefore be seen as a method used by Chinese firms to spend excess cash instead of paying it out to shareholders.

In this chapter, we also find significant sensitivities of engagement in takeover activities to excess cash for firms that are subject to tunneling. This implies that tunneling is likely to amplify free-cash-flow-driven takeovers. Namely, Chinese firms tend to use M&As as a channel to expropriate cash through tunneling.

We further investigate whether liquidity conditions are responsible for the method of payment in acquisitions. We show that firms with greater growth prospects, reflected by a higher Tobin's *Q*, are less likely to use cash payments in acquisitions. This effect tends to be magnified with the level of financial constraints that firms face. We argue that cash is more valuable for constrained bidders, especially those with valuable growth opportunities, which is in line with the opportunity cost of cash hypothesis (Alshwer *et al.* 2011). In addition, capital market imperfections cause firms with higher investment opportunities to hesitate to spend cash in takeover transactions.

Finally, we find that cash acquisitions under-perform in both the short- and long-term. We suggest that given the lower opportunity costs of cash holding, cash acquisitions do not make better use of excess cash, and consequently display worse announcement abnormal returns and operating performance following mergers compared to stock acquisitions. Thus, the underperformance of cash acquisition once again confirms the opportunity cost of cash hypothesis.

5.2. Policy and managerial implications

First of all, the findings in this thesis suggest that financial conditions play a crucial role on Chinese firms' investment, cash holdings, and acquisition behavior. Due to the relatively under-developed financial system, asymmetric information and the "political pecking order"[184], non-SOEs or small firms are more likely to face higher levels of financial constraints than their state-owned counterparts, which may lead to under-investment. Thus, considering that private firms have been the growth engine of China over last 30 years, a more effective capital market including banking, equity finance, intermediation sectors and an effective credit-rating system should be established to allocate financial resources in a more productive or market-based way. Some necessary reforms should be implemented to reduce the degree of political intervention in banks' lending decisions and improve market discipline. In addition, given the greater marginal value of cash shown by small and private firms, our estimates suggest that these firms should be encouraged to hold sufficient cash to offset the negative shocks to the availability of cash flow, bank loans or equity issues through their management of liquidity. This strategy would enable them to avoid the cost premium they would have to pay in the imperfect capital markets. Policies aimed at reducing the costs of liquidity would therefore benefit the economy.

Second, this study suggests that the existing unique concentrated and state-owned ownership structure and weak corporate governance in China lead managers and/or controlling shareholders to over-invest their free cash flow in projects with negative NPV. This effect of free cash flow is more severe for SOEs (especially those affiliated with local

[184] State-owned firms in China are favoured by domestic banks and typically experience soft budget constraints due to social and political reasons. In contrast, given a relatively low political status, Chinese private firms find it difficult to obtain loans from banks. Thus, these firms are more subject to financing constraints than their state-owned counterparts.

governments) and firms with weak corporate governance, e.g. firms characterized by a divergence between voting rights and cash-flow rights, and firms with low levels of managerial ownership, and without competition within large shareholders. The effect is also magnified by the expropriation of minority shareholders (tunneling), which may cause Chinese cash-rich firms to use their excess liquid assets to pursue value-destroying mergers and acquisitions. Therefore, in order to promote firms' investment efficiency, it is important to further reduce state ownership and to decrease the divergence between voting (control) rights and cash flow rights. What is also needed is more transparency in firms' disclosure, especially for administrative transfers and connected transactions; as well as a more effective supervision and monitoring from investors and financial institutions; an improved legal protection for minority shareholders; a more sophisticated regulation of corporate profit distribution; and a more market-based managerial compensation scheme. Last but not least, our study confirms the benefit of some regulations and reforms made by the Chinese government, such as the "special treatment" policy and the split share structure reform.

5.3. Suggestions for future research

In chapter 2, we construct under- and over-investment as in Richardson (2006), simply using an accounting method. One could either attempt to use other economic models to produce estimates of optimal investment, or to incorporate forward looking variables or variables measuring risk in the investment equation. In addition, we use the 2005 split share reform as an exogenous shock to undertake a difference-in-differences (DID) study. We find that SOEs affiliated with local governments (SOELGs) benefit from the reform, as they exhibit a reduction in agency costs. Further research could look at how exactly SOELGs strengthened their corporate governance via the reform.

In chapter 3, we find strong empirical support for cash rebalancing due to adjustment costs. It would be interesting to further examine the effects of cash holdings on fixed investment or firm growth. In addition, there are some relevant questions that we do not address in this chapter. For instance, there are a number of papers suggesting that corporate governance plays an important role in determining cash holdings of western firms (Dittmar *et al.* 2003; Ozkan & Ozkan 2004; Harford *et al.* 2008). A study regarding this issue in the Chinese context may be fruitful. Moreover, our work does not fully explain the reason of the dramatic increase in the average cash holdings of our firms over the sample period. We believe this evolution could be attributed to changes in firm characteristics and their business environment. This is on the agenda for future research.

In chapter 4, we find that there is a relationship between Chinese bidders' corporate liquidity and acquisition. Results can be extended to consider a study of targets. In addition, there has been an increasing trend of acquisitions abroad for Chinese firms. Further research could investigate whether liquidity has a significant influence on Chinese cross-border acquisitions.

