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Excess cash holdings and investment: the moderating roles of financial constraints and managerial entrenchment

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Abstract

Our study investigates the relationship between excess cash holdings and investment behaviour under two dimensions of financial constraints and managerial entrenchment, based upon a sample of Taiwanese firms operating in an environment characterized by poor legal protection for investors, with data covering the years 2000–2006. We find that excess cash is significantly correlated with capital expenditure, particularly for firms financially constrained and with severe managerial entrenchment. However, the evidence shows that excess cash is insensitive to R&D expenditure under these two dimensions.

Key words: Excess cash; Financial constraints; Managerial entrenchment; Overinvestment; Underinvestment

JEL Classification: G31, G34

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1. Introduction

When studying corporate finance, it is important to see how the determinants complement each other to influence a firm's investment decisions. Various forces prevent a firm from pursuing its optimal investment level when the presumption of a perfect market is violated. Information asymmetries and agency problems are

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the most important factors influencing investment efficiency (Stein, 2003), whereas cash holdings are strongly related to a firm's investment when facing these frictions. On the one hand, the adverse selection problem arises, because managers are reluctant to issue undervalued securities because of information asymmetries, which leads to underinvestment. Cash holdings also help firms with high external financing costs (i.e. financially constrained firms) take up positive net present value (NPV) projects. Such a phenomenon therefore makes an investment sensitive to cash holdings. On the other hand, empire-building preferences lead to overinvestment, causing entrenched managers to spend all available funds on investment (Jensen, 1986). This also leads to higher investment because of cash holdings.

Prior studies have shown how cash holdings are associated with investment when considering either financial constraints or corporate governance. Almeida *et al.* (2004) indicate that financially constrained firms tend to save cash, whereas unconstrained firms do not. Consistent with the costly external finance view of Faulkender and Wang (2006) and Pinkowitz and Willionson (2004) in that cash holdings are more valuable for constrained than for unconstrained firms, Denis and Sibilkov (2010) explain that higher cash holdings allow financially constrained firms to undertake value-increasing projects that might be bypassed. Another strand of research addresses the agency cost hypotheses, as recent studies document that poor corporate governance is detrimental to the value of corporate cash holdings (Dittmar *et al.*, 2003; Pinkowitz *et al.*, 2006; Dittmar and Mahrt-Smith, 2007). Harford *et al.* (2008) propose that self-interested managers of US firms act to avoid the attention of activists, and therefore, they choose to spend cash quickly on capital expenditures and acquisitions.

La Porta *et al.* (1998) argue that greater investor protection increases investors' willingness to provide funds in exchange for securities, hence reflecting in a lower cost for the availability of external financing. Khurana *et al.* (2006) document that financial constraints are more pronounced in less financially developed countries with weaker institutions that protect investors. In addition, Harford *et al.* (2008) propose true entrenchment requires low legal shareholder rights. Thus, it is much easier for managers in a weaker legal protection environment to act contrary to the interests of shareholders.

McLean *et al.* (2012) indicate that investor protection affects firm-level resource allocation. They provide evidence by analysing a large sample of firms from 44 countries during the period 1990–2007 and showing that investment sensitivity to q and external finance relative to q are stronger in countries with greater investor protections, because high q firms can easily obtain external finance to fund investments, while investment sensitivity to cash flow is higher in countries with fewer investor protections. Their findings highlight that strong investor protection laws predict accurate share prices, reduce financial constraints and encourage efficient investment. According to their country-level estimation, the investment-q sensitivity is 0.127 in the United States compared with 0.058 for Taiwan, while the investment-cash flow sensitivity is 0.077 in the United States compared with 0.686 for Taiwan.

The low investment-q and high investment-cash flow sensitivity of Taiwan[1] thus provide an interesting setting for us to consider, compared with the United States, how differences in a country-level investor protection environment interacting with a firm-level corporate governance structure make liquidity decisions different. Weaker investor protection laws and a less-developed financial market in Taiwan make firms rely even more on internal resources, and we argue the effect is stronger when facing financing constraints. In addition to cash flow, cash is a good candidate to fund investment.[2] Besides, the true entrenchment effect is more likely to influence managers' liquidity decisions in countries with poor investor protection. Therefore, we argue that high cash holdings could more quickly facilitate overinvestment at the expense of shareholders in poorly governed firms in Taiwan. Furthermore, another question arises: do highly entrenched managers still engage in overinvestment when their firms face higher external financing costs?

Using a study sample covering the years 2000–2006, we focus on excess cash used for two types of investment expenditure: (i) capital expenditure; and (ii) research and development (R&D) expenditure. We apply six criteria constraints and develop a managerial entrenchment index to capture the governance mechanism in Taiwan.

Splitting our sample for testing the costly external finance hypothesis in accordance with the financial constraint criteria, our results show that capital expenditures have statistically significant sensitivity to excess cash, which is stronger for constrained firms, providing support for the underinvestment argument. However, although excess cash is found to be significantly and positively correlated with R&D expenditure for both constrained and unconstrained firms, we are unable to provide any consistent results to suggest that the relationship is stronger for constrained firms.

Splitting our sample for testing the agency problem hypothesis in accordance with the managerial entrenchment index, our results find that the sensitivity of investment to excess cash has a positive sign under higher entrenchment, thereby indicating a tendency towards overinvestment. When we apply low (high) institutional blockholdings to proxy for an inefficient (efficient) corporate governance mechanism, the results also show that capital expenditure-excess cash sensitivity is stronger for low blockholding firms. This confirms the overinvestment argument.

Our empirical evidence contributes to the extant literature on investment behaviour when using excess cash by simultaneously accounting for both

[1] McLean *et al*. (2012) use five different measures of investor protection and two variables to investigate how easily firms can issue equity. Taiwan displays lower investor protection (for example, the investor protection index is 0.547 in Taiwan versus 1.000 in the United States) and less easy access to equity markets than the United States.

[2] In our sample, the correlation between cash flow and cash is 0.334.

underinvestment arising from financing constraints and overinvestment arising from managerial entrenchment. The evidence in this study reveals that both dimensions affect investment-excess cash sensitivity. If a firm suffers from financing constraints, then excess cash can finance investment projects that the firm may have previously given up as a result of a shortage of internal resources. Furthermore, if the firm is characterized by managerial entrenchment, then excess cash may induce such managers to invest in projects that could prove detrimental to shareholder wealth. When the ownership share held by institutional investors is used as a proxy for the quality of a firm's corporate governance structure, the two dimensions become even more significant, thereby indicating both problems of underinvestment and overinvestment actually coexist on investment-excess cash sensitivity.

Our results indicate that in contrast to capital expenditure, R&D expenditure is insensitive to excess cash under these two dimensions. Our findings suggest that financially constrained firms do not invest in large R&D expenditure when holding excess cash, while entrenched managers are less likely to overinvest in R&D, essentially as a result of their risk aversion.[3] Owing to the high adjustment costs of R&D, Taiwanese firms use cash reserves to finance R&D expenditures regardless of their financial status. We provide evidence that cash holdings are positively associated with real R&D investment spending for both financially constrained and unconstrained firms. We explain that firms prefer to use internal funds on R&D investment instead of expensive equity sources. The findings in Taiwan are different from Brown and Petersen's (2011) results that US firms most likely facing financing frictions rely extensively on cash holdings to smooth R&D, whereas less financially constrained firms do not, because equity finance appears to be the principal source of funds.

