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ORIGINAL RESEARCH

Financial flexibility, corporate investment and performance: evidence from financial crises

Özgür Arslan-Ayaydin · Chris Florackis · Aydin Ozkan

Abstract This study examines the impact of financial flexibility on the investment and performance of East Asian firms over the period 1994–2009. We employ a sample of 1,068 firms and place particular emphasis on the periods of the Asian crisis (1997–1998) and the recent credit crisis (2007–2009). The results show that firms can attain financial flexibility, primarily through conservative leverage policies and less commonly by holding large cash balances. Financial flexibility appears to be an important determinant of investment and performance, mainly during the Asian 1997–1998 crisis. In particular, firms that are financially flexible prior to this crisis (1) have a greater ability to take investment opportunities, (2) rely much less on the availability of internal funds to invest, and (3) perform better than less flexible firms during the crisis. Our analysis covering the credit crisis period of 2007–2009 suggests that some of the advantages of flexible firms towards investing persist but are significantly less pronounced over that period. We also find that the value of financial flexibility is region/country specific, which may be explained by the fact that different regions/countries often adopt different macroeconomic policies and operate in diverse economic/legal environments.

Keywords Financial flexibility · Corporate investment · Liquidity management · Financial crisis · Financing constraints

JEL Classification G01 · G31 · G32

Ö. Arslan-Ayaydin
Department of Finance, University of Illinois at Chicago, 2416 University Hall, 601 South Morgan St., Chicago, IL 60607, USA
e-mail: orslan@uic.edu

C. Florackis (✉)
The Management School, University of Liverpool, Liverpool L69 7ZH, UK
e-mail: c.florackis@liv.ac.uk

A. Ozkan
Department of Accounting and Finance, Business School, University of Hull, Hull HU6 7RX, UK
e-mail: a.ozkan@hull.ac.uk

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1 Introduction

The majority of senior corporate managers around the world consider financial flexibility as one of the most important determinants of their capital structure decisions (Graham and Harvey 2001; Bancel and Mittoo 2004; Brounen et al. 2006). The academic literature argues that the motives to attain financial flexibility are related to the future ability and need of firms to raise external funds and restructure their financing at low cost (DeAngelo and DeAngelo 2007; Gamba and Triantis 2008; Byoun 2008). Firms with financial flexibility enjoy easier access to external capital markets to meet funding needs arising from unanticipated earnings shortfalls—and/or new growth opportunities—and hence, avoid situations that may lead to suboptimal investment and poor performance.[1]

In this study we empirically investigate the effects of financial flexibility on corporate investment and performance over the period 1994–2009, by paying particular attention to the East Asian crisis of 1997–1998 and the credit crisis of 2007–2009. Focusing on crises periods provides us with clear advantages. Economic and financial crises clearly represent exogenous shocks to firms' viability, profitability and cash flows, and generally reduce the expected return on investment opportunities. Moreover, due to lower asset prices, crises create opportunities for firms with the ability to invest (Mitton 2002; Byoun and Xu 2011). To the extent that flexible firms are better equipped to cope with the adverse consequences of exogenous shocks, our analysis allows us to test the impact of financial flexibility on corporate performance and investment during periods of financial stress. The main hypothesis we investigate in this paper is that, *ceteris paribus*, the greater a firm's financial flexibility at the onset of a crisis, the less severe the decline in its investment expenditures and performance during the crisis. Further analysis, covering non-crises periods, seeks to address the question of whether such effects persist during normal periods of the economic cycle.

Our analysis begins with the construction of simple indicators of financial flexibility. Existing studies mainly focus on leverage and cash holdings decisions as ways of preserving flexibility, though these policies are generally considered separately.[2] Only recently have studies adopted the view that firms can attain financial flexibility through both their debt financing and cash holdings policies.[3] By drawing insights from these

[1] Similar views have also been put forward by earlier studies. For example, the pecking order theory of capital structure, proposed by Myers (1984) and Myers and Majluf (1984), is based on the assumption that firms preserve financial slack to avoid the need for external funds in financing future investment opportunities. Also, Froot et al (1993) suggest that firms maintain financial flexibility to avoid the costs of underinvestment.

[2] A number of studies emphasize the importance of obtaining financial flexibility through low leverage policies (Billet et al. 2007; Byoun 2008; Lins et al. 2010; Campello et al. 2010) or moderate/high cash balances (Opler et al. 1999; Billet and Garfinkel 2004; Almeida et al. 2004; Acharya et al. 2007; Faulkender and Wang 2006; Dittmar and Mahrt-Smith 2007; Kalcheva and Lins 2007; Harford et al. 2008; Riddick and Whited 2008). The main argument of both lines of research is that firms with readily available large cash balances or low leverage can better cope with earnings shortfalls and hence avoid underinvestment.

[3] For example, DeAngelo and DeAngelo (2007) explicitly consider leverage and cash holdings to define financial flexibility and argue that low leverage combined with moderate cash holdings and high dividend payouts constitute an optimal policy regarding flexibility. In line with this view, Gamba and Triantis (2008) show that financial flexibility can be a result of the firm's strategic decisions regarding its capital structure, liquidity and investment. Moreover, in the light of increased risk in the economic environment, Bates et al. (2008) argue that high cash holdings are related to low levels of debt and hence the simultaneous practice of these policies enable firms to forestall distress and default. Finally, Byoun (2008) reports that small developing firms are more likely to seek financial flexibility and do so through lower leverage and larger cash holdings policies.

studies and noting that firms can attain financial flexibility through alternative routes (e.g. by accumulating cash, adopting a conservative leverage policy or adjusting simultaneously their cash and leverage levels), we classify firms into several groups of financial flexibility on the basis of their leverage and cash holding positions during pre crisis periods. We then examine whether firms that attain financial flexibility in pre crisis periods benefit from it by having a greater ability to take investment opportunities during crises. For comparison purposes, a similar analysis is conducted by using flexibility proxies that are based on excess cash and retained earnings (see Lee et al. 2011; Blau and Fuller 2008; DeAngelo and DeAngelo 2006).

To address the relationship between financial flexibility and corporate investment, we estimate cash flow sensitivities using the investment equation framework commonly used in the literature (see e.g. Fazzari et al. 1988; Hubbard et al. 1995; Cleary 2006; Carpenter and Guariglia 2008 among others). However, our emphasis is similar to that in recent studies that attempt to provide insights into the effects of supply-side shocks on corporate investment (see Duchin et al. 2010). We also examine whether the performance of firms with greater flexibility differs from that of less flexible firms. By doing so, our study adds to the literature that investigates the effects of financial crises on corporate performance and contributes to the recent research on the value of financial flexibility (see e.g., Gamba and Triantis 2008; Byoun 2008; 2011). For example, prior studies of the East Asian crisis present strong evidence for the importance of several firm characteristics, such as ownership structure and corporate governance, in determining corporate performance (Johnson et al. 2000; Mitton 2002; Fisman 2002; Lemmon and Lins 2003). Our analysis builds on these studies by specifically focusing on the potential role that financial flexibility might play for corporate valuation during the crisis.

Finally, drawing on recent findings showing strong inter-relations across several indicators of financial constraints and financial health (Cleary 2006; Carpenter and Guariglia 2008), our study also examines how traditional measures of financial constraints, such as dividend, firm size, firm age and business group affiliation, interact with the flexibility indicators utilized in this study. To this end, we evaluate the relative importance of traditional measures of financing constraints and leverage-based and cash-based flexibility indicators in explaining corporate investment and performance. By doing so, our study also contributes to the rich literature that examines whether large investment to cash flow sensitivities can be treated as evidence of financing frictions (see, e.g., Fazzari et al. 1988; Kaplan and Zingales 1997; Cleary 1999; Guariglia 2008; Pindado et al. 2011).

Our analysis provides several important findings. First, flexible firms seem to have a greater capacity to pursue growth opportunities in the face of unanticipated earnings shortfalls during the crisis of 1997–1998. This effect is significantly less pronounced over the period 2007–2009. Second, between the two components of flexibility, namely cash and leverage, leverage seems to be the main driver of investment behaviour during crisis periods. Our results suggest that cash is more likely to be held as a form of insurance against financial distress and bankruptcy. Third, companies cannot solely rely on a business group affiliation to hedge against uncertain future contingencies. It seems that during economic downturns financial flexibility is an important determinant of investment for all firms, independently of whether they belong to a business group or not. Fourth, based on the results for the 1997–1998 crisis, financial flexibility not only leads to higher investment expenditures and lower investment cash flow sensitivity but also to better performance. Interestingly, we do not observe any significant differences in terms of investment level and cash flow sensitivity to investment between flexible and inflexible firms during normal times (e.g. over the period 1999–2006). This reinforces the argument that the value of

financial flexibility is higher during abnormal periods of the economic cycle. Fifth, our results suggest that the impact of financial flexibility on investment does not only vary with time but also with macroeconomic conditions. To the extent that different countries/regions adopt different macroeconomic policies, the benefits of financial flexibility are country/region specific. Finally, our results, which go through a battery of robustness checks, demonstrate that cash and leverage policies of flexible firms in the pre crisis period are neither random nor driven by constraints arising from capital market imperfections.

The rest of the paper is organized as follows: Sect. 2 describes the data and provides summary statistics. Section 3 provides a detailed analysis regarding the role of financial flexibility in determining corporate investment. Section 4 investigates the relationship between financial flexibility and corporate performance, and Sect. 5 provides a series of robustness tests. Finally, Sect. 6 concludes.

2 Data and descriptive statistics

Our analysis to examine the value of financial flexibility is based on a sample of 1,068 listed firms from the following countries: Hong Kong, Indonesia, Malaysia, South Korea, and Thailand, including four of the most affected Asian economies plus Hong Kong, a key market in the region, which was relatively less affected by the crisis than others but was still subject to some large shocks due to the openness of its economy and its close relationship with the other East Asian economies. Given our objective to emphasize on crises periods, including the East Asian crisis of 1997–1998, we exclude from the analysis Philippines, Singapore and Taiwan as they account for three of the mildly affected countries from the crisis (see Winters 1999).[4]

Our dataset is constructed using data from several sources. Specifically, we obtain data on accounting and market variables from Thomson Reuters Datastream. The dataset covers pre Asian crisis (1994–1996), Asian crisis (1997–1998), post Asian crisis (1999–2006) and credit crisis (2007–2009) periods.[5] To select the sample of firms, we drop financial firms and delete firm year observations with missing data and extreme values for the variables included in the regression analysis. Finally, we keep in the sample only those firms that are traceable during the sample period. These criteria led to a final sample of 1,068 firms. We match firms in this sample with those from the study of Claessens et al. (2000) to obtain information on business group affiliation, the magnitude of separation between cash flow and control rights, the identity of the largest shareholder, and the role of CEOs and other senior managers as controlling shareholders of the company. These data are of either

[4] Characteristically, between July and November 1997, both Taiwan and Singapore had a current account surplus of more than 10 % and Philippines had almost no deficit although the other countries in the region had a current account deficit of more than 10 % on average. Also, between May 1997 and May 1998 Taiwan was the only East Asian country for which the average daily change in its stock market was not negative (see also Radelet and Sachs 1998; Nixson and Walters 1999).

[5] To identify the pre Asian crisis and Asian crisis period, we follow earlier studies on the subject (see e.g., Lee and Song 2012; Claessens et al. 2006; Lemmon and Lins 2003). For robustness purposes we also adjust the pre crisis, Asian crisis and post crisis to 1995–1997, 1998–1999 and 2000–2007 respectively, for Hong Kong. This helps control for the fact that the crisis occurred in Hong Kong with some delay (Radelet and Sachs 1998; Nixson and Walters 1999; Lam et al. 2010). The results (available upon request) are not affected significantly by this adjustment.

December 1996 or the end of the fiscal year 1996, which is just before the start of the crisis in East Asia.[6] Finally, given the cross country nature of our study, we also consider a country based rule of law measure that ranges from 0 to 10, with lower scores corresponding to less tradition for law and order. This measure is based on an assessment of the law and order tradition in a country as produced by the country risk taking agency International Country Risk (ICR).[7]

Table 1 summarizes the basic descriptive statistics for the key variables of the study using the whole sample, reported separately for the pre crisis, 1997–1998 crisis, post crisis and credit crisis periods (Panels A, B, C and D respectively). We start with analyzing the changes in the statistics of the key variables from the pre crisis to the 1997–1998 crisis period. In general, the statistics differ significantly across the two sub-periods. For example, the mean value of investment expenditures of firms drops from 8.1 % in the pre crisis period to about 4.1 % during the crisis, which represents 49 % decrease. Not surprisingly, the average cash flow ratio also drops by about 30 %, from 9.9 to 6.9 %. Furthermore, both growth opportunities, measured by the market to book ratio, and firm size get smaller during the crisis period, with the average values of the market to book ratio and the logarithm of total assets (expressed in US dollars) dropping from 1.57 to 1.19, and 12.44 to 12.33, respectively. Additionally, the crisis leads firms to significantly reduce their dividend payout ratios by about 35 % (from 2.0 to 1.3 %). Turning to the changes in the cash holding and leverage ratios of firms, we find that the cash holdings ratio of the average firm in our sample remains almost unchanged during the crisis period at about 11 %. However, the change in the average value of leverage is significant, increasing from 29.2 % in the pre crisis period to 34.7 % in the crisis period, corresponding to an 18.8 % increase. In line with the findings regarding leverage and cash holdings, there is an increase in net debt (defined as total debt minus cash holdings), divided by total assets during the crisis, which is mainly driven by the increase in leverage.