Last, this thesis only focuses on Chinese listed firms. However, there is a large difference in firms' investment, financing, governance, and management strategies between listed firms and unlisted firms. Prior studies suggest that unlisted firms may suffer more from liquidity constraints (Allen *et al.* 2005). It is hoped that future research will provide an insight into liquidity management for unlisted firms and enhance our understating of China's growth miracle despite a malfunctioning financial system.

References

Abhyankar, A., Ho, K.-Y., Zhao, H., 2005. Long-run post-merger stock performance of UK acquiring firms: a stochastic dominance perspective. Applied Financial Economics 15, 679 - 690

Acharya, V.V., Almeida, H., Campello, M., 2007. Is cash negative debt? A hedging perspective on corporate financial policies. Journal of Financial Intermediation 16, 515-554

Allen, F., Qian, J., Qian, M., 2005. Law, finance, and economic growth in China. Journal of Financial Economics 77, 57-116

Allen, F., Qian, J., Qian, M., 2007. China' s Financial System: Past, Present, and Future. In L. Brandt and T. G. Rawski (eds.), China's Great Economic Transition, pp. 506–68. Cambridge, UK: Cambridge University Press

Allen, F., Qian, J., Zhang, C., Zhao, M., 2012. China's Financial System: Opportunities and Challenges. National Bureau of Economic Research

Alles, L., Lian, Y., Xu, C., 2012. The Determinants of Target Cash Holdings and Adjustment Speeds: An Empirical Analysis of Chinese Firms. In: 2012 Financial Markets & Corporate Governance Conference

Almeida, H., Campello, M., 2007. Financial constraints, asset tangibility, and corporate investment. Review of Financial Studies 20, 1429-1460

Almeida, H., Campello, M., Weisbach, M.S., 2004. The cash flow sensitivity of cash. Journal of Finance 59, 1777-1804

Alshwer, A., Sibilkov, V., Zaiats, N., 2011. Financial constraints and the method of payment in mergers and acquisitions. Available at SSRN 1364455

Andrade, G., Mitchell, M., Stafford, E., 2001. New Evidence and Perspectives on Mergers. The Journal of Economic Perspectives 15, 103-120

Ang, J.S., Cole, R.A., Lin, J.W., 2000. Agency costs and ownership structure. Journal of Finance 55, 81-106

Arellano, M., Bond, S., 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. Review of Economic Studies 58, 277-297

Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. Journal of Econometrics 68, 29-51

Asquith, P., Bruner, R.F., Mullins Jr, D.W., 1983. The gains to bidding firms from merger. Journal of Financial Economics 11, 121-139

Ayyagari, M., Demirgüç-Kunt, A., Maksimovic, V., 2010. Formal versus Informal Finance: Evidence from China. Review of Financial Studies 23, 3048-3097

Aziz, J., Duenwald, C., 2002. Growth-financial intermediation nexus in China. International Monetary Fund Discussion Paper No. 02/194

Bai, C.-E., Lu, J., Tao, Z., 2006. The Multitask Theory of State Enterprise Reform: Empirical Evidence from China. American Economic Review 96, 353-357

Bai, Y., Chen, S.K., Lin, B.-X., Wu, L., 2008. Firm performance, asset acquisition and the method of controlling rights transfer: Evidence from the Chinese market. International Review of Economics & Finance 17, 138-149

Barber, B.M., Lyon, J.D., 1996. Detecting abnormal operating performance: The empirical power and specification of test statistics. Journal of financial Economics 41, 359-399

Barth, J.R., Tatom, J.A., Yago, G., 2009. China's Emerging Financial Markets: Challenges and Opportunities. Springer.

Bates, T.W., 2005. Asset sales, investment opportunities, and the use of proceeds. Journal of Finance 60, 105-135

Bates, T.W., Kahle, K.M., Stulz, R.M., 2009. Why Do U.S. Firms Hold So Much More Cash than They Used To? The Journal of Finance 64, 1985-2021

Baum, C.F., 2006. An introduction to modern econometrics using Stata. Stata Press, College Station, Texas

Beck, T., DemirgÜÇ-Kunt, A., Maksimovic, V., 2005. Financial and legal constraints to growth: does firm size matter? Journal of Finance 60, 137-177

Beltratti, A., Bortolotti, B., 2007. The nontradable share reform in the Chinese stock market: The role of fundamentals. working paper, Bocconi University

Benito, A., 2005. Financial Pressure, Monetary Policy Effects and Inventories: Firm-level Evidence from a Market-based and a Bank-based Financial System. Economica 72, 201-224

Bergstresser, D., 2006. Discussion of "Overinvestment of free cash flow". Review of Accounting Studies 11, 191-202

Bigelli, M., Sánchez-Vidal, J., 2012. Cash holdings in private firms. Journal of Banking & Finance 36, 26-35

Billett, M.T., Qian, Y., 2008. Are overconfident CEOs born or made? Evidence of self-attribution bias from frequent acquirers. Management Science 54, 1037-1051

Black, E.L., Doukas, A.J., Xing, X., Guo, J., 2013. Gains to Chinese Bidder Firms: Domestic vs. Foreign Acquisitions. European Financial Management 9999, 1-31

Blanchard, O.J., Lopez-de-Silanes, F., Shleifer, A., 1994. What do firms do with cash windfalls? Journal of Financial Economics 36, 337-360

Blinder, A.S., Maccini, L.J., 1991. Taking Stock: A Critical Assessment of Recent Research on Inventories. The Journal of Economic Perspectives 5, 73-96

