Essays in Empirical Corporate Finance

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Le, Nhan (Ph.D., Business Administration)

Essays in Empirical Corporate Finance

Thesis directed by Prof. Mattias Nilsson

The dissertation consists of two essays in the literature of corporate cash holding policy.

The first essay investigates the role of large cash holdings on firm recovery following an abrupt negative performance shock. The results show that large cash holdings have a negative effect on performance recovery. This adverse impact of cash on performance does not occur for the same sample firms in a pseudo performance shock event, nor does it occur for matched placebo sample firms that did not experience a similar performance shock. The results suggest that cash holdings have a dynamic effect on corporate behavior and performance, and the agency costs associated with large cash reserves are state contingent. Further investigation reveals that the difference in performance outcome is mainly due to low cash firms significantly downsizing their asset base whereas high cash firms do not follow this pattern. The evidence implies that large cash holdings reduce pressure on management when they need to be highly disciplined to restructure their activities.

In the second essay, I examine how managers adjust their corporate cash holding policy in response to the intra-industry bankruptcy filings. I find that on average firms significantly increase their cash holdings following the incidence of bankruptcy filings by their industry peers. This result is in general consistent with managers hedging against potential contagion from these bankruptcies. However, for a subsample of firms in industries with a high degree of concentration I do not find an effect on cash holdings from intra-industry bankruptcies. This result is consistent with firms in concentrated industries expecting to capture enough benefits from their competitors' financial distress that it outweighs any needs to hedge against contagion. Consistent with a precautionary (aka "hedging") motive for the increase in cash holdings, the effect is larger for firms with high leverage or greater growth opportunities. These are firms that potentially will suffer the most from

negative spillover effects in terms of increased risk of financial distress or underinvestment. Some tentative evidence suggest that the sources of the cash increase are equity issues and a reduction of net working capital. Overall, the evidence suggest that not only creditors reassess their perceived default risk of surviving firms as empirically documented in prior literature, but so do also the managers of these firms. Although the cash increase is consistent with precautionary behavior on part of the managers, it is not self-evident that this is optimal behavior from a firm value perspective. Although examining a different empirical setting, the evidence in Chapter 1 of this dissertation in fact suggest that the managers' response, no matter how well-intended, may very well be suboptimal due to agency costs of cash.

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Contents

Chapter

Tables

Table

Figures

Figure

Chapter 1

Do Large Cash Holdings Help or Hinder Firms' Performance Recovery?

1.1 Introduction

The average cash-to-assets ratio for U.S. industrial firms substantially increased from 10.5% in 1980 to 23.2% in 2006 (Bates et al. (2009)). A considerable amount of theoretical and empirical work has been devoted to examining the motivation and implication of this phenomenon.[1] Exante, firms justify their substantial cash holdings with plausible and valid reasons such as increasing competitive pressure in product markets (Bates et al. (2009) and Morellec and Nikolov (2008)), tax savings objectives (Foley et al. (2007)) or precautionary and liquidity motives (Moyen and Boileau (2009)). Nevertheless, the expost implications of large cash reserves on management behavior might not turn out as benign as intended ex ante. The empirical evidence as to whether cash hoarding is ultimately beneficial or detrimental to firm value is still inconclusive (Harford et al. (2008)). For instance, in the context of product market competition, Frésard (2010) shows that large cash reserves help firms gain market share at the expense of industry rivals. On the contrary, according to Harford (1999) or Harford et al. (2008), cash-rich firms are more likely to make diversifying acquisitions, which are more likely to be value-decreasing. Conflicting evidence like this suggests that cash holdings can have a dynamic implication on management behavior and corporate performance depending on the economic and financial situation that a firm is facing. To further explore this idea, I identify firms experiencing an abrupt operating performance decline and

[1] See Bates et al. (2009) for a more comprehensive review of theory and empirical evidence on why firms hold cash.

examine if large cash holdings help or hinder their recovery.

Although high cash holdings can obviously help firms fulfill their financial obligations in a situation that would otherwise lead to financial distress, the ultimate impact of high cash holdings on firm recovery following a negative performance shock might not be as apparent. On the one hand, when firms are facing promising growth prospects, substantial cash can help to mitigate financing frictions, offer management more operational flexibility and alleviate problems of under-investment. On the other hand, when firms are facing problems of inefficiency, sizable cash reserves reduce pressure on management when they need to be highly disciplined to downsize and restructure their activities. Managers in cash rich firms could be prone to engage in costly diversification of their operations to cope with a performance shock, or excessively continue inefficient investment projects. In brief, they can exacerbate problems of over-investment. Therefore the true effect of large cash reserves on firm performance in this scenario is still an open empirical question.

I identify a sample of public U.S. firms between 1985 and 2006 that experience an abrupt and significant negative operating performance shock, where the firms go from being superior to poor within-industry performers in the course of one year. Except for suffering the material deterioration in operating performance, the sample firms do not exhibit any strong sign of financial distress. The average and median leverage ratios of my sample firms are still under 30% over the period of two years before and after the shock. Analyzing this sample, I find that firms with large cash reserves at the onset of the performance shock are more likely to underperform cash-poor ones. A standard deviation increase in the industry-adjusted cash ratio reduces the improvement of industry-adjusted return on assets ("ROA") by 1.05 percentage points. Given the average improvement of industry-adjusted ROA of 4 percentage points, the difference of 1.05 percentage points is economically significant ($\sim$ 25% of the average improvement). The result remains qualitatively unchanged when I extend the analysis into a three year period following the shock.

To provide insights into how large cash holdings might destroy firm value, I decompose the operating performance measure, namely return-on-assets, into profit margin and asset turnover. I find that although there is some evidence that cash poor firms improve their profit margins relative

to cash rich firms, a significant improvement in assets turnover is the main reason for the post-shock profitability discrepancy. Investigating the components of asset turnover, I find that low cash holding firms substantially downsize their scale of operations to cope with the performance shock. By contrast, cash rich firms are more likely to expand their asset base (i.e., including net assets, property, plant and equipment and acquisition expenditure) without achieving sufficient sales growth. Specifically, a standard deviation increase in cash ratio elevates the growth rate of net assets by 13.8 percentage points but only helps to improve the sales growth rate by 4.8 percentage points. It appears that high cash holding firms exhibit some signs of overinvestment (i.e., relative asset expansion without accompanying sufficient sales growth, and showing a reduction in profitability instead). Additionally, I do not find evidence that the firms conducting major asset reductions exhibit economically stronger signs of also being in financial distress. Given that my sample firms are not financially distressed firms but firms with an operational shock, it is reasonable to argue that these firms on average undertake asset sales for efficiency considerations rather than fire sales to avoid default and bankruptcy.

When analyzing how firms' cash reserves change following the shock, I find that an average or median cash rich firm depletes its cash reserve by 2.4 percentage points or 2.1 percentage points, respectively, while cash poor firms do not exhibit any sign of cash depletion. The evidence suggests that firms utilize large cash reserves to finance their operating losses.

If large cash reserves are valuable from a precautionary perspective, we should expect them to be valuable in particular for firms that face financing constraints. Using three different measures for financing constraints, I find that the negative impact of cash on performance recovery is somewhat mitigated for financially constrained firms, but there is still a significantly negative effect of cash. Moreover I find that the negative effect of cash is almost twice the magnitude for firms in concentrated industries. Because product market competition can serve to reduce agency costs of managerial discretion, this result further suggest that the negative effect of large cash reserves is related to agency problems. Relatedly, to ensure that the results are not driven by cash reserves simply being a proxy for the underlying state of corporate governance in the firms, I employ direct

measures of the corporate governance structure to control for this possibility. The results remains robust to this modification.

One might argue that the primary result on the negative impact of cash holdings following the performance shock can be driven by endogenous feedback from performance to cash. Firms may be able to anticipate the upcoming negative performance shock and hence accumulate more cash as a precautionary measure. To test this alternative explanation of my findings, I analyze the percentages of high and low cash firms experiencing the performance shock during the years of my sample. If the assumption is true, we should observe a higher proportion of cash rich firms entering the sample relative to cash poor ones. However, I do not find the percentage of high-cash firms to be disproportionately larger. Furthermore, analyzing the cash ratio of the sample firms over three years before the shock year I do not notice a material upward trend in firms' cash holdings. Since my sample does not include firms performing poorly over a prolonged period of time but only ones experiencing a large and sudden shock of going from a superior to poor performer, we can reasonably argue that the exact timing, magnitude, and consequences of these shocks are not fully anticipated. As a result, this particular endogeneity concern seems to be considerably reduced in this scenario.

Another possible concern is that a subset of selected firms with high/low cash holdings in the sample might not be representative of the entire group of firms with high/low cash holdings. It might be the case that low cash firms are less likely to survive long enough to have the data required for the post-shock analysis. So, if they do, they are firms with an unusually strong level of performance. Therefore it is easy for us to come to the conclusion that cash poor firms outperform cash rich ones. However, a Heckman two-step sample selection procedure reveals that my result is not likely driven by this kind of survivorship bias. The negative effect of cash on performance recovery remains robust after correcting for this potential problem.

Additionally, following the methodology of Barber and Lyon (1997), I construct a sample of control firms that matches the sample firms in three digit SIC code, year and pre-event performance. By adopting the control firms approach, I hope to control for various factors such as corporate

strategy, management ability, or investment opportunities that are unrelated to an event but affect firms' operating performance. The primary finding remains robust to the use of this modification.

Finally, I further explore the dynamic effects of cash holdings on firm value over time and cross-sectionally. I employ a pseudo shock event which is defined to occur at three years prior to the actual distress year. Given the previous sample identification strategy, these firms before the shock used to be top performers in their industries. During this time when overinvestment is presumably less likely to be a concern, I do not find a significantly adverse impact of cash on performance. Financial slack might help to mitigate financing frictions and therefore does not harm firms with ample investment opportunities. To test the dynamic effect cross-sectionally, I construct a group of placebo sample firms that are matched with the sample firms in three digit SIC code, year and pre-event performance but do not concurrently experience this form of the performance shock. Within the sample that do not face performance problems, again, I do not observe the adverse impact of large cash reserves. It suggests that in the scenario when overinvestment is less likely to be costly (e.g., top performers in an industry with high investment opportunities or high growth rate), agency costs associated with large financial slack can be insignificant.

Taken together, the analysis provides further evidence on the possible downside of large cash reserves on firm behavior and performance. The findings suggest that in the scenario of a sharp operating performance drop, management with overly large cash holdings might fail to efficiently downsize their operations, which seems essential for performance recovery. Having low cash holdings can effectively work as a disciplining device on how firms respond and perform. As such, the paper contributes to two related strands of literature:

First, it adds to the growing literature on corporate cash holdings. Departing from existing studies, I focus solely on firms that experience an abrupt and significant performance decline. In the context of restructuring activities, I show that excessive cash reserves fail to discipline management to respond drastically to a sharp performance decline and hence inhibit performance recovery. I also propose a possible mechanism through which excessive cash might hurt firm value. In essence, the results are consistent with the free cash flow and managerial discretion hypotheses

of Jensen (1986). Jensen (1986) proposes that managers with an abundance of resources are prone to empire building and reluctant to give up their control benefits by not disgorging free cash flow to investors. Empirically, the results are highly consistent with the evidence documenting the negative relationship between liquidity and performance at individual, firm, and country level (Hurst and Lusardi (2004), Hvide and Møen (2010), Harford (1999), Harford et al. (2008) and Blanchard et al. (1994)).[2] In addition, the fact that I do not find this adverse impact of cash for the sample firms in the pseudo shock events, or for the placebo sample firms, suggests that the effects of large cash holdings on firm behavior is highly dynamic depending on the particular situation that a firm is facing. In other words, the finding suggests that the severity of agency problems related to cash reserves are likely to be state contingent. This implication is in line with the argument in Stulz (1990) that the empire-building behavior of managers is particularly damaging when investment opportunities are low and financial slack is high. Empirically, it is consistent with the findings of Lang et al. (1991) that agency costs of managerial discretion tend to be highest for firms with low investment opportunities.

Second, my study extends the literature in corporate restructuring. In this literature, the role of the takeover market is investigated in Denis and Kruse (2000), capital structure in Ofek (1993), board of directors in Perry and Shivdasani (2005) and stakeholders in Atanassov and Kim (2009). However the literature is still silent on the important role of cash reserves. Cash or liquidity management is theoretically and empirically documented as an important component in corporate policies. It encompasses many business dimensions. Especially with the recent phenomenon of substantial cash accumulation in the corporate sector, further understanding of how cash impacts the way firms respond to economic shocks is necessary and important. The findings that a shortage of liquidity has a disciplining effect is highly in line with the findings of Ofek (1993). He documents

[2] At the individual level (ie. entrepreneurs), Hurst and Lusardi (2004) show that even though there is no relation between wealth and entry into entrepreneurship over the majority of the wealth distribution, at the top of the wealth distribution, the wealthier households, the more entry into entrepreneurship. Taking a further step, Hvide and Møen (2010) provide evidence that there is drop in the profitability of start-ups in the upper wealth quartile of founders. At the firm level, Harford (1999) and Harford et al. (2008) report that cash-rich firms or firms with substantial cash windfalls are more likely to make diversifying acquisitions which are more likely to be value-decreasing. At the country level, it is widely documented that substantial capital inflows to the economy are one of the reasons for the widespread sub-prime lending in the United States.

that firms with higher leverage before the period of distress respond faster to performance shocks than their lower leverage counterparts. Hence, together with the study of Ofek (1993), I contribute evidence on how a firm's financial status prior to a performance shock affects its subsequent behavior and performance.

The paper proceeds as follows. In Section 2, I present the related literature and the hypotheses development. Section 3 describes my sample construction and data. Section 4 presents empirical results. Section 5 discusses alternative explanations and presents a variety of robustness checks. Section 6 concludes.