The rest of this paper proceeds as follows. Section 2. Theoretical background and hypotheses describes the theoretical background and develops the hypotheses. Section 3. Data and variable construction describes data and variables that are used in the study. Section 4. Methodology details the research methodology. Section 5. Empirical results presents our empirical findings. Section 6. Conclusions concludes the paper.

2. Theoretical background and hypothesis

Myers and Majluf (1984) suggest that, in an imperfect market, information asymmetry between corporate insiders and outsiders invariably results in costly external financing, which causes the adverse selection problem. Managers may be forced to give up positive NPV projects, because they are not willing to raise

[3] It should be noted that compared with capital expenditure on property, plant and equipment, R&D expenditure is typically viewed as high-risk investment (Kothari *et al*., 2002).

external capital by issuing underpriced securities. Therefore, cash flow and cash can benefit those firms facing external financing constraints by funding necessary expenditures, which makes their investment sensitive to the availability of internal funds (Stein, 2003; Franzoni, 2009).[4]

Faulkender and Wang (2006) argue that liquidity provides a benefit for constrained firms, thereby demonstrating that the marginal value of cash holdings is more valuable for financially constrained firms than for unconstrained ones. Denis and Sibilkov (2010) interpret prior findings to mean that constrained firms with higher cash holdings are more likely to use cash to increase investment in positive NPV projects and that marginal investment is more valuable to financial constrained than for unconstrained firms. Brown and Petersen (2011) provide evidence that firms facing financing frictions tend to rely heavily on cash holdings to smooth their R&D spending, essentially because cash provides a buffer to R&D from financial shocks and avoids the high adjustment costs of R&D. This reasoning results in our first hypothesis as follows.

H_1: After controlling for investment opportunities and cash flow, the sensitivity of corporate investment expenditure to excess cash is more positive for financially constrained firms than for unconstrained firms.

Managers with empire-building preferences will use all available resources on investment projects beyond a level that would maximize shareholder value (Jensen, 1986). As noted by Myers and Rajan (1998), when managers have power over corporate decisions and are not constrained by legal provisions or effective external monitoring, it is much easier for cash reserves to be expropriated. Indeed, even when insiders cannot expropriate directly, they may use cash to finance negative NPV projects for their personal benefit – that is, they have a tendency for overinvestment based upon empire-building.[5]

Cross-border studies provide evidence to show that weak shareholder rights are associated with higher cash holdings (Dittmar *et al*., 2003; Pinkowitz and

[4] Fazzari *et al*. (1988) argue that cash flow is the primary capital for financially constrained firms and that the sensitivity of cash flow to investment is stronger for constrained than for unconstrained firms. Kaplan and Zingales (1997) show that investment-cash flow sensitivity is not necessarily higher for firms that are more constrained because Tobin's q is a noisy proxy for marginal q. If cash flow contains more information about future investment opportunities, then even less constrained firms are likely to adjust their investment in response to the informativeness of cash-flow shocks and exhibit higher investment-cash flow sensitivities (Alti, 2003). Rather than focusing on investment-cash flow sensitivity, Almeida *et al*. (2004) find that constrained firms display a significantly positive cash-flow sensitivity of cash, while unconstrained firms do not.

[5] Fresard and Salva (2010) explain that this occurs when insiders do not have sufficient power to expropriate outsiders or when legal protections effectively constrain such expropriation.

Willionson, 2004), with the value of cash holdings lower in those countries (Pinkowitz *et al.*, 2006; Kalcheva and Lins, 2007).

Dittmar and Mahrt-Smith (2007) and Harford *et al.* (2008) provide evidence to show how corporate governance influences the decision on the ways in which cash should be spent. Dittmar and Mahrt-Smith (2007) note that firms with poor governance structures and higher excess cash experience lower operating performance because of a rapid dissipation of cash, implying that, under the conditions of serious agency problems, excess cash reduces the pressure on managers to operate efficiently. Harford *et al.* (2008) show that, relative to their industry peers, poorly governed firms with higher levels of excess cash tend to increase their capital and acquisition expenditures, while reducing R&D investment. This reasoning results in our second hypothesis as follows.

H_2: After controlling for investment opportunities and cash flow, the sensitivity of corporate investment expenditure to excess cash is more positive for higher entrenchment firms than for lower entrenchment firms.

Stein (2003) argues that financial slack is important to investment, but it is far from clear as to whether this relationship is attributable to financing constraints or empire-building. With regard to the sensitivity of investment to cash flows, although the costly external financing and agency conflict theories are essentially equivalent, their policy implications differ markedly. Therefore, the two dimensions may well coexist in a unified model that considers both underinvestment and overinvestment (Stein, 2003; Franzoni, 2009).

With the purpose to find that the sensitivity of investment to financial slack depends on either under- or overinvestment, Franzoni (2009) nests both the financial constraints and empire-building models into one specification. The results demonstrate that a reduction in liquidity leads financially constrained firms to underinvestment, which has a negative effect on shareholder value. Conversely, when managers pursue their personal interests, the reduction in internal resources, which is less costly for outside investors, has a positive effect on firm value. The evidence shows that underinvestment is more relevant for the entire sample. Analogous to Franzoni (2009) and Xu *et al.* (2012) demonstrate that listed family firms in China are prone to underinvestment, as opposed to overinvestment, and that political connectedness could reduce the level of investment-cash flow sensitivity for those firms with financial constraints, thereby providing further support for the underinvestment argument.

Acknowledging that underinvestment and overinvestment may coexist within the same firm (Stein, 2003; Franzoni, 2009), we take the financing constraints variable and the managerial entrenchment variable into account and try to find out whether the two dimensions coexist to influence the relationship between excess cash and investment expenditure.

3. Data and variable construction

3.1. Data

Our sample includes all nonfinancial listed firms in Taiwan, covering the years from 2000 to 2006. After discarding all observations with incomplete data, we are left with a total sample of 2596 firm-year observations for subsequent analysis. Corporate governance data and other company information are collected from the *Taiwan Economic Journal* (TEJ) database.

We follow Opler *et al.* (1999) approach to measure the normal level of cash holdings. Excess cash is the difference between actual and predicted normal cash holdings.[6] Those firms with excess cash greater than zero are adopted as our sample to test our hypotheses.

3.2. Managerial entrenchment measures

3.2.1. Construction of the managerial entrenchment index

Managerial entrenchment has gained considerable attention as a result of its implications for corporate governance. Managers entrench themselves by pursuing self-interest policies that do not maximize shareholder value (Shleifer and Vishny, 1989). We adopt the following proxies, each of which has predicted associations with managerial entrenchment.

1. *Affiliated board seats* (*Aff_Bd*): Board seats are classified as being affiliated when they are held by the firm's largest shareholder, by the identifiable relatives of the largest shareholder or by legal representatives from other

[6] We use *natural log of cash to net assets* as the dependent variable (*Ln (Cash/NA)*), while the independent variables include natural log of assets (*Size*), cash flow to net assets (*CashFlow/NA*), net working capital to net assets (*NWC/NA*), the mean industry standard deviation in cash flow over assets over the previous 5-year period (*IndustrySigma*), market value to net assets (*MV/NA*), R&D to net assets (*RD/NA*), total debt to net assets (*Leverage/NA*), capital expenditure to net assets (*Capex/NA*) and a dummy indicating whether the firm paid dividends in that year (*Dividend*) and includes industry and year indicators to estimate the normal level of cash holdings. To avoid the problem of endogeneity, we follow the procedure of Dittmar and Mahrt-Smith (2007) to employ 3-year lagged sales growth (*SalesG)* as an instrument variable for *MV* and find that *SalesG* is a good proxy for investment opportunity. Our regression results shows that $Ln\,(Cash/NA) = -0.251 + 0.549CashFlow/NA - 0.284Size - 0.365\ NWC/NA + 1.245IndustrySigma + 1.746RD/NA + 0.465MV/NA + 0.105Capex/NA + 0.912Leverage/NA + 0.143\ Dividend$. We find that smaller firms and firms with larger cash flows, growth opportunities, R&D expenditure and leverage tend to hold more cash, as do dividend paying firms and firms with lower net working capital.

companies controlled by the largest shareholder (Yeh and Woidtke, 2005). *Aff_Bd* is defined as the number of affiliated directors divided by the total number of directors.