Bloomberg, 2012. The 2012 M&A outlook. Retrieved from http://about.bloomberg.com/pdf/manda.pdf

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87, 115-143

Blundell, R., Bond, S., Windmeijer, F., 2001. Estimation in dynamic panel data models: improving on the performance of the standard GMM estimator. In Badi H. Baltagi, Thomas B. Fomby, R. Carter Hill (ed.) Nonstationary Panels, Panel Cointegration, and Dynamic Panels (Advances in Econometrics, Volume 15), Emerald Group Publishing Limited, pp.53-91

Boateng, A., Bi, X., 2010. Method of Payment and Long-run Performance of Chinese Domestic Mergers & Acquisitions. Working Paper, University of Nottingham

Bond, S., Cummins, J., 1999. Noisy share prices and the Q model of investment. IFS Working Papers 54

Bond, S., Elston, J.A., Mairesse, J., Mulkay, B., 2003. Financial Factors and Investment in Belgium, France, Germany, and the United Kingdom: A Comparison Using Company Panel Data. Review of Economics and Statistics 85, 153-165

Bond, S., Van Reenen, J., 2007. Microeconometric models of investment and employment. Handbook of econometrics 6, 4417-4498

Bond, S.R., Hoeffler, A., Temple, J., 2001. GMM estimation of empirical growth models. Discussion paper No. 3048. CEPR, London

Born, B., Breitung, J., 2012. Testing for Serial Correlation in Fixed-Effects Panel Data Models. Working Paper

Boyreau-Debray, G., 2003. Financial intermediation and growth: Chinese style. World Bank Policy Research Working Paper No. 3027

Butler, A.W., Cornaggia, J., 2011. Does access to external finance improve productivity? Evidence from a natural experiment. Journal of Financial Economics 99, 184-203

Campa, J.M., Shaver, J.M., 2002a. Exporting and capital investment: On the strategic behavior of exporters. IESE Business School, University of Navarra, Discussion Paper

Campa, J.M., Shaver, J.M., 2002b. Exporting and capital investment: On the strategic behavior of exporters. IESE Business School, University of Navarra, Discussion Paper

Carpenter, J.N., Lu, F., Whitelaw, R.F., 2014. The Real Value of China's Stock Market. New York University, Working Paper

Carpenter, R.E., Fazzari, S.M., Petersen, B.C., 1998. Financing Constraints and Inventory Investment: A Comparative Study with High-Frequency Panel Data. Review of Economics and Statistics 80, 513-519

Carpenter, R.E., Fazzari, S.M., Petersen, B.C., Kashyap, A.K., Friedman, B.M., 1994. Inventory Investment, Internal-Finance Fluctuations, and the Business Cycle. Brookings Papers on Economic Activity 1994, 75-138

Carpenter, R.E., Guariglia, A., 2007. Investment behavior, observable expectations, and internal funds: a comment on Cummins et al. (AER, 2006). Economics Bulletin 5

Carpenter, R.E., Guariglia, A., 2008. Cash flow, investment, and investment opportunities: New tests using UK panel data. Journal of Banking and Finance 32, 1894-1906

Carpenter, R.E., Petersen, B.C., 2002. Is the growth of small firms constrained by internal finance? Review of Economics and statistics 84, 298-309

Chen, G., Firth, M., Xu, L., 2009a. Does the type of ownership control matter? Evidence from China's listed companies. Journal of Banking & Finance 33, 171-181

Chen, H., 2006. Development of financial intermediation and economic growth: The Chinese experience. China Economic Review 17, 347-362

Chen, M., 2008. Financial constraints to the investment of Chinese listed firms across firm characteristics. Unpublished Working Paper, University of Nottingham

Chen, Q., Chen, X., Schipper, K., Xu, Y., Xue, J., 2012. The sensitivity of corporate cash holdings to corporate governance. Review of Financial Studies 25, 3610-3644

Chen, S., Sun, Z., Tang, S., Wu, D., 2011. Government intervention and investment efficiency: Evidence from China. Journal of Corporate Finance 17, 259-271

Chen, Y.-R., Huang, Y.-L., Chen, C.-N., 2009b. Financing Constraints, Ownership Control, and Cross-Border M&As: Evidence from Nine East Asian Economies. Corporate Governance: An International Review 17, 665-680

Cheung, Y.-L., Rau, P.R., Stouraitis, A., 2010. Helping Hand or Grabbing Hand? Central vs. Local Government Shareholders in Chinese Listed Firms. Review of Finance 14, 669-694

Chi, J., Sun, Q., Young, M., 2011. Performance and characteristics of acquiring firms in the Chinese stock markets. Emerging markets review 12, 152-170

Chow, C.K.-W., Fung, M.K.Y., 2000. Small businesses and liquidity constraints in financing business investment: Evidence from shanghai's manufacturing sector. Journal of Business Venturing 15, 363-383

Chow, C.K.W., Fung, M.K.Y., 1998. Ownership Structure, Lending Bias, and Liquidity Constraints: Evidence from Shanghai's Manufacturing Sector. Journal of Comparative Economics 26, 301-316

Chow, C.K.W., Song, F.M., Wong, K.P., 2010. Investment and the soft budget constraint in China. International Review of Economics & Finance 19, 219-227

Claessens, S., Djankov, S., Fan, J.P.H., Lang, L.H.P., 2002. Disentangling the Incentive and Entrenchment Effects of Large Shareholdings. The Journal of Finance 57, 2741-2771