1.2 Related Literature and Hypothesis Development

1.2.1 Corporate Cash Holdings

The literature on corporate cash holdings can be broadly classified into two streams of research that study the motivation and implication of cash holdings. Regarding the motivation, there are four different motives for why firms hold cash. They include tax-based, transaction, precautionary and agency motives (Opler et al. (1999) and Bates et al. (2009)). Foley et al. (2007) provide a tax-based explanation for cash reserves; firms that have foreign income and are subject to higher repatriation taxes have a propensity to accumulate more cash. The transaction motive implies that firms accumulate cash to minimize transaction costs of converting a noncash financial asset into cash (see, e.g., Miller and Orr (1966)). The precautionary motive hypothesis suggests that firms with limited access to capital markets or better investment opportunities have a propensity to hoard more cash to avoid underinvestment and/or liquidation. Almeida et al. (2004) offer a theoretical argument and Opler et al. (1999) provide some empirical evidence for this hypothesis. Moyen and Boileau (2009) develop a structural model that distinguishes between the liquidity (i.e., transaction) motive and the precautionary motive for corporate cash savings, and show that the recent trend of large cash holdings among firms are more consistent with the transaction motive.

Finally, in the spirit of Jensen (1986) and Stulz (1990), managers may build large cash reserves to maintain discretion for future empire building, thereby incurring agency costs for the firms' shareholders. Dittmar et al. (2003), Kalcheva and Lins (2007a) and Pinkowitz et al. (2006) find evidence consistent with this hypothesis that firms with weaker governance structures are more likely to be associated with higher cash holdings.

With respect to the implication of cash reserves, prior studies debate if substantial cash holdings are beneficial or detrimental to firm value. The agency theory predicts that ample cash reserves induce managers to engage in value-destroying business expansion or excessive continuation of inefficient projects even when it is optimal to run a 'lean and mean' operation (e.g., due to empire building tendencies as in Jensen (1986)). Similarly, managers without the pressure of a cash shortage may be more inclined to go after more easily conducted measures instead of seeking really hard for "cognitively difficult" (Bertrand and Mullainathan (2003)) restructuring decisions. On the contrary, the theory of precautionary motives argues that ample cash on hand provides operational flexibility for managers. Cash rich firms can timely finance potential investment opportunities when they arise or aggressively compete with their rivals in the product market.

Empirical evidence is still inclusive about this dichotomy. Depending on the situation that a firm is facing, the effect on firm value can be positive or negative. In a general context, Harford (1999) and Harford et al. (2010) report that cash-rich firms are more likely to make diversifying acquisitions and their acquisitions are more likely to be value-decreasing. When firms receive a cash windfall from a won or settled law suit, Blanchard et al. (1994) find that managers of these firms have a propensity to keep resources inefficiently within the firms instead of distributing these to investors. Kalcheva and Lins (2007a) and Dittmar and Mahrt-Smith (2007) find that cash reserves are heavily discounted by investors in countries with poor investor rights protection. However when firms face an intensifying competitive pressure, Frésard (2010) documents that firms with more cash gain market share and consequently enhance market value and operating performance. When firms face a negative shock to the supply of external funding, Duchin et al. (2010) show that firms with low cash reserves experience the greatest decline in investment. However they do not

provide evidence if the decline in investment of cash poor firms gives rise to a decline in subsequent performance. Without this important link it is uncertain whether greater investment by high cash firms (which can easily turn into overinvestment) is optimal for the firm value and profitability. Another noteworthy study is the one of Mikkelson and Partch (2003). They investigate firms that had more than one-fourth of their assets in cash and cash equivalents for a five-year period. They find that these firms have greater investment and higher growth in assets without sacrificing corporate performance.

Since different business situations call for different firm responses, it is thus likely that large cash holdings have a dynamic implication on managerial behavior and firm value. To provide further insights into this issue, my study focuses on a sample of firms experiencing a significant negative performance event. These firms are more likely to face problems of operational efficiency rather than underinvestment due to future high-growth prospects. This contrasts with the sample of Mikkelson and Partch (2003), which includes firms that consistently perform well on average.[3]

If a firm has a promising outlook and faces financing frictions, large cash holdings could help the firm attain a higher growth rate in investment and as a result achieve greater profitability. Overinvestment tendencies in this strong growth phase are less likely to hinder firm performance (Stulz (1990)). However, if firms encounter problems of inefficiency or operational/economic distress, overinvestment tendencies can destroy firm value. In a potential economic distress scenario, the past literature widely documents that asset divestiture/disposal is often an optimal response for performance recovery (see the next section).

Since we are uncertain about the eventual (net) outcome, I develop two directions for the hypothesis:

Hypothesis 1a: Based on the precautionary savings motive, I expect to observe a positive relationship between large cash reserves and subsequent performance following a negative performance shock.

Hypothesis 1b: Based on the managerial agency model, I expect to observe a negative rela-

[3] The median return on assets (ROA) in their study is approximately 20-30%

tionship between large cash reserves and subsequent performance following a negative performance shock.

I analyze the impact of cash through changes in operation earnings (ROA), profit margin, asset turnover, sales, and asset growth rate.

1.2.2 Restructuring Activities

John et al. (1992) conduct a detailed descriptive analysis of the voluntary restructuring responses of 46 large (at least one billion dollars in assets) firms in the 1980s that experience at least one year of negative earnings followed by three years of positive earnings. They report that on average firms quickly adopt both financial and operational restructuring measures such as downsizing operations, concentrating on their focus and rapidly cutting 5% in the cost of the labor force.

Ofek (1993) investigates the relation between capital structure and the likelihood of each types of firm restructuring responses. The sample includes 358 firms that experience a year of average or above-average performance (base year) followed by a year of very poor performance (distress year), defined as an annual stock return in the bottom decile of the market during the period from 1983 to 1987. He finds that higher predistress leverage firms respond faster to the performance shock than their lower leverage counterparts. In particular, these firms are more likely to undertake not only operational actions such as asset restructuring and employee layoffs but also financial actions such as dividend cuts.

Kang and Shivdasani (1997) report the variance of restructuring measures between US and Japanese firms, and the role of blockholders on disciplinary events. The analysis comprises 92 publicly traded Japanese manufacturing firms and 114 publicly traded US manufacturing firms that were initially healthy, then suffered a substantial decline in their operating performance in a given year during 1985 to 1990. Substantial decline is defined as a drop in performance from a positive, above-industry median EBITDA/TA in the base year and then a drop of more than 50% in EBITDA in the following year. They show that the frequency of asset downsizing and layoffs

in Japanese firms increases with the ownership by the firm's main bank and other blockholders and the improvements in operating performance is often associated with downsizing actions. They document evidence that that main banks and blockholders help preserve firm value by triggering responses even when firms are not financially distressed.

Denis and Kruse (2000) examine if there is any difference in the way firms react to performance decline between the active (1985-1988) and the less active (1989-1992) period of takeover activities. The sample include 350 firms that have total assets greater than $100 million and experience a sharp decline in industry-adjusted operating performance (ie. EBITDA/TA initially being from above the industry median and then falling to the bottom quartile of its industry in the following year). They find a significant decline in the frequency of managerial disciplinary events from the active to the less active takeover period. However, in terms of the frequency of performance-enhancing restructurings, they do not find evidence of a lower instance of such restructurings in the less active takeover period.

Perry and Shivdasani (2005) document the role of the composition of the board of directors on restructuring activities and subsequent operation improvement. The sample includes 94 firms that experienced a material decline in performance (ie., a decline in pretax income (excluding extraordinary items) of at least 33% in the following year). They show that firms with a majority of outside directors on the board are more likely to respond faster to the decline in performance. In terms of frequency and magnitude of restructuring activities, they are more likely to initiate asset restructuring and employee layoffs relative to firms without a majority of outside directors. Also, they find that these firms achieve larger subsequent improvements in operating performance.

Recently the study of Atanassov and Kim (2009) employs an international context to investigate the interaction among different stakeholders (ie. management, labor, and investors) and their effects on the way firms respond to performance shock. For layoffs and asset sales, they define poorly performing firms following the criteria adopted in Kang and Shivdasani (1997). To identify poorly performing top management, they use a different criterion based on a relative performance measure as defined in Denis and Kruse (2000). They report that strong union laws protect not only

workers but also underperforming managers. Asset sales which are normally conducted to prevent large-scale layoffs in countries with weak investor protection lead to further deterioration in performance, whereas in countries with strong investor protection they improve performance and lead to more layoffs. Similarly like the finding of Ofek (1993), they find evidence for the disciplining effect of high financial leverage. Strong union laws are less effective in preventing layoffs when financial leverage is high.

I complement the literature by providing evidence on the role of large cash holdings on the firm recovery process. In particular, the paper extends the study of Ofek (1993) regarding the impact of financial characteristics on firm behavior and performance following a negative performance shock. Given the recent phenomenon of increasing cash accumulation in the corporate sector, further understanding how cash impacts the way firms respond to economic shocks is necessary and important.

1.3 Sample Construction and Data

1.3.1 Sample construction and performance measurement

The sample includes public companies in the United States with financial data available on Standard & Poor's Compustat database extracted over the period of 1982-2009. I examine firms that suffered a sharp and sudden drop in operating performance during the period between 1985 to 2006. I collect data three years before and after the onset of this poor performance. To measure firm operating performance, I use an industry-adjusted ratio of earnings before interest, taxes, depreciation, and amortization ("EBITDA") to total assets (hereafter referred to as ROA - Return on Assets). [4] For selection criteria of poorly performing firms, I follow the approach of Denis and Kruse (2000). [5] Firms are included in the sample if their industry-adjusted operating performance exceeds the overall sample median in one year, but is in the bottom quartile of the

[4] EBITDA is the sum of Sales minus Cost of Goods Sold (COGS) minus Selling, General & Administrative Expense (XSGA) and therefore does not include special charges from extraordinary events (such as assets liquidation).

[5] This approach has been widely employed in the literature such as Atanassov and Kim (2009), Yawson (2009), and Easterwood and Raheja (2008).

sample the following year. Industry-adjusted ROA is calculated by subtracting from each firm's operating performance the median ratio of ROA for all other companies having the same three-digit Standard Industrial Classification (SIC) code. I refer to the year of the negative performance shock as year 0 (or the base year), the immediate pre-shock years as year -1 or -2, and the immediate post-shock years as year +1 or +2.

I use an accounting measure of performance rather than stock returns because stock returns might incorporate the market expectation of the value of any proposed restructuring actions (Denis and Kruse (2000)). I do not include firms with prolonged prior poor performance as I want to observe a firm's response right after a clearly defined starting point of their difficulties.

In addition, I drop firms with missing values in total assets, EBITDA, total liabilities and total shareholder equity. I remove utility firms (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). Following Denis and Sibilkov (2010), I exclude firms whose total book assets in 1994 dollars are less than $25 million. Some firms have more than one performance shock year during its life. In addition to firms with only one performance shock year, I include firms that have two or more shock years as long as the events are at least 5 years apart. I collect 3 years of information before and after a firm's performance shock. To mitigate the influence of outliers, I winsorize all variables at the 1st and 99th percentiles of the sample values.

I focus, in particular, on firm performance of the two years immediately following the performance shock. I understand that some firms might improve their performance beyond 2 years after restructuring. However I do not extend the period over 3 years or more because the performance after that is very likely to be confounded by other factors other than restructuring activities.

Prior studies in the literature on restructuring often analyze news reports to study firms' restructuring responses. However, as discussed in Perry and Shivdasani (2005), news reports are subject to reporting bias. Firms do not systematically report the magnitude of all restructuring activities. Following news publications, we tend to pick up extensive restructuring responses but do not have information on frequent but smaller-scale restructuring actions. As a result, I use actual changes in the value of property, plant and equipment, net total assets, or acquisition expenditures

to study the magnitude of firms' responses.

Figure 1.1 contains four panels depicting the movement of returns on assets ("ROA"), leverage, interest ratio and cash ratio over the period of three years before and after the year of the negative performance shock. In panel 1, the average and median of ROA increase before the event year, then suddenly experience a steep decline in performance. We can therefore reasonably argue that the performance shock is an abrupt event to some extent. This identification strategy alleviates some endogeneity concerns. Panels 2 to 4 show that my sample firms on average do not seem to encounter financial distress. Both the mean and median of firm leverage are lower than 30% over the period. Interest and cash ratio still remain relatively stable before and after the shock. Overall, except for the performance shock, I do not observe any material deterioration in financial abilities of the average and median firms in the sample.

Insert Figure 1.1 here.

Figure 1.1: Performance and financial characteristics of sample firms around the negative performance shock

The figure presents the movement of sample firm characteristics over the period three years before and after the onset of the performance shock. The sample consists of firms that suffered a sharp and sudden drop in operating performance during the period between 1985 to 2006. Firms are included in the sample if their industry-adjusted operating performance exceeds the overall sample median in one year, but is in the bottom quartile of the sample the following year (t=0 is the shock year). ROA is EBITDA over total assets. "Lev" is total debt over total assets.