The findings regarding leverage and net debt ratios are at odds with the view that the average debt level usually drops during a crisis period as a response to the increase in uncertainty and asymmetric information between borrowers and lenders. As we discuss later in Sect. 3, however, on closer inspection it appears that there are two groups of firms in our sample that behave differently with respect to their capital structure decision. On the one hand, a large proportion of firms, mainly those that adopt aggressive leverage policies in the pre crisis period, experience difficulties to increase their leverage during the crisis period. On the other hand, consistent with our expectations, firms that adopt conservative policies in normal times (e.g. by retaining leverage at relatively low levels) indicate a higher ability to raise external financing in abnormal times.

Moving to the transition from the 1997–1998 crisis to the post Asian crisis period, we do not observe any significant changes to the levels of capital expenditures, cash flow, firm size and asset tangibility. However, there is a notable increase in the levels of cash holding where the average (median) value increases from 11.1 (7.2)% in the crisis period to 12.7 (8.8)% in the post crisis period. Moreover, a year-by-year analysis suggests a consistent increase of the median level of cash holdings from about 7.6 % in 1999 to more than 10 % in 2006. This confirms the recent findings of Lee and Song (2012) for eight East Asian countries and is also in line with the strong precautionary motive to hold more cash

[6] Ownership data cannot be obtained for a small number of firms in our sample. This should not bias, however, our results in a particular manner as there are no statistically significant differences, with respect to their key characteristics, between East Asian firms with and without ownership data at a particular point of time (see also Lins 2003; Lemmon and Lins 2003).

[7] See also La Porta et al. (1998).

Table 1 Descriptive statistics for all firms: 1994–2009

	Mean	Median	Min	Max	Mean	Median	Min	Max
	Panel A: Pre crisis period (1994–1996)				*Panel B: Asian crisis period (1997–1998)*			
Investment	0.081	0.063	0	0.590	0.041	0.026	0	0.346
CFLOW	0.099	0.091	−0.128	0.761	0.069	0.064	−0.630	0.520
MTB	1.568	1.224	0.220	15.29	1.186	0.950	0.173	11.98
Size	12.44	12.29	7.908	17.49	12.33	12.25	7.174	17.71
Leverage	0.292	0.283	0	0.854	0.347	0.324	0	1
Cash	0.112	0.073	0	0.748	0.111	0.072	0	0.833
Dividend	0.020	0.013	0	0.273	0.013	0.002	0	0.606
Tangibility	0.409	0.394	0	0.965	0.439	0.429	0	1.167
Short debt	0.591	0.593	0	1	0.604	0.607	0	1
	Panel C: Post Asian crisis period (1999–2006)				*Panel D: Credit crisis period (2007–2009)*			
Investment	0.041	0.025	0	0.460	0.048	0.027	0	0.571
CFLOW	0.070	0.066	−0.500	0.622	0.072	0.063	−0.694	1.121
MTB	1.139	0.939	0.061	14.68	1.132	0.918	0.113	19.41
Size	12.47	12.34	7.28	18.42	12.89	12.77	7.56	18.37
Leverage	0.256	0.235	0	1	0.220	0.193	0	1.42
Cash	0.127	0.088	0	1	0.148	0.108	0	1
Dividend	0.018	0.005	0	0.878	0.017	0.004	0	0.752
Tangibility	0.411	0.401	0	0.997	0.340	0.317	0	0.966
Short debt	0.563	0.555	0	1	0.563	0.564	0	1

This table presents descriptive statistics for the whole sample of 1,068 firms. Pre crisis period (Panel A) includes the years 1994, 1995 and 1996, Asian crisis period (Panel B) includes the years 1997 and 1998, post Asian crisis period (Panel C) includes the years from 1999 to 2006 and credit crisis period (Panel D) includes the years from 2007 to 2009. *Investment* is measured as the ratio of capital expenditures to total assets. *CFLOW* is the sum of operating income and depreciation/depletion/amortization over total assets. *MTB* is the ratio of the book value of total assets minus the book value of equity plus the market value of equity to the book value of assets. *Size* is USD currency adjusted of total assets (in natural logarithm). *Leverage* is the ratio of total debt to total assets. *Cash* is the ratio of cash and equivalents to total assets. *Dividend* is the ratio of total dividends to total assets. *Tangibility* is measured as the ratio of tangible assets to total assets. Finally, *Shor debt* is the ratio of short term debt to total debt

following crisis periods (Almeida et al. 2004; Lee and Song 2012). The increase in cash holdings, accompanied by the large percentage drop in leverage, leads to a substantially lower leverage (net-debt ratio).

Based on the statistics for the credit crisis period, we find that the average ratio of capital expenditure to total assets increases to 4.8 % during the credit crisis period while average cash flow remains almost unchanged (at 7.2 %). The crisis period of 2007–2009 is accompanied by a further drop in the average leverage ratio (to 22 %) and an increase in the cash holdings ratio (to 14.8 %). Overall, the findings of Table 1 suggest that capital expenditures of East Asian firms experienced a substantial decline during the crisis of 1997–1998 and never reverted to their pre-crisis levels. Still, despite the deterioration of macroeconomic conditions, capital expenditures increased during the global crisis of 2007–2009. Following the 1997–1998 crisis, firms also significantly increased their level of financial flexibility by significantly cutting leverage and increasing their level of cash holdings.

3 Financial flexibility and corporate investment

This section provides more detailed descriptive statistics by dividing firms into subsamples on the basis of their cash and leverage positions at the onset of the 1997–1998 and 2007–2009 crises. Initially, by using the median values of cash holdings and leverage ratios of firms during the pre crisis period, we generate four subsamples of firms: (1) low leverage (LL); (2) high leverage (HL); (3) low cash (LC); and (4) high cash (HC) firms.[8] Additionally, we identify two further groups of firms; (5) low leverage and high cash (LL-HC); and (6) high leverage and low cash (HL–LC) firms, by considering both policies simultaneously. In Table 2, we provide the mean values of the main variables of interest for each subsample and compare them across the four periods under investigation (i.e. 1994–1996; 1997–1998; 1999–2006; and 2007–2009).

3.1 Financial flexibility by low leverage

Panel A.1 of Table 2 presents the average values of the key firm characteristics of the leverage subgroups of firms in the pre Asian crisis period. There are several observations that are of particular interest. First, in line with earlier findings in the literature, HL firms have lower cash holdings than LL firms (8.5 vs. 13.8 %). Second, the average HL firm invests more than the average LL firm in the pre crisis period, which may look surprising given that growth opportunities, proxied by the market to book ratio, and the cash flow ratio of HL firms are lower than the corresponding values for LL firms. In particular, the investment ratios are 8.6 and 7.6 % for HL and LL firms respectively. Overall, the firm characteristics during the pre crisis period suggest that HL firms are on average larger, have lower growth opportunities, cash holdings and cash flows.

In Panel B.1 we present the summary statistics of the same variables during the crisis of 1997–1998. In line with the argument that financially flexible firms have greater capacity to invest, LL firms seem to be more flexible than HL firms, suggested by their higher investment to assets ratio in the crisis period. The investment ratio for the average LL firm is about 4.6 % whereas it is 3.7 % for the average HL firm. As explained above, the pre crisis results suggest an opposite pattern. The corresponding percentage decreases in the investment ratio from the pre crisis to the crisis period are about 57 and 40 % for HL and LL firms respectively. Comparing the mean values of other variables also leads to interesting inferences. HL firms are on average larger, have much more debt with lower growth opportunities and cash flows, and hold lower cash balances than LL firms during the crisis. However, a closer inspection of the changes in the average values during the crisis period reveals a more striking picture. We observe that the changes in the cash holdings ratio of both HL and LL firms are negligible. However, the changes in the leverage ratio during the crisis are significant where LL firms increase their leverage ratio by about 44 % whereas the increase in leverage by HL firms is limited to only about 9 %. These findings imply that the net debt ratio of LL (HL) firms increases by 340 (10.3)% from about 2.3 (34) to 10.2 (37.5)%. There is strong evidence that LL firms of the pre crisis period are able to increase their leverage significantly in the crisis period and this probably enables them to maintain a higher level of investment expenditures than those of HL firms. We also check the debt

[8] In a series of robustness checks that are analytically discussed in Sect. 5, we use industry-adjusted median values for cash and leverage as well as different cut-off points (e.g. the 25th and the 75th percentiles) for classifying firms into different categories. Our results, which are discussed analytically in Sect. 3.4.2, remain robust across the different classifications. .

Table 2 Descriptive statistics for different subgroups of firms

	(A.1)			(A.2)			(A.3)		
	HL firms	LL firms	*t* test	HC firms	LC firms	*t* test	LL–HC firms	HL–LC firms	*t* test
	Panel A: Pre crisis period (1994–1996)								
Investment	0.086	0.076	−2.17**	0.080	0.082	−0.31	0.075	0.084	−1.71*
CFLOW	0.083	0.116	7.45***	0.108	0.092	3.70***	0.123	0.081	6.92***
MTB	1.436	1.670	3.73***	1.688	1.449	3.37***	1.849	1.418	4.39***
Size	12.66	12.23	−4.88***	12.43	12.44	−0.11	12.19	12.57	−3.29***
Leverage	0.425	0.160	−33.76***	0.256	0.328	−6.52***	0.145	0.433	−27.57***
Cash	0.085	0.138	8.18***	0.185	0.038	29.96***	0.208	0.037	24.73***
Net debt	0.340	0.023	−28.02***	0.071	0.290	−16.40***	−0.063	0.396	−32.45***
Dividend	0.013	0.027	10.17***	0.023	0.017	4.09***	0.029	0.011	9.09***
Tangibility	0.414	0.404	−0.72	0.357	0.461	−8.00***	0.350	0.447	−5.98***
Short debt	0.548	0.635	5.18***	0.586	0.596	−0.60	0.633	0.565	3.11***
	(B.1)			(B.2)			(B.3)		
	HL firms	LL firms	*t* test	HC firms	LC firms	*t* test	LL–HC firms	HL–LC firms	*t* test
	Panel B: Asian crisis period (1997–1998)								
Investment	0.037	0.046	2.89**	0.043	0.038	1.26	0.047	0.036	2.70***
CFLOW	0.055	0.083	4.54***	0.076	0.062	2.40**	0.087	0.051	4.57***
MTB	1.162	1.203	0.66	1.249	1.123	2.02**	1.309	1.158	1.65
Size	12.53	12.14	−4.05***	12.37	12.29	0.85	12.17	12.44	−2.17**
Leverage	0.463	0.231	−17.65***	0.311	0.382	−4.77***	0.206	0.465	−15.44**
Cash	0.088	0.135	7.05***	0.151	0.071	12.64***	0.173	0.063	13.14***
Net debt	0.375	0.102	−16.90***	0.160	0.312	−8.29***	0.032	0.402	−17.47***
Dividend	0.006	0.019	7.34***	0.015	0.010	3.03***	0.021	0.005	7.95***
Tangibility	0.446	0.432	−0.98	0.403	0.476	−5.44	0.392	0.467	−4.25***

Table 2 continued

	(B.1)			(B.2)			(B.3)		
	HL firms	LL firms	*t* test	HC firms	LC firms	*t* test	LL–HC firms	HL–LC firms	*t* test
Short debt	0.580	0.627	2.58**	0.611	0.597	0.73	0.630	0.576	2.23**
	(C.1)			(C.2)			(C.3)		
	HL firms	LL firms	*t* test	HC firms	LC firms	*t* test	LL–HC firms	HL–LC firms	*t* test
	Panel C: Post Asian crisis period (1999–2006)								
Investment	0.043	0.040	2.43**	0.043	0.039	3.77***	0.042	0.041	0.61
CFLOW	0.061	0.083	−10.77***	0.083	0.057	12.70***	0.094	0.057	14.77***
MTB	1.086	1.147	−3.34***	1.241	1.038	10.68***	1.260	1.046	8.92***
Size	12.74	12.25	13.84***	12.46	12.48	−0.38	12.21	12.63	−9.54***
Leverage	0.420	0.092	120.1***	0.193	0.319	−29.39***	0.077	0.433	−106.6***
Cash	0.086	0.170	−31.58***	0.216	0.039	87.20***	0.242	0.037	72.76***
Net debt	0.334	−0.078	100.2***	−0.022	0.280	−58.74***	−0.165	0.395	−119.5***
Dividend	0.009	0.028	−21.31***	0.025	0.011	15.90***	0.034	0.007	20.82***
Tangibility	0.450	0.370	16.23***	0.342	0.481	−29.61***	0.320	0.491	−30.10***
Short debt	0.503	0.634	−17.75***	0.576	0.551	3.32***	0.650	0.522	13.84***
	(D.1)			(D.2)			(D.3)		
	HL firms	LL firms	*t* test	HC firms	LC firms	*t* test	LL–HC firms	HL–LC firms	*t-test*
	Panel D: Credit crisis period (2007–2009)								
Investment	0.054	0.041	5.78***	0.048	0.048	0.002	0.043	0.053	−3.76***
CFLOW	0.068	0.076	−2.16**	0.084	0.060	6.408***	0.087	0.062	5.16***
MTB	1.079	1.170	−2.54**	1.220	1.030	5.34***	1.254	1.035	4.72***
Size	13.28	12.54	11.69***	12.95	12.87	1.25	12.54	13.05	−6.75***

Table 2 continued

	(D.1)			(D.2)			(D.3)		
	HL firms	LL firms	*t* test	HC firms	LC firms	*t* test	LL–HC firms	HL–LC firms	*t-test*
Leverage	0.371	0.069	70.84***	0.159	0.280	−18.31***	0.058	0.387	−60.25***
Cash	0.102	0.194	−19.08***	0.246	0.052	51.34***	0.273	0.050	44.51***
Net debt	0.269	−0.126	56.41***	−0.086	0.228	−38.08***	−0.215	0.337	−69.40***
Dividend	0.010	0.025	−10.85***	0.024	0.011	8.89***	0.029	0.007	12.161
Tangibility	0.385	0.295	11.29***	0.270	0.410	−17.90***	0.255	0.434	−19.30***
Short debt	0.506	0.640	−9.85***	0.562	0.561	0.06	0.637	0.531	6.66***

This table presents descriptive statistics for the following subgroups of firms (all classifications are based on median values): high leverage (*HL*) firms; low leverage (*LL*) firms; high cash (*HC*) firms; low cash (*LC*) firms; low leverage and high cash (*LL–HC*) firms; high leverage and low cash (*HL–LC*) firms. Pre crisis period (Panel A) includes the years 1994, 1995 and 1996, Asian crisis period (Panel B) includes the years 1997 and 1998, post Asian crisis period (Panel C) includes the years from 1999 to 2006, and credit crisis (Panel D) includes the years from 2007 to 2009. *Investment* is measured as the ratio of capital expenditures to total assets. *CFLOW* is the sum of operating income and depreciation/depletion/amortization over total assets. *MTB* is the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets. *Size* is USD currency adjusted total assets (in natural logarithm). *Leverage* is the ratio of total debt to total assets. *Cash* is the ratio of cash and equivalents to total assets. *Net Debt* is the difference between *Leverage* and *Cash*. *Dividend* is the ratio of total dividends to total assets. *Tangibility* is measured as the ratio of tangible assets to total assets. Finally, *Short debt* is ratio of short term debt to total debt

maturity structure of HL and LL firms to provide further insights about the changes in the capital structure of firms during the crisis. The results indicate that the ratio of short term debt to total debt increases (decreases) for HL (LL) firms, suggesting that the increase in the leverage ratio of HL firms during the crisis is mainly maintained through short term debt. On the contrary, LL firms, despite the increase in their leverage ratio by almost 44 %, are able to slightly reduce the share of short term debt in total debt by 1.3 % (from 63.5 to 62.7).