Claessens, S., Tzioumis, K., 2006. Measuring firms' access to finance. World Bank

Cleary, S., 1999. The relationship between firm investment and financial status. Journal of Finance 54, 673-692

Clementi, G.L., Hopenhayn, H.A., 2006. A theory of financing constraints and firm dynamics. Quarterly Journal of Economics 121, 229-265

Cull, R., Xu, L.C., 2005. Institutions, ownership, and finance: the determinants of profit reinvestment among Chinese firms. Journal of Financial Economics 77, 117-146

Cull, R., Xu, L.C., Zhu, T., 2009. Formal finance and trade credit during China's transition. Journal of Financial Intermediation 18, 173-192

Cumming, D., Hou, W., Lee, E., 2012. Impact of Split Share Structure Reform in China on CEO Accountability to Corporate Fraud. Unpublished Working Paper, University of York

Cummins, J., G. , Kevin, A.H., Stephen, D.O., 2006. Investment behavior, observable expectations, and internal funds. American Economic Review 96, 796-810

D'Mello, R., Krishnaswami, S., Larkin, P.J., 2008. Determinants of corporate cash holdings: Evidence from spin-offs. Journal of Banking & Finance 32, 1209-1220

de Haan, L., Hinloopen, J., 2003. Preference hierarchies for internal finance, bank loans, bond, and share issues: evidence for Dutch firms. Journal of Empirical Finance 10, 661-681

De Mello, L.R., 1997. Foreign direct investment in developing countries and growth: A selective survey. The Journal of Development Studies 34, 1-34

Demirgüç-Kunt, A., Maksimovic, V., 1998. Law, finance, and firm growth. The Journal of Finance 53, 2107-2137

Denis, D.J., Sibilkov, V., 2010. Financial Constraints, Investment, and the Value of Cash Holdings. Review of Financial Studies 23, 247-269

Devonshire-Ellis, C., Scott, A., Woollard, S., 2011. Mergers and Acquisitions in China. Springer.

Ding, S., Guariglia, A., Knight, J., 2010. Does China overinvest? Evidence from a panel of Chinese firms. Department of Economics Discussion Paper No. 2010-32, University of Glasgow

Ding, S., Guariglia, A., Knight, J., 2012. Negative investment in China: financing constraints and restructuring versus growth. Nottingham University Business School Research Paper

Ding, S., Guariglia, A., Knight, J., 2013. Investment and financing constraints in China: does working capital management make a difference? Journal of Banking & Finance 37, 1490-1507

Dittmar, A., Duchin, R., 2010. The dynamics of cash. Ross School of Business Paper No. 1138. Available at SSRN: http://ssrn.com/abstract=1569529 or http://dx.doi.org/10.2139/ssrn.1569529

Dittmar, A., Mahrt-Smith, J., 2007. Corporate governance and the value of cash holdings. Journal of Financial Economics 83, 599-634

Dittmar, A., Mahrt-Smith, J., Servaes, H., 2003. International corporate governance and corporate cash holdings. Journal of Financial and Quantitative Analysis 38, 111-134

Djankov, S., La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 2008. The law and economics of self-dealing. Journal of Financial Economics 88, 430-465

Du, J., Rui, O.M., Wong, S.M., 2013. Financing-Motivated Mergers and Acquisitions: Evidence from Corporate China. Unpublished working paper

Duchin, R., Ozbas, O., Sensoy, B.A., 2010. Costly external finance, corporate investment, and the subprime mortgage credit crisis. Journal of Financial Economics 97, 418-435

Eisfeldt, A.L., Rampini, A.A., 2006. Capital reallocation and liquidity. Journal of Monetary Economics 53, 369-399

Elliott, D.J., Yan, K., 2013. The Chinese Financial System: an introduction and overview. The Brookings Institution. Retrieved from http://www.brookings.edu/research/papers/2013/07/01-china-financial-system-elliott.

Erel, I., Jang, Y., Weisbach, M.S., 2014. Do Acquisitions Relieve Target Firms' Financial Constraints? Forthcoming The Journal of Finance

Erickson, T., Whited, T.M., 2000. Measurement Error and the Relationship between Investment and q. The Journal of Political Economy 108, 1027-1057

Faccio, M., Lang, L.H.P., 2002. The ultimate ownership of Western European corporations. Journal of Financial Economics 65, 365-395

Faccio, M., Masulis, R.W., 2005. The Choice of Payment Method in European Mergers and Acquisitions. The Journal of Finance 60, 1345-1388

Fama, E.F., 1971. Risk, Return, and Equilibrium. Journal of Political Economy 79, 30-55

Fama, E.F., French, K.R., 1993. Common risk factors in the returns on stocks and bonds. Journal of Financial Economics 33, 3-56

Fama, E.F., MacBeth, J.D., 1973. Risk, Return, and Equilibrium: Empirical Tests. Journal of Political Economy 81, 607-636

Fan, X., Jacobs, J., Lensink, R., 2005. Chicken or egg: financial development and economic growth in China, 1992-2004. University of Groningen, CCSO Centre for Economic Research

Faulkender, M., Wang, R., 2006. Corporate Financial Policy and the Value of Cash. The Journal of Finance 61, 1957-1990

Fazzari, S.M., Hubbard, R.G., Petersen, B.C., 2000. Investment-cash flow sensitivities are useful: A comment on Kaplan and Zingales. The Quarterly Journal of Economics 115, 695-705