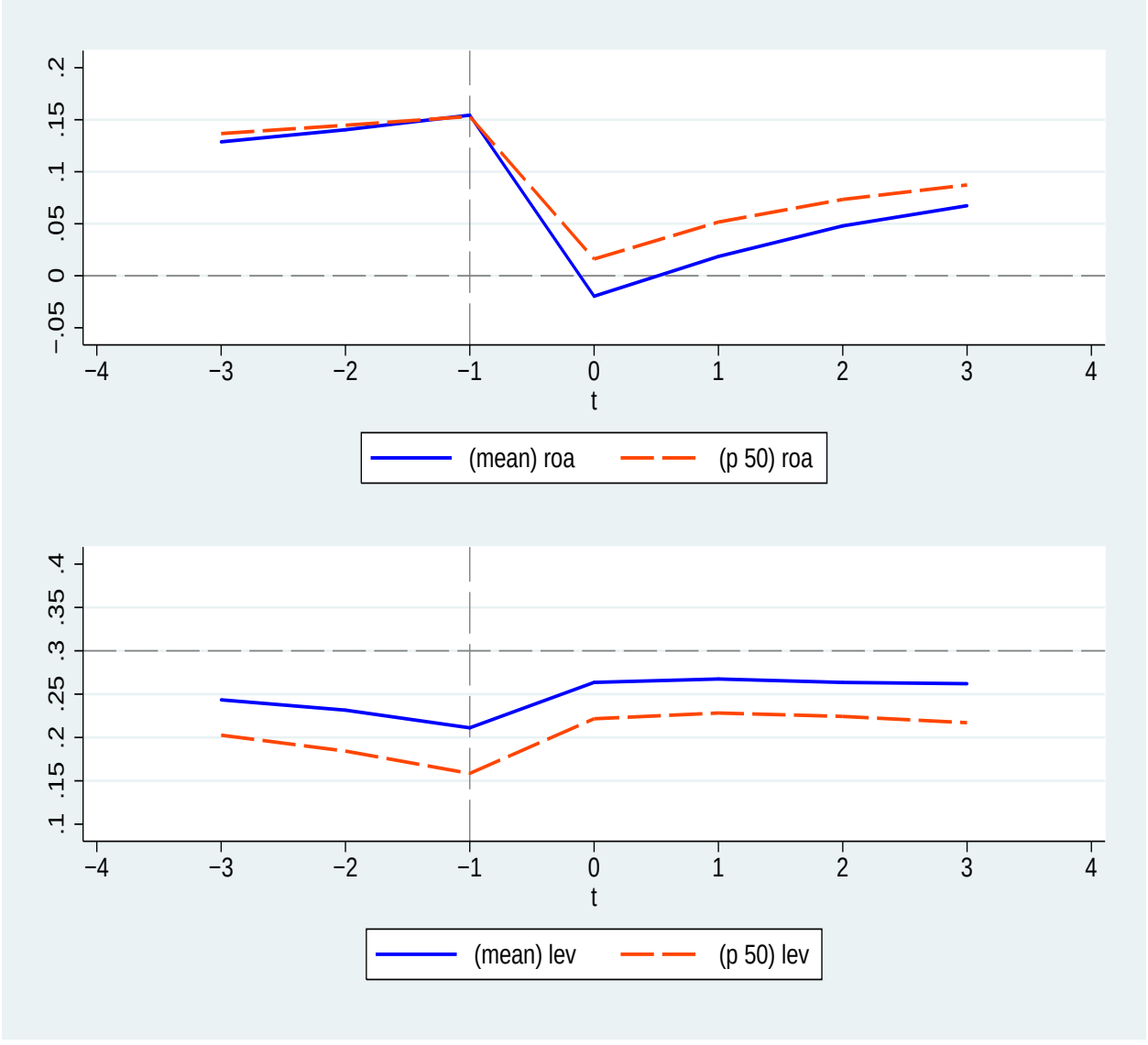

Table 1.1 reports summary statistics of the sample firms during the period between 1985 to 2006. Except for a significant decline in industry-adjusted ROA, again I do not observe on average any obvious signs of severe financial distress in my sample firms. This highlights the fact that although my sample firms experience a significant operating performance shock, most are not financially distressed firms. Subsequent firm responses to this economic shock, such as asset sales, are thus more likely to be driven by operational efficiency considerations than the need to meet financial obligations.

Table 1.1: Summary statistics

The table presents summary statistics of the sample firms' characteristics at the onset of performance shock during the period between 1985 to 2006. Firms are included in the sample if their industry-adjusted operating performance exceeds the overall sample median in one year, but is in the bottom quartile of the sample the following year. All variables are defined in Appendix A.

	Whole sample			
	Number of firms	Mean	Median	Standard deviation
Cash ratio	1618	0.160	0.069	0.197
ROA	1618	-0.003	0.026	0.109
Industry adjusted ROA	1618	-0.112	-0.087	0.076
Firm size	1618	5.209	4.880	1.415
Sales/Total assets	1618	1.064	0.921	0.753
R&D over assets	1618	0.048	0.000	0.082
Assets tangibility	1618	0.305	0.241	0.235
Leverage ratio	1618	0.256	0.219	0.231
Cashflow volatility	1436	0.109	0.067	0.142
Market-to-book ratio	1507	1.169	0.926	0.850
EBITDA/Sales	1610	-0.056	0.023	0.404
SG&A expenses/Total assets	1476	0.309	0.251	0.256
SG&A expenses/Sales	1468	0.325	0.252	0.268

1.3.2 Measures of cash holdings

Cash reserve is the main variable of interest. To ensure that my findings are not driven by the choice of cash holdings variable, I employ three different measures for cash reserves. Since the level of cash holdings is strongly dependent on industry characteristics, I employ an industry-adjusted cash ratio which is the difference between a firm's cash ratio and its corresponding industry (SIC3) median cash ratio for a given year. The second measure is a dummy variable of cash holding status. The indicator equals 1 if firm's cash ratio is higher than its industry median cash ratio for a given year and zero if otherwise. The third measure is excess cash which is the difference between the predicted and actual cash holdings. To estimate the normal (predicted) level of cash, I follow the approach from Opler et al. (1999) and Dittmar and Mahrt-Smith (2007). Specifically, I estimate the following specification:

$$\begin{aligned} cash_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 CF_{i,t} + \beta_3 NWC_{i,t} + \beta_4 (IndustryCFvolatility)_{i,t} + \\ \beta_5 M/B_{i,t} + \beta_6 DEBT_{i,t} + \beta_7 CAPEX_{i,t} + \beta_1 (Dividenddummy)_{i,t} + YearDummies + \epsilon_{i,t} \end{aligned} \tag{1.1}$$

Then I take the residuals from this regression to compute excess cash.

1.4 Main results

1.4.1 Univariate Analysis

Table 1.2 presents a univariate analysis of the subsequent performance and responses of firms after the economic shock, classified by cash holding status. Firms are considered as high/(low) cash holding if their cash ratio is higher/(lower) than their industry (three-digit SIC) median in a given year. The analysis shows that low cash holding firms significantly improve their performance and asset turnover as compared with high cash firms. The difference of industry-adjusted ROA and assets turnover between high and low cash holding firms are both highly significant at the 1% level. For the operating margin and overhead cost performance (i.e,. EBITDA/Sales and SG&A expenses/Sales), the difference is minimal. Another noteworthy point is that cash poor

firms substantially and consistently downsize their operational scale in net assets, property, plant and equipment ("PPE") and acquisition expenditure relative to cash rich firms. On average, a high cash holding firm increases its net assets by 21% while the growth rate of net assets in a low cash holding firm is only 4%. A median firm in the low cash holding group cuts down their investment in net assets and PPE while the opposite happens for a median firm of the high cash holding group.

Table 1.2: Subsequent performance and firm responses after a negative performance shock

This table presents the two year average growth rate of firm performance, assets, property, plant and equipment ("PPE") and acquisition expenditure after the onset of the operation shock. The change of performance is measured by the difference between the average of performance of two years after the negative performance event (year t+1 and year t+2) and performance at year t. The change of assets, Net PPE, and acquisition expenditure is the difference between the average value of the two years after the negative performance shock (year t+1 and year t+2) and the shock year (year t) divided by the value at the shock year (year t). Firms are considered as high/(low) cash holding if their cash ratio is higher/(lower) than their industry median in a given year.

	Low Cash		High Cash		Difference	
	Mean	Median	Mean	Median	Mean	Median
Subsequent performance - Change of						
ROA - Returns on assets	0.047	0.037	0.028	0.026	0.019***	0.011***
Industry adjusted ROA	0.051	0.045	0.029	0.034	0.022***	0.011***
Sales/Total assets	0.118	0.098	0.075	0.057	0.043***	0.041***
EBITDA/Sales	0.048	0.024	0.023	0.018	0.025*	0.006*
SG&A expenses/Sales	-0.017	-0.010	-0.009	-0.006	-0.008*	-0.004*
Firm responses - Change of						
Net assets	0.041	-0.029	0.219	0.056	-0.178***	-0.085***
Property Plant and Equipment	0.078	-0.050	0.271	0.018	-0.193***	-0.068***
Acquisition expenditures	1.136	-0.965	4.865	-0.834	-3.729**	-0.131**

*** p<0.01, ** p<0.05, * p<0.1

1.4.2 Cash holdings and subsequent performance

In table 1.3, I examine the impact of cash holdings on firm performance following the operating shock. Cash reserves is my main variable of interest. To ensure that the findings are not driven by the choice of the cash holdings variable, I employ the three different measures of cash reserves outlined in Section 3.2: industry-adjusted cash ratio, high cash firm dummy, and the excess cash measure. The formula of excess cash is detailed in Appendix A.

The dependent variable is the change of industry-adjusted operating performance after the onset of the abrupt performance shock, defined as the difference between the average of industry-adjusted ROA two years after the performance shock (year t+1 and year t+2) and the industry adjusted ROA at year t (the performance shock year). As control variables I use firm size, leverage, R&D/Assets, assets tangibility, and industry sales growth. The definitions of these variables are provided in Appendix A. Size is included to control for returns to scale. Leverage is included because of its potential disciplining effect on management (Ofek (1993)). R&D/Assets is included to proxy for manager's insider information and firm's riskiness. As documented in Lang et al. (1991), the agency costs of managerial discretion tend to be highest for firms with low investment opportunities. Also performance improvement depends on firm's growth opportunities. I thus include industry sales growth to control for growth potential and the level of agency problem. All control variables are measured at the end of the performance shock year. I also include the industry-adjusted ROA to control for the severity of the performance shock. Finally, I include performance shock year dummies to control for the general economic environment in the event year.

Consistent with the univariate evidence, table 1.1 shows that there is a significant negative effect of cash reserves on post-shock performance across the three specifications. This finding indicates that large cash reserves on average hinder rather than help subsequent firm recovery. As an example of the economic magnitude, a standard deviation increase in the cash ratio reduces a firm's ROA by 1.05%. The result is in line with prior literature on agency problems of excessive cash holdings (e.g., Dittmar and Mahrt-Smith (2007), Harford (1999), Harford et al. (2008), and

Kalcheva and Lins (2007a)). In this selected setting of firms with a sudden and sharp performance drop, when cash is presumably valuable from a precautionary savings perspective, there is still evidence consistent with considerable agency costs of large cash holdings.

Table 1.3: Operating performance after the negative performance shock - Effect of cash holdings

This table presents estimates from the regressions of the change of industry-adjusted operating performance after an abrupt negative performance shock. The change of performance is measured by the difference between the average of industry-adjusted ROA two years after the shock (year t+1 and year t+2) and the industry adjusted ROA at year t, the shock year. Other variables are defined in Appendix A. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	(1)	(2)	(3)
Industry adjusted cash ratio	-0.068***		
	(-2.956)		
High cash firms - Dummy		-0.015***	
		(-2.777)	
Excess cash			-0.010***
			(-4.118)
Size	0.002	0.002	0.002
	(1.158)	(1.302)	(1.321)
Leverage	0.045***	0.050***	0.059***
	(3.491)	(3.899)	(4.076)
ROA	-0.391***	-0.393***	-0.390***
	(-10.896)	(-10.989)	(-10.507)
R&D over assets	-0.139**	-0.138**	-0.144**
	(-2.260)	(-2.249)	(-2.286)
Industry growth rate	0.218***	0.208***	0.252***
	(3.112)	(3.003)	(3.377)
Assets tangibility	0.081***	0.090***	0.093***
	(5.008)	(5.618)	(5.372)
Constant	-0.030*	-0.042***	-0.065***
	(-1.946)	(-2.954)	(-4.507)
Year dummies	Yes	Yes	Yes
Observations	1,618	1,618	1,432
R-squared	0.173	0.170	0.176

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

To shed further light on the channels through which cash reserves affect operating performance, I break down the change in ROA (i.e., EBITDA/Assets) into profit margin (i.e., EBITDA/Sales) and assets turnover (i.e., Sales/Assets). Basically, firms can improve their cash flows through either increasing their profit margin or their asset turnover (or both). In Table 1.4 I repeat the analysis as above, but use the change in EBITDA/sales and Sales/Assets instead of the change in industry-adjusted ROA as dependent variables. To further explore if lack of cost control contributes to the lower performance of high cash firms, I also use SG&A cost ratios (i.e. SG&A/Assets or SG&A/Sales) as dependent variables. The control variables remain the same in all specifications as in Table 1.3, except that the control for performance at the end of the shock year is based on each particular performance measure I analyze.

In the above univariate analysis, I find that there is not much discrepancy in the improvement of profit margin between cash rich and poor firms, whereas there is an improvement in asset turnover for low cash firms relative high cash firms. Consistent with this evidence, the multivariate regressions in table 1.4 present similar results. The statistical significance and economic magnitude of the cash ratio coefficient in the regression of asset turnover (column 2) is much greater than the one of profit margin (column 1). It appears that substantial cash reserves impair firm assets turnover more severely than profit margin. In other words, it is more likely that the improvement of assets turnover in cash poor firms is the main driver of their subsequent recovery of overall operating performance. In addition, there is some evidence that high cash firms also incur greater overhead expenses, as there is a positive association between the industry-adjusted cash ratio and the change of SG&A expense ratios (significant at the 10% level). In the next section, I take further steps to explore how cash poor firms improve their asset utilization. Particularly, I want to identify whether they achieve it through relatively larger sales growth or asset reduction.