2. *Independent directors* (*Ind_Dir*): Independent directors have expertise in management and decision-making and are less subject to agency conflicts (Fama and Jensen, 1983). *Ind_Dir* is measured as the number of independent board seats divided by the total number of board seats.
3. *Separation of ownership and control* (*Sep_OC*): La Porta *et al.* (1999) suggest the separation of ownership and control can benefit controlling shareholders to control a firm's operations with a small direct stake in cash-flow rights. *Sep_OC* is equal to 1 if the voting rights of the controlling shareholders are higher than cash-flow rights; otherwise, 0.[7]
4. *Cash compensation ratio* (*CCR*): Berger *et al.* (1997) argue that CEOs with higher levels of cash compensation are more likely to be entrenched and will therefore seek to avoid risk. Listed firms in Taiwan pay stock bonuses as incentives for employees. Therefore, we define *CCR* as the proportion of cash salary to total compensation paid to CEOs.[8]
5. *CEO_duality*: On the basis of the agency cost hypothesis, Jensen (1993) points out that CEO duality may hinder board effectiveness, while also increasing agency costs. Nevertheless, the 'stewardship theory' suggests that CEO duality may benefit firm value, because it provides a unity of leadership structure (Donaldson, 1990). The *CEO_duality* dummy variable is equal to 1 if the CEO is also the chairman of the board; otherwise, 0.

We use principal component analysis (PCA) to construct a managerial entrenchment index.[9] As reported by Florackis and Ozkan (2009), PCA helps to control for problems of multicollinearity that may arise when several governance and control variables are incorporated within the empirical models. PCA automatically produces the weights so that the

[7] Claessens *et al.* (2000) find that almost 80 per cent of firms in Taiwan have managers and directors who are controlling shareholders. Moreover, Yeh and Woidtke (2005) indicate that Taiwan is characterized by having a high level of ownership concentrated in the largest controlling shareholders, as well as a significant divergence in control and ownership. It is pervasive for the controlling shareholders of Taiwan firms to utilize dominant control power to exploit minority shareholders.

[8] Total compensation comprises cash salary plus the value of stock bonuses.

[9] Callahan *et al.* (2003) construct an index of management involvement in director nominations using PCA and ten governance variables, while Florackis and Ozkan (2009) also utilize the same approach, combining governance variables to construct a corporate governance measure in UK firms.

measure will capture the largest proportion of variance in the underlying data.[10]

3.2.2. Institutional blockholdings

We follow prior studies to use the blockholdings of institutional investors as an additional measure of the quality of corporate governance (Dittmar and Mahrt-Smith, 2007; Franzoni, 2009).[11] Institutional blockholders are better-informed investors and have strong incentives to devote resources to monitoring, because they have large amounts of investment at stake (Shleifer and Vishny, 1986). Therefore, the presence of institutional investors creates effective monitoring and hence mitigates agency conflicts. Higher (lower) institutional blockholdings are associated with better (worse) monitoring and discipline on management and thus indicate better (poor) governance structure.

3.3. Financial constraints criteria

We select six approaches associated with firm-level financial status as proxies for financial constraints below.

1. *Firm size* (*Size*): Almeida *et al*. (2004) state that small firms have difficulties in raising capital within the market, because they are less well known. We classify financially constrained firms if their book value of total assets is below the median level in the year.
2. *Dividend dummy* (*Dividend*): Compared with constrained firms, unconstrained firms are more likely to have higher payout ratios (Almeida *et al*., 2004). We classify financially constrained firms if they did not pay cash dividends in the year.[12]
3. *Cash flow* (*CashFlow*): Firms with larger internal cash flows may find it easier to obtain external financing, because such firms are invariably perceived by lenders as being less risky (Leland and Pyle, 1977). We classify financially constrained firms if their cash flow normalized by the start-of-year book assets is below the sample median level (Babenko *et al*., 2011) in the year.

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[10] Taking a combination of the above five governance variables based upon PCA, with the selection of the first principal component, the managerial entrenchment index = 0.613**Aff_Bd*-0.626**Ind_Dir* + 0.208**Sep_OC* + 0.398**CCR*−0.177**CEO_duality*. The negative weight of *CEO_duality* provides support for the stewardship theory (Donaldson, 1990), which argues that leadership unity that effectively reduces entrenchment is beneficial to firm performance.

[11] Institutional blockholdings are defined as equity ownership by an institutional shareholder with ownership greater than 5 per cent.

[12] We find the empirical results are unchanged if we use the average payout ratio as a constraint criteria.

4. *Firm age* (*Age*): As suggested by Hadlock and Pierce (2010), firm age and firm size are the two variables with the greatest relevance to financial constraints.[13] We estimate the ages of Taiwanese firms since their listing on the TSE or OTC market, classifying financially constrained firms if their ages are below the sample median level in the year.
5. *Bank loans* (*Loan*): Shen and Wang (2005) investigate that firms in Taiwan are less financially constrained when they have a strong bank relationship.[14] We use bank loans as a proxy for bank relationships and categorize financially constrained firms if their total bank loans are below the sample mean for each year.
6. *KZ index* (*KZ*): Following Almeida *et al*. (2004), we divide our sample into two groups according to the measure (which is called the *KZ index*)[15] developed by Kaplan and Zingales (1997). We classify financially constrained firms if their KZ index ranking is above the sample medium level in the year.

Table 1 provides descriptive statistics. Panel A of Table 1 shows summary statistics of the variables used to predict the normal level of cash holdings and the firm-specific variables to proxy for financial constraints. All ratios are winsorized at 1 per cent and 99 per cent to reduce the impact of outliers. Panel B reports summary statistics of the variables we use to construct the managerial entrenchment index and the institutional blockholdings.

Table 2 reports the Pearson correlation coefficients for the proxies of financial constraints and managerial entrenchment, showing that the correlation coefficients on the financial constraints proxy range from −0.654 to 0.593, each with statistical significance. Although the high correlations imply that the measures are picking up similar information, it appears that each measure picks up certain unique information (Denis and Sibilkov, 2010). Finally, blockholdings are uncorrelated with the managerial entrenchment index.

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[13] Hadlock and Pierce (2010) use qualitative information on firms to develop an index of financial constraints. After evaluating several common sorting variables, they conclude that firm size and age (SA index) appear to be closely related to financial constraints.

[14] Shen and Wang (2005) evaluate the bank relationship using three proxies: the number of banks that a firm engages with for its borrowing, the loan amounts and the loan duration. The results remain robust regardless of which of these is used as the proxy for bank relationship.

[15] The *KZ index,* which is defined normalizing variables by total assets in the previous period, is calculated as $-1.002*CashFlow + 0.283*Q + 3.139*LTD - 39.368*Dividends - 1.315*Cash$, where *CashFlow* is the ratio of cash flow to total assets, *Q* is Tobin's q, *LTD* is ratio of long-term debt to total assets, *Dividends* is the ratio of total dividends to book assets, *Cash* is the ratio of cash to total assets.