Fazzari, S.M., Hubbard, R.G., Petersen, B.C., Blinder, A.S., Poterba, J.M., 1988. Financing constraints and corporate investment. Brookings Papers on Economic Activity 1, 141-195

Fazzari, S.M., Petersen, B.C., 1993. Working Capital and Fixed Investment: New Evidence on Financing Constraints. The RAND Journal of Economics 24, 328-342

Ferreira, M.A., Vilela, A.S., 2004. Why Do Firms Hold Cash? Evidence from EMU Countries. European Financial Management 10, 295-319

Firth, M., Fung, P.M.Y., Rui, O.M., 2006. Corporate performance and CEO compensation in China. Journal of Corporate Finance 12, 693-714

Firth, M., Malatesta, P.H., Xin, Q., Xu, L., 2012. Corporate investment, government control, and financing channels: Evidence from China's Listed Companies. Journal of Corporate Finance 18, 433-450

Fishman, M.J., 1989. Preemptive Bidding and the Role of the Medium of Exchange in Acquisitions. The Journal of Finance 44, 41-57

Ganesh-Kumar, A., Sen, K., Vaidya, R., 2001. Outward orientation, investment and finance constraints: A study of indian firms. Journal of Development Studies 37, 133-149

Garcia-Vega, M., Guariglia, A., 2011. Volatility, financial constraints, and trade. International Review of Economics and Finance 21, 57-76

Ge, Y., Qiu, J., 2007. Financial development, bank discrimination and trade credit. Journal of Banking & Finance 31, 513-530

Gertler, M., Gilchrist, S., 1994. Monetary-policy, business cycles, and the behavior of small manufacturing firms. Quarterly Journal of Economics 109, 309-340

Gilson, R.J., Black, B.S., 1986. The law and finance of corporate acquisitions. Foundation Press.

Girma, S., Greenaway, D., Kneller, R., 2004. Does exporting increase productivity? A microeconometric analysis of matched firms. Review of International Economics 12, 855-866

Golubov, A., Petmezas, D., Travlos, N.G., 2012. When it pays to pay your investment banker: New evidence on the role of financial advisors in M&As. The Journal of Finance 67, 271-311

Greenaway, D., Guariglia, A., Kneller, R., 2007. Financial factors and exporting decisions. Journal of International Economics 73, 377-395

Greenaway, D., Guariglia, A., Yu, Z., 2013. The more the better? Foreign ownership and corporate performance in China. Forthcoming The European Journal of Finance

Guariglia, A., 1999. An analysis of the inventory behavior in a q-theoretic framework. International Journal of Production Economics 58, 131-146

Guariglia, A., 2000. Inventory investment and capital market imperfections: A generalization of the linear quadratic inventory model. Oxford Bulletin of Economics and Statistics 62, 223-242

Guariglia, A., 2008. Internal financial constraints, external financial constraints, and investment choice: Evidence from a panel of UK firms. Journal of Banking and Finance 32, 1795-1809

Guariglia, A., Junhong, Y., 2014. Corporate liquidity and acquisitions: The China experience. Working Paper

Guariglia, A., Liu, X., Song, L., 2011. Internal finance and growth: Microeconometric evidence on Chinese firms. Journal of Development Economics 96, 79-94

Guariglia, A., Mateut, S., 2006. Credit channel, trade credit channel, and inventory investment: Evidence from a panel of UK firms. Journal of Banking and Finance 30, 2835-2856

Guariglia, A., Mateut, S., 2010. Inventory investment, global engagement, and financial constraints in the UK: Evidence from micro data. Journal of Macroeconomics 32, 239-250

Guariglia, A., Poncet, S., 2008. Could financial distortions be no impediment to economic growth after all? Evidence from China. Journal of Comparative Economics 36, 633-657

Hall, B.H., 2002. The Financing of Research and Development. Oxford Review of Economic Policy 18, 35-51

Hall, P., Horowitz, J.L., 1996. Bootstrap Critical Values for Tests Based on Generalized-Method-of-Moments Estimators. Econometrica 64, 891-916

Han, S., Qiu, J., 2007. Corporate precautionary cash holdings. Journal of Corporate Finance 13, 43-57

Hansen, R.G., 1987. A Theory for the Choice of Exchange Medium in Mergers and Acquisitions. The Journal of Business 60, 75-95

Hanson, R.C., 1992. Tender Offers and Free Cash Flow: An Empirical Analysis. Financial Review 27, 185-209

Harford, J., 1999. Corporate Cash Reserves and Acquisitions. Journal of Finance 54, 1969-1997

Harford, J., 2005. What drives merger waves? Journal of Financial Economics 77, 529-560

Harford, J., Klasa, S., Walcott, N., 2009. Do firms have leverage targets? Evidence from acquisitions. Journal of Financial Economics 93, 1-14

Harford, J., Mansi, S.A., Maxwell, W.F., 2008. Corporate governance and firm cash holdings in the US. Journal of Financial Economics 87, 535-555

Harhoff, D., 1998. Are There Financing Constraints for R&D and Investment in German Manufacturing Firms? Annales d'Économie et de Statistique, 421-456

Hasan, I., Wachtel, P., Zhou, M., 2009. Institutional development, financial deepening and economic growth: Evidence from China. Journal of Banking & Finance 33, 157-170

Havrylchyk, O., Poncet, S., 2007. Foreign direct investment in China: reward or remedy? The World Economy 30, 1662-1681

Healy, P.M., Palepu, K.G., Ruback, R.S., 1992. Does corporate performance improve after mergers? Journal of Financial Economics 31, 135-175

Heckman, J.J., 1976. The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models. In: Annals of Economic and Social Measurement, Volume 5, number 4. NBER, pp. 475-492.