Table 1.4: Profit margin and assets turnover - Effect of Cash Holdings

This table presents estimates from the regressions of the change of profit margin and asset turnover after a negative operating performance shock. The change of performance is measured by the difference between the average of performance of two years after the shock (year t+1 and year t+2) and performance at year t, the shock year. Other variables are defined in Appendix A. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	△ EBITDA/Sales	△ Sales/Assets	△ SG&A expenses/Assets	△ SG&A expenses/Sales
VARIABLES	(1)	(2)	(3)	(4)
Industry adjusted cash ratio	-0.081	-0.126**	0.041*	0.060**
	(-1.365)	(-2.341)	(1.819)	(2.171)
Size	0.011***	-0.007	-0.000	-0.004**
	(2.792)	(-1.201)	(-0.100)	(-1.998)
Leverage	0.087**	0.123***	-0.014	-0.045***
	(2.207)	(3.209)	(-1.107)	(-3.341)
R&D over assets	-0.331*	-0.503***	-0.042	0.156*
	(-1.893)	(-4.827)	(-0.591)	(1.813)
EBITDA/Sales	-0.223***			
	(-3.477)			
Sales/Assets		-0.087***		
		(-4.532)		
SGA/Assets			-0.103***	
			(-4.353)	
G&A expenses over sale				-0.175***
				(-5.106)
Industry growth rate	0.174	-0.395	-0.125	-0.019
	(1.502)	(-1.308)	(-1.168)	(-0.310)
Assets tangibility	0.192***	-0.097**	-0.050***	-0.062***
	(3.405)	(-2.262)	(-3.536)	(-3.086)
Constant	-0.064**	0.482***	0.044***	0.004
	(-2.084)	(9.437)	(2.645)	(0.261)
Year dummies	Yes	Yes	Yes	Yes
Observations	1,604	1,618	1,465	1,453
R-squared	0.129	0.121	0.109	0.148

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.4.3 The sources of improvement in asset turnover

Table 1.5 presents estimates of the effects of large cash holdings on the growth rate of sales, net property, plant and equipment (NPPE), net assets (i.e., total assets minus cash and short term investments), acquisition expenditures, and the likelihood of major asset sales after the onset of an abrupt performance shock. Dependent variables in the specification from (1) to (4) are measured by the difference between the variable at year t+2 and year t divided by the variable at year t. In specification (5), I estimate a probit model of the probability of experiencing major asset sales. The dependent variable in column (5) is a binary indicator which equals one if a company has a decline in annual NPPE value of more than 15% and zero otherwise. The 15% cut-off is employed in Atanassov and Kim (2009). They derive the cut-off based on previous empirical findings in the restructuring studies of Ofek (1993), Kang and Shivdasani (1997) and Denis and Kruse (2000).

The results in table 1.5 show that cash rich firms increase their assets scale and sales value after the performance shock relative to cash poor firms. The coefficients of cash holdings are highly significant in all specifications from 1 to 5. Cash holdings are positively correlated with sales growth (specification 1), asset expansion (specifications 2-4) and negatively with assets disposal (specification 5). However, the economic magnitude and statistical significance of the effect of the cash ratio on the growth rates of sales (column 1) is smaller than it is on the growth rate of net assets. In particular, a standard deviation increase of the cash ratio is associated with a higher growth rate of net assets and sales by 13.8% and 4.8% respectively. Relatively larger asset expansions (or lower asset contractions) thus seem to be the main reason for the much lower improvement of assets turnover of cash rich firms. Regarding the tendency of business expansion in the group of cash rich firms, this evidence is also consistent with the findings in the univariate analysis.

Firms with more cash on hand are more likely to engage in acquisition projects following the performance shock. Also they are less likely to conduct major asset sales. The effect persists even after I control for all related factors including size, leverage, growth opportunities, performance,

and the condition of the economy. This evidence is highly consistent with the empire building propensity argued by Jensen (1986) and Stulz (1990). It is also in line with the empirical results documented in Lang et al. (1991) and Opler et al. (1999) on the positive correlation between cash reserves and subsequent acquisition spending (especially for firms with low investment opportunities). Management in cash rich firms tend to keep or even expand resources on hand when faced with a negative economic event even when it seems better to run a 'mean and lean' operation. Alternatively, it can also reflect a preference for the "quiet life" as in Bertrand and Mullainathan (2003).

Table 1.5: Firm responses after the negative performance shock - Effects of cash holding

This table presents estimates from the regressions on the change of sales, net assets (i.e., total assets minus cash and short term investments), property plant and equipment (NPPE), and acquisition expenditure after an abrupt negative performance shock. Dependent variables in specification from (1) to (4) are growth rates measured by the difference between the variable at year t+2 and year t divided by the variable at year t, the shock year. In specification (5), I estimate a probit model of the probability of experiencing major asset sales. The dependent variable in (5) is a binary indicator which equals one if a company has a decline in annual NPPE value of more than 15% and zero otherwise. Net assets variable equals total assets minus cash and short-term investment. Industry-adjusted cash ratio is the difference between cash ratio and its industry median. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	Sales growth	Net asset growth	NPPE growth	△ Acquisition expenditure	Major asset sales
	(1)	(2)	(3)	(4)	(5)
Industry adjusted cash ratio	0.313**	0.894***	0.572***	0.038***	-0.990***
	(2.364)	(5.465)	(3.651)	(3.187)	(-2.962)
Size	-0.017*	-0.036***	-0.044***	-0.003*	-0.035
	(-1.691)	(-3.639)	(-3.463)	(-1.865)	(-1.014)
ROA	0.302	0.409*	0.816***	-0.097***	-3.506***
	(1.481)	(1.942)	(3.710)	(-4.600)	(-4.576)
Leverage	0.132	-0.124*	-0.111	-0.069***	0.522*
	(1.569)	(-1.693)	(-1.283)	(-5.731)	(1.848)
R&D over assets	-0.431*	0.358	-0.575**	-0.088***	1.917**
	(-1.873)	(1.201)	(-2.201)	(-2.726)	(2.323)
Assets tangibility	-0.147	-0.188*	-0.806***	0.038***	0.088
	(-1.152)	(-1.658)	(-4.638)	(2.841)	(0.256)
Industry growth rate	-0.203	0.708	-0.019	0.132**	-3.147
	(-0.447)	(0.998)	(-0.034)	(2.390)	(-1.275)
Constant	0.759***	0.440***	2.181***	0.207***	0.142
	(7.682)	(4.102)	(21.228)	(17.244)	(0.547)
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	1,618	1,446	1,445	1,446	1,618
Pseudo R-squared	0.073	0.136	0.141	0.107	0.161

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

One might argue that the significant assets curtailment of cash poor firms might not be attributed to efficiency consideration, but rather heavy pressures of financial obligations (such as debt payment). Firms with ample cash reserves are able to avoid asset fire sales and thus maintain or even increase their investment level, whereas cash poor firms may be more likely to experience financial distress along with the economic shock. Therefore cash poor firms may not have any choice other than undertaking larger-scale downsizing activities. If this alternative story holds true, then we would expect the group that conducts major asset sales to exhibit serious signs of financial distress such as high leverage, high current liability ratio, or high interest expense ratio. However, I do not observe a clear pattern in this case. Table 1.6 shows that firms with major asset sales have a significantly lower industry-adjusted cash ratio, higher current assets and current liabilities ratios. The statistical significance of leverage and liquidity ratio (ie. current assets/current liabilities) is not consistent across median and average firms. It is noteworthy that the interest ratio (interest expenses/assets) of firms with major asset sales is even lower than the one without major sales. Because there are no stronger signs that firms conducting major asset sales are facing any imminent danger of financial distress, it is reasonable to argue that firms conduct major asset curtailment for efficiency considerations rather than as forced fire sales.

Table 1.6: Financial characteristics of firms that do/(do not) conduct major asset sales

This table presents mean and median characteristics of firms that do/do not conduct major asset sales. Firms do major asset sales when they have a decline in annual NPPE value of more than 15%. Industry-adjusted cash ratio is the difference between cash ratio and its industry (SIC3) median. Leverage is total debt over total assets. Interest ratio is interest expenses over total assets. Other names of variables reflect their definition.

	Major asset sales					
	No		Yes		Difference	
	Mean	Median	Mean	Median	Mean	Median
Industry-adjusted cash ratio	0.0460	0.0000	0.0161	-0.0054	0.0299***	0.0054***
Current assets/Total assets	0.5226	0.5440	0.5683	0.6060	-0.0457***	-0.062***
Current liabilities/Total assets	0.2478	0.2084	0.3071	0.2546	-0.0593***	-0.0462***
Current assets/Current liabilities	2.9442	2.0924	2.7777	1.8997	-0.1672	0.1927**
Leverage	0.2604	0.2236	0.2455	0.2051	0.0149	0.0185*
Interest ratio	0.0283	0.0198	0.0233	0.0161	0.005***	0.0037***

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Taken together, the results confirm the main findings in the previous part on the negative relationship between cash reserves and subsequent performance. Additionally, the results suggest a reason why cash rich firms underperform cash poor ones. Managements with an abundance of cash resources are inclined to pursue business expansion objectives which do not enhance firm performance. They appear to exhibit some signs of overinvestment. They experience relatively larger asset expansion without accompanying sufficient sales growth, and achieve a smaller improvement in profitability. These findings are highly consistent with various pieces of empirical evidence supporting the agency hypothesis of cash holdings. Harford (1999) documents that cash rich firms are more likely to attempt diversifying and value-destroying acquisition. Blanchard et al. (1994) report that firms that experience cash windfalls tend to retain cash or invest cash inefficiently. Harford and Haushalter (2003) find that following temporary oil price increases associated with the Persian Gulf crisis of 1991 expenditures by oil and gas firms were driven by percentage of managerial ownership.

1.4.4 Do firms use large cash holdings to cover operating losses?

In this section, I investigate whether firms use excessive cash reserves to finance their operating losses. Table 1.7 presents the change of industry-adjusted cash ratio after the negative performance shock, classified by high and low cash firms. The change of industry-adjusted cash ratio is measured by the difference of the ratio between year t and year t-1. An average or median low-cash holding firm slightly improves its cash holding status by 2.5 percentage points or 0.8 percentage point respectively in the first year following the performance shock. On the contrary, an average or median cash rich firm depletes its cash reserve by 2.4 percentage points or 2.1 percentage points respectively. The difference of the changes between the two types of firms is statistically significant at 1% level. The finding remains true for the second year after the shock. It appears that excessive cash reserves allow management to avoid making required divestiture/downsizing and use firm cash resources to finance operating losses.

Table 1.7: Depletion of firms' cash holdings after the negative performance shock

This table presents the change of industry-adjusted cash ratio after the negative performance shock. Cash ratio equals cash and short term investments over total assets. The change of industry-adjusted cash ratio is measured by the difference of the cash ratio between year t and year t-1. Net cash ratio equals cash and short term investments over net assets (ie. total assets minus cash and short term investments). Industry-adjusted cash/(net cash) ratio is the difference between cash/(net cash) ratio and SIC3 industry median of cash/(net cash) ratio. Median is presented in brackets.

	Year 1			Year 2		
	Low	High	Diff	Low	High	Diff
Change of cash ratio after the negative performance shock						
Industry-adjusted cash ratio - Mean	0.0253	-0.0243	***	0.0104	-0.0104	***
Industry-adjusted cash ratio - Median	(0.0083)	(-0.0211)	***	(0.0025)	(-0.0045)	***

*** p<0.01, ** p<0.05, * p<0.1

1.4.5 Effects of financial constraints

In this section I will investigate if the adverse impact of excessive cash is mitigated for firms with valid precautionary motives. In the theoretical model of Almeida et al. (2004), they find that cash holdings are more valuable to financially constrained firms. Motivated by this finding, I hypothesize that large cash reserves will be less likely to be misused since management in these firms are under heavy discipline and have less financial slack.

The existing literature proposes a variety of criteria to identify the level of financial constraints that firms face. Theoretically, a firm is defined as financially constrained if it does not have sufficient cash to undertake investment opportunities when they arise and if it faces severe agency costs when accessing financial markets (Denis and Sibilkov (2010)). However empirically, there is no general consensus on the best way to measure financial constraints. In this paper, I adopt three measures that have been used in the studies of Denis and Sibilkov (2010), Duchin et al. (2010), Alshwer and Sibilkov (2010) and Almeida et al. (2004). In particular, I sort firms into financially constrained and unconstrained groups by using the following criteria:

1. Annual payout ratio: Fazzari, Hubbard, and Petersen (1988) argue that unconstrained/constrained firms are more likely to have higher/lower payout ratios. Therefore, one of the common criteria to measure financial constraints is to assign firms in the bottom (top) three deciles of the annual cash payout ratio distribution to the financially constrained (unconstrained) group. Payout ratio is defined as the ratio of dividends and common stock repurchases to operating income. Observations with a positive payout and zero or negative cash flow are assigned the highest payout ratio.

2. Firm size: Taking into account the common fact that smaller firms are more likely younger and less well known, they are more likely to be affected by capital market imperfections. Therefore, each year I rank firms based on their book value of total assets. Constrained/unconstrained firms are in the bottom (top) three deciles of the firm size distribution. This approach is used in many other studies like Erickson and Whited (2000); Almeida et al. (2004); and Acharya et al. (2007a).

3. Whited-Wu index (Whited and Wu (2006)): The index is estimated by: WW index =

-0.091*Cash flow + 0.062*Dividend dummy + 0.021*Long-term leverage - 0.044*Size + 0.102*Industry sales growth - 0.035*Sales growth.

Firms are classified as financially constrained/unconstrained if their index is higher/lower than the median of all firms in a given year.

The results in table 1.8 show that the downside of having too much cash is more pronounced for unconstrained firms. The coefficients of the cash ratio for constrained firms are overall smaller as compared with the ones of unconstrained firms. The economic magnitude differs a bit across the financial constraints measures. However, none of the differences are statistically significant. Thus, financial constraints at best only seem to marginally create discipline for managers to use cash more efficiently.

Table 1.8: Performance change and the effects of financial constraints

This table presents estimates of the regressions of the change of industry-adjusted operating performance after the negative performance shock. The change of performance is measured by the difference between the average of performance of two years after the shock (year t+1 and year t+2) and performance at year t, the shock year. Financial constraint classification is based on the existence of total payouts, the magnitude of total assets and Whited-Wu index. All regressions include year fixed effects. t statistics (in brackets) are heteroscedasticity-consistent.