Table 1
Descriptive statistics

Variables	N	Mean	Median	SD	25%	75%
Panel A						
XCash/Assets	3776	0.101	0.065	0.109	0.028	0.134
Size	3776	15.183	15.027	1.151	14.284	15.860
CashFlow/Assets	3776	0.074	0.070	0.080	0.032	0.117
NWC/Assets	3776	0.142	0.132	0.171	0.019	0.259
IndustrySigma	3776	0.059	0.048	0.044	0.029	0.075
RD/Assets	3776	0.020	0.009	0.029	0.000	0.026
MV/Assets	3776	1.279	1.121	0.543	0.914	1.480
SalesG	3776	0.219	0.143	0.389	−0.002	0.350
Capex/Assets	3776	0.059	0.041	0.059	0.016	0.084
Leverage/Assets	3776	0.458	0.462	0.168	0.342	0.578
Dividend	3776	0.614	1.000	0.487	0.000	1.000
Age	3776	23.009	22.000	11.012	14.000	30.000
Loan (millions)	3107	1152.437	445.555	2631.944	150.000	1079.532
KZ index	3776	−0.405	−0.128	1.022	−0.879	0.312
Panel B						
Aff_Bd	2597	0.683	0.667	0.207	0.571	0.833
Ind_Dir	2597	0.092	0.000	0.146	0.000	0.200
Sep_OC	2597	0.772	1.000	0.420	1.000	1.000
CCR	2597	0.719	0.899	0.326	0.417	1.000
CEO_duality	2597	0.324	0.000	0.468	0.000	1.000
Managerial entrenchment index	2597	−0.127	0.048	1.275	−1.004	0.908
Blockholdings	3512	0.334	0.301	0.209	0.160	0.475

Panel A reports summary statistics of the variables used to predict the normal level of cash holdings and the firm-specific variables to proxy for financial constraints based on a sample covering the 2000–2006 period. *XCash/Assets* is the ratio of excess cash to assets; *Size* is natural log of assets; *CashFlow/Assets* is the ratio of cash flow to assets; *NWC/Assets* is the ratio of current assets excluding cash minus current liabilities to assets; *IndustrySigma* is the mean industry standard deviation in cash flow over assets over the previous 5-year period; *RD/Assets* is the ratio of R&D to assets; *MV/Assets* is the ratio of the market value of equity plus the book value of assets minus the book value of equity divided by book value of total assets; *SalesG* is the growth in sales over the previous 3-year period; *Capex/Assets* is the ratio of capital expenditure to assets; and *Leverage/Assets* is the ratio of the sum of long-term debt and current liabilities to assets. *Dividend* is a dummy variable which is equal to 1 if the firm paid a common dividend in that year; otherwise 0. *Age* is number of years since the firm is listed on the TSE or OTC market; *Loan* is the total amount of bank loans; *KZ index* is a linear combination of financial variables developed by Kaplan and Zingales (1997); all ratios are winsorized at the 1% and 99% levels. Panel B reports summary statistics of the variables we use to construct the *managerial entrenchment index*: *Aff_Bd* is the number of affiliated directors divided by the total number of directors; *Ind_Dir* is the ratio of the number of independent board seats divided by the total number of board seats; *Sep_OC* is a dummy which takes the value of 1 if the voting rights of the controlling shareholders exceeds cash-flow rights; otherwise 0.; *CCR* is cash compensation ratio; *CEO_duality* is a dummy which is equal to 1 if the CEO is also the chairman of the board; otherwise 0. The managerial entrenchment index is calculated as the weighted sum of the above five components. *Blockholdings* is equity ownership of institutional blockholders.

Table 2
Correlation matrix of financial constraints and managerial entrenchment

Variables	*Size*	*Dividend*	*CashFlow*	*Age*	*KZ*	*Loan*	*M-index*	*Blockholdings*
Size	1							
Dividend	0.051 (0.000)	1						
CashFlow	0.593 (<0.000)	0.053 (<0.000)	1					
Age	0.255 (<0.000)	0.009 (0.036)	0.036 (0.017)	1				
KZ	−0.241 (<0.000)	−0.654 (<0.000)	−0.165 (<0.000)	−0.194 (0.000)	1			
Loan	0.443 (<0.000)	−0.063 (<0.000)	0.166 (<0.000)	0.165 (<0.000)	−0.120 (<0.000)	1		
M-index	−0.131 (<0.000)	0.020 (<0.000)	−0.083 (<0.000)	−0.130 (<0.000)	0.043 (0.000)	−0.046 (<0.010)	1	
Blockholdings	0.215 (<0.000)	−0.110 (<0.000)	0.177 (<0.000)	−0.032 (0.035)	0.065 (<0.000)	0.111 (<0.000)	−0.035 (0.020)	1

This table reports the correlations between the variables in our analysis of the financial constraints and managerial entrenchment, with the data covering the 2000–2006 period having been obtained from the TEJ. We exclude companies within the financial industries. See section Financial constraints criteria of the text for full definitions of the financial constraints criteria: *Size*; *Dividend*; *CashFlow*; *Age; KZ* and *Loan*. *M-index* refers to the managerial entrenchment index; and *Blockholdings* is equity ownership of institutional blockholders. The *p*-values (reported in parentheses) are based on robust standard errors.

4. Methodology

We consider two measures of firm investment: (i) capital expenditure; and (ii) R&D expenditure.[16] We further note that R&D has a number of characteristics that differ from ordinary investment, as detailed below.

First, R&D investment is particularly subject to financing constraints, because it is firm-specific and difficult to evaluate (Himmelberg and Petersen, 1994). Second, R&D involves substantial adjustment costs, essentially because most costs of R&D are related to wage payments to highly skilled workers. Firms facing financial friction should therefore manage their liquidity to maintain smooth R&D (Brown and Petersen, 2011).

We test our first hypothesis on the investment-excess cash sensitivity with the division of our sample into financially constrained and unconstrained firms being undertaken in accordance with our six financial constraints. We test our second hypothesis on the investment-excess cash sensitivity with the division of our sample into higher entrenchment and lower entrenchment firms being undertaken according to our managerial entrenchment index.[17]

The equation is as follows:

$$I_{it} = \beta_0 + \beta_1 XCash_{i,t-1} + \beta_2 Q_{i,t-1} + \beta_3 CashFlow_{i,t} + x_{i,t} * \gamma + \text{Year Dummies} + \text{Industry Fixed Effects} + \varepsilon_{i,t} \quad (1)$$

Here, I_{it} represents the investment expenditure by firm i in year t; and $XCash_{i,t-1}$ is the start-of-year excess cash, scaled by the start-of-year book assets. The latter is measured by lagging the data by a year, which reduces the extent of the potential problem of endogeneity arising from simultaneous determination of these variables. Term $Q_{i,t-1}$ is the start-of-year market-to-book ratio to control for investment opportunity, which is the market value of equity plus the book value of assets minus the book value of equity divided by the book value of total assets. $CashFlow_{i,t}$ is cash flow normalized by the start-of-year book assets. Lastly, $x_{i,t}$ is a set of control variables representing the firm's financial status.

To test the costly external finance hypothesis, we expect that, ceteris paribus, the coefficient on *XCash* is more positive for financially constrained than for unconstrained firms. To test the empire-building hypothesis, we expect that, ceteris paribus, the coefficient on *XCash* is more positive for higher entrenchment than for lower entrenchment firms.