Heckman, J.J., 1979. Sample selection bias as a specification error. Econometrica: Journal of the econometric society, 153-161

Hennessy, C.A., Whited, T.M., 2007. How Costly Is External Financing? Evidence from a Structural Estimation. The Journal of Finance 62, 1705-1745

Henry, D., 2010. Agency costs, ownership structure and corporate governance compliance: A private contracting perspective. Pacific-Basin Finance Journal 18, 24-46

Héricourt, J., Poncet, S., 2009. FDI and credit constraints: Firm-level evidence from China. Economic Systems 33, 1-21

Heron, R., Lie, E., 2002. Operating Performance and the Method of Payment in Takeovers. The Journal of Financial and Quantitative Analysis 37, 137-155

Hou, W., Kuo, J.M., Lee, E., 2012. The Impact of State Ownership on Share Price Informativeness: The Case of the Split Share Structure Reform in China. British Accounting Review, forthcoming

Hou, W., Lee, E., Stathopoulos, K., Tong, Z., 2011. Does Ownership Reform Influence Executive Pay in China? Unpublished Working Paper, University of Edinburgh

Hoxby, C., Paserman, M.D., 1998. Overidentification Tests with Grouped Data. National Bureau of Economic Research Technical Working Paper Series No. 223

Huang, W., Jiang, F., Liu, Z., Zhang, M., 2011. Agency cost, top executives' overconfidence, and investment-cash flow sensitivity - Evidence from listed companies in China. Pacific-Basin Finance Journal 19, 261-277

Huang, Y., 2003. Selling China: Foreign direct investment during the reform era. Cambridge University Press.

Hubbard, R.G., 1998. Capital-market imperfections and investment. Journal of Economic Literature 36, 193-225

Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance, and takeovers. American Economic Review 76, 323-329

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics 3, 305-360

Jian, M., Wong, T., 2010. Propping through related party transactions. Review of Accounting Studies 15, 70-105

Jiang, G., Lee, C.M.C., Yue, H., 2010. Tunneling through intercorporate loans: The China experience. Journal of Financial Economics 98, 1-20

Jung, K., Kim, Y.-C., Stulz, R., 1996. Timing, investment opportunities, managerial discretion, and the security issue decision. Journal of Financial Economics 42, 159-186

Kam, A., Citron, D., Muradoglu, G., 2008. Distress and restructuring in China: Does ownership matter? China Economic Review 19, 567-579

Kaplan, S.N., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? Quarterly Journal of Economics 112, 169-215

Kaplan, S.N., Zingales, L., 2000. Investment-cash flow sensitivities are not valid measures of financing constraints. The Quarterly Journal of Economics 115, 707-712

Karampatsas, N., Petmezas, D., Travlos, N., 2014. Credit Ratings and the Choice of Payment Method in Mergers and Acquisitions. Journal of Corporate Finance, Forthcoming. Available at SSRN: http://ssrn.com/abstract=2203536 or http://dx.doi.org/10.2139/ssrn.2203536

Kashyap, A.K., Lamont, O.A., Stein, J.C., 1994. Credit Conditions and the Cyclical Behavior of Inventories. The Quarterly Journal of Economics 109, 565-592

Keynes, J.M., 2006. General theory of employment, interest and money. Atlantic Publishers & Dist.

Kim, C.-S., Mauer, D.C., Sherman, A.E., 1998. The determinants of corporate liquidity: Theory and evidence. Journal of Financial and Quantitative Analysis 33

Konings, J., Rizov, M., Vandenbussche, H., 2003. Investment and financial constraints in transition economies: micro evidence from Poland, the Czech Republic, Bulgaria and Romania. Economics Letters 78, 253-258

Koons, C., 2014, January 8. Global Companies Rethink M&A Deals in China. The Wall Street Journal. Retrieved March 7, 2014, from http://online.wsj.com/news/articles/SB10001424052702303848104579307922233275520.

Kuh, E., Meyer, J.R., 1957. The investment decision: An empirical study. Cambridge, Mass.: Harvard University Press.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 2002. Government Ownership of Banks. The Journal of Finance 57, 265-301

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 1997. Legal Determinants of External Finance. The Journal of Finance 52, 1131-1150

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W., 1998. Law and finance. Journal of political economy 106, 1113-1155

Lamont, O., Polk, C., Saá-Requejo, J., 2001. Financial constraints and stock returns. Review of Financial Studies 14, 529-554

Lee, E., Powell, R., 2011. Excess cash holdings and shareholder value. Accounting & Finance 51, 549-574

Lemmon, M.L., Lins, K.V., 2003. Ownership Structure, Corporate Governance, and Firm Value: Evidence from the East Asian Financial Crisis. The Journal of Finance 58, 1445-1468

Levine, R., 2005. Finance and growth: Theory and evidence. Handbook of economic growth 1, 865-934

Li, G., 2010. The pervasiveness and severity of tunneling by controlling shareholders in China. China Economic Review 21, 310-323

Li, J., 2009. Finance-growth Nexus in China: A Channel Decomposition Analysis. Journal of Modern Chinese Studies 1, 51-82

Li, J., Hsu, S., 2009. Informal finance in China: American and Chinese perspectives. Oxford University Press.