	Size		Payout ratio		Whited-Wu	
	Unconstr	Constr	Unconstr	Constr	Unconstr	Constr
	(1)	(2)	(3)	(4)	(5)	(6)
Industry adjusted cash ratio	-0.101***	-0.077***	-0.093**	-0.073***	-0.090***	-0.072***
	(-3.152)	(-3.554)	(-2.106)	(-4.241)	(-2.911)	(-3.027)
Size	0.010***	-0.014***	0.003	-0.001	0.011***	-0.001
	(3.197)	(-2.808)	(1.152)	(-0.281)	(3.658)	(-0.240)
Leverage	0.038**	0.043**	0.019	0.050***	0.050**	0.050***
	(2.213)	(2.416)	(0.950)	(3.011)	(2.479)	(2.692)
ROA	-0.419***	-0.321***	-0.363***	-0.347***	-0.413***	-0.344***
	(-10.673)	(-9.443)	(-8.987)	(-10.262)	(-9.341)	(-9.427)
R&D over assets	-0.035	-0.122***	-0.076	-0.098**	-0.021	-0.141***
	(-0.502)	(-2.684)	(-1.170)	(-2.107)	(-0.342)	(-2.681)
Assets tangibility	0.070***	0.057***	0.067***	0.059***	0.053***	0.070***
	(4.310)	(3.370)	(3.798)	(3.646)	(2.813)	(4.107)
Industry growth rate	0.158	0.206	0.201	0.170	0.138	0.120
	(1.097)	(1.621)	(1.452)	(1.281)	(0.639)	(1.085)
Constant	-0.046**	0.080***	0.014	0.015	-0.059***	0.022
	(-2.025)	(3.441)	(0.870)	(0.965)	(-2.760)	(1.055)
Observations	586	1,032	590	1,028	638	774
R-squared	0.215	0.127	0.161	0.140	0.162	0.158

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1.4.6 Effects of product market competition

In addition to financial constraints, I also investigate the role of product market competition in alleviating potential agency costs of having excessive cash holdings. The role of competitive pressure as an effective informal governance mechanism has been documented in several prior studies (eg. Kim and Lu (2010) and Giroud and Mueller (2010)). Relative to firms in a concentrated industry, I expect firms in an competitive industry to be more disciplined and use their cash more efficiently.

I use the industry concentration ratio ("ICR") to proxy for product market competition. I compute ICR similarly to the Economic Census approach. It is defined as the percentage of the sum of the four biggest firms' sales value among the sales of all firms in Compustat in the same industry for a given year. I adopt a similar approach like the one used in Kim and Lu (2010) by just relying on the 4 largest companies because ICRs based on the 8, 20, or 50 largest companies might result in classification errors. To be consistent with the industry classification that has been used for the original sample firm selection, I use SIC industry classification instead of 48 Fama-French (1997) industry groupings. Following Kim and Lu (2010), I define firms as having high/low ICR when its industry ICR is higher/lower than the median of all firm-year observations.

The results in table 1.9 show that the downside of having too much cash is vastly more pronounced for the less competitive firms. The coefficient on cash ratio for the competitive firms are almost half the size of the same coefficient for firms in concentrated industries (-0.095 versus -0.176). The difference is also statistically significant in a formal test of the equality of the coefficients. Thus, competition seems to have a statistical and economic significant effect on the effect of cash on performance recovery. This finding is consistent with the previous agency cost interpretations of the results.

Table 1.9: Performance change and the effects of product market competition

This table presents estimates of the regressions of the change of industry-adjusted operating performance after the negative performance shock. The change of performance is measured by the difference between the average of performance of two years after the shock (year t+1 and year t+2) and performance at year t, the shock year. ICR stands for industry concentration ratio. Please refer Appendix A for detailed definition. All regressions include year fixed effects. t statistics (in brackets) are heteroscedasticity-consistent.

	ICR	
	Competitive	Concentrated
	(1)	(2)
Industry adjusted cash ratio	-0.095***	-0.176***
	(-4.619)	(-3.689)
Size	0.001	0.002
	(0.299)	(0.556)
Leverage	0.037**	0.055**
	(2.167)	(2.421)
Initial ROA	-0.333***	-0.604***
	(-9.809)	(-11.048)
R&D/Assets	-0.137***	0.273
	(-2.764)	(0.542)
market to book ratio	0.002	0.026**
	(0.494)	(2.425)
Constant	0.022	-0.051
	(0.201)	(-0.722)
Observations	1,285	223
R-squared	0.120	0.603

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.5 Alternative explanation and Robustness Testings

1.5.1 Effects of corporate governance

As discussed earlier, I include industry sales growth to proxy for firm's growth opportunities and potential level of agency costs. [6] Nevertheless, in this section, I employ multiple direct measures of corporate governance structure to investigate if the primary findings are driven by the status of governance mechanism. In the specification from 1 to 6 of table 1.10, I use the G and E index of antitakeover provisions developed by Gompers et al. (2003) and Bebchuk et al. (2009) respectively.

[6] Lang et al. (1991) document that agency costs of managerial discretion tend to be highest for firms with low investment opportunities.

Table 1.10: Effects of cash holdings - Control for corporate governance mechanism

This table presents estimates from the regressions of the change of industry-adjusted operating performance after an abrupt negative performance shock. The change of performance is measured by the difference between the average of industry-adjusted ROA two years after the shock (year t+1 and year t+2) and the industry adjusted ROA at year t, the shock year. Other variables are defined in Appendix A. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	G Index			E Index		
	(1)	(2)	(3)	(4)	(5)	(6)
Industry adjusted cash ratio	-0.106*			-0.100*		
	(-1.882)			(-1.825)		
High cash firms - Dummy		-0.044***			-0.045***	
		(-2.844)			(-3.029)	
Excess cash			-0.013*			-0.020***
			(-1.788)			(-2.835)
G Index	-0.003	-0.003	-0.002			
	(-1.248)	(-1.099)	(-0.756)			
E Index				-0.007	-0.007	-0.007
				(-1.306)	(-1.334)	(-1.236)
Size	0.014**	0.014**	0.015**	0.016**	0.017***	0.020***
	(2.182)	(2.245)	(2.065)	(2.523)	(2.683)	(2.772)
Leverage	0.068	0.059	0.081*	0.006	-0.000	0.002
	(1.493)	(1.339)	(1.723)	(0.141)	(-0.001)	(0.034)
ROA	-0.220**	-0.216**	-0.236**	-0.286***	-0.283***	-0.309***
	(-2.235)	(-2.228)	(-2.336)	(-2.794)	(-2.840)	(-3.071)
R&D over assets	-0.085	-0.078	-0.111	-0.186	-0.183	-0.232
	(-0.537)	(-0.515)	(-0.639)	(-1.066)	(-1.095)	(-1.226)
Assets tangibility	0.098**	0.095**	0.104**	0.100**	0.094*	0.101**
	(2.018)	(1.987)	(2.144)	(2.049)	(1.967)	(2.054)
Industry growth rate	0.192	0.195	0.131	0.237	0.243*	0.192
	(1.340)	(1.572)	(1.013)	(1.513)	(1.782)	(1.372)
Constant	-0.364***	-0.362***	-0.096**	-0.369***	-0.367***	-0.147**
	(-6.179)	(-6.265)	(-2.315)	(-7.377)	(-7.332)	(-2.109)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	251	251	232	228	228	211
R-squared	0.249	0.267	0.224	0.268	0.292	0.260

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results in table 1.10 show that the primary findings remain unchanged after controlling for firms' governance structure. The coefficients of governance measures (i.e., G, E index and industry concentration ratio) and other control variables show the expected signs of correlation. The higher the G or E index is, the worse the governance is. In table 1.10, the coefficient of the G and E index on the regressions of performance are negative, suggesting that the higher the governance index, the worse the performance recovery, however these coefficients are not significant. The number of observations in specifications 1-6 drops substantially since information on G and E index is only available for 1500 large firms during the 1990s.

1.5.2 Endogeneity problem of cash holdings and subsequent performance

Since cash holdings and performance are jointly determined to some degree, one can question the causality interpretation of the findings. Even though I am not able to completely rule out this potential endogeneity problem, I design my tests to address this problem in three ways.

First, as put forth by Harford et al. (2008), the use of lagged value of firm's cash holdings helps to mitigate, to some extent, the potential endogeneity problem. In my estimation, cash reserves are recorded at the end of the shock year, and thus lag one to two years behind the performance realizations I use for the dependent variable.[7] Alternatively, in an unreported analysis, I use the average of the cash ratio of two to three years before the shock year and the significance of the results remains unchanged. In addition, I use relative-to-industry variables (performance and cash reserves), and year dummies to remove time invariant heterogeneous effects of industry characteristics and macro volatility. Campello (2006) suggests that this can mitigate the concern of spurious causality caused by unobserved and underlying trends of industry effects.

Second, my sample does not include firms performing poorly over a prolonged period of time but only ones that experience a large and sudden shock from being a superior to poor performers. Figure 1.1 depicts a substantial and sudden drop of performance following a steady increase of

[7] Recall that the change in ROA is calculated as the difference between the average of ROA for the two years following the distress event minus the ROA of the distress year.

performance before the event. With this identification strategy, we can reasonably argue that the exact timing, magnitude and consequences of these shocks are not fully anticipated.

Lastly, if the endogenous feedback from performance to cash reserves is still true in this case (i.e., firms had anticipated an upcoming drastic performance decline and hence accumulated cash as a precautionary motive), we then would observe a steady upward trend of the cash ratio of firms before the onset of distress, and furthermore, the number of firms with high cash holdings entering the performance shock sample should be higher than the low cash ones. Figure 1.2 graphs the movement of the industry-adjusted cash ratio 3 years before and after the negative performance event. In unreported tests, there is no statistical significance for the difference in cash ratios over time. There is no clear pattern of an increasing cash ratio before the shock. Additionally, table 1.11 describes the proportion of low and high cash firms entering the sample over the years. As we can see, the percentage of low cash firms is greater than 50% for all years before 2000 suggesting that low cash holding firms are more likely to enter the sample. There are many years that have a proportion of cash poor firms statistically greater than 50% while I do not see a similar pattern for the high cash ones. In brief, based on the analysis, I believe the likelihood of reverse causality explaining the results to be low.

Figure 1.2: Cash ratios before and after the negative performance shock

The sample consists of firms that suffered a sharp and sudden drop in operating performance during the period between 1985 to 2006. Firms are included in the sample if their industry-adjusted operating performance exceeds the overall sample median in one year, but is in the bottom quartile of the sample the following year. Firms are considered as high/low cash holding if their cash ratio (cash and short-term investments over total assets) is higher/lower than their industry (three-digit SIC) median in a given year.

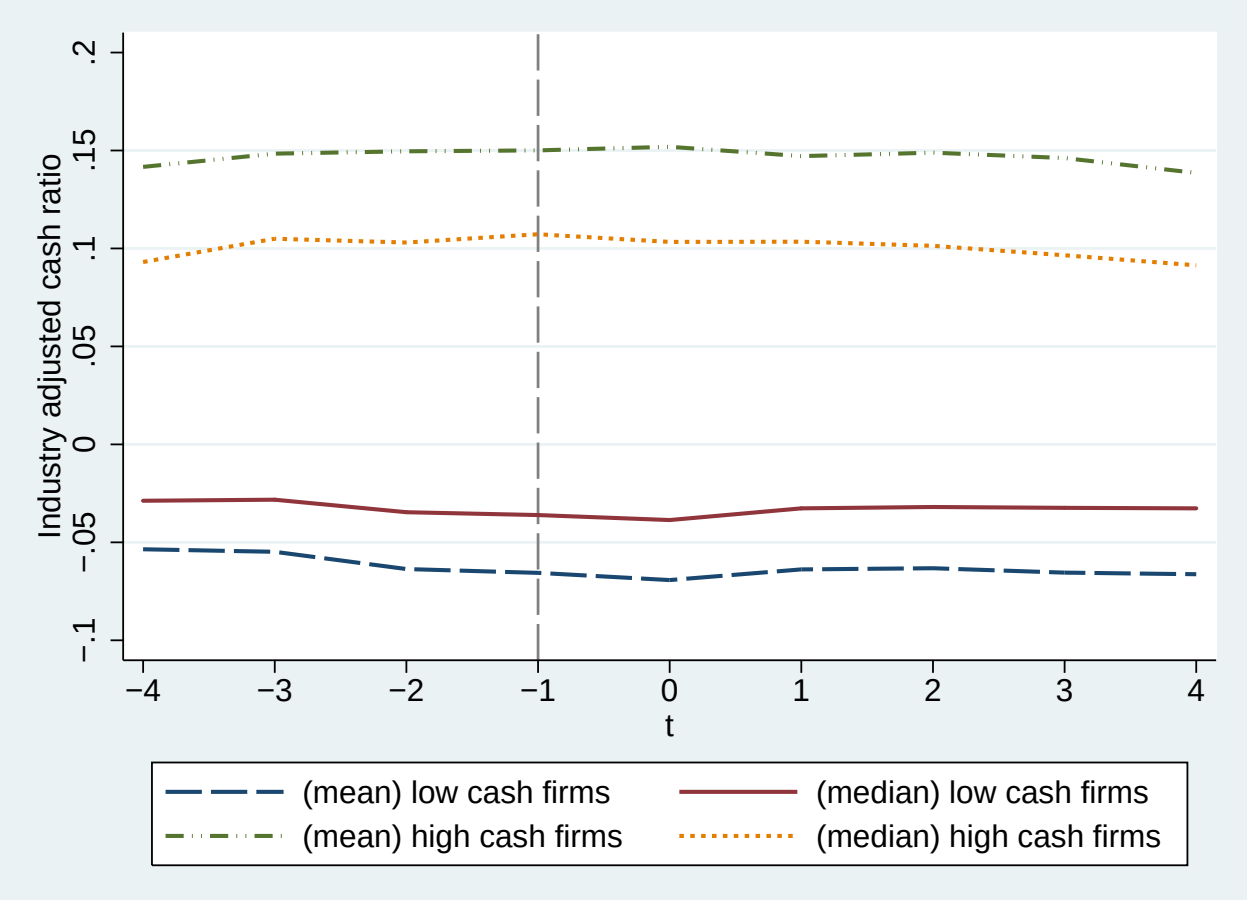

Table 1.11: Proportion of low and high cash holding firms entering the sample over years.