According to Stein (2003), we demonstrate the logic behind taking into account both the costly external finance model and the empire-building model. Our

[16] When there are missing values on R&D, it is set as being equal to zero.

[17] We also classify low (high) blockholding firms if their institutional blockholdings are below (above) the sample medium level to represent the firms with a weaker (better) governance structure.

financial constraints and managerial entrenchment proxies are included in Eqn (2), along with their interactions with excess cash. The equation is as follows:

$$\begin{aligned} I_{it} = {} & \beta_0 + \beta_1 XCash_{i,t-1} + \beta_2 FC_{i,t-1} + \beta_3 XCash_{i,t-1} * FC_{i,t-1} + \beta_4 M_{i,t-1} \\ & + \beta_5 XCash_{i,t-1} * M_{i,t-1} + \beta_6 Q_{i,t-1} + \beta_7 CashFlow_{i,t} + x_{i,t}\gamma \\ & + \text{Year Dummies} + \text{Industry Fixed Effects} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

Here, $FC_{i,t-1}$ is an indicator variable equal to 1 for firms with greater financial constraints at the start of year, and $M_{i,t-1}$ is an indicator variable equal to 1 for firms with higher managerial entrenchment at the start of year. All other variables are the same as defined in Eqn (1).

When considering both external financing cost and agency cost on the relationship between excess cash and investment, we include the interactions of *XCash*FC* and *XCash*M* in the model. If the coefficient on *XCash*FC* is significantly greater than zero, then it reflects that excess cash could be used to increase investment for constrained firms (underinvestment). If the coefficient on *XCash*M* is significantly greater than zero, then it reflects that entrenched managers spend more on investments out of the excess cash (overinvestment). When both *XCash*FC* and *XCash*M* are statistically greater than zero, it reflects that excess cash could be used to avoid underinvestment for constrained firms, whereas excess cash could also be spent towards overinvestment if constrained firms have a poor governance structure.

Numerous empirical studies focus on the ways in which financial status affects investment.[18] We rely upon these studies on investment decision-making for the control variables representing financial status. They include growth in sales (*SalesG*), firm size (*Size*) and total leverage (*Leverage*).[19]

The investment regression includes both industry and year fixed effects. The industry fixed effects may help to minimize the likelihood of excess cash affecting different types of investment friction across different industries.[20] The year fixed

[18] See, for example, Fazzari *et al*. (1988), Kaplan and Zingales (1997) and Denis and Sibilkov (2010).

[19] Owing to the editorial issues, we do not report all the control variables on our tables. Detailed results are available from the authors upon request.

[20] Denis and Sibilkov (2010) suggest that industry fixed effects rather than firm fixed effects are more appropriate for testing the hypothesis that greater cash holdings allow constrained firms to invest more than unconstrained firms could, because constrained firms rationally choose to maintain higher cash levels to fund investment. They do not think a firm's year-to-year variation in cash reserves is associated with investment. Furthermore, if firms with higher cash holdings invest more, then a firm's fixed effect specification will not pick up the effect, because it would disregard the higher level of investment as being a fixed effect. On the basis of the above reasons, we adopt industry fixed effects instead of firm fixed effects.

effects are used to control for the macroeconomic effects that could conceivably affect investment decision-making.

5. Empirical results

Table 3 reports the fixed effects regressions of investment on excess cash under financial constraints criteria. Panel A of Table 3 reports the sensitivity of capital expenditure to excess cash. As compared to unconstrained firms, under five of the six financial constraints, excess cash is found to have a significantly positive correlation with the capital expenditure for constrained firms. The coefficients on *XCash* indicate that about NT$0.036 ($p = 0.064$) to NT$0.079 ($p = 0.007$) of each one NT dollar of excess cash is allocated to increase capital expenditure for constrained firms compared with -NT$0.078 ($p = 0.000$) to -NT$0.047 ($p = 0.017$) for unconstrained firms. These results are largely in agreement with the first hypothesis, in that the dependence of excess cash on capital expenditure is stronger for constrained than for unconstrained firms.

Panel B of Table 3 presents the sensitivity of R&D expenditure to excess cash, from which we find that for both constrained and unconstrained firms, excess cash has a positive and significant correlation with R&D expenditure. The coefficients on *XCash* indicate that about NT$0.033 ($p = 0.000$) to NT$0.054 ($p = 0.000$) of each one NT dollar of excess cash is allocated to increase R&D expenditure for constrained firms compared with NT$0.020 ($p = 0.000$) to NT$0.049 ($p = 0.001$) for unconstrained firms. However, only two of the six constraints criteria show that the constrained firms would spend more excess cash on R&D spending. The results in Panel B indicate that excess cash enables both constrained and unconstrained firms to increase R&D investment.[21]

Table 4 reports the fixed effects regressions of investment on excess cash under managerial entrenchment. Panel A of Table 4 shows the investment-excess cash sensitivity when we use managerial entrenchment index as the measure for corporate governance. The dependence of *XCash* on capital expenditure is positive 0.022 ($p = 0.223$) for higher entrenchment firms and −0.023 ($p = 0.302$) for lower entrenchment firms, providing the empire-building preference of highly entrenched managers to use excess cash on capital expenditure although the difference is not significant. The R&D-excess cash sensitivity results show that NT$0.044 ($p = 0.000$) of each one NT dollar of excess cash is allocated to increase R&D expenditure for higher entrenchment firms compared with NT$0.031 ($p = 0.000$) for lower entrenchment firms. However, we are unable to

[21] We also restrict the sample to the firms with R&D expenditure greater than zero to test all of our empirical settings and find the results are unchanged.

Table 3
Fixed effects regressions of investment on excess cash under financial constraints criteria

	Size		*Dividend*		*CashFlow*		*Age*		*Loan*		*KZ*	
Variables	FC	UN	FC	UN	FC	UN	FC	UN	FC	UN	FC	UN
Panel A: Capex												
XCash	0.036	−0.047	0.062	−0.020	0.053	−0.078	0.007	0.006	0.054	−0.075	0.079	−0.022
	(0.064)*	(0.017)**	(0.021)**	(0.209)	(0.001)***	(0.000)***	(0.718)	(0.744)	(0.013)**	(0.102)	(0.007)***	(0.175)
Q	0.018	0.009	0.033	0.007	0.021	0.008	0.012	0.016	0.009	0.021	0.024	0.009
	(0.000)**	(0.026)**	(0.000)***	(0.061)*	(0.000) ***	(0.054)*	(0.005)***	(0.000)***	(0.045)**	(0.013)**	(0.000)***	(0.015)**
Cash Flow	0.194	0.329	0.187	0.287	0.119	0.390	0.248	0.274	0.273	0.303	0.249	0.255
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
No. of Obs.	1193	1403	824	1772	1178	1417	1219	1302	1253	442	1148	1448
Adj. R^2	0.213	0.347	0.260	0.280	0.198	0.309	0.277	0.283	0.272	0.377	0.345	0.229
p-value difference in coefficients on *XCash*	0.021**		0.008***		0.000***		0.724		0.027**		0.000***	
Panel B: R&D												
XCash	0.042	0.031	0.037	0.039	0.033	0.038	0.052	0.020	0.054	0.049	0.033	0.038
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.001)***	(0.001)***	(0.000)***
Q	0.014	0.007	0.012	0.011	0.015	0.008	0.015	0.006	0.011	0.013	0.008	0.012
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Cash Flow	0.007	0.016	−0.023	0.019	−0.009	0.021*	0.005	0.018	0.005	0.005	0.007	0.008
	(0.436)	(0.042)**	(0.034)**	(0.016)**	(0.352)	(0.057)	(0.603)	(0.013)**	(0.587)	(0.741)	(0.388)	(0.378)
No. of Obs.	1193	1403	824	1772	1178	1417	1219	1302	1353	442	1148	1448
Adj. R^2	0.377	0.395	0.371	0.378	0.375	0.375	0.377	0.323	0.357	0.413	0.346	0.381
p-value difference in coefficients on *XCash*	0.006***		0.162		0.979		0.000***		0.774		0.637	