Li, K., Wang, T., Cheung, Y.-L., Jiang, P., 2011. Privatization and Risk Sharing: Evidence from the Split Share Structure Reform in China. Review of Financial Studies 24, 2499-2525

Lian, Y., Xu, Y., Zhou, K., 2010. How and Why Do Firms Adjust Their Cash Holdings Toward Targets: Evidence from China. Available at SSRN 1536904

Liang, Z., 2005. Financial development, market deregulation and growth: evidence from China. Journal of Chinese Economic and Business Studies 3, 247-262

Liang, Z., 2006. Financial development, growth and regional disparity in post-reform China. Research Paper, UNU-WIDER, United Nations University (UNU).

Lin, H.-C.M., Bo, H., 2012. State-ownership and financial constraints on investment of Chinese-listed firms: new evidence. The European Journal of Finance 18, 497-513

Linn, S.C., Switzer, J.A., 2001. Are cash acquisitions associated with better postcombination operating performance than stock acquisitions? Journal of Banking and Finance 25, 1113-1138

Liu, Q., Lu, Z., 2007. Corporate governance and earnings management in the Chinese listed companies: A tunneling perspective. Journal of Corporate Finance 13, 881-906

Loughran, T., Anand, M.V., 1997. Do Long-Term Shareholders Benefit From Corporate Acquisitions? The Journal of Finance 52, 1765-1790

Luo, Y., 2000. How to enter China: Choices and lessons. University of Michigan Press.

Maeshiro, A., 1996. Teaching regressions with a lagged dependent variable and autocorrelated disturbances. Journal of Economic Education 27, 72-84

Maeshiro, A., 1999. A lagged dependent variable, autocorrelated disturbances, and unit root tests - peculiar OLS bias properties - a pedagogical note. Applied Economics 31, 381-396

Malmendier, U., Tate, G., 2008. Who makes acquisitions? CEO overconfidence and the market's reaction. Journal of Financial Economics 89, 20-43

Margsiri, W., Mello, A.S., Ruckes, M.E., 2008. A dynamic analysis of growth via acquisition. Review of Finance 12, 635-671

Martin, K.J., 1996. The Method of Payment in Corporate Acquisitions, Investment Opportunities, and Management Ownership. The Journal of Finance 51, 1227-1246

Megginson, W.L., Wei, Z., 2012. State Ownership, Soft-Budget Constraint and Cash Holdings: Evidence from China's Privatized Firms. 23rd Australasian Finance and Banking Conference 2010 Paper. Available at SSRN: http://ssrn.com/abstract=1652860 or http://dx.doi.org/10.2139/ssrn.1652860

Miller, M.H., Orr, D., 1966. A Model of the Demand for Money by Firms. The Quarterly Journal of Economics 80, 413-435

Modigliani, F., Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. The American Economic Review 48, 261-297

Moeller, S.B., Schlingemann, F.P., Stulz, R.M., 2004. Firm size and the gains from acquisitions. Journal of Financial Economics 73, 201-228

Mulligan, Casey B., 1997. Scale Economies, the Value of Time, and the Demand for Money: Longitudinal Evidence from Firms. Journal of Political Economy 105, 1061-1079

Myers, S.C., 1984. The Capital Structure Puzzle. The Journal of Finance 39, 575-592

Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187-221

Myers, S.C., Rajan, R.G., 1998. The Paradox of Liquidity. The Quarterly Journal of Economics 113, 733-771

Ng, M.H., 2013. Foreign Direct Investment in China: Theories and Practices. Routledge.

Nickell, S., Nicolitsas, D., 1999. How does financial pressure affect firms? European Economic Review 43, 1435-1456

Noble, J., 2013, February 26. Chinese shadow banks face major test. The Financial Times. Retrieved March 17, 2014, from http://www.ft.com/cms/s/0/223777b6-7fec-11e2-adbd-00144feabdc0.html#axzz2wG9YvNYh.

Oler, D., 2008. Does acquirer cash level predict post-acquisition returns? Review of Accounting Studies 13, 479-511

Opler, T., Pinkowitz, L., Stulz, R., Williamson, R., 1999. The determinants and implications of corporate cash holdings. Journal of Financial Economics 52, 3-46

Ozkan, A., Ozkan, N., 2004. Corporate cash holdings: An empirical investigation of UK companies. Journal of Banking and Finance 28, 2103-2134

Pawlina, G., Renneboog, L., 2005. Is investment-cash flow sensitivity caused by agency costs or asymmetric information? Evidence from the UK. European Financial Management 11, 483-513

Peng, M.W., 2006. Making M&A fly in China. harvard business review 84, 26-27

Peng, W.Q., Wei, K.C.J., Yang, Z., 2011. Tunneling or propping: Evidence from connected transactions in China. Journal of Corporate Finance 17, 306-325

Pinkowitz, L.E.E., Stulz, R., Williamson, R., 2006. Does the Contribution of Corporate Cash Holdings and Dividends to Firm Value Depend on Governance? A Cross-country Analysis. The Journal of Finance 61, 2725-2751

Polk, C., Sapienza, P., 2009. The stock market and corporate investment: a test of catering theory. Review of Financial Studies 22, 187-217

Poncet, S., Steingress, W., Vandenbussche, H., 2010. Financial constraints in China: Firm-level evidence. China Economic Review 21, 411-422

Prasad, E., Wei, S.-J., 2007. The Chinese approach to capital inflows: patterns and possible explanations. In: Capital Controls and Capital Flows in Emerging Economies: Policies, Practices and Consequences. University of Chicago Press, pp. 421-480.