In panel C.1 of Table 2 we report the summary statistics of the variables for firms in HL and LL groups during the post Asian crisis period. We find that LL firms invest slightly less than HL firms (4 vs. 4.3 %), which represents a 16 (13)% increase (decrease) for HL (LL) firms compared to their investment level prevailing during the 1997–1998 crisis. This finding does not support the view that financial flexibility provides firms with the ability to invest more. Rather, LL firms seem to reduce their investment expenditures during the post crisis period. Also, HL firms have a leverage ratio of 42 %, at about its pre-crisis level. On the contrary, LL firms seem to adopt a different strategy in the post crisis period by reducing their leverage ratio further to 9.2 % from 23.1 %, representing about a 60 % drop. In addition, LL firms increase their cash holdings in the post crisis period by about 25 % (from 13.5 to 17 %) while HL firms reduce it only by about 2.3 % (from 8.8 to 8.6 %). The findings suggest that the LL firms of the pre Asian crisis become more financially conservative during the post Asian crisis by reducing debt and increasing cash balances.

Finally, in panel D.1 of Table 2 we report the corresponding summary statistics for the credit crisis period. Interestingly, while LL firms essentially maintain their investment ratio around 4 %, HL firms manage to increase it further to the level of 5.4 % from 4.3 % over the period 1999–2006. It seems that, instead of investing more, LL firms further increase their cash holdings to 19.4 % while HL firms increase it only moderately from 8.6 to 10.2 %. This suggests that LL firms choose to put more emphasis on financial flexibility during the 2007–2009 period. It is important to note that the net debt ratio becomes negative. Also, dividends and the maturity structure of debt remain close to their pre-credit crisis levels for both LL and HL firms.

Overall, the descriptive statistics discussed in this section provide preliminary evidence consistent with the view that maintaining debt at low levels enables firms to preserve debt capacity to fund investment opportunities in the face of unanticipated adverse shocks. This finding is consistent with the interpretation that firms that have the ability to do so may better prepare for future recessions (see Ang and Smedema 2011). However, this pattern holds only for the Asian crisis period of 1997–1998 although financially flexible firms become more conservative with respect to their debt and cash holding choices during the credit crisis period of 2007–2009.

3.2 Financial flexibility by high cash balances

In this section we examine firm characteristics of the two subgroups of firms, grouped on the basis of their cash balances in the pre Asian crisis period. In Panel A.2 of Table 2, we start by comparing high cash (HC) and low cash (LC) firms in the pre crisis period. The results suggest that the average net debt ratio of HC firms is only about 7.1 % compared with 29 % net debt ratio for LC firms. HC and the LC firms also differ significantly in several other characteristics in this period. For example, HC firms have greater cash flow to assets and market to book ratios. The differences are also statistically significant. Nevertheless, the investment ratio does not differ significantly across the two groups, and HC and LC firms are similar in size. Furthermore, the difference between the maturity structures of

debt holdings of each group of firms is not statistically significant and about 60 % of total debt for the average firm in both groups matures within 1 year.

In Panel B.2 of Table 2 we present the summary statistics of the two groups in the crisis period of 1997–1998. The findings are very similar to those reported above for the pre crisis period. That is, compared to LC firms, HC firms have higher cash flow and market to book ratios, hold less debt in their capital structures, and pay more dividends. Moreover, the investment expenditures, size and the debt maturity structure of debt are similar for both groups. It is, however, important to note that although the difference is not statistically significant and both groups drop their investment expenditures substantially, the average investment ratio of HC firms is now greater than that of LC firms in the crisis period.

We also find that both HC and LC firms increase their leverage ratio during the crisis, by 21.5 and 16.5 % respectively (from 25.6 to 31.1 % for HC firms and from 32.8 to 38.2 % for LC firms). However, HC firms reduce the cash to assets ratio by about 18 % whereas LC firms increase it by more than 85 %. These changes result in a significant increase in the net debt ratio of HC firms by nearly 125 % and a small change of 7.5 % for LC firms. Finally, both groups of firms reduce their investment expenditures substantially in the crisis period. The percentage drop in the investment to assets ratios for HC and LC firms are about 46 and 54 % respectively.

In Panels C.2 and D.2 of Table 2 we present the summary statistics of HC and LC groups for the post Asian crisis and credit crisis periods respectively. The results show that HC and LC firms retain their crisis investment levels (at about 4.3 and 3.9 % respectively), over the period 1999–2006, despite increasing their cash reserves during the same period. We also find that while HC firms substantially increase their cash balances and reduce their leverage substantially (to 21.6 and 19.3 % respectively), LC firms reduce their cash further (to 3.9 %) and reduce their leverage (to 31.9 %) during the period 1999–2006. This finding for HC firms supports Lee and Song's (2012) view that the Asian crisis of 1997–1998 has substantially changed firm's cash holding policies. Moving to the credit crisis period of 2007–2009, the investment ratio increases by about 12 % (from 4.3 to 4.8 % for HC firms) and by about 24 % (from 3.9 to 4.8 %) for LC firms. Cash holdings increase while leverage drops further during the credit crisis for both HC and LC firms. Overall, the results reported in this subsection do not provide any convincing evidence supporting the view that large cash balances provide firms with greater financial flexibility, which can be used for investment purposes during periods of economic stress.

3.3 Financial flexibility by low leverage and high cash balances

Despite its useful insights, the analysis in the previous two subsections can be misleading given that it is based on a univariate setting and considers the cash and leverage positions of firms separately in grouping them into different groups. Corporate cash and leverage decisions, however, are strongly interrelated in the sense that an adjustment in one policy variable implies that other policy variables must also adjust (see Gatchev et al. 2010). As a result, firms may choose to attain financial flexibility by simultaneously maintaining a low leverage and a high cash policy. We take this view into consideration by regrouping firms on the basis of both policies, and we compare the characteristics of low leverage-high cash (LL–HC) versus high leverage-low cash (HL–LC) firms. We expect LL–HC firms to be more financially flexible than HL–LC firms in funding investment expenditures during the crisis period.

We start by assessing the differences in firm characteristics in the pre Asian crisis period, shown in Panel A.3. By construction, HL–LC firms have higher leverage and lower

cash holdings than LL–HC firms. However, their cash flow to assets and market to book ratios are lower than those of LL–HC firms. Additionally, compared to LL–HC firms, they are smaller, hold less short term debt in their capital structures, and pay out lower dividends relative to their total assets. More importantly, the average HL–LC firm invests more than the average LL–HC firm in the pre crisis period, though the difference is statistically significant only at the 10 % level.

We now turn to the statistics in the Asian crisis period of 1997–1998. We find that LL–HC firms have a greater investment ratio than that of HL–LC firms, given by 4.7 and 3.6 % respectively. The corresponding figures for the pre crisis period are 7.5 and 8.4 %. That is, the findings reveal that the investment ratio of LL–HC firms dropped by 37 % whereas the decrease for HL–LC firms is 57 %. Interestingly, the 57 % drop in investment is the highest across all the subgroups in our sample during the same period. Furthermore, HL–LC firms display the lowest rise in the net debt ratio, which increases in the crisis period only by 1.6 %. HL–LC firms drop their dividend payout ratio by 55 % and increase their leverage ratio by only 7.4 %. By contrast, LL–HC firms during the same period reduce their dividend payouts and cash holdings by 26.6 and 16.8 % respectively, and increase their leverage ratio by about 42 %. The net debt ratio hence increases significantly, by more than 150 % (from −6.3 to 3.2 %). The resulting drop of 37 % in the investment ratio of LL–HC firms is the lowest among the subgroups.

In Panel C.3 of Table 2 we present the summary statistics of LL–HC and HL–LC firms in the post crisis period (1999–2006). The results reveal that both LL–HC and HL–LC firms have similar investment ratios of 4.2 and 4.1 % respectively, which are not statistically different either. A comparison of these findings with those obtained for the 1997–1998 period further reinforces the argument that financial flexibility may not be an important determinant of investment during normal times. Interestingly, while LL–HC firms reduce their investment expenditures in relation to their total assets (from 4.7 to 4.2 %), HL–LC firms are able to increase investment (from 3.6 to 4.1 %) during the years following the 1997–1998 crisis. This pattern prevails in the credit crisis period (2007–2009). In particular, HL–LC firms are the ones that managed to substantially increase their investment ratios further (from 4.1 to 5.3 %). On the contrary, LL–HC firms retain an investment ratio of about 4.3 % during the 2007–2009 period. Instead of investing more, flexible firms further increase their level of financial flexibility during the credit crisis period.

Overall, it seems that flexible firms of the pre Asian crisis period (i.e. LL–HC firms) revert to being cautious by building up more flexibility during the post Asian crisis (1999–2006). Interestingly, LL–HC firms remain conservative during the credit crisis of 2007–2009 and do not increase their investment expenditures. A potential explanation for such behaviour is as follows. It is well known that the 2007–2009 crisis did not originate in Asia but in the US. This was due to loose monetary policy for a pro-longed period, which led to the bust of the housing market. Additionally, Asian countries in structural terms were generally in good shape in that period compared to 1997–1998. For example, Korean companies during the 1997–1998 crisis had substantially higher debt ratios and considerably lower interest coverage ratios compared with the global financial crisis (see Kim 2010). Mizen and Tsoukas (2012) also show that Asian firms during the 1997–1998 crisis were more indebted, less profitable and riskier compared to the later years of our sample which span the 2007–2009 global financial crisis. In summary, the recent global crisis did not have the same profound effects on Asian firms as the 1997–1998 crisis. The effects can be characterized as "second round effects" (e.g. foreign investors have withdrawn capital to home markets, and have required higher returns to compensate for the perceived risks of investing abroad).

These findings provide suggestive evidence that firms combining low leverage with high cash balances in the pre Asian crisis period are better positioned to maintain their investment expenditures during the crisis period of 1997–1998. Their pre crisis behavior to preserve flexibility followed by a less severe decline in investment during crises suggests that flexible firms may have been better prepared for the crisis (Ang and Smedema 2011). However, financial flexibility is less of an important determinant of investment during the post Asian crisis (1999–2006) and credit crisis (2007–2009) periods. The latter finding is consistent with the view expressed in Mizen and Tsoukas (2012) that the external finance premium for constrained firms is much greater during the Asian crisis compared to other times.

3.4 Financial flexibility and the cash flow sensitivity of investment

Based on the results so far, especially those referring to the crisis of 1997–1998, one can argue that the investment expenditures of firms with low levels of debt and large cash balances are less sensitive to unanticipated negative shocks to earnings. In this section, we examine this issue further in a multivariate framework. Our empirical strategy is to estimate an investment model for different subgroups of firms, where the subgroups are determined on the basis of firms' pre Asian crisis leverage and cash positions. Our main objective in this section is to examine the extent to which the cash flow sensitivity of investment varies across the subgroups in the pre Asian crisis, Asian crisis, post Asian crisis and credit crisis periods.

In line with prior research, the cash flow ratio is used as a proxy for the availability of internal sources for investment.[9] We expect that less flexible firms are more dependent on the level of cash flows for funding investment because of their limited ability to raise external finance. We estimate the cash flow sensitivity of investment using the following model

$$I_{it} = a + \delta_1 CFLOW_{it-1} + \delta_2 MTB^{f}_{it-1} + \delta_3 MTB^{r}_{it-1} + u_{it} \quad (1)$$

In Eq. (1), I is the ratio of capital expenditures to lagged total assets, $CFLOW$ is the sum of operating income and depreciation/depletion/amortization over total assets and MTB represents the firm's growth opportunities, measured by the market to book ratio. In an attempt to use a proxy that properly controls for growth opportunities, we decompose the market to book ratio into two parts—a fundamental component (MTB^{f}) and a residual component (MTB^{r})—and then examine how investment responds to changes in these two components. We consider that such decomposition is necessary because stock valuations tend to deviate significantly from fundamentals in periods characterized by asset price shocks.[10]

[9] See Fazzari et al. (1988) and Hubbard et al. (1995) for a discussion on the use of the investment cash flow sensitivity as a proxy for financial constraints.