This table reports the coefficients on the fixed effects of investment on excess cash under the financial constraints criteria, presenting the models separately for the groups of financial constrained (FC) and unconstrained (UN) firms. The dependent variable in Panel A is capital expenditure (*Capex*), and the dependent variable in Panel B is R&D expenditure (*R&D*); each of the dependent variables is normalized by the start-of-year book assets. *XCash* refers to the beginning-of-year excess cash holdings of a firm normalized by the start-of-year book assets. The control variables are as follows: *Q* is the beginning-of-year market-to-book ratio; *Cash Flow* is cash flow normalized by the start-of-year book assets; *Size* is natural log of assets; *SalesG* is the growth in sales over the previous three-year period, and *Leverage* is the sum of long-term debt and current liabilities normalized by the start-of-year book assets. The *p*-values based on robust standard errors are reported in parentheses. ***, **, and * indicate statistical significance at the 1, 5, 10% levels, respectively. All estimations include industry and year indicators as well as intercept term.

Table 4
Fixed effects regressions of investment on excess cash under managerial entrenchment

	Panel A				Panel B			
	Capex		R&D		Capex		R&D	
Variables	Higher entrenchment	Lower entrenchment	Higher entrenchment	Lower entrenchment	Low blockholding	High blockholding	Low blockholding	High blockholding
XCash	0.022 (0.223)	−0.023 (0.302)	0.044 (0.000)***	0.031 (0.000)***	0.037 (0.031)**	−0.061 (0.006)***	0.040 (0.000)***	0.036 (0.000)***
Q	0.011 (0.002)***	0.015 (0.008)***	0.011 (0.000)***	0.010 (0.000)***	0.021 (0.000)***	0.006 (0.219)	0.011 (0.000)***	0.011 (0.000)***
Cash Flow	0.262 (0.000)***	0.254 (0.000)***	0.009 (0.211)	0.014 (0.243)	0.176 (0.000)***	0.347 (0.000)***	0.015 (0.064)*	0.005 (0.603)
No. of Obs.	1724	872	1724	872	1390	1205	1390	1205
Adj. R^2	0.298	0.245	0.390	0.359	0.268	0.317	0.383	0.371
p-value difference in coefficients on *XCash*	0.227		0.317		0.002***		0.469	

Panel A reports the coefficients on the fixed effects of investment on excess cash under managerial entrenchment, presenting the models separately for groups of higher/lower entrenchment firms, where higher (lower) entrenchment firms are defined as those with managerial entrenchment index above (below) the quartile. Panel B reports the coefficients on the fixed effects of investment on excess cash under institutional blockholdings, presenting the models separately for groups of high/low blockholding firms, where high (low) blockholding firms are defined as those with institutional blockholdings above (below) the medium. The dependent variables are capital expenditure normalized by the start-of-year book assets (*Capex*); R&D expenditure normalized by the start-of-year book assets *(R&D*). *XCash* refers to the beginning-of-year excess cash holdings of a firm normalized by the start-of-year book assets. The control variables are as follows: *Q* is the beginning-of-year market-to-book ratio; *Cash Flow* is cash flow normalized by the start-of-year book assets; *Size* is natural log of assets; *SalesG* is the growth in sales over the previous three-year period, and *Leverage* is the sum of long-term debt and current liabilities normalized by the start-of-year book assets. The *p*-values based on robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. All estimations include industry and year indicators as well as intercept term.

find evidence that R&D-excess cash sensitivity is stronger for higher entrenchment than for lower entrenchment firms.[22]

Panel B of Table 4 presents the results of investment-excess cash sensitivity when we use institutional blockholdings as a robustness check. For low blockholding firms, NT$0.037 ($p = 0.031$) of each one NT dollar of excess cash is allocated to capital expenditure compared with -NT$0.061 ($p = 0.006$) for high blockholding firms. Thus, the findings confirm the entrenchment effect on capital expenditure-excess cash sensitivity. However, although excess cash is significantly positive to R&D for both high and low blockholding firms, we still cannot find that the sensitivity is higher for low blockholding than for high blockholding firms.

Table 5 presents the regression results examining the effect of excess cash on investment under financial constraints and managerial entrenchment. Panel A of Table 5 reports the sensitivity of capital expenditure to excess cash under the two dimensions. The coefficients on the interactions *XCash*FC* and *XCash*M* indicate that (an) additional NT$0.072 ($p = 0.007$) to NT$0.124 ($p = 0.014$) of each one NT dollar of excess cash is used in capital expenditure for constrained than for unconstrained firms. On the other hand, (an) additional NT$0.049 ($p = 0.063$) to NT$0.073 ($p = 0.046$) of each one NT dollar of excess cash might be overinvested on capital expenditure when constrained firms are poorly governed. We therefore conclude that firms that are small in size have lower cash-flow levels and have bank loans below the mean level tend to use excess cash to fund their capital expenditure. Moreover, when their managers are more highly entrenched, the firms will also have a tendency for overinvestment.

Panel B of Table 5 reports R&D-excess cash sensitivity under the two dimensions. The coefficients on *XCash*FC* are positively significant only for the size and age criteria. However, the coefficients on *XCash*M* are all found to be positive, although only the size and loan criteria have statistical significance. Overall, there is no consistent evidence to show which dimension affects R&D-excess cash sensitivity.

Table 6 presents the regression results examining the effect of excess cash on investment under financial constraints and institutional blockholdings. Panel A

[22] We also examine the cash holdings by adding the managerial entrenchment index in the predicted normal cash holding regression. The regression shows $Ln\ (Cash/NA) = -1.742 + 2.361 CashFlow/NA - 0.097 Size + 0.327\ WC/NA - 0.972 IndustrySigma + 4.859 RD/NA + 0.093 MV/NA + 0.099 Capex/NA + 0.603 Leverage/NA + 0.219 Dividend - 0.059 M\text{-}inex$. This means that highly entrenched firms in Taiwan hold lower cash reserves, which is consistent with the finding of Harford *et al.* (2008) in that managers in United States firms with a weaker governance structure spend cash quickly. We explain weak governance firms have lower cash reserves because managers spend cash on capital expenditures (overinvestment).