Qian, Y., 1996. Enterprise reform in China: agency problems and political control. Economics of Transition 4, 427-447

Rabinovitch, S., 2013, February 26. China to tighten shadow banking rules. The Financial Times. Retrieved March 7, 2014, from http://www.ft.com/cms/s/0/223777b6-7fec-11e2-adbd-00144feabdc0.html#axzz2wFt1zFbB.

Rau, P.R., Vermaelen, T., 1998. Glamour, value and the post-acquisition performance of acquiring firms. Journal of Financial Economics 49, 223-253

Rhodes-Kropf, M., Viswanathan, S., 2004. Market valuation and merger waves. The Journal of Finance 59, 2685-2718

Richardson, S., 2006. Over-investment of free cash flow. Review of Accounting Studies 11, 159-189

Riddick, L.A., Whited, T.M., 2009. The Corporate Propensity to Save. The Journal of Finance 64, 1729-1766

Roll, R., 1986. The Hubris Hypothesis of Corporate Takeovers. The Journal of Business 59, 197

Roodman, D., 2006. How to do xtabond2: An introduction to" Difference" and" System" GMM in Stata. Working Paper, Center for Global Development, Washington

Rosen, R.J., 2006. Merger Momentum and Investor Sentiment: The Stock Market Reaction to Merger Announcements. Journal of Business 79, 987-1017

Schiantarelli, F., 1996. Financial constraints and investment: methodological issues and international evidence. Oxford Review of Economic Policy 12, 70-89

Sharpe, S.A., 1994. Financial Market Imperfections, Firm Leverage, and the Cyclicality of Employment. The American Economic Review 84, 1060-1074

Shleifer, A., Vishny, R.W., 1992. Liquidation Values and Debt Capacity: A Market Equilibrium Approach. The Journal of Finance 47, 1343-1366

Shleifer, A., Vishny, R.W., 1994. Politicians and firms. Quarterly Journal of Economics 109, 995-1025

Shleifer, A., Vishny, R.W., 2003. Stock market driven acquisitions. Journal of Financial Economics 70, 295-311

Singh, M., Davidson III, W.N., 2003. Agency costs, ownership structure and corporate governance mechanisms. Journal of Banking & Finance 27, 793-816

Smith, R.L., Kim, J.-H., 1994. The Combined Effects of Free Cash Flow and Financial Slack on Bidder and Target Stock Returns. The Journal of Business 67, 281-310

Stein, J.C., 2003. Chapter 2 Agency, information and corporate investment. In: G.M. Constantinides MH & Stulz RM (eds.) Handbook of the Economics of Finance. Elsevier, pp. 111-165.

Stulz, R., 1990. Managerial discretion and optimal financing policies. Journal of Financial Economics 26, 3-27

Tatlow, D.K., 2013, January 17. Is Something Toxic Buried in China's Financial System? The New York Times, Retrieved 7 March, 2014, from http://rendezvous.blogs.nytimes.com/2013/01/17/is-something-toxic-buried-in-chinas-financial-system/?_php=true&_type=blogs&_php=true&_type=blogs&_r=1.

The World Bank, 2014. Foreign direct investment, net inflows. Data retrieved March 2, 2014, from World DataBank: World Development Indicators database

The World Bank, 2014, March 1. China Overview. Retrieved March 7, 2014, from http://www.worldbank.org/en/country/ china/overview.

Travlos, N.G., 1987. Corporate Takeover Bids, Methods of Payment, and Bidding Firms' Stock Returns. The Journal of Finance 42, 943-963

Venkiteshwaran, V., 2011. Partial adjustment toward optimal cash holding levels. Review of Financial Economics 20, 113-121

Wang, Y., Wu, L., Yang, Y., 2009. Does the stock market affect firm investment in China? A price informativeness perspective. Journal of Banking and Finance 33, 53-62

Wei, Z., Xie, F., Zhang, S., 2005. Ownership structure and firm value in China's privatized firms: 1991–2001. Journal of Financial and Quantitative Analysis 40, 87-108

Whited, T.M., Wu, G.J., 2006. Financial constraints risk. Review of Financial Studies 19, 531-559

Wooldridge, J.M., 2002. Econometric analysis of cross section and panel data. The MIT press.

Wooldridge, J.M., 2003. Cluster-Sample Methods in Applied Econometrics. American Economic Review 93, 133-138

Xu, N., Xu, X., Yuan, Q., 2013. Political connections, financing friction, and corporate investment: evidence from Chinese listed family firms. European Financial Management 19, 675-702

Zhang, T., 2007. Chapter 1. Urban development patterns in China: new, renewed, and ignored urban spaces, in Urbanization in China: Critical Issues in an Era of Rapid growth, edited by Song, Y. L. Lincoln Institute of Land Policy, 3-27

Zhou, B., Guo, J.M., Hua, J., Doukas, A.J., 2012. Does State Ownership Drive M&A Performance? Evidence from China. European Financial Management 00, 1-26