[10] To decompose the market to book ratio we follow a similar approach to that of Goyal and Yamada's (2004). Specifically, we regress the MTB ratio against contemporary and lagged sales growth, squared sales growth and industry dummies. The fitted values of this regression are used as a proxy for the fundamental component of stock valuations (MTB^{f}), while the residual component is used as a proxy for the residual values (MTB^{r}). The inclusion of both components of MTB in the regressions helps capture not only outsiders' but also insiders' evaluation of growth opportunities. Alternative ways to avoid the mis-measurement of the proxy of growth opportunities include: (1) the use of contracted capital expenditures alongside MTB in the model (see Carpenter and Guariglia 2008) and (2) the use of an error-correction specification (see Guariglia 2008). Notwithstanding their merit, these methods cannot be utilized in our study due to the nature

In estimating Eq. (1), we initially use a random effects GLS regression approach in which independent variables are lagged 1 year to control for potential endogeneity problems (see Duchin et al. 2010). For the estimation of the random effects model, one can assume both cross-sectional and time heterogeneity. We put forward several alternative one-way specifications and use the standard Breusch–Pagan Lagrange multiplier (LM) test for random effects with the null hypothesis that variances of groups (e.g. across time periods or across firms) are zero. The null hypothesis is rejected when cross-sectional heterogeneity is allowed for, while it cannot be rejected when time effects are allowed for. This is probably due to the structure of our data (i.e. we estimate our investment models separately for four sub-periods, which minimizes the importance of time effects). As a result, we estimate a one-way random effects model allowing for firm rather than time heterogeneity.

For completeness, we also obtain results by estimating a fixed effects model. The rationale behind the implementation of the latter method is that companies may anticipate a downturn in their conditions and hence prepare for it. To this end, firm-specific fixed effects may be important in our investment framework.[11] Equation (1) is estimated for flexible and less flexible firms in the pre crisis, 1997–1998 crisis, post Asian crisis and credit crisis periods.[12]

3.4.1 Baseline investment results

We start by estimating Eq. (1) using the whole sample without distinguishing between flexible and less flexible firms (Model 1 in Table 3). The estimated coefficient of cash flow is positive and statistically significant across all periods. The estimated cash flow sensitivity of investment is 0.289 during the period 1994–1996; it declines substantially to the level of 0.087 during the 1997–1998 crisis period; then it increases to the level of 0.129 in the post crisis period and 0.142 in the credit crisis period.

Footnote 10 continued
of our data (e.g. a short-panel) and the lack of availability of information on contracted expenditures. We therefore stick to Goyal and Yamada's (2004) method to tackle the measurement issue of growth opportunities. Other more straightforward variables that have been suggested as proxies for growth opportunities (e.g. ratio of R&D expenses to total sales, as discussed by Han and Chuang 2011) cannot be implemented in our analysis given the limited data availability (e.g. for the case of Korea, only 10 % of the companies included in our sample disclosed to their R&D expenditures for the year 1998).

[11] The results of the fixed effects model are not qualitatively different from the ones obtained using the random effects estimator. We therefore decide to report only those results that are based on the random-effects estimator (all unreported results are available upon request by the authors).

[12] Recent studies on the inter-temporal nature of financial decisions (see Gatchev et al. 2010) suggest that the lagged value of investment should be included in Eq. (1). However, it is difficult to estimate a well-specified dynamic model using short panels such as ours. Specifically, the requirement to use the lagged values of the dependent and independent variables as instruments makes it difficult to estimate such model separately for all four periods under investigation (pre-crisis, Asian crisis, post Asian crisis and credit crisis) and hence produce directly comparable results. Still, in the spirit of Pindado et al. (2011), we perform a GMM estimation using all firms over the entire sample period (1994–2009). The results show that the adjustment coefficient (given by 1 minus the coefficient of the lagged dependent variable) is above 0.6. One possible explanation for the high value of the adjustment coefficient might be that the costs of deviating from the target are significant, supporting the argument that corporate investment expenditures are persistent over time and firms attempt to sustain their existing policies. We therefore conclude that the substantial differences in terms of investment level and cash flow sensitivity to investment between flexible and inflexible firms in the crisis period, as identified using a specific empirical framework, are less likely to be random and more likely to reflect unexpected changes in the availability of financing.

Table 3 The cash flow sensitivity of investment across different subgroups of firms

Dependent variable I (*investment*)	Independent variables						Independent variables					
	CFLOW	MTB^f	MTB^r	Constant	R^2	N	CFLOW	MTB^f	MTB^r	Constant	R^2	N
	Panel A: Pre Asian crisis period (1994–1996)						*Panel B: Asian crisis period (1997–1998)*					
(1) All firms	0.289 (6.49)***	0.002 (0.80)	0.002 (0.87)	0.095 (8.51)***	0.07	1,504	0.087 (4.32)***	0.031 (8.00)***	0.030 (9.19)***	0.009 (1.29)	0.07	2,035
(2) HL firms	0.273 (3.33)***	0.149 (2.83)***	0.013 (2.32)**	−0.168 (−1.71)*	0.08	724	0.114 (4.47)***	0.001 (0.06)	0.017 (2.82)***	0.027 (0.058)	0.05	1,007
(3) LL firms	0.369 (7.61)***	−0.001 (−0.44)	−0.001 (−0.28)	0.093 (8.06)***	0.16	778	0.038 (1.17)	0.038 (8.14)***	0.037 (8.98)***	0.005 (0.45)	0.09	1,024
(4) HC firms	0.275 (3.90)***	0.0001 (0.03)	0.0001 (0.03)	0.081 (4.36)***	0.04	687	0.090 (2.92)**	0.039 (8.29)***	0.037 (9.04)***	−0.018 (−1.92)*	0.10	1,009
(5) LC firms	0.281 (4.99)***	0.016 (1.50)	0.007 (2.15)**	0.055 (3.12)***	0.11	815	0.081 (3.04)***	0.001 (0.05)	0.017 (3.01)***	0.029 (1.20)	0.04	1,022
(6) LL–HC firms I	0.348 (5.25)***	−0.003 (−0.76)	−0.003 (−0.67)	0.078 (4.00)***	0.13	380	0.035 (0.76)	0.048 (8.29)***	0.046 (8.97)***	0.005 (0.32)	0.13	590
(7) HL–LC firms I	0.250 (2.89)***	0.155 (2.36)**	0.009 (1.68)*	−0.133 (−1.40)	0.10	417	0.101 (2.92)***	0.003 (0.14)	0.030 (3.24)***	0.059 (0.60)	0.05	586
(8) LL–HC firms II	0.377 (4.80)***	−0.005 (−1.32)	−0.005 (−1.23)	0.086 (5.18)***	0.11	362	0.022 (0.41)	0.184 (3.80)***	0.042 (7.64)***	−0.196 (−2.99)***	0.14	541
(9) HL–LC firms II	0.267 (2.88)**	0.161 (2.36)**	0.007 (1.20)	−0.205 (−1.60)	0.10	405	0.126 (2.73)***	0.178 (3.27)***	0.029 (2.58)***	−0.233 (−3.06)***	0.05	508
	Panel C: Post Asian crisis period (1999–2006)						*Panel D: Credit crisis period (2007–2009)*					
(1) All firms	0.129 (17.21)***	0.063 (6.58)***	0.008 (6.25)***	−2.079 (−3.81)***	0.17	6,905	0.142 (10.7)***	−0.024 (−1.29)	0.009 (4.57)***	−5.896 (−1.61)	0.13	1,944
(2) HL firms	0.137 (12.60)***	0.080 (5.87)***	0.009 (4.46)***	−4.193 (−5.35)***	0.18	3,434	0.160 (7.91)***	−0.030 (−1.25)	0.009 (2.46)**	−13.32 (−2.95)***	0.13	966
(3) LL firms	0.126 (11.27)***	0.061 (4.26)***	0.008 (4.71)***	0.154 (0.19)	0.18	3,367	0.128 (7.13)***	−0.011 (−0.41)	0.009 (4.12)***	2.841 (0.49)	0.15	972

Table 3 continued

Dependent variable I (*investment*)	Independent variables						Independent variables					
	CFLOW	MTB^f	MTB^r	Constant	R^2	N	CFLOW	MTB^f	MTB^r	Constant	R^2	N
(4) HC firms	0.117 (11.07)***	0.059 (4.19)***	0.007 (4.04)***	−0.911 (−1.10)	0.14	3,417	0.133 (7.23)***	−0.030 (−0.98)	0.005 (1.84)*	−3.969 (−0.68)	0.14	975
(5) LC firms	0.149 (14.29)***	0.067 (5.14)***	0.008 (4.49)***	−3.728 (−4.41)***	0.21	3,488	0.146 (7.39)***	−0.018 (−0.78)	0.017 (6.11)***	−6.147 (−1.41)	0.14	963
6) LL–HC firms I	0.111 (7.93)***	0.064 (3.52)***	0.007 (3.45)***	0.988 (0.94)	0.14	2,146	0.129 (6.01)***	−0.017 (−0.34)	0.005 (1.83)*	−0.654 (−0.08)	0.14	630
(7) HL–LC firms I	0.1445 (10.41)***	0.084 (5.05)***	0.009 (3.44)***	−4.191 (−4.31)***	0.19	2,192	0.160 (6.81)***	−0.031 (−0.91)	0.020 (3.61)***	−13.63 (−2.54)**	0.17	621
(8) LL–HC firms II	0.150 (8.22)***	0.104 (4.60)***	0.006 (2.35)**	0.369 (0.31)	0.14	1,908	0.156 (4.86)***	0.005 (0.09)	0.004 (1.01)	−3.862 (−0.43)	0.13	540
(9) HL–LC firms II	0.247 (11.20)***	0.103 (4.86)***	0.004 (1.36)	−5.539 (−4.77)***	0.18	1,800	0.256 (6.23)***	−0.074 (−1.78)*	0.027 (3.67)***	−13.47 (−2.23)**	0.17	514

This table shows the cash flow sensitivity of investment for the following subgroups of firms: ALL firms, high leverage (*HL*) firms; low leverage (*LL*) firms; high cash (*HC*) firms; low cash (*LC*) firms; low leverage and high cash (*LL–HC* firms I) firms; high leverage and low cash (*HL*–LC firms I) firms; low leverage and high cash firms with positive cash flows (*LL–HC* firms II); high leverage and low cash firms with positive cash flows (*HL–LC* firms II). I (*investment*) is measured as the ratio of capital expenditures to lagged total assets. *CFLOW* is the sum of operating income and depreciation/depletion/amortization over total assets. *MTB* is decomposed into two parts—a fundamental component, MTB^f, and a residual component, MTB^r (see Sect. 3.4 for details). *z* statistic values are reported in parentheses. ***, ** and * indicate coefficient is significant at the 1, 5 and 10 % level respectively

The results also show that during the pre crisis period of 1994–1996 the estimated coefficients of both components (fundamental MTB^{f} and residual MTB^{r}) of the market to book ratio are economically and statistically insignificant, though they generally become significant during the following periods. Although we do not investigate this further, a possible explanation relates to the overinvestment tendency of firms during economic booms (Hadlock 1998; Wei and Zhang 2008), which possibly weakens the link between growth opportunities and investment in the pre crisis period. This is also consistent with our earlier descriptive analysis reporting that the investment expenditures and cash flows of firms are at record high levels in the pre crisis period despite a modest average market to book ratio of 1.57.[13] The descriptive statistics for the post crisis period of 1999–2006 and credit crisis period of 2007–2009 show that the levels of investment and market to book ratio do not revert to their pre-crisis levels.

We next estimate the investment model through grouping firms into flexible and less flexible subsamples on the basis of their leverage behaviour. The results are reported in Models 2 and 3. The most striking finding from these estimations relates to the investment cash flow sensitivity coefficient. For high leverage (HL) and hence less flexible firms, the estimated coefficient on CFLOW is positive and statistically significant for both 1994–1996 and 1997–1998 periods. However, in Model 3, which refers to low leverage firms (i.e. LL), the coefficient on CFLOW becomes insignificant in the crisis period of 1997–1998, though it remains highly statistically significant in the pre crisis period. In terms of economic significance, while the coefficient for HL firms drops from 0.273 in the pre crisis period to 0.114 during the crisis period, the drop in the economic significance for LL firms is much bigger, from 0.369 in the pre crisis to 0.038 during the crisis period. The results also indicate that despite the irrelevance of the market to book ratio in determining the investment expenditures of LL firms in the pre crisis period, the coefficients on the market to book variables in the crisis period switch signs and become positive and significant at the 1% level.

Moving to the period of 1999–2006 and 2007–2009, we find that leverage does not seem to significantly affect the cash flow sensitivity of investment in the post Asian crisis period. The estimated coefficient of CFLOW is positive and statistically significant for both HL and LL firms. The two cash flow sensitivities are also very similar in terms of their magnitude (0.137 vs. 0.126 respectively). A moderate differential in the cash flow sensitivity of investment is also observed during the credit crisis period of 2007–2009, which are 0.160 for HL and 0.128 for LL firms. In summary, these findings provide evidence supporting the view that financial flexibility can be attained through a low leverage policy. Importantly, it seems that flexible firms rely less on internal resources (i.e. cash flow) for investing. Moreover, such firms are better equipped to meet financing needs though external financing and hence have a greater ability to undertake valuable growth opportunities that arise during crises. These effects, however, are particularly pronounced during the Asian crisis period of 1997–1998.