Table 5
Fixed effects regressions of investment on excess cash under financial constraints and managerial entrenchment

	Size		*Dividend*		*CashFlow*		*Age*		*Loan*		*KZ*	
Variables	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Panel A: Capex												
XCash	−0.058**	0.019	−0.027	0.166	−0.081***	0.001	−0.006	0.804	−0.107**	0.045	-0.028	0.152
FC	−0.001	0.810	−0.014***	0.001	−0.009**	0.032	0.005	0.221	0.005	0.335	−0.006	0.115
*FC*XCash*	0.072***	0.007	0.081**	0.013	0.114***	0.000	−0.090	0.727	0.124**	0.014	0.110***	0.001
M	−0.005	0.289	−0.002	0.613	−0.005	0.254	−0.003	0.479	−0.009*	0.091	−0.003	0.561
*M*XCash*	0.049*	0.063	0.022	0.404	0.051*	0.054	0.031	0.236	0.073**	0.046	0.015	0.572
No. of Obs.	2596		2596		2595		2521		1795		2596	
Adj. R^2	0.281		0.282		0.284		0.282		0.295		0.283	
Panel B: R&D												
XCash	0.015	0.109	0.035***	0.000	0.032***	0.000	0.001	0.950	0.025	0.172	0.036***	0.000
FC	0.001	0.448	0.001	0.350	−0.002	0.193	−0.001	0.396	−0.003	0.119	0.001	0.394
*FC*XCash*	0.029***	0.003	−0.018	0.123	0.001	0.899	0.058***	0.000	0.004	0.814	−0.022*	0.052
M	−0.003*	0.095	−0.002	0.150	−0.002	0.183	−0.002	0.178	−0.004**	0.019	−0.002	0.151
*M*XCash*	0.017*	0.075	0.012	0.214	0.010	0.297	0.011	0.238	0.046***	0.000	0.013	0.182
No. of Obs.	2596		2596		2595		2521		1795		2596	
Adj. R^2	0.374		0.371		0.371		0.387		0.376		0.371	

This table reports the coefficients on the fixed effects of investment on excess cash under both financial constraints and managerial entrenchment. The dependent variable in Panel A is capital expenditure (*Capex*), while the dependent variable in Panel B is R&D expenditure (*R&D*); all of the dependent variables are normalized by the start-of-year book assets. *XCash* refers to the beginning-of-year excess cash holdings of a firm normalized by the start-of-year book assets. *FC* is a dummy variable for financial constraints which is equal to 1 (0) if the firm is financially constrained (unconstrained); *M* is a dummy variable which is equal to 1 (0) if the managerial entrenchment index is above (below) the sample quartile. The control variables are as follows: *Cash Flow* is cash flow normalized by the start-of-year book assets; *Q* is the beginning-of-year market-to-book ratio; *Size* is natural log of assets; *SalesG* is the growth in sales over the previous three-year period, and *Leverage* is the sum of long-term debt and current liabilities normalized by the start-of-year book assets. The *p*-values based on robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. All estimations include industry and year indicators as well as intercept term. Detailed results are available from the authors upon requests.

of Table 6 provides results on capital expenditure under the two dimensions.[23] The coefficients on the interactions *XCash*FC* and *XCash*Block* indicate that (an) additional NT$0.044 ($p = 0.099$) to NT$0.113 ($p = 0.000$) of each one NT dollar of excess cash is used on capital expenditure for constrained than for unconstrained firms. Conversely, (an) additional NT$0.065 ($p = 0.012$) to NT$0.081 ($p = 0.002$) of each one NT dollar of excess cash might be overinvested on capital expenditure for constrained firms with low institutional blockholdings.

Panel B of Table 6 shows the results on R&D under the two dimensions. The coefficients on the interaction *XCash*FC* are found to be significantly positive for two of the six criteria, whereas none of the other coefficients on the interaction *XCash*Block* are found to have any statistical significance. We still cannot find a consistent effect on R&D-excess cash sensitivity.

Compared with the results of Table 5, the significance of the interaction *XCash*Block* in the results of Table 6 highlights the entrenchment effect on investment-excess cash sensitivity, even though the firms are financially constrained. The excess cash can help these firms take on profitable projects, but a part of it is still overinvested when constrained firms are less monitored by institutional blockholders.

6. Conclusions

In this study, we aim to determine how excess cash affects firm investment expenditure in an imperfect market. Two hypotheses are developed to examine whether underinvestment arising from information asymmetry exists in financially constrained firms and whether overinvestment arising from agency problems exists in poor governance firms. Furthermore, considering both the costly external finance and empire-building dimensions, we attempt to find out whether these two dimensions coexist to affect investment-excess cash sensitivity.

Using six financial constraints approaches, we find that the dependence of excess cash for capital expenditure is stronger for constrained than for unconstrained firms. This is mostly consistent with the argument of underinvestment. Nevertheless, excess cash is associated with R&D for both constrained and unconstrained firms.

We develop a managerial entrenchment index and find empire-building preferences in capital expenditure for highly entrenched managers. The evidence holds for low blockholding firms when we use institutional blckholdings as a robust check. Nevertheless, R&D expenditure is unrelated to the problem of overinvestment.

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[23] When we use institutional blockholdings as another measure of corporate governance, the *Block* dummy is an indicator variable equal to 1 for firms less monitored by institutional blockholders at the start of year.

Table 6
Fixed effects regressions of investment on excess cash under financial constraints and institutional blockholdings

	Size		*Dividend*		*CashFlow*		*Age*		*Loan*		*KZ*	
Variables	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value	Coeff.	*p*-value
Panel A: Capex												
XCash	−0.057***	0.009	−0.056***	0.007	−0.083***	0.000	−0.036	0.152	−0.089	0.175	−0.067***	0.002
FC	0.001	0.832	−0.013***	0.002	−0.007*	0.090	0.005	0.236	0.002	0.788	−0.006	0.124
*FC*XCash*	0.044*	0.099	0.078**	0.014	0.095***	0.000	−0.009	0.711	0.096	0.159	0.113***	0.000
Block	−0.010***	0.006	−0.010***	0.006	−0.009***	0.007	−0.011***	0.004	−0.012***	0.008	−0.011***	0.002
*Block*XCash*	0.068**	0.011	0.072***	0.005	0.065**	0.012	0.080***	0.002	0.072*	0.052	0.081***	0.002
No. of Obs.	2595		2595		2594		2520		1798		2594	
Adj. R^2	0.283		0.285		0.286		0.285		0.292		0.285	
Panel B: R&D												
XCash	0.025***	0.002	0.037**	0.000	0.035***	0.000	0.005	0.587	0.057**	0.012	0.038***	0.000
FC	0.002	0.378	0.001	0.479	−0.002	0.234	−0.001	0.453	−0.002	0.318	0.001	0.589
*FC*XCash*	0.025***	0.009	−0.017	0.158	−0.001	0.898	0.057***	0.000	−0.003	0.903	−0.018*	0.099
Block	0.002*	0.094	0.002	0.219	0.002	0.177	0.002	0.168	0.003**	0.045	0.002	0.193
*Block*XCash*	0.001	0.952	0.007	0.419	0.006	0.488	0.003	0.760	−0.003	0.805	0.006	0.508
No. of Obs.	2595		2595		2594		2520		1798		2594	
Adj. R^2	0.374		0.372		0.372		0.388		0.374		0.372	

This table reports the coefficients on the fixed effects of investment on excess cash under both financial constraints and institutional blockholdings. The dependent variable in Panel A is capital expenditure (*Capex*), while the dependent variable in Panel B is R&D expenditure (*R&D*); all of the dependent variables are normalized by the start-of-year book assets. *XCash* refers to the beginning-of-year excess cash holdings of a firm normalized by the start-of-year book assets. *FC* is a dummy variable for financial constraints which is equal to 1 (0) if the firm is financially constrained (unconstrained); *Block* is a dummy variable which is equal to 1 (0) if the institutional blockholdings of the firm are below (above) the median for the sample. The control variables include *Cash Flow* is cash flow normalized by the start-of-year book assets; *Q* is the beginning-of-year market-to-book ratio; *Size* is natural log of assets; *SalesG* is the growth in sales over the previous three-year period, and *Leverage* is the sum of long-term debt and current liabilities normalized by the start-of-year book assets. The *p*-values based on robust standard errors are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. All estimations include industry and year indicators as well as intercept term. Detailed results are available from the authors upon requests.