Cash ratio is the ratio between cash and short-term investment over assets. Industry adjusted cash ratio is the difference between cash ratios and its industry median. Firm is considered as high/(low) cash holding if its cash ratio (cash and short-term investments over total assets) is higher/lower than its industry (three-digit SIC) median in a given year.

Performance shock year	Total firms	High cash firms	Low cash firms	Proportion of high cash firms	Proportion of low cash firms
1985	69	30	39	43%	57%
1986	78	32	46	41%	59%*
1987	75	27	48	36%	64%**
1988	76	39	37	51%	49%
1989	71	38	33	54%	46%
1990	64	24	40	38%	63%**
1991	84	45	39	54%	46%
1992	79	38	41	48%	52%
1993	76	37	39	49%	51%
1994	67	29	38	43%	57%
1995	79	30	49	38%	62%*
1996	91	42	49	46%	54%
1997	79	39	40	49%	51%
1998	103	44	59	43%	57%
1999	72	38	34	53%	47%
2000	73	32	41	44%	56%
2001	98	55	43	56%	44%
2002	68	48	20	71%***	29%
2003	56	29	27	52%	48%
2004	56	21	35	38%	63%**
2005	56	24	32	43%	57%
2006	48	26	22	54%	46%
Total	1618	767	851	47%	53%**

*** p<0.01, ** p<0.05, * p<0.1

1.5.3 Survivorship bias analysis

One can also argue that the results are potentially the result of survivorship bias rather than a true casual effect. Some firms that are initially identified as experiencing negative performance shock in the study were not ultimately used in the analysis due to the requirement of having two years of post-shock ROA. Low cash holding status is plausibly related to some unobserved factor that makes it less likely for firms to survive a drastic negative performance shock. The low cash survivors that end up in the final sample are then likely to be unusually strong-performing firms. Therefore it is biased to the conclusion that cash poor firms outperform cash rich ones. In other words, ignoring this potential survivorship effect would bias the results to finding a negative relation between cash and performance.

Table 1.12 presents the difference of cash ratio between surviving and non-surviving firms. The differences in industry-adjusted cash ratios are not statistically significant. This univariate analysis suggests that the cash ratio is less likely to be a main driver for survival and hence the likelihood of survivorship bias is small.

Table 1.12: Cash ratios of survived/(non-survived) firms

Firms are considered as survived if they still exist in the Compustat database two years after the negative performance shock. Cash ratio is the ratio between cash and short-term investment over assets. Industry adjusted cash ratio is the difference between cash ratios and its industry (SIC three digit) median.

	Survived		Not survived		Difference	
	Mean	Median	Mean	Median	Mean	Median
Cash ratio	0.168	0.087	0.183	0.103	-0.015	-0.016
Industry-adjusted cash ratio	0.043	0.001	0.046	0.000	-0.003	0.001

*** p<0.01, ** p<0.05, * p<0.1

Nonetheless, I perform additional tests to control for this potential problem. I modify my estimation procedure by using a Heckman two-step method. It is difficult to find a good instrument that proxies for firm survival but is unrelated to performance. I thus rely on the non-linearity of the first stage logit estimation (captured by the inverse Mill's ratio) as an identification strategy. Table 1.13 presents the results. I find some evidence of selection effects since the inverse Mill's ratio is significant in the second stage no matter how the cash reserve variable is defined. However, this selection effect does not affect the coefficient on the cash variables in any material way. The coefficients on the cash variables in the performance regressions (i.e., the second stage) are still negative and their economic magnitudes and statistical significance are in the neighborhood of the original findings. It is noteworthy that there is no significant relation between the cash variables and the likelihood of survival, confirming the univariate analysis.

Table 1.13: Control for survivorship bias

This table presents estimates of the Heckman two-step procedures for the change of industry-adjusted operating performance after the negative performance shock. The change of performance is measured by the difference between the average of performance of two years after the shcok (year t+1 and year t+2) and performance at year t, the shock year. Other variables are defined in Appendix A. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	$2^{nd} stage$	$1^{st} stage$	$2^{nd} stage$	$1^{st} stage$	$2^{nd} stage$	$1^{st} stage$
	(1)	(2)	(3)	(4)	(5)	(6)
Industry adjusted cash ratio	-0.080***	0.141				
	(-4.356)	(0.666)				
High cash firms - Dummy			-0.015***	0.089		
			(-2.598)	(1.344)		
Excess cash					-0.011***	-0.017
					(-3.802)	(-0.483)
Size	0.006**	0.164***	0.006**	0.163***	0.008***	0.185***
	(2.190)	(6.383)	(2.432)	(6.348)	(2.718)	(6.375)
Leverage	0.022	-0.591***	0.027*	-0.570***	0.032**	-0.703***
	(1.533)	(-4.108)	(1.825)	(-4.000)	(1.972)	(-4.422)
ROA	-0.295***	2.155***	-0.287***	2.159***	-0.281***	2.201***
	(-8.017)	(7.480)	(-7.709)	(7.489)	(-7.286)	(7.089)
R&D over assets	-0.088**	0.289	-0.077*	0.267	-0.078*	0.309
	(-2.222)	(0.611)	(-1.929)	(0.564)	(-1.861)	(0.621)
Industry growth rate	0.172*	-0.659	0.158	-0.652	0.190*	-0.427
	(1.696)	(-0.589)	(1.544)	(-0.583)	(1.695)	(-0.347)
Assets tangibility	0.072***	0.428**	0.078***	0.442**	0.078***	0.443**
	(5.528)	(2.144)	(5.927)	(2.248)	(5.280)	(2.015)
Mill's ratio	0.059**		0.067**		0.080***	
	(2.278)		(2.561)		(3.038)	
Constant	-0.033	-0.566	-0.039*	-0.576	-0.059***	-0.623
	(-1.515)	(-0.617)	(-1.739)	(-0.629)	(-2.611)	(-0.669)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,618	2,176	1,618	2,176	1,432	1,905

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.5.4 Performance-matched control firms

To assess whether a firm is performing unusually well or poorly, I must specify the performance I expect in the absence of an event, thus providing a benchmark against which sample firms can be compared. Previously I have used a simple industry adjustment of ROA which has been commonly adopted in prior literature. Following the methodology of Barber and Lyon (1997), I now construct a sample of control firms that matches sample firms in three digit SIC code, year and pre-event performance. I then subtract the matched firm's ROA from the ROA of the corresponding sample firm. This approach potentially allows us to better control for various factors such as corporate strategy, management ability, or investment opportunities that are unrelated to the event but affect firm operating performance. For sample firms that do not have any matching firms in the same three-digit SIC code, I extend the search for firms that are in the same two-digit SIC code. If I am still not able to find a performance match, I use all firms in the same one-digit SIC code. Finally, my last filtering rule considers firms that have performance closest to the sample firms without regard to SIC code.

The first round of searching provides us matches for approximately 83% of the sample firms. The next three alternative steps give us additional matches for 14% of the sample firms. In total, I am able to find good matches for up to 97% of the sample firms.

Table 1.14 reports the results of using the change in control-firm adjusted ROA as the dependent variable. The main findings remain robust to the usage of this method. I still find that large cash reserves adversely impact firm performance following the negative performance event.

Table 1.14: Cash holdings and control-match adjusted performance

The control-match adjusted performance is the difference of performance between the sample and control firms. Dependent variable is the change of this adjusted performance and is measured by the difference between the average of performance of two years after the negative performance shock (year t+1 and year t+2) and performance at year t. The majority of control firms are matched with the sample firms based on three digit SIC code, event year, and pre-event performance. In case of no matches found, I follow alternative steps. Please refer to section 5.4 for more details. Other variables are defined in Appendix A. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	(1)	(2)	(3)
Industry adjusted cash ratio	-0.085***		
	(-3.157)		
High cash firms - Dummy		-0.019***	
		(-2.828)	
Residuals			-0.008***
			(-2.688)
Size	0.001	0.002	0.004
	(0.499)	(0.916)	(1.641)
Leverage	0.041**	0.056***	0.072***
	(2.402)	(3.403)	(4.302)
Initial ROA	-0.458***	-0.449***	-0.453***
	(-10.712)	(-10.905)	(-11.058)
R&D/Assets	-0.071	-0.054	-0.076
	(-0.980)	(-0.733)	(-1.036)
Market to book ratio	0.006	0.006	0.006
	(1.151)	(1.048)	(1.065)
Constant	-0.021	-0.005	-0.028**
	(-0.524)	(-0.248)	(-2.427)
Year dummies	Yes	Yes	Yes
Observations	1,302	1,302	1,147
R-squared	0.205	0.204	0.216

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.5.5 Other robustness tests

In this part, I extend the analysis to three year period. Table 1.15 presents the regression result of the effects of cash holdings on performance three years after the performance shock. The primary finding in table 1.15 remains robust to this modification.

Table 1.15: Operating performance three year following the negative performance shock - Effect of cash holdings

This table presents estimates from the regressions of the change of industry-adjusted operating performance after an abrupt negative performance shock. The change of performance is measured by the difference between the average of industry-adjusted ROA two years after the shock (year t+1 and year t+2) and the industry adjusted ROA at year t, the shock year. Other variables are defined in Appendix A. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	(1)	(2)	(3)
Industry adjusted cash ratio	-0.069***		
	(-3.194)		
High cash firms - Dummy		-0.015***	
		(-2.924)	
Excess cash			-0.013***
			(-5.470)
Size	0.001	0.001	0.001
	(0.438)	(0.879)	(0.806)
Leverage	0.048***	0.045***	0.056***
	(3.850)	(3.741)	(4.143)
ROA	-0.502***	-0.488***	-0.491***
	(-11.609)	(-10.924)	(-10.464)
R&D over assets	-0.128**	-0.122**	-0.134**
	(-2.358)	(-2.125)	(-2.259)
Industry growth rate	0.124*	0.064	0.083
	(1.691)	(0.941)	(1.231)
Assets tangibility	0.064***	0.069***	0.060***
	(5.744)	(5.956)	(4.800)
Constant	0.030***	0.029***	0.021*
	(3.077)	(2.721)	(1.894)
Observations	1,363	1,225	1,095
R-squared	0.244	0.235	0.244

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.6 Evidence on the dynamic effects of large cash reserves

Financial theory implies that the value of cash reserves varies across firms depending on potential costs of under or overinvestment. In this part, I examine whether the impact of cash reserves on performance will change for firms outside the defined context of a sharp performance decline.

1.6.1 Performance following a pseudo performance shock

First, I explore the dynamic effects of cash holdings on firm value over time. I employ a pseudo shock event which is defined to occur at three years prior to the actual distress year. Given the identification strategy, these firms before the shock used to be top performers in their industries.

Table 1.16 presents the relationship of cash holding and performance for the sample firms at the pseudo performance shock. Interestingly, the results do not hold. The cash ratio is either positively or not statistically significantly related to the change in operating performance.

The finding suggests that during this time when overinvestment is presumably less likely to be costly, I do not find the significant adverse impact of cash on performance. Financial slack might help to mitigate financing frictions and therefore does not harm growing firms with ample investment opportunities.

Table 1.16: Effect of cash holdings following pseudo performance shock

This table presents estimates from the regressions of the change of industry-adjusted operating performance before the performance shock. The change of performance is measured by the difference between the average of performance two years before the shock (year t-2 and year t-3) and performance at year t-1. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	(1)	(2)	(3)
Industry adjusted cash ratio	0.040***		
	(3.355)		
High cash firms - Dummy		0.003	
		(1.065)	
Excess cash			-0.001
			(-0.415)
Size	-0.004***	-0.005***	-0.005***
	(-4.368)	(-4.515)	(-4.221)
Leverage	0.021***	0.014*	0.007
	(2.598)	(1.676)	(0.718)
ROA	-0.572***	-0.573***	-0.551***
	(-34.467)	(-34.501)	(-29.800)
R&D over assets	-0.029	-0.026	-0.006
	(-0.961)	(-0.862)	(-0.199)
Industry growth rate	-0.063	-0.061	-0.064
	(-1.365)	(-1.296)	(-1.097)
Assets tangibility	0.013	0.006	0.007
	(1.288)	(0.661)	(0.513)
Constant	0.094***	0.101***	0.096***
	(9.463)	(9.858)	(9.141)
Year dummies	Yes	Yes	Yes
Observations	1,579	1,579	1,102
R-squared	0.627	0.623	0.646

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.6.2 Performance of placebo sample firms

To test the dynamic effect cross-sectionally, I construct a group of placebo sample firms that are matched with the sample firms by three-digit SIC code, year and pre-event performance but do not concurrently experience this form of the performance shock.

Table 1.17 presents the relationship of cash holding and performance for the placebo sample firms. Within the placebo sample, again, I do not observe the adverse impact of large cash reserves.

Table 1.17: Effects of cash holdings on placebo sample firms

This table presents estimates from the regressions of the change of operating performance of control firms. The change of performance is measured by the difference between the average of performance of two years (year t+1 and year t+2) and performance at year t, i.e., the shock year for the corresponding matched actual sample firm. The majority of control firms are matched with sample firms based on three digit SIC code, event year, and pre-event performance. In case of no matches found, we follow alternative steps. Please refer to section 5.3 for more details. Other variables are defined in Appendix A. All regressions include year fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent.