We next carry out the same analysis using firms' cash holdings to distinguish between the financially flexible and less flexible firms. Specifically, as shown in Models 4 and 5, the cash flow sensitivity of investment for both flexible (HC) and less flexible (LC) firms is positive and significant during both 1994–1996 and 1997–1998 periods. The values of the estimated coefficients on CFLOW, however, drop significantly during the crisis, whereas

[13] The weak relation can also be due to the poor empirical performance of q models especially when estimated adjustment costs are excessively large (see, Chirinko 1993 for further discussion on the performance of q-models).

the economic significance of the market to book variables improves significantly especially for the flexible firms. More importantly, in contrast to leverage, cash balances do not seem to significantly affect the cash flow sensitivity of investment during the crisis period. Also, HC and LC firms exhibit positive, statistically significant and similar (in magnitude) sensitivities during the periods of 1999–2006 and 2007–2009.

In models (6) and (7) we estimate the investment equation after combining both cash and leverage to assign firms into flexible (LL–HC) and less flexible (HL–LC) categories. The results are similar to those reported in Models 2 and 3 where low leverage is used to construct our flexibility proxy. The investment of flexible firms during the crisis of 1997–1998 does not depend on the level of cash flow and, as expected, is determined by the availability of valuable investment opportunities. However, this is not the case for less flexible firms as indicated by the positive and significant coefficient on CFLOW. It is important to note that adding cash holdings as an additional criterion in identifying financially flexible firms does not change the results significantly in either periods, where the results seem to be driven mostly by the leverage positions of firms prior to the crisis. Once again, the results in Panel C for the post Asian crisis period are considerably different compared to the ones referring to the 1997–1998 crisis. In particular, the cash flow sensitivity of investment is positive and statistically significant for both LL–HC and HL–LC firms over the period of 1999–2006. Moving to the results for the recent credit crisis (Panel D of Table 3), LL–HC firms exhibit a lower investment sensitivity than HL–LC firms during the period of 2007–2009. Interestingly, the sensitivities are positive and statistically significant for both groups of firms.

Finally, in Models (8) and (9), we re-estimate Models (6) and (7) after excluding negative cash flow observations from the sample. As Allayannis and Mozumdar (2004) and Bhagat et al. (2005) also suggest, negative cash flow observations may bias the results of an investment model. This is because investment expenditures are unlikely to respond to cash flow changes when companies are in sufficiently bad shape. To address this issue, we identify and delete all negative firm year observations. However, our results, reported in Models 8 and 9, remain very similar, suggesting that they are not biased by the presence of negative cash flow firm year observations in our sample.

Overall, the results presented in Table 3 are consistent with the view that financial flexibility is desirable to fund future growth opportunities when firms find external finance more costly and/or experience cash flow shortfalls. Prior to the crisis of 1997–1998, and also during the period 1999–2006, it is difficult to distinguish between the investment behaviour of flexible and less flexible firms; whereas their behaviour becomes quite distinct during the crises of 1997–1998 and 2007–2009 (mainly during the former period). More specifically, firms attaining financial flexibility through low leverage during normal times do not heavily rely on the availability of internal funds to finance their capital expenditures during crises. On the contrary, high leverage firms seem to make relatively greater use of cash flows as a source of finance during a crisis. As mentioned above, these effects are particularly pronounced during the crisis periods of 1997–1998. Furthermore, our findings suggest that in contrast to leverage, cash holdings do not seem to be important for funding future investment opportunities (i.e. the cash flow sensitivity of investment does not differ substantially across HC and LC groups). This finding is consistent with recent qualitative evidence by Lins et al. (2010) suggesting that excess cash is usually held as a form of insurance against financial distress while lines of credit are held to fund future growth.

3.4.2 *Investment results based on alternative flexibility measures*

In this section we check the validity of the results presented so far for crises periods using a series of alternative measures for financial flexibility. One potential issue with our proxies for financial flexibility used in Table 3 relates to the use of median values for classifying firms into flexible and less flexible categories. For robustness purposes, we estimate our investment and performance models again using a 25 % cut off point for leverage and cash to classify. For example, under the criterion that combines both leverage and cash holdings, a firm is characterized as flexible (less flexible) if its leverage ratio lies in the first (fourth) quartile of the leverage distribution and its cash ratio lies in the fourth (first) quartile of the cash distribution in the pre crisis period. The results presented in Model 1 of Table 4 confirm that the investment expenditures of flexible firms exhibit a negative (at −0.072) and insignificant sensitivity to cash flow changes during the 1997–1998 crisis. On the contrary, the investment sensitivity is positive (at 0.157) and statistically significant for less flexible firms. As for the credit crisis period (Panel B1), the coefficient on CFLOW is positive and statistically significant for both flexible and less flexible firms. However, similar to the results for the 1997–1998 period, the cash flow sensitivity of investment is significantly higher for less flexible firms (0.104 vs. 0.196).

Furthermore, we utilize an alternative flexibility measure that tackles the issue of persistence. The financial flexibility proxies used so far are based on average firm level information for cash and leverage over 3 years before a crisis occurs. However, it is possible that cash and leverage distributions evolve over time in a way that firms may be erroneously assigned to a specific group. For example, a particularly high leverage ratio for a firm in 1994 may contribute to a high average leverage ratio for the 1994–1996 period, independently of whether the firm may have significantly dropped its leverage ratio close to the industry average in years 1995 and 1996 (just before the 1997–1998 crisis). Although we partially control for this problem by using different cut off points (i.e. median values vs. 25 % cut off points), an additional task is put forward to take into account the issue of persistence. Specifically, we classify firms into flexible (less flexible) if they display both low (high) leverage and high (low) cash balances for three consecutive years prior to the crisis to estimate the investment specification again. The results do not differ materially from those reported so far. Specifically, the investment of flexible firms seems to be less dependent on internal resources than that of less flexible firms (Panels A2 and B2). Once again, this result is more pronounced during the crisis period of 1997–1998.

Furthermore, instead of simply looking at firms' cash and leverage policies at the onset of a crisis, we also look at the changes in cash holdings and leverage. Firms are classified as flexible if they have low leverage and high cash holdings at the onset of the crisis and their cash holdings ratio does not drop during the crisis. An appealing feature of such classification criterion is that it helps us distinguish between financially flexible firms from financial constrained firms. This is because financially constrained firms usually burn through their cash reserves to meet their liquidity needs during a crisis (see Campello et al. 2010). Clearly, our groups of flexible firms are not likely to include any constrained firms as none of these groups includes firms that burn through their cash reserves. The results of our empirical analysis, which are not reported for brevity but are available upon request, remain qualitatively similar to those reported so far.

A further issue that needs investigation is the substitutability between cash and leverage when they are considered as attributes of financial flexibility. Our analysis so far provides some insights into this issue by providing separate results for the cases when only cash, only leverage and both cash and leverage are used as classification criteria. Given the

Table 4 The cash flow sensitivity of investment across different subgroups of firms (alternative flexibility measures)

Dependent variable *I* (*investment*)	Independent variables						Independent variables					
	CFLOW	MTB^f	MTB^r	Constant	R^2	N	CFLOW	MTB^f	MTB^r	Constant	R^2	N
	Panel A: Asian crisis period (*1997–1998*)						*Panel B: Credit crisis period* (*2007–2009*)					
(1) *Flexibility measure*: *LL–HC and HL–LC* (25th and 75th *percentiles*)												
Flexible firms	−0.072	0.178	0.058	−0.119	0.25	218	0.104	−0.037	0.006	6.815	0.17	254
	(−0.88)	(2.89)***	(7.45)***	(−1.79)*			(4.36)***	(−0.51)	(2.01)**	(0.60)		
Less flexible firms	0.157	0.154	0.009	−0.129	0.08	177	0.196	−0.070	0.0001	−22.42	0.27	199
	(2.37)**	(1.66)*	(0.47)	(−1.35)			(6.19)***	(−1.90)**	(0.02)	(−2.57)***		
(2) *Flexibility measure*: *LL–HC and HL–LC* (*persistence*)												
Flexible firms	0.079	0.031	0.031	0.029	0.25	139	0.128	−0.076	0.007	2.213	0.17	4.34
	(1.33)	(4.05)***	(4.05)***	(2.08)**			(5.66)***	(−1.19)	(2.66)***	(0.25)		
Less flexible firms	0.081	0.055	0.004	0.002	0.06	876	0.193	−0.016	0.100	−20.98	0.22	401
	(3.00)***	(2.00)**	(0.75)	(0.07)			(6.93)***	(−0.52)	(1.47)	(−2.95)***		
(3) *Flexibility measure*: *KZ-index*												
Flexible firms	0.050	0.040	0.038	0.014	0.09	988	0.093	−0.027	0.011	0.736	0.13	969
	(1.40)	(7.86)***	(8.58)***	(1.02)			(4.73)***	(−0.81)	(4.84)***	(0.14)		
Less flexible firms	0.095	0.003	0.020	0.047	0.05	967	0.187	−0.028	0.007	−13.34	0.15	930
	(3.80)***	(0.16)	(3.24)***	(2.77)***			(9.25)***	(−1.26)	(2.15)**	(−2.73)***		
(4) *Flexibility measure: Excess cash*												
Flexible Firms	0.114	0.012	0.010	0.012	0.06	725	0.156	−0.060	0.001	−5.760	0.12	867
	(3.63)***	(1.92)*	(1.70)*	(1.16)			(7.61)***	(−1.48)	(0.38)	(−0.43)		
Less flexible Firms	0.092	−0.005	0.011	0.030	0.05	730	0.135	−0.021	0.008	−10.04	0.15	859
	(2.84)***	(−0.23)	(2.04)**	(0.97)			(6.70)***	(−1.01)	(3.09)***	(−2.12)**		
(5) *Flexibility measure*: *Retained earnings*												
Flexible Firms	0.126	0.199	0.010	−0.207	0.06	625	0.139	−0.028	0.009	−2.862	0.18	871
	(3.09)***	(3.95)***	(1.52)	(−2.83)***			(6.55)***	(−0.85)	(3.18)***	(−0.57)		

Table 4 continued

Dependent variable *I* (*investment*)	Independent variables						Independent variables					
	CFLOW	MTB^f	MTB^r	Constant	R^2	N	CFLOW	MTB^f	MTB^r	Constant	R^2	N
Less flexible Firms	0.085 (2.26)***	0.035 (1.69)*	0.072 (11.79)***	0.010 (0.31)	0.19	615	0.150 (7.30)***	−0.065 (−2.24)**	0.010 (3.76)***	−13.09 (−2.31)**	0.12	812

This table shows the cash flow sensitivity of investment for different subgroups of firms as classified according to the following flexibility measures: (1) *LL–HC and HL–LC* (25th and 75th *Percentiles*) a firm is characterized as flexible (less flexible) if its leverage ratio lies in the first (fourth) quartile of the leverage distribution, and, also its cash ratio lies in the fourth (first) quartile of the cash distribution. (2) *LL–HC and HL–LC* (*Persistence*) a firm is classified as flexible (less flexible) if it displays both low (high) leverage and high (low) cash for the three consecutive years before classification. (3) *Flexibility measure*: *KZ-index* flexible firms (less flexible firms) are the ones that exhibit a small (large) KZ-score (based on median values), where the KZ-Index which is calculated as -1.002^* *CashFlow* $+ 0.283^*$ *Q* $+ 3.139^*$ *Leverage* $- 39.368^*$ *Dividends* $- 1.315^*$ *CashHolding*. (4) *Flexibility measure: excess cash* firms are classified as flexible (less flexible) if they have high (low) level of excess cash, as calculated through an excess can model (see Sect. 3.4.2 for details). (5) *Flexibility measure: Retained earnings.* Firms are classified as flexible (less flexible) if they have high (low) level of retained earnings. All other variables are defined in previous Tables. *z* statistic values are reported in parentheses. ***, ** and * indicate coefficient is significant at the 1, 5 and 10 % level respectively

recent evidence by Acharya et al. (2007), which suggests that cash should not be viewed as negative debt in the presence of financing frictions, there is some scope for tackling the substitutability between cash and leverage more formally. To do so, we use the KZ-Index to classify firms into flexible and less flexible groups. The main advantage of the KZ-Index is that it assigns different weights to the cash and leverage variables.[14] Additionally, the index is composed of variables such as cash flow and dividends and have it explicitly controls for the possibility that flexibility can also be established through dividend policy by, for instance, reducing the payout ratio and retaining more earnings (see Lee et al. 2011).[15] Firms are classified as flexible (less flexible) if they exhibit a small (large) KZ-Score based on median values. Such classification scheme seems reasonable given that firms assigned to the flexible group (low KZ firms) exhibit a lower leverage ratio, a higher cash holdings ratio, pay higher dividends and generate more earnings (cash flow). As discussed in Sect. 2 these are among the main characteristics of flexible firms as classified by our earlier criteria. As shown in Panel A3 of Table 4, under this classification, the cash flow sensitivity of investment is positive and statistically significant only in the case of less flexible firms. In Panel B3 of Table 4, which reports the results for the credit crisis period, the coefficient on CFLOW is positive and statistically significant for both flexible and less flexible firms. Still, in line with previous findings, the estimated sensitivity is much higher for less flexible firms (0.187 vs. 0.093).