Our paper complements recent literature by considering how both costly external finance and management entrenchment influence investment-excess cash sensitivity. We find that excess cash is significantly correlated with capital expenditure, particularly for firms that are financially constrained and under severe managerial entrenchment. However, excess cash is not correlated with R&D under these two dimensions.

In summary, our results have implications for corporate liquidity management in an emerging market like Taiwan. Although excess cash is beneficial for financially constrained firms, it could expropriate shareholders' interests by facilitating empire-building overinvestment when such firms also have severe managerial entrenchment. Therefore, it might be questionable for poorly managed firms to accumulate cash even though they are facing costly external funds. Further research could be carried out to find under which state excess cash can be used for value-increasing or value-decreasing investment when both financial constraints and agency problems are considered.

References

Almeida, H., M. Campello, and M. S. Weisbach, 2004, The cash flow sensitivity of cash, *Journal of Finance* 59, 1777–1804.

Alti, A., 2003, How sensitive is investment to cash flow when financing is frictionless?, *Journal of Finance* 58, 707–722.

Babenko, I., M. Lemmon, and Y. Tserlukevich, 2011, Employee stock options and investment, *Journal of Finance* 66, 981–1009.

Berger, P. G., E. Ofek, and D. L. Yermack, 1997, Managerial entrenchment and capital structure decisions, *Journal of Finance* 52, 1411–1438.

Brown, J. R., and B. C. Petersen, 2011, Cash holdings and R&D smoothing, *Journal of Corporate Finance* 17, 694–709.

Callahan, W. T., J. A. Millar, and C. Schulman, 2003, An analysis of the effect of management participation in director selection on the long-term performance of the firm, *Journal of Corporate Finance* 9, 169–181.

Claessens, S., S. Djankov, and L. Lang, 2000, The separation of ownership and control in East Asia corporations, *Journal of Financial Economics* 58, 81–112.

Denis, D. J., and V. Sibilkov, 2010, Financial constraints, investment and the value of cash holdings, *Review of Financial Studies* 23, 247–269.

Dittmar, A., and J. Mahrt-Smith, 2007, Corporate governance and the value of cash holdings, *Journal of Financial Economics* 83, 599–634.

Dittmar, A., J. Mahrt-Smith, and H. Servaes, 2003, International corporate governance and corporate cash holdings, *Journal of Financial and Quantitative Analysis* 38, 111–133.

Donaldson, L., 1990, The ethereal hand: organizational economics and management theory, *Academy of Management Review* 15, 369–381.

Fama, E. F., and M. C. Jensen, 1983, Separation of ownership and control, *Journal of Law and Economics* 26, 301–325.

Faulkender, M., and R. Wang, 2006, Corporate financial policy and the value of cash, *Journal of Finance* 61, 1957–1990.

Fazzari, S., G. Hubbard, and B. Petersen, 1988, Financing constraints and corporate investment, *Brooking Papers on Economic Activity* 1, 141–195.

Florackis, C., and A. Ozkan, 2009, Managerial incentives and corporate leverage: evidence from the United Kingdom, *Accounting and Finance* 49, 531–553.
Franzoni, F., 2009, Underinvestment vs. overinvestment: evidence from price reaction to pension contributions, *Journal of Financial Economics* 92, 491–518.
Fresard, L., and C. Salva, 2010, The value of excess cash and corporate governance: evidence from US cross-listings, *Journal of Financial Economics* 98, 359–384.
Hadlock, C. J., and J. R. Pierce, 2010, New evidence on measuring financial constraints: moving beyond the KZ Index, *Review of Financial Studies* 23, 1909–1940.
Harford, J., S. Mansi, and W. Maxwell, 2008, Corporate governance and firm cash holdings in the US, *Journal of Financial Economics* 87, 535–555.
Himmelberg, C. P., and B. C. Petersen, 1994, R&D and internal finance: a panel study of small firms in high-tech industries, *Review of Economics and Statistics* 76, 38–51.
Jensen, M., 1986, Agency costs of the free cash flow, corporate finance and takeovers, *American Economic Review* 76, 323–329.
Jensen, M., 1993, Presidential address: the modern industrial revolution, exit and the failure of internal control systems, *Journal of Finance* 48, 831–880.
Kalcheva, I., and K. Lins, 2007, International evidence on cash holdings and expected managerial agency problems, *Review of Financial Studies* 20, 1087–1112.
Kaplan, S., and L. Zingales, 1997, Do investment-cash flow sensitivities provide useful measures of financing constraints? *Quarterly Journal of Economics* 112, 169–215.
Khurana, I. K., X. Martin, and R. Pereira, 2006, Financial development and the cash flow sensitivity of cash, *Journal of Financial and Quantitative Analysis* 41, 787–807.
Kothari, S. P., T. E. Laguerre, and A. J. Leone, 2002, Capitalization versus expensing: evidence on the uncertainty of future earnings from capital expenditure versus R&D outlays, *Review of Accounting Studies* 7, 355–382.
La Porta, R., F. Lopez-de-Silanes, and A. Shleifer, 1998, Law and finance, *Journal of Political Economy* 106, 1113–1155.
La Porta, R., F. Lopez-de-Silanes, and A. Shleifer, 1999, Corporate ownership around the world, *Journal of Finance* 54, 471–517.
Leland, H., and D. Pyle, 1977, Information asymmetries, financial structure and financial intermediation, *Journal of Finance* 32, 371–387.
McLean, R. D., T. Zhang, and M. Zhao, 2012, Why does the law matter? Investor protection and its effects on investment, finance and growth, *Journal of Finance* 67, 313–350.
Myers, S. C., and N. S. Majluf, 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., and R. G. Rajan, 1998, The paradox of liquidity, *Quarterly Journal of Economics* 113, 733–771.
Opler, T., L. Pinkowitz, R. M. Stulz, and R. Williamson, 1999, The determinants and implications of corporate cash holdings, *Journal of Financial Economics* 52, 3–46.
Pinkowitz, L., and R. Willionson, 2004, *What is a Dollar Worth? The Market Value of Cash Holdings*, Working paper (Georgetown University, McDonough School of Business, Washington, DC).
Pinkowitz, L., R. M. Stulz, and R. Williamson, 2006, Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis. *Journal of Finance* 61, 2725–2752.
Shen, C. H., and C. A. Wang, 2005, Does bank relationship matter for a firm's investment and financial constraints? The case of Taiwan, *Pacific-Basin Finance Journal* 13, 163–184.
Shleifer, A., and R. W. Vishny, 1986, Large shareholders and corporate control, *Journal of Political Economy* 94, 461–488.

Shleifer, A., and R. W. Vishny, 1989, Management entrenchment: the case of manager-specific investments, *Journal of Financial Economics* 25, 123–139.
Stein, J., 2003, Agency, information and corporate investment, in: G. Constantinides, M. Harris, R. Stulz, eds., *Handbook of the Economics of Finance*, (Elsevier/North-Holland, New York), 111–165.
Xu, N., X. Xu, and Q. Yuan, 2012, Political connection, financing frictions and corporate investment: evidence from Chinese listed family firms, *European Financial Management*, forthcoming.
Yeh, Y. H., and T. Woidtke, 2005, Commitment or entrenchment? Controlling shareholders and board composition, *Journal of Banking and Finance* 29, 1857–1885.