	(1)	(2)	(3)
Industry adjusted cash ratio	0.012		
	(0.780)		
High cash firms - Dummy		0.001	
		(0.361)	
Excess cash			-0.003
			(-1.531)
Size	0.004***	0.004***	0.004***
	(4.454)	(4.436)	(4.287)
Leverage	0.011	0.009	0.001
	(0.959)	(0.804)	(0.084)
Initial ROA	-0.038	-0.039	-0.031
	(-1.126)	(-1.160)	(-0.852)
R&D/Assets	0.022	0.021	0.003
	(0.434)	(0.408)	(0.051)
Market to book ratio	-0.006***	-0.006***	-0.006***
	(-2.639)	(-2.586)	(-2.711)
Constant	-0.040***	-0.039***	0.014
	(-3.656)	(-3.388)	(0.820)
Year dummies	Yes	Yes	Yes
Observations	1,560	1,560	1,380
R-squared	0.078	0.077	0.078

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In brief, the finding suggests that the impact of large cash reserves varies depending on the economic or financial situation that a firm is facing. In the scenario when efficiency problems prevail and downsizing activities are deemed to be the most optimal, large cash reserves seem to hinder the performance recovery by insulating managers from conducting drastic but necessary restructuring measures or exacerbate problems of overinvestment. Agency problems in this case may manifest themselves through empire building managers' hesitation of drastically curtailing their inefficient assets, or perhaps through a "quiet life" preference such as avoidance of undertaking "cognitively difficult" restructuring decisions (Bertrand and Mullainathan (2003)). Conversely, when firms are growing, financial slack might not hurt firm values.

1.7 Conclusion

I investigate the impact of cash holdings on firm responses and performance following the onset of an abrupt performance decline. I find that cash reserves negatively correlate with subsequent performance. I present a potential mechanism explaining how too much financial slack (i.e., large cash reserves in this case) can be harmful for firm recovery. That is, cash rich firms exhibit signs of overinvestment. While cash poor firms significantly improve their asset turnover by substantially scaling down their asset base after the significant performance drop, cash rich firms do not follow this pattern. The results remain true after I control for governance mechanisms and survivorship bias. The agency costs of cash are likely to fluctuate depending on the economic and financial situation that a firm is facing. It seems that if large cash holdings can lead to overinvestment in some situations, but not in others.

Chapter 2

Spillover effects of intra-industry bankruptcy filings on firms' cash holding policy

2.1 Introduction

A bankruptcy filing is a significant credit event not just for the filing firm itself but also for the firm's industry peers. Prior literature documents wide-spread spillover effects on surviving peers in capital markets. For example, early work by Lang and Stulz (1992) report that investors contemporaneously downgrade the equity value of a value-weighted portfolio of industry competitors at the time of bankruptcy announcements, suggesting significant contagion effects on peer firms. Jorion and Zhang (2007) document a large increase in cross-firm credit default swap (CDS) among surviving peers. A recent study of Hertzel and Officer (2011) find that capital providers (i.e. lenders) impose large loan spreads for new or renegotiated loans in the two years following the bankruptcy filings of industry rivals. Loan providers additionally require more collateral and set out stricter covenants. Moreover, bankruptcy spillover effects on the stock prices of customers, suppliers, and strategic alliance partners have been documented in the studies of Hertzel et al. (2008) and Boone and Ivanov (2011). However, the literature is still silent on the responses of the management of non-filing peer firms. Given the documented contagion effects in capital markets, it is reasonable to expect that the management of these peer firms will respond accordingly by adjusting their financial policies in a more conservative way.

This paper attempts to fill the aforementioned gap in the literature by investigating the spillover effects of industry peers' bankruptcy fillings on firms' cash holdings policy. Cash holdings

policy encompasses many strategic dimensions and is obviously not a static financial decision. The extant literature widely reports that management adjust their cash holdings policy in response to changing business situations. Foley et al. (2007) find that in response to high earnings repatriation tax, firms hold back their cash in foreign subsidiaries instead of redistributing them back to the firm's US head office. Yun (2009) documents that firms increase their cash reserves and reduce credit line usage to enjoy larger management discretion following an increase in takeover protection. Additionally, Della Seta (2011) and Bates et al. (2009) theoretically and empirically show that to cope with intensifying pressure of product market competition, firms decide to accumulate more cash. Therefore, I hypothesize that firms will adjust their cash holding status in response to a bankruptcy announcement of the firm's rival. In particular, given the documented evidence of tightened credit policies of lenders and undermined confidence in surviving peers by investors and business partners, I expect that on average the non-bankrupt peer firms have a propensity to become more financially conservative by increasing their cash holdings. An increase in cash holdings can help the peer firms avoid underinvestment problems due to increasing financing constraints, and can also serve as a general hedge in case the peer firm bankruptcies are signaling worsening business conditions in the industry.

All firms are not necessarily affected by the same type of spillover effects following their industry peers bankruptcies. To the extent that a bankrupt firm will become a weaker competitor in reorganization (Chapter 11), or disappear completely (Chapter 7), non-bankrupt firms may be able to capture market share and see an improvement in performance. Supporting the existence of such a "competitive effect," Lang and Stulz (1992) find that although the average bankruptcy announcement abnormal return of non-bankrupt industry peers is significantly negative, the effect is significantly positive for firms in highly concentrated industries. Thus, to the extent that firms will enjoy these competitive effects, they may have a reduced precautionary motive for increasing cash holdings immediately following their peer firms' bankruptcies.

The empirical analysis based on a large panel of U.S. firms from 1970 to 2006 supports the hypothesis that firms become more financially conservative following peer firms' bankruptcies. I

find that on average firms significantly increase their cash holdings following bankruptcy filings by their industry peers the previous year. It is possible that rather than reflecting negative contagion effects, the result is simply due to the underlying industry business conditions. Deterioration of industry conditions can simultaneously give rise to a larger number of bankruptcy filings and a stronger tendency of managers to become more financially conservative. To ensure that I control for this possibility, I always include industry sales growth rate as an explanatory variable in the main regressions. In robustness tests I also control for alternative time-variant proxies for industry business conditions and riskiness such as industry stock return and cash flow volatility. It is of course still possible that peer firm bankruptcy filings are merely symptoms of changes in an unobserved (to the econometrician) industry factor, and it is this factor that affects firms' cash holdings. However, if firms are increasing their cash holdings as a response to such an underlying factor, we should expect a significant relation between bankruptcy filings and industry peer firms cash holdings also when both variables are measured contemporaneously, or even that firms' current cash holdings are related to instances of peer firms' bankruptcy filings in the future. I find no evidence of this in the sample. Regressing cash holdings on same-year or future (i.e., next-year) intra-industry bankruptcy filings generate no significant results. Only lagged instances of bankruptcies matter for peer firms' cash holdings, which is suggestive of a causal link.

To test the hypothesis that some firms may capture positive competitive rents following peer firms' bankruptcies, I split the sample between firms in competitive industries (i.e., industries with below median Herfindahl-Hirschman index) and firms in concentrated industries (ie., industries with above median Herfindahl-Hirschman index). The idea is that firms that face fewer competitors to begin with can gain more from a competitor's bankruptcy than firms that have a lot of competitors. Consistent with the competitive hypothesis, I find that there is no significant relation between peer firms' bankruptcies and cash holdings for firms in concentrated industries. The results only hold for firms in competitive industries.

I also find that the magnitude of the cash holdings adjustment to intra-industry bankruptcies is dependent on the business conditions of the industry. The effect is larger the higher the industry

sales growth is. This finding is consistent with contagion effects since a bankruptcy filing is likely to convey more news about the industry's prospects if the industry is not already doing poorly. Furthermore, also consistent with contagion effects, I find that the increase in cash holdings is on average greater among non-filing firms with stronger incentives for precautionary savings, such as firms with high leverage, greater investment opportunities, and in riskier lines of business (i.e., R&D intensive business). These findings are highly in line with prior literature on the precautionary motives for firms' cash holdings. For example, Morellec and Nikolov (2008) show that corporate cash holdings are associated with the intensity of product market competition. Almeida et al. (2004) offer a theoretical argument and Opler et al. (1999) provide empirical evidence that firms with limited access to capital markets or better investment opportunities have a propensity to hoard more cash to avoid underinvestment and/or liquidation.

Taken together, my study contributes to two related strands of literature. First, the findings imply strong interdependence in financial policies among industry peers. It emphasizes the importance of the interlink and network effect on firm behavior. Experiences of competitors are important reference points for managers' financial decision making, which is consistent with the findings of, for example, Leary and Roberts (2010). Additionally, the paper extends the literature on financial contagion effects. Reactions to intra-industry bankruptcy filings has been previously documented for all related parties such as investors, lenders, customers and suppliers but not the management of the surviving firms themselves. I fill this gap by providing evidence on how managers financially respond to the severe distress events of their rivals.

An important qualifier regarding manager's precautionary motives for increasing cash holdings following industry peers' bankruptcies is that such motives may not necessarily be optimal for shareholders, but rather be based solely on the private utility of managers. Indeed, the results of Chapter 1 in this dissertation suggest that large cash holdings can lead to substantial agency problems. Future research will have to reveal to what extent the evidence in the current study is consistent with firm value maximization.

The remainder of the paper proceeds as follows. Section 2 discuss related literature and

hypothesis development. Section 3 describes the data and sample selection procedure. Section 4 presents empirical results and robustness testings. Section 5 concludes.

2.2 Related Literature and Hypothesis Development

2.2.1 Bankruptcy spillover effects

The existing literature documents evidence on contagion and competitive effects from intra-industry bankruptcy filings. A bankruptcy filing can signal future negative prospects of the industry. Investors and other related parties such as suppliers or customers reassess their perception of increasing default risks and hence discount the valuation of surviving firms. I call this the contagion effect of bankruptcy announcements. On the other hand, the announcement can convey a positive signal for the surviving firms. The surviving firms can expect to earn rents from capturing part of the market share from the bankrupt firms. The industry's wealth is therefore distributed among a fewer number of players in the industry. I call this positive effect the competitive effect.

Lang and Stulz (1992) examine the reaction of investors following 59 large intra-industry filings for Chapter 11 bankruptcies (i.e. with liabilities in excess of $120 million) over the period 1970 to 1989. On average, bankruptcy announcements convey bad news for other industry rivals. Investors discount the value of a value-weighted portfolio of competitors by 1% on average (contagion effects). However for a subset of surviving firms that are less levered and in a more concentrated industry, they document evidence for positive stock price effects (competitive effects).

Extending the work of Lang and Stulz (1992), Ferris et al. (1997) investigate the effects from the bankruptcy filings of both large and small firms in Chapter 11. Overall, they find evidence consistent with the contagion effects. This effect is dominant even for the group of firms exhibiting the highest likelihood of experiencing competitive effects, such as firms in concentrated industries. However, the authors also find that any competitive effects may have been incorporated in stock prices prior to the filing for Chapter 11. They observe significant positive stock price reactions by competitors for the period of a hundred days prior to the bankruptcy announcement.

Hertzel et al. (2008) broaden the analysis to the wealth effects along the supply chain (i.e., customers and suppliers) of filing firms. They find that distress related to bankruptcy filings is associated with negative and significant stock price effects for suppliers but not for customers. They suggest that customers might be able to anticipate the distress of a supplier, they do not hence suffer contagion effects. Additionally, they show that the contagion effects for suppliers are more severe if the industry of filing firms is also in distress.

Boone and Ivanov (2011) expands the investigation of bankruptcy spillover effects by analyzing the effects on strategic alliance partners. They document that the non-bankrupt strategic alliance partners on average experience a negative stock price reaction and drops in profit margins and investment levels in the following two years of the partner's bankruptcy filing. This negative effect is more severe for longer and closer partnerships. Industry-wide declines also plays an important role in explaining problems of the non-bankrupt firms. However the impact on the performance of joint venture partners is insignificant.

Jorion and Zhang (2007) examine the spillover impact on cross-firm credit default swap (CDS) spreads. They show that intra-industry CDS spreads increase for Chapter 11 bankruptcy announcements (contagion effects) and decrease for Chapter 7 bankruptcies (competitive effects). In addition, they find that industry characteristics have a strong impact on the magnitude of contagion and competition effects on non-filing peers. For example, consistent with contagion effects, peer firms' CDS spreads are positively related to the degree of intra-industry stock returns and the peer firms' own leverage ratios. Consistent with competitive effects, they find that CDS spreads of peer firms are lower for firms in concentrated industries.

In line with the results of Jorion and Zhang (2007), Hertzel and Officer (2011) present empirical evidence that corporate loan spreads are significantly larger for new or renegotiated loans in the two years following the bankruptcy filings of industry rivals. In addition they report that loan providers adjust other non-price terms in credit agreements such as requiring more collateral, imposing stricter covenants and offering loans with shorter maturity. However, contagion in loan spreads is mitigated in concentrated industries which is consistent with the hypothesis and evidence

in Lang and Stulz (1992).

In brief, the current literature provides many important findings on how equity and loan providers respond to the intra-industry bankruptcy filings. However, there is no broad-based evidence on firm level responses by non-filing peers. Following the filing of a bankrupt firm, prior studies show that suppliers, stock investors, and creditors learn from other firms' defaults, reassess the prospects of the industry and then update their perceived default risk of non-filing industry peers. On average, they become more conservative and take a more precautionary approach in doing business with the surviving firms. A remaining interesting question is how managers of peer firms will adjust their financial policies in response to these radical changes in business and credit environment. Given the evidence of tightened credit policies and deteriorated business conditions incurred among the surviving firms, I hypothesize that the peer firms will on average become more financially conservative.

However, also based on the evidence of the current literature, I additionally hypothesize that firms that are more likely to enjoy the positive competitive effects, such as firms in concentrated industries, have less of a need to become financially conservative following industry peers' bankruptcy filings.

2.2.2 Corporate cash holdings

In terms of what financial policies firms would adjust as a reaction to industry peers' bankruptcies, I focus mainly on corporate cash holdings. The idea is that the level of cash holdings is the financial policy firms can most quickly adjust at the margin and with the lowest transaction costs.