Finally, in the spirit of Hu et al. (2013), Lee et al. (2011), Blau and Fuller (2008) and DeAngelo and DeAngelo (2006), we put forward two more flexibility measures that relate to the level of excess cash and retained earnings of firms. Our measure of excess cash is calculated through an optimal cash holding model to find the required level of cash reserve. We specifically estimate the following equation for each industry in our sample at the onset of the 1997–1998 and 2007–2009 crisis periods

$$\begin{aligned} Cash\ Holdings_i = & a_1 MTB + a_2 SIZE_i + \alpha_3 CFAST_i + a_4 NWCAST_i + a_5 CAPEXAST_i \\ & + a_6 LEV_i + a_7 INDSIGMA_i + a_8 DIVDUMMY_i + e_i \end{aligned} \quad (2)$$

where i stands for firm i, MTB is the market-to-book ratio, SIZE is the logarithm of total assets, CFAST is net income before depreciation and amortization over book value of assets, NWCAST is net working capital over book value of assets, CAPEXAST is capital expenditure over book value of assets, LEV is total debt over book value of total assets, INDSIGMA is the mean cash-flow standard deviation of firms in the same industry over previous 5 years and DIVDUM is a dummy variable set to one if a firm pays dividends in that year and zero otherwise.[16] The residual e_i of Eq. (2), which is the difference between estimated (or required) cash holding and actual cash holding, is used as a proxy for excess cash. We also construct a flexibility measure that is based on the ratio of retained earnings to total assets of firms. Based on these two measures, we classify firm into flexible and inflexible groups. Specifically, firms with high (low) excess cash or high (low) retained earnings are assigned to the flexible (less flexible) group.

[14] Following Almeida et al. (2004) the KZ index is calculated using the following equation KZ-Index = − 1.002* CashFlow + 0.283* Q + 3.139* Leverage − 39.368* Dividends − 1.315* CashHoldings

[15] Bhaduri (2008) further supports this argument by showing that low dividend payout firms are more likely to be confronted with financial constraints, when compared to their respective counterparts.

[16] The model utilized in Opler et al. (1999) also includes a R&D ratio as an additional explanatory variable. However, we could not obtain reliable information for a large number of firms in our sample and hence do not include R&D in our estimation. Also, we only estimate Eq. (2) for particular years and for each industry separately. This means that there is no need to control for year and industry dummies in Eq. (2).

The estimated results using the excess cash and retained earnings criterion are presented in Panels A4 & B4 and A5 & B5 of Table 4 respectively. Starting with panels A4 and B4, the results suggest that the coefficient on CFLOW is positive and statistically significant for both flexible and less flexible firms and across both periods under examination (1997–1998 and 2007–2009). The coefficients are also similar in terms of size for both periods across the two flexibility groups (0.114 vs. 0092 over the 1997–1998 period and 0.156 vs. 0.135 over the 2007–2009 period). Moving to the results in panels A5 and B5, we find that the investment of flexible firms, as classified on the basis of their retained earnings, exhibit a higher sensitivity to cash flow than less flexible firms during the 1997–1998 period (0.126 vs. 0.085). However, this pattern is reversed over the period 2007–2009 but the estimated sensitivity for flexible firms is only marginally lower than that of less flexible firms (0.139 vs. 0.150). Overall, similar to what we find in our earlier analysis with respect to cash holdings criterion, the findings suggest flexibility measures based on excess cash and retained earnings do not seem to significantly affect the cash flow sensitivity of investment for East Asian firms. A recent study by Lins et al. (2010) might help explain and interpret this finding. Lins et al. (2010) note that: "excess cash holdings act as a buffer against future cash flow shortfalls… lines of credit appear to be held to fund future growth options while non-operational cash appears to be held as general purpose insurance, p.161". Put simply, firms might not use excess cash or retained earnings for investment purposes but rather focus on external financing sources to finance investment.

3.4.3 Investment results for different regions

In this section we provide further results for the investment model by classifying firms geographically into different groups. We use the LL–HC and HL–LC criteria to classify firms into different flexibility groups within each region. In terms of their geographical region, firms from South Korea and Hong Kong, which do not belong to the Association of South East Asian Nations (ASEAN), are assigned to Group 1 (or "NON-ASEAN COUNTRIES"). On the other hand, firms from Indonesia, Malaysia and Thailand are assigned to Group 2 (or ASEAN group).

Table 5 presents the results from such exercise for flexible and less flexible firms within each group. Panel A of Table 5 reports the results for the crisis period of 1997–-1998 while Panel B of Table 5 presents the results for the credit crisis (2007–2009). The findings in panel A.1 and B.1 for Group 1 firms reiterate those obtained so far. In particular, while the cash flow sensitivity of investment is positive and statistically significant for less flexible firms (i.e. HL–LC), it is statistically insignificant for flexible firms (i.e. LL–HC) during the crisis of 1997–1998. Furthermore, as shown in Panel B1, the coefficient on CFLOW is positive and statistically significant for both LL–HC and HL–LC firms. Similar to the results for all firms, the coefficient is much higher for the case of less flexible (i.e. HL–LC) firms (0.176 vs. 0.118). These findings reinforce our earlier evidence that financial flexibility is an important determinant of corporate investment during crisis periods. Still, this result is more pronounced during the 1997–1998 crisis.

Interestingly, a competing view is supported by the findings from firms belonging to the Group 2 (i.e. ASEAN group). As shown in Panels A.2 and B.2 of Table 5, there is no significant differential in the cash flow sensitivities of HL–LC and LL–HC firms' investment over the 1997–1998 crisis period. This suggests that financial flexibility does not play an important role in identifying the investment of firms in the ASEAN group during that period. Our results covering the 2007–2009 crisis period, however, provide some (rather weak) evidence that flexibility matters to the investment of firms belonging to

Table 5 The cash flow sensitivity of investment across different regions and flexibility groups

Dependent variable I (*investment*)	A.1		A.2		A.3		A.4	
	Group 1		Group 2		Group 3		Group 4	
	NON-ASEAN countries		ASEAN countries		Countries receive IMF help		Countries did not receive IMF help	
Independent variables	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms
	Panel A: Asian crisis period (1997–1998)							
CFLOW	0.053	0.134	0.071	0.070	0.189	0.071	−0.126	0.0113
	(0.76)	(2.72)***	(1.20)	(1.42)	(4.37)***	(1.05)	(−1.71)*	(2.87)***
MTB^f	0.178	0.143	0.014	−0.012	0.009	0.004	0.069	−0.008
	(3.03)***	(1.43)	(1.52)	(−0.47)	(0.21)	(0.12)	(9.20)***	(−0.27)
MTB^r	0.055	0.037	0.012	0.018	−0.0002	0.007	0.068	0.031
	(8.32)***	(3.19)***	(1.39)	(1.27)	(−0.03)	(0.21)	(9.69)***	(3.39)***
Constant	−0.127	−0.115	0.015	0.046	0.008	0.020	−0.011	0.080
	(−2.09)**	(−1.03)	(1.03)	(1.38)	(0.15)	(0.48)	(−0.88)	(1.53)
R-squared	0.25	0.07	0.04	0.04	0.14	0.02	0.20	0.07
N	301	303	289	283	238	238	352	348
Dependent variable I (*investment*)	B.1		B.2		B.3		B.4	
	Group 1		Group 2		Group 3		Group 4	
	NON-ASEAN countries		ASEAN countries		Countries received IMF help		Countries did not receive IMF help	
Independent variables	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms
	Panel B: Credit crisis period (2007–2009)							
CFLOW	0.118	0.176	0.119	0.144	0.192	0.215	0.103	0.096
	(4.44)***	(4.81)***	(4.75)***	(4.75)***	(4.02)***	(6.91)***	(5.37)***	(2.91)***
MTB^f	−0.139	−0.001	−0.007	−0.029	−0.004	−0.040	−0.008	0.015
	(−2.81)***	(−0.02)	(−0.11)	(−0.81)	(−0.14)	(−2.16)**	(−0.19)	(0.27)

Table 5 continued

Dependent variableI (*investment*)	B.1		B.2		B.3		B.4	
	Group 1		Group 2		Group 3		Group 4	
	NON-ASEAN countries		ASEAN countries		Countries received IMF help		Countries did not receive IMF help	
Independent variables	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms	LL–HC firms	HL–LC firms
MTB^r	0.008 (1.91)*	0.029 (4.00)***	−0.002 (−0.45)	0.004 (0.48)	−0.0005 (−0.08)	0.018 (2.34)**	0.007 (2.54)**	0.032 (4.44)***
Constant	−1.056 (−0.10)	−3.800 (−0.50)	−5.505 (−0.44)	−24.71 (−3.21)***	0.048 (1.46)	0.076 (3.69)***	0.039 (0.89)	0.027 (0.42)
R-squared	0.11	0.22	0.18	0.12	0.10	0.20	0.13	0.13
N	339	336	291	285	294	278	336	343

This table shows the cash flow sensitivity of investment for different subgroups of firms during the Asian crisis of 1997–1998 (Panel A) and credit crisis of 2007–2009 (Panel B). Sub-panels A1 and B1 present the results for firms from countries that do not belong to the Association of South East Asian Nations (Group 1). Group 1 firms are from South Korea and Hong Kong (NON ASEAN COUNTRIES). Sub-panels A2 and B2 present the results for firms from countries that belong to the Association of South East Asian Nations (Group 2). Group 2 firms are from Indonesia, Malaysia and Thailand (ASEAN COUNTRIES). Sub-panels A3 and B3 present the results for firms from countries that received immediate IMF financial support after the 1997–1998 crisis; these are, Thailand, Korea and Indonesia (Group 3). Finally, A4 and B4 present the results for firms from countries that did not receive immediate IMF financial support help after the 1997–1998 crisis; these are Hong Kong and Malaysia (Group 4). All other variables are defined in previous Tables. *z* statistic values are reported in parentheses. ***, ** and * indicate coefficient is significant at the 1, 5 and 10 % level respectively

the ASEAN group (see Panels A.2 and B.2). In particular, the cash flow sensitivity of investment for HL–LC (LL–HC) firms is 0.144 (0.119). Also, both sensitivities are statistically significant at the 1 % level.

As an additional test, we group firms further on the basis of the extent of the financial crisis. The first group (Group 3) includes Hong Kong and Malaysia. As mentioned above, Hong Kong was generally less affected by the 1997–1998 crisis. Also, the crisis hit Hong Kong with some delay (see Radelet and Sachs 1998; Nixson and Walters 1999; Lam et al. 2010). Malaysia was significantly hit by the financial contagion that affected Asian countries from mid-1997 but its experience was somewhat different from other countries due to its strong macroeconomic characteristics (e.g. lower levels of external debt and lower inflation, and higher savings) and strong banking and corporate sectors (IMF 2000). One common characteristic of Hong Kong and Malaysia is that they did not receive immediate help by the IMF. Firms from these two countries are classified into Group 3. On the contrary, the rest of firms in our sample come from countries that received immediate help from the IMF right after the crisis (i.e. Indonesia, South Korea, and Thailand) (hereafter Group 4). The findings, which are reported separately in panel A.3 and A.4 for groups 3 and 4 respectively, suggest that flexibility matters to investment mainly for firms from countries that did not receive immediate IMF help right after the crisis of 1997–1998 (i.e. Group 4 firms). On the other hand, flexible firms from Group 3 have a higher cash flow sensitivity of investment than less flexible firms from that group. Regarding the results for the recent crisis of 2007–2009, the estimated investment to cash flow sensitivities do not differ significantly between flexible and inflexible firms in panels B.3 (Group 3 firms) and B.4 (Group 4 firms). Given that the classification of firms into Groups 3 and 4 is based on information prevailing during the 1997–1998 and not the 2007–2009 crisis (i.e. whether a country received IMF help or not), this finding is not surprising.

Overall, the findings presented in Table 5 suggest that flexibility matters to corporate investment during periods of economic stress. However, the value of flexibility varies with time and across regions/countries. In particular, our results show that the effect of flexibility on investment is particularly pronounced during the crisis of 1997–1998, and only for firms from countries outside the ASEAN group and those that did not receive immediate financial support from IMF after the 1997–1998 crisis.

4 Financial flexibility and corporate performance: evidence from the Asian Crisis of 1997–1998

Our analysis so far provides evidence that financial flexibility plays a crucial role in easing firms' cash flow shortfalls and their adverse effects on investment during crisis periods. In this section we directly examine the performance consequences of establishing financial flexibility. The question that we aim to address in this section is whether preserving financial flexibility in a pre crisis period enhances the relative performance of firms during a crisis period. To address this question, we restrict our attention the East Asian crisis of 1997–1998, a period for which we can get complete information on corporate performance, capital structure and corporate governance quality.

We use three performance measures, namely Tobin's Q, interest coverage ratio, and operating margin, as our dependent variables. These variables, which have been extensively used in studies that analyze the performance of East Asian firms prior and during the 1998 crisis (see Claessens et al. 2002; Allayannis et al. 2003; Lemmon and Lins 2003; Lins 2003), are regressed on a number of independent variables including our main variable of

interest, a dummy variable defining the flexibility status of firms in the pre crisis period. To control for the impact of corporate governance on performance, we follow Claessens et al. (2000) and include a set of dummy variables as explanatory variables in our performance equation. More specifically, these variables indicate whether: (1) ownership control rights of the largest owner exceed ownership cash flow rights (*Control* vs. *C.F. Rights*); (2) a company is controlled through a pyramid structure (*Pyramid*); (3) the largest shareholder is a widely held financial institution (*Financial Owner*); and (4) the CEO, the board chairman or vice chairman are part of the controlling owner (*Managerial Ownership*). To control for the important role that a business group affiliation can play on the performance of a company, we also include a dummy variable that takes the value of unity if a firm belongs to a business group and zero otherwise (*Business Group*). Finally, we also include the natural logarithm of total assets (*Size*), the ratio of capital expenditures to total assets (*Investment),* and the country's rule of law score (*Rule of Law*) as control variables in the regression.

Following Claessens et al. (2002), the estimation is conducted using a random effects GLS regression approach.[17] To control for endogeneity problems, the dependent variable is measured at time *t* while for the independent variables lagged values are used. Specifically, business group affiliation, ownership dummies, rule of law measures and financial flexibility are measured at their pre crisis levels. For the remaining independent variables, namely size and investment, 1 year lagged values are used. The results of the performance model estimations are reported in Table 6. In Models 1, 3 and 5 financial flexibility is defined by using the low leverage criterion (LL), whereas in Models 2, 4 and 6 the flexibility definition is based on the low leverage and high cash criterion (LL–HC). To ensure the robustness of our results, a series of additional flexibility measures is also put forward as discussed below.

Starting with Models 1 and 2, where firm performance is measured by Tobin's Q, the results show a positive and statistically significant relationship between financial flexibility and performance under both definitions of flexibility. In economic terms, flexible firms indicate a much higher Tobin's Q than that of less flexible firms. We also find that firms that are affiliated with a business group are more likely to have a greater Tobin's Q ratio than those without an affiliation. The results also reveal that the rule of law variable is positive and statistically significant in Models 1 and 2, suggesting that firms in countries with strong legal protection perform better than those firms in countries with weak legal protection of minority shareholders. This finding is consistent with La Porta et al. (2002) and also with Hossain et al. (2010), who also report a strong association between legal protection and firm performance in their sample of 539 firms from 27 countries. The rest of the independent variables do not appear to have a statistically significant impact on the performance of firms during the crisis period.

The results presented in Models 3–4 (for interest coverage ratio) and Models 5–6 (for operating margin) are generally similar to the ones reported so far. Specifically, financial flexibility, business group and rule of law dummies affect performance positively.[18]

[17] The utilization of a fixed estimator is not possible given the static nature of some of the variables included in our performance model.

[18] We note that some caution should be taken when interpreting the coefficients on flexibility proxies in Models 3 and 4. We are aware that the positive relationship between the interest coverage ratio and the (leverage) financial flexibility dummy is generated by construction. However, there are reasons why the endogeneity problem should not be as serious as one would suspect initially. First, it should be stressed that the flexibility measure is based on firms' leverage positions in the pre crisis period and performance is observed during the crisis. Second, as reported earlier, low leverage and hence flexible firms of the pre crisis

Table 6 Performance of firms during the Asian crisis of 1997–1998

Independent variables	Dependent variable = Tobin'Q		Dependent variable = interest coverage ratio		Dependent variable = operating margin	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Flexibility (LL)	0.140 (2.13)**	–	2.123 (8.02)***	–	0.023 (2.43)**	–
Flexibility (LL–HC)	–	0.253 (3.47)***	–	2.369 (8.00)***	–	0.018 (1.68)*
Investment	0.566 (1.13)	0.549 (1.10)	5.195 (2.89)***	5.266 (2.93)***	0.134 (2.28)**	0.136 (2.31)**
Business group	0.159 (2.05)**	0.167 (2.17)**	0.718 (2.30)**	0.822 (2.63)***	0.022 (1.95)*	0.024 (2.04)**
Pyramid	−0.012 (−0.10)	−0.010 (−0.08)	−1.181 (−2.24)**	−1.208 (−2.29)**	−0.033 (−1.69)*	−0.033 (−1.72)*
Financial owner	0.025 (0.15)	0.022 (0.13)	0.216 (0.32)	0.161 (0.24)	−0.013 (−0.55)	−0.014 (−0.58)
Control vs. C.F. Rights	−0.093 (−0.74)	−0.104 (−0.84)	0.511 (1.01)	0.456 (0.90)	0.018 (0.98)	0.018 (0.98)
Managerial ownership	−0.524 (−0.74)	0.009 (0.11)	−0.481 (−1.45)	−0.524 (−1.59)	−0.026 (−2.17)**	−0.007 (−2.17)**
Rule of law	0.104 (2.77)***	0.106 (2.93)***	0.785 (5.22)***	0.944 (6.48)***	−0.010 (−1.46)	−0.008 (−1.45)
Size	0.003 (0.16)	0.003 (0.14)	−0.327 (−3.65)***	−0.327 (−3.65)***	0.015 (4.52)***	0.014 (4.27)***
Number of observations	1,010	1,010	1,010	1,010	1,010	1,010
Adjusted R^2	0.037	0.048	0.1935	0.1935	0.103	0.098

This table presents the results from our performance models. *Tobin's Q* is measured as the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets. *Interest coverage ratio* is measured as earnings before interest and tax dividend by interest expense. *Operating margin* is obtained by dividing operating income to sales. In models 1, 3 and 5 (2, 4 and 6) *Flexibility* is a dummy variable that takes the value of 1 if the firms belongs to the LL (or LL–HC) group and zero otherwise at the onset of the crisis. *Investment* is measured as the ratio of investment in fixed assets to total assets. *Business group* is a dummy variable that takes the value of unity if the firm belongs to a business group and zero otherwise. *Pyramid* is a dummy variable indicating whether the firm is controlled through a pyramid structure. *Financial owner* is a dummy variable indicating whether the largest shareholder is a widely held financial institution or not. *Control* vs. *C.F. Rights* is a dummy variable that takes the value of unity if control rights of the largest owner exceed cash flow rights and zero otherwise. *Managerial ownership* is a dummy variable if the CEO, the board chairman or vice chairman are part of the controlling owner. *Rule of law* is a score that ranges from 0 to 11, lower scores corresponding to less tradition to law and order. Finally, *Size* is the USD currency adjusted total assets. *z* statistic values are reported in parentheses. ***, ** and * indicate coefficient is significant at the 1, 5 and 10 % level respectively

However, there are also important differences. For example, the coefficient on the variable *Pyramid* is negative and statistically significant, suggesting that firms controlled through a pyramid structure do not perform as well as the others during the crisis. Also, the results

Footnote 18 continued
period increase their leverage substantially in the crisis period. Finally, the positive finding is also in line with the summary statistics regarding the cash flow ratio given that the LL and LL–HC firms have the lowest drops in their cash flows among all the subgroups of firms (see Table 2).

regarding the firm size are mixed. When we use the interest coverage ratio as the dependent variable the relationship between size and performance is negative and significant, whereas the relation becomes positive when performance is measured using the firm's operating margin. Using the latter definition, we also observe that managerial ownership exerts a negative effect on firm performance, which is consistent with the view that firms with senior managers being part of the controlling owners exhibit inferior performance compared to firms that are run by independent senior managers. This implies that the entrenchment effects of large shareholdings by the CEO or Chairman may dominate the alignment incentive effect (see Claessens et al. 2002). Finally, in contrast to the results reported in Models 1 and 2, the findings indicate that firms with greater investment expenditures are also likely to perform better.

Among the remaining findings, it seems that the ownership variables, except for managerial ownership, do not appear to play a significant role in affecting firm performance of firms in the crisis period. Specifically, the estimated coefficients on *Pyramid, Financial Owner* and *Control* vs. *C.F Rights* in models 5 and 6 are statistically insignificant, leading to the conclusion that agency problems between large and minority shareholders may not be among the key drivers of performance in the crisis period. This finding is in line with the results of Leung and Horwitz (2010) study, which focuses on the East Asian crisis and presents supportive evidence for the alignment theory of large managerial shareholdings. This evidence, however, is at odds with the findings of Claessens et al. (2002) who study the relationship between equity ownership and firm value in eight East Asian markets and find that the divergence between cash-flow ownership and control rights leads to a decrease in performance. The difference in findings may be partly attributed to the different samples and time-periods utilized across the two studies. For example, while Claessens et al. (2002) study the performance of firms in the pre crisis period, our analysis focuses on the performance of firms during the crisis period. This explanation seems reasonable given the recent evidence by Wei and Zhang (2008) that the crisis altered the nature of agency problems in which Asian corporations are exposed to. It is then likely that the effectiveness of certain governance mechanisms/devices differs across different phases of the economic cycle (see Wei and Zhang 2008; Leung and Horwitz 2010).

Overall, the findings reported in Table 6 suggest that a firm's choice to establish financial flexibility and participate in a business group in the pre crisis period affects its performance positively during the crisis. However, flexibility through relatively high cash and low leverage policies, and group affiliation does not necessarily work as substitutes in helping firms to hedge against unexpected future contingencies. When we interact the financial flexibility proxies with the business group dummy and include the underlying interaction terms in the performance equation, the results indicate that the estimated coefficient on the interaction terms is statistically insignificant in most of the regressions (results are available upon request). Our findings reiterate earlier findings regarding the crucial role that financial flexibility can play during economic downturns. Also, the results emphasize the benefits of participating in a business group, which seem to materialize for all firms during a crisis period. In this respect, our study builds on the study of Claessens et al. (2006), which indicates that a group membership in the pre crisis period is beneficial only for mature firms with sluggish growth.

These results also hold under alternative measures of financial flexibility. Table 7 presents results for performance models as estimated using "*LL–HC* (25th and 75th *percentiles*)", "*LL–HC persistence*" and "*Flexibility-KZ index*" to measure flexibility. In the vast majority of cases, flexibility affects corporate performance strongly. However, the results are only weaker when flexibility is measured through the variable "*LL-HC*

Table 7 Performance of firms during the Asian crisis of 1997–1998: Alternative flexibility measures

Independent variables	Dependent variable: Tobin's Q			Dependent variable: interest coverage ratio			Dependent variable: operating margin		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
LL–HC (25th and 75th Percentiles)	0.432 (4.01)***	–	–	3.417 (7.76)***	–	–	0.042 (2.62)***	–	–
LL–HC (persistence)	–	–	0.187 (1.48)	–	–	2.142 (4.03)***	–	–	−0.006 (−0.31)
Flexibility (KZ-Index)	–	0.121 (1.75)*	–	–	2.882 (10.40)***	–	–	0.045 (4.25)***	–
Investment	0.564 (1.13)	0.600 (1.21)	0.605 (1.20)	5.408 (3.00)***	5.130 (2.89)***	5.375 (2.94)***	0.136 (2.31)**	0.133 (2.22)**	0.140 (2.38)**
Business group	0.151 (1.97)**	0.147 (1.98)**	0.160 (2.05)**	0.698 (2.23)**	0.864 (2.88)***	0.746 (2.28)**	0.022 (1.92)*	0.024 (2.11)**	0.023 (2.03)**
Pyramid	−0.018 (−0.14)	0.014 (0.11)	−0.030 (−0.23)	−1.289 (−2.44)**	−1.264 (−2.53)**	−1.417 (−2.57)**	−0.034 (−1.75)*	−0.034 (−1.77)*	−0.034 (−1.75)*
Financial owner	0.047 (0.29)	0.043 (0.27)	0.008 (0.05)	0.358 (0.53)	0.439 (0.69)	0.002 (0.00)	−0.012 (−0.48)	−0.011 (−0.45)	−0.014 (−0.56)
Control vs. C.F. Rights	−0.062 (−0.50)	−0.075 (−0.63)	−0.081 (−0.64)	0.826 (1.62)	0.636 (1.32)	0.691 (1.30)	0.022 (1.18)	0.018 (0.99)	0.020 (1.06)
Managerial ownership	0.001 (0.01)	−0.045 (−0.58)	−0.012 (−0.15)	−0.632 (−1.91)*	−0.542 (−1.72)*	−0.705 (−2.05)**	−0.028 (−2.30)**	−0.028 (−2.35)**	−0.030 (−2.47)**
Rule of law	0.102 (2.83)***	0.123 (3.56)***	0.128 (3.54)***	0.947 (6.48)***	1.008 (7.32)***	1.149 (7.69)***	−0.009 (−1.64)	−0.008 (−1.48)	−0.006 (−1.15)
Size	0.008 (0.35)	0.001 (0.04)	−0.006 (−0.27)	−0.365 (−4.10)***	−0.335 (−3.94)***	−0.476 (−5.20)***	0.014 (4.48)***	0.015 (4.65)***	0.013 (4.08)***

Table 7 continued

Independent variables	Dependent variable: Tobin's Q			Dependent variable: interest coverage ratio			Dependent variable: operating margin		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Number of observations	1,010	986	1,010	1,010	986	1,010	1,010	986	1,010
Adjusted R^2	0.053	0.037	0.034	0.190	0.250	0.130	0.104	0.127	0.094

This table presents the results from the performance models as estimated across the different flexibility subgroups of firms. In models 1, 4, 7; LL–HC (25th and 75th *percentiles*) is a dummy variable that takes the value of 1 for firms that have their leverage ratio lying in the first quartile of the leverage distribution, and, also their cash ratio lying in the fourth quartile of the cash distribution, and zero otherwise. In models 2, 5, 8; LL–HC (*Persistence*) is a dummy variable that takes the value of 1 for firms that fit into the category of low leverage and high cash for the three consecutive years of 1994, 1995 and 1996, and zero otherwise. In models 3, 6, 9; Flexibility (KZ-Index) is a dummy variable that takes the value of 1 for firms that exhibit a below median KZ-score, which is measured as -1.002^{*} *CFLOW* $+ 0.283^{*}$ *Q* $+ 3.139^{*}$ *Leverage* $- 39.368^{*}$ *Dividends* $- 1.315^{*}$ *CashHolding,* and zero otherwise. Analytical definitions for the variables *Tobin's Q*, *Interest coverage ratio, Operating margin, Investment, Business group, Financial owner, Control* vs. *C.F. Rights*, *Managerial ownership*, *Rule of law* and *Size* are provided in Table 6. *Z* statistic values are reported in parentheses. ***, ** and * indicate coefficient is significant at the 1, 5 and 10 % level respectively

persistence" (see models 3 and 9 of Table 7). This finding can be explained by the fact that the classification criterion that is based on persistence is rather a strict one, leading most of them to be assigned to the less flexible group. We have also estimated our performance models using flexibility measures based on excess cash and retained earnings. However, we failed to find any statistically significant association between flexibility and corporate performance (results available upon request).

5 Further checks

To ensure the validity of our findings from the investment and performance models, this section goes through a series of additional checks. The first thing examined is whether low leverage and high cash policies, which are assumed to help preserve flexibility, are indeed optimal or due to constraints arising from capital market imperfections. For example, we are aware of the possibility that firms hold large cash balances and/or low levels of debt in their capital structure because the cost of external finance is prohibitively high. Put differently, by using low leverage and high cash holdings ratios as our classification criteria, we may be picking up financially constrained firms and wrongly classifying them as financially flexible. For example, recent studies by Lins et al. (2010) and Hadlock and Pierce (2010), suggest that a high level of cash holdings may relate to financial constraints in the sense that firms hold elevated levels of cash for precautionary reasons. Another possibility is that hoarding cash is not the only way through which companies can establish financial flexibility. Lee et al. (2011) show that high growth firms can build up "precautionary reserves" for flexibility considerations through dividend policy (e.g. by reducing the payout ratio and retaining more earnings). Finally, it is also likely that the policies towards flexibility observed prior to the crisis are simply random despite the performance enhancing effects of such policies we observe during the crisis.

To explore these possibilities we perform the following checks. We estimate our baseline investment equation in the pre crisis period for constrained and unconstrained groups using firm characteristics such as size, age and dividend payout ratio. We find that, across all measures, the cash flow ratio of firms has a positive and significant impact on investment for both constrained and unconstrained firms, while the relationship between investment and the market to book ratio is weak. The extent to which the cash flow sensitivity of investment can be used to determine financially constrained firms, we cannot find any firm characteristics which would enable us to distinguish between financially constrained and unconstrained firms in the pre crisis period. Our analyses suggest that neither the flexible nor the less flexible firms in our sample are likely to be constrained in the pre crisis period. The summary statistics we report in Sects. 2 and 3 mostly support this view. Specifically, as noted earlier, the characteristics of the flexible firms in the crisis period are such that they have greater growth opportunities, are smaller, and have higher dividend payout, cash flow and investment ratios than the less flexible ones. The significant and persistent differences between the characteristics of flexible and inflexible firms in both periods also rule out the possibility that our classification of flexibility is driven by random behaviour of firms.

The other issue addressed in this section is whether financial flexibility, which seemed to matter a lot to corporate investment during the crisis of 1997–1998, was equally valuable to firms belonging and not belonging into a business group. Business groups of Asian firms are diversifying organizations with a significant amount of ownership and control. Such groups can provide benefits to their affiliate firms through capital and product

markets, contract enforcement, and government influence (see Khanna and Palepu 2000; Rousseau and Kim 2008). Recent evidence for East Asian (in particular Korean) corporations, for example, supports a significant association between the existence of a business group and corporate debt policies (see Kang and Kim 2006; Gul and Kealey 1999; Kwak et al. 2012). The specific questions that we try to address in this section are the following: (1) Does the investment expenditure of firms that belong to a business group (BG) exhibit a lower sensitivity to the availability of internal funds than that of firms without a business group affiliation (non-BG), (2) Does business group affiliation work as substitute to financial flexibility, as attained through cash and leverage, during the crisis?

To address the first question, we estimate Eq. (1) after splitting the sample into two subsamples based on their business group affiliation. The results from this estimation are reported in Panel A of Table 8. To address the second question, we estimate the investment model again by focusing on the subgroups based on a combination of the group affiliation and financial flexibility features of firms. For example, in Panel B of Table 8, Model 3 reports the estimation results using a subsample of firms that are defined as financially flexible and are also affiliated with a business group. On the other hand, Model 5 in Panel C considers firms that are financially inflexible (HL–LC firms) and affiliated with a business group.

The results presented in Panel A show that the cash flow sensitivity of investment is positive and statistically significant for both groups of firms, though the economic significance of the coefficient on cash flow is greater for firms without a business group affiliation (0.142 vs. 0.073). This finding is consistent with the view that the investment of firms that belong to a business group is less dependent on the availability of cash flow. Another interesting finding, which is in line with our expectations, relates to the coefficient of the market to book ratio, which also plays a significant role for the BG firms in determining investment during the crisis period.[19]

The results in Panel B, where we estimate the investment model for the BG and non BG firms with financial flexibility, reveal that the cash flow sensitivity of investment becomes insignificant when we consider only those BG firms with financial flexibility (Model 3). However, there is some evidence that the availability of internal funds may still be important in determining the ability of firms to invest even though they have financial flexibility through low leverage and high cash balances (Model 4). The economic significance of the estimated coefficient on cash flow is similar to that of Model 2 but the coefficient is only marginally significant at the 5 % level. Although the findings in Panel B may suggest that establishing financial flexibility may not be sufficient on its own to eliminate the adverse effects of the crisis on investment, it is more important to analyze the impact of business group affiliation among the less flexible firms in order to draw more definite conclusions. We conduct this analysis in Models 5 and 6 in Panel C and find that the cash flow sensitivity of investment is positive and significant for the less flexible firms regardless of whether they are affiliated with a business group. Thus, in line with our earlier findings, financial flexibility appears to be the main determinant of whether the investment expenditures of firms are cash flow dependent during the crisis period. The economic significance of the estimated coefficients in both subsamples is also very similar.

[19] These findings, however, may be mainly driven by the economic conditions that characterized East Asian countries during the crisis period. To this end, an interesting avenue for future research would be the examination of the role of business groups in East Asia within a dynamic setting (i.e. before, during and after the crisis). Indeed, recent studies that focus on Korean firms view the crisis of 1997/1998 as a structural break with respect to the investment behaviour and a shift towards stronger market orientation (see e.g. Rousseau and Kim 2008).

Table 8 The cash flow sensitivity of investment across different subgroups of firms: Flexibility versus Business group affiliation

Dependent variable I (*investment*)	Crisis period (1997–1998)					
	Independent variables					
	CFLOW	MTB^f	MTB^r	Constant	R^2	N
Panel A						
(1) BG_firms	0.073 (2.37)**	0.062 (2.70)***	0.040 (9.49)***	−0.027 (−0.66)	0.14	934
(2) Non BG_firms	0.142 (4.29)***	0.044 (1.26)	0.010 (1.61)	−0.020 (−4.51)***	0.11	539
Panel B						
(3) BG_firms & LL–HC firms	−0.007 (−0.10)	0.178 (3.27)***	0.055 (7.82)***	−0.205 (2.76)***	0.26	252
(4) Non BG_firms & LL–HC firms	0.124 (1.97)**	0.045 (0.66)	0.008 (0.69)	−0.009 (−0.10)	0.10	167
Panel C						
(5) BG_firms & HL–LC firms	0.153 (3.33)***	−0.005 (−0.17)	0.037 (3.42)***	0.040 (1.01)	0.12	278
(6) Non BG_firms & HL–LC firms	0.166 (2.98)***	0.126 (1.67)*	0.045 (2.93)***	−0.123 (−1.27)	0.17	131

This table shows the cash flow sensitivity of investment for different subgroups of firms. I (*investment*) is measured as the ratio of capital expenditures to lagged total assets. *CFLOW* is the sum of operating income and depreciation/depletion/amortization over total assets. *MTB* is decomposed into two parts—a fundamental component, MTB^f, and a residual component, MTB^r (see Sect. 3.4 for details). BG_firms are the firms with a business group affiliation just before the start of the crisis. Non BG_firms are the firms without a business group affiliation just before the start of the crisis. *LL–HC firms* are the firms that combine low leverage and high cash. *HL–LC firms* are the firms that combine high leverage and low cash. *z* statistic values are reported in parentheses. ***, ** and * indicate coefficient is significant at the 1, 5 and 10 % level respectively

Overall, the results of Table 8 suggest that companies cannot count solely on a business group affiliation to hedge against uncertain future contingencies, such as low profitability, low cash flow and/or high cost of external financing. Also, it seems that a sufficient level of financial flexibility can be attained through conservative leverage policies, even for firms that do not have a business group affiliation.[20]

Moving to the performance results and their robustness, we first examine whether the impact of financial flexibility on performance varies with firms' geographical location. We construct a dummy variable, which takes the value of 1 for firms that firm do not below to the ASEAN group, and 0 otherwise. Likewise, we construct a dummy variable that takes the value of 1 for firms from countries that received help from the IMF in the immediate aftermath of the 1997–1998 crisis, and 0 otherwise. Both dummies are interacted with our flexibility proxies and the subsequent interaction terms are included in the performance models as additional explanatory variables. The results, which are not reported, support the contention that the value of financial flexibility is higher for firms from countries outside the ASEAN group and for those that did not receive financial support by the IMF.

[20] These results hold in models that use different proxies for flexibility (e.g. LL) and/or samples that exclude companies with negative cash flow observations (the results are available upon request).

As a final robustness test, we consider an alternative interpretation of our findings. Specifically, we consider the possibility that the improved performance during the crisis of 1997–1998 may arise from lower agency costs rather than the ability to exploit valuable investment opportunities that financial flexibility offers (although such explanations are not necessarily mutually exclusive). The fact that our performance models also include a set of corporate governance characteristics that may capture agency costs effects confirms that any performance differentials between flexibly and inflexible firms is more likely to be attributed to the different ability of each group to undertake profitable investment projects rather than agency costs. Such ability may of course be strongly linked with the fact that flexible firms have lower interest payment obligations. To further investigate the validity of this argument, we conduct the following check. We calculate the asset-turnover ratio (the ratio of total sales to total assets) of each firm and following Florackis and Ozkan (2009), we interpret it as an inverse proxy of expected agency costs. We then examine whether the agency cost differential between flexible and inflexible firms varies over time. Appropriate t tests for differences in means suggest that the agency cost differential in the pre-crisis period is not statistically different from the agency cost differential in the crisis period [$t = 1.174$; $P(T \leq t) = 0.240$]. We therefore conclude that the observed outperformance of financially flexible firms during the crisis period do not seem to be arising from lower agency costs in that period.[21] Still, we acknowledge that further analysis simultaneously considering optimal rather than observed levels of cash and leverage (see e.g. Frésard and Salva 2010; Lee and Lee 2009; Ozkan and Ozkan 2004; Opler et al. 1999 on optimal cash, and Morellec 2004; Johnson 1998 on optimal leverage) would provide additional insights into the link between financial flexibility, agency costs and firm value.

6 Conclusions

Using a large sample of firms from five East Asian countries, we investigate the impact of financial flexibility on corporate investment and performance over the period 1994–2009. We identify financially flexible firms on the basis of their cash and leverage policies using several criteria. Our findings strongly suggest that financial flexibility appears to be an important determinant of investment, mainly during the 1997–1998 crisis and, to a lesser extent, during the 2007–2009 crisis. Interestingly, while flexibility measures combining cash and leverage proved useful in explaining corporate investment and performance, this has not been the case with measures of excess cash and retained earnings. This may be explained by the fact that companies may not use cash reserves (or retained earnings) to fund future growth but, rather, as a form of insurance against financial distress (see also Lins et al. 2010).

Analytically, we find that financially flexible firms invest more than less flexible firms during the crisis of 1997–1998. We also find that the sensitivity of the investment expenditures of flexible firms to the availability of internal funds is lower than that of the less flexible firms. The later finding hold only for periods of economic stress (e.g. 1997–1998 and 2007–2009). Interestingly, our analysis covering normal periods of the economic cycle (e.g. 1999–2006) does not reveal any significant differentials in investment behaviour of flexible and inflexible firms. Furthermore, the results suggest that the value of financial flexibility is region specific; it mainly matters to corporate investment for

[21] We thank an anonymous reviewer for suggesting to explore and analyze this alternative interpretation of our findings

countries not belonging to the ASEAN group and for those that did not receive immediate help from the IMF in the aftermath of the 1997–1998 crisis. Finally, our findings suggests that simple flexibility measures, which are based on cash holdings and leverage, are more important determinants of corporate investment and performance than traditional measures of financial constraints (e.g. firm size, dividend payout, firm age and business group affiliation).

Overall, our results complement and extend those of previous studies on corporate investment and performance. In particular, we present strong evidence that less flexible firms are more vulnerable to sudden drops in their cash flows. More importantly, we find that while the leverage policy and to a lesser extent the cash holding policy of firms are decisive determinants of financial flexibility, business group affiliation of firms play a modest role in maintaining corporate investment at a satisfactory level during the crisis period of 1997–1998. Furthermore, measures of excess cash and retained earnings are not among the key determinants of corporate investment. These findings reduce the ambiguity in the use of the term *financial flexibility* in the literature, as mentioned in a recent survey by Byoun (2011). In particular, if financial flexibility is defined as the ability of a firm to access and restructure its financing to cope with uncertain future contingencies, the group of firms with the highest ability to do so is that of relatively low leverage and high cash. Additionally, our findings complement the ones of Duchin et al. (2010) for US firms, who focus on the subprime mortgage credit crisis and observe substantial declines in the investment of firms with low cash reserves and high short-term debt. Our findings suggest that the level of capital expenditures of such firms in East Asia has not declined during the credit crisis. These findings are supplementary to those obtained by de Jong et al. (2012) for US firms, which show that financial flexibility has a significant and positive effect on US firms' future investments. Finally, our analysis builds on existing studies that analyze the factors that affect corporate performance during the East Asian crisis (see, e.g., Johnson et al. 2000; Mitton 2002; Fisman 2002; Lemmon and Lins 2003; Lins 2003). In particular, our paper presents overwhelming evidence that in addition to several corporate governance characteristics, financial flexibility is an important driver of firm performance.

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