The literature on corporate cash holdings documents various determinants for why firms hold cash. Basically, there are four main motives in the literature for why firms hold cash. They include tax-based, transaction, precautionary and agency motives (Opler et al. (1999) and Bates et al. (2009)). Foley et al. (2007) provide a tax-based explanation for cash reserves; firms that have foreign income and are subject to higher repatriation taxes have a propensity to accumulate more cash. The transaction motive implies that firms accumulate cash to minimize transaction costs of

converting a noncash financial asset into cash (see, e.g., Miller and Orr (1966)). The precautionary motive hypothesis suggests that firms with limited access to capital markets or better investment opportunities have a propensity to hoard more cash to avoid underinvestment and/or liquidation. Almeida et al. (2004) offer a theoretical argument and Opler et al. (1999) provide some empirical evidence for this hypothesis. Moyen and Boileau (2009) develops a structural model that distinguish between the liquidity (i.e., transaction) motive and the precautionary motive for corporate cash savings, and show that the recent trend of large cash holdings among firms are more consistent with the transaction motive. Finally, in the spirit of Jensen (1986) and Stulz (1990), managers may build large cash reserves to maintain discretion for future empire building, thereby incurring agency costs for the firms' shareholders. Kalcheva and Lins (2007b) and Dittmar and Mahrt-Smith (2007) find evidence consistent with such an agency motive by showing that cash reserves are heavily discounted by investors in countries with poor investor rights protection.

Firm cash holding policy is not a static decision that remains relatively stable over time. Firms often adjust their cash policy in response to changes in the economic conditions and governance environment. For example, Yun (2009) reports that firms increase cash relative to credit lines after the introduction of anti-takeover legislation. This exogenous event reduces the threat of takeover. Managers increase cash and reduce credit lines to enjoy more managerial discretion and take advantage of loosen market disciplines.

Foley et al. (2007) employ a large sample of firms from Compustat over the 1982 to 2004 period and data drawn from the detailed results of the Bureau of Economic Analysis (BEA) annual survey of US Direct Investment Abroad to examine how firms adjust their cash holdings to respond to a problem of higher earning repatriation tax. They find that firms hold more cash abroad and hold this cash in affiliates that are subject to high tax costs when repatriating earnings.

Constructing a stylized real options model in which the managers of the firm can abandon its business if product demand falls to a sufficiently low level, Morellec and Nikolov (2008) show that corporate cash holdings are associated with the intensity of product market competition. They empirically report that a firm is more likely to accumulate more cash when the price-to-cost margin

of the firm is low, when the number of firms in the industry is large, or when foreign competition is high.

Therefore under such a radical changes in product market competition and credit environment triggered from an intra-industry bankruptcy filing, I anticipate that management will adjust their cash holdings policy accordingly. In particular, given the documented evidence of tightened credit policies of lenders and undermined confidence in surviving peers by investors and suppliers, I expect that on average these peer firms have a propensity to increase their cash holdings.

2.3 Data

The initial sample includes public companies in the United States with financial data available on Standard & Poor's Compustat database extracted over the period of 1970-2006. I exclude firms that have missing data on assets, cash, sales and earnings before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999) since the cash holdings in these firms are subject to statutory capital requirements or regulatory supervision in a number of states. I also exclude firms with missing values in total assets, cash, sales and earnings before interest, tax and depreciation (EBITDA). The approach yields a universal sample of 23,332 firms.

To identify restructuring firms in Chapter 11 or Chapter 7, I collect information of filing years from the Lopucki Bankruptcy Research Database ("BRD") and firm footnotes in Standard & Poor's COMPUSTAT database. I come up with 2,253 firm-year observations of bankruptcy filings. Industry peers are defined as firms in the same three-digit Standard Industrial Classification (SIC) code with the filing firms.

Following Opler et al. (1999), I define cash ratio as the natural logarithm of the ratio of cash and marketable securities to net assets (i.e., total assets minus cash and marketable securities). Also following Opler et al. (1999), the control variables include firm size, leverage, cash flow, net working capital, R&D expenditure ratio, market to book ratio, dividend dummy, capital expenditure. Firm size is the natural logarithm of the book value of assets. Leverage equals (long-term debt+short-

term debt)/book value of assets. Cash flow is measured as earnings after interest, dividends, and taxes, but before depreciation, divided by net assets. Net working capital is calculated without cash and divided by net assets. We use the R&D expense-to-sales ratio as a measure of the business riskiness. Firms that do not report R&D expenses are considered to be firms with no R&D expenses. The market-to-book ratio is measured as the book value of assets, less the book value of equity, plus the market value of equity, divided by net assets. The dividend dummy equals one if a firm pays a dividend in that year and zero if otherwise. Capital expenditures are scaled by net assets.

I include firm fixed effects in all specifications to control for any unobserved heterogeneity in time-invariant firm characteristics. GDP growth is included to control for economy wide business cycle effects. I employ three different proxies including industry sales growth rate, cash flow volatility and stock returns to measure industry business condition and riskiness. Industry sales growth rate is the industry median of yearly firm sales growth rate. Industry cash flow volatility is the volatility of an industry's cash flow for the past 10-year period. Industry stock return is the industry median of firms' stock returns.

All control variables are lagged one year relative to the dependent variable unless specifically stated otherwise below.

Table 2.1 presents summary statistics of firm year characteristics for the whole sample. The median firm has cash ratio of approximately 7% of net assets, leverage of 21% and market to book ratio of 1.05.

Table 2.1: Summary statistics.

The table presents summary statistics of firm years during the period between 1970 to 2006. Firms are included in the sample if they have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). All variables are defined in Appendix A.

	Whole sample			
	N	Mean	Median	Standard deviation
Cash ratio	161410	0.161	0.076	0.201
Log of total assets	161410	4.293	4.158	2.185
Return on Assets	161410	0.018	0.111	0.395
Firm Size - Log of total assets	161410	4.293	4.158	2.185
Leverage	161410	0.257	0.211	0.273
Market to book ratio	161410	1.894	1.059	2.830
Capital expenditure over assets	161410	0.075	0.050	0.081
Net working capital over assets	161410	0.071	0.094	0.360
R&D over assets	161410	0.046	0.000	0.111

2.4 Empirical results

2.4.1 Main results

Table 2.2 presents the results of multiple regressions examining the past (one year lag), current and future (one year lead) effects of intra-industry bankruptcy filings on firm cash holding policy. Since the bankruptcy event is an industry-year event, I cluster standard errors at the industry year level in all regressions. The regressions include firm fixed effects and all commonly adopted control variables for cash holdings.

Consistent with my hypothesis, the result in column (1) (for the one year lagged effect) shows that the intra-industry filing is highly significant at 1% level and positively correlates with firm cash ratios. In terms of economic significance, one extra increase of the number of intra-industry bankruptcy filing results in an increase of firm's cash holdings by 2%. On average firms increase their cash holdings following the incidence of bankruptcy filings of their peers. The result is robust to the inclusion of all commonly adopted control variables in cash holdings literature, macro economic conditions, and also firm fixed effects. Other variables have the expected signs that are consistent with prior literature. The higher R&D expenditure and market to book ratio,

the more likely firms accumulate cash. In addition, industry condition plays an important role in the responses of managers. When industry condition is promising, managers have a stronger tendency to hoard more cash.

Although I control for industry sales growth, one concern with the results is that there is an unobserved omitted industry factor that drives both the instances of bankruptcy filings and the increase in firm cash holdings. If that is the case I should reasonably observe a contemporaneous relation between the number of bankruptcy filings and firm cash holdings. Moreover, if firms observe a signal of future deterioration of industry prospects they may start to increase cash holdings prior to bankruptcy filings starting to occur within the industry. In column (2) of table 2.2 I replace the one year lagged number of bankruptcy filings used in column (1) with the contemporaneous number of filings. In column (3), I replace the lagged value with the lead value of the number of bankruptcy filings . The results show that there is only a lagged response on firms' cash holdings. The contemporaneous and future bankruptcy filings are not significantly related to firms' cash ratios.

Table 2.2: Cash holding policy - Lead and lag effects of the intra-industry bankruptcy filings.

The table presents estimates from the regressions of firms' cash ratios during the period from 1970 to 2006. Firms are included in the sample if they have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). The dependent variable is the natural log of cash over net assets. Explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

	(1)	(2)	(3)
Number of intra-industry bankruptcy filings $_{t-1}$	0.020***		
	(2.744)		
Number of intra-industry bankruptcy filings $_{t}$		0.007	
		(1.320)	
Number of intra-industry bankruptcy filings $_{t+1}$			-0.006
			(-1.038)
Firm size	-0.339***	-0.339***	-0.329***
	(-41.186)	(-41.148)	(-39.779)
Cash flow	0.005	0.006	0.012
	(0.586)	(0.617)	(1.234)
Net working capital	-0.058***	-0.058***	-0.092***
	(-2.839)	(-2.868)	(-4.013)
R&D expenditure	0.494***	0.494***	0.499***
	(16.760)	(16.748)	(16.278)
Market to book	0.029***	0.029***	0.028***
	(9.775)	(9.757)	(8.937)
Leverage	-0.422***	-0.422***	-0.423***
	(-12.605)	(-12.584)	(-11.805)
Dividend dummy	0.176***	0.176***	0.168***
	(14.551)	(14.553)	(13.685)
Capital expenditure	1.182***	1.178***	1.112***
	(20.831)	(20.694)	(19.051)
Industry sales growth rate	0.131**	0.124**	0.095*
	(2.456)	(2.281)	(1.706)
GDP growth rate	0.178	0.182	0.162
	(0.596)	(0.608)	(0.534)
Constant	-1.276***	-1.270***	-1.262***
	(-35.038)	(-35.083)	(-34.203)
Firm fixed effects	Yes	Yes	Yes
Observations	161,410	161,410	149,351
R-squared	0.681	0.681	0.685

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.4.2 The effect of product market competition

To test the hypothesis that competitive effects can reduce peer firms' incentives to become more financially conservative following the intra-industry bankruptcies, I partition the sample firms into two groups based on the Herfindahl-Hirschman index (HHI). I use HHI values on three-digit SIC code level provided by Hoberg and Philips (2010). They estimates their HHIs based on a mix of COMPUSTAT and Census data. Thus, these HHI values are likely to be better representations of an industry's true competitive situation compared to HHI values based on COMPUSTAT firms alone. See Hoberg and Philips (2010) for a complete description of their estimation procedure. A firm is classified as belonging to a competitive industry if its industry HHI value is below the median for all three-digit SIC industries, otherwise it is classified as belonging to a concentrated industry. The results for each sub-sample are presented in table 2.3.

As can be seen in table 2.3, the positive relation between intra-industry bankruptcy filings and firm cash holdings only exists in the competitive industry sub-sample. Firms in concentrated industries do not alter their cash policy in response to bankruptcy within their industry. These results are consistent with bankruptcies in concentrated industries creating opportunities for remaining firms to increase market share, which may offset any negative information conveyed about future industry prospects. These results are consistent with the evidence in Lang and Stulz (1992) and Jorion and Zhang (2007), among others.

Table 2.3: Cash holding policy - Effects of product market competition.

The table presents estimates from the regressions of firms' cash ratios for the periods before and after 1991. To be included in the regression, firms need to have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). The dependent variable is the natural log of cash over net assets. Explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

	HHI	
	Competitive	Concentrated
	(1)	(2)
Number of intra-industry bankruptcy filings	0.019**	-0.016
	(2.243)	(-0.935)
Firm size	-0.367***	-0.396***
	(-32.510)	(-24.008)
Cash flow	-0.002	0.111***
	(-0.233)	(2.619)
Net working capital	0.014	-0.207***
	(0.654)	(-3.813)
R&D expenditure	0.472***	0.561***
	(15.204)	(3.601)
Market to book	0.019***	0.056***
	(5.760)	(7.287)
Leverage	-0.325***	-0.642***
	(-8.780)	(-10.533)
Dividend dummy	0.134***	0.174***
	(8.040)	(6.215)
Capital expenditure	1.185***	1.126***
	(17.099)	(7.429)
Industry sales growth rate	0.200***	0.091
	(2.975)	(0.942)
GDP growth rate	0.135	0.173
	(0.374)	(0.325)
Constant	-1.061***	-1.060***
	(-22.552)	(-12.363)
Firm fixed effects	Yes	Yes
Observations	102,596	30,132
R-squared	0.721	0.671
Robust t-statistics in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

2.4.3 The effect of industry conditions

Boone and Ivanov (2011), and Lang and Stulz (1992) document that industry conditions

play an important role in explaining the magnitude of the bankruptcy spillover effects on the non-bankrupt firms. In column (1) of the table 2.4, I examine if the firms' responses in their cash holding policy vary based on industry conditions. I include an interaction term between the number of industry bankruptcy filings and industry sales growth. The coefficient on the interaction is positive and highly significant. It seems as if firms react more strongly to peer firms' bankruptcies during favorable business conditions. This result is consistent with bankruptcy filings containing unexpected negative information about industry conditions in particular when the industry is currently doing well. Conversely, if the industry is already doing very poorly, any resulting bankruptcies are not likely to come as a surprise to peer firms. An alternative interpretation is that firms are less able to adjust cash holdings when the industry is doing poorly. Future analysis will further address this issue.

In column (2) and (3), I examine if the impact of industry condition varies across concentrated or competitive industries. I use the same classification scheme as described in the previous section to sort firms into concentrated and competitive industries . The impact of the number of intra-industry bankruptcy filings remains consistent with the result in table 2.3. The positive relation between intra-industry bankruptcy filings and firm cash holdings only exists in the competitive industry sub-sample. Regarding the interaction term, it is positive and significant for both group. For competitive industries, the previous interpretation of the interaction effect is still reasonable. For concentrated industries, the interpretation becomes less straight-forward. Assuming the prospect of earning competitive benefits would negate the need to increase cash holdings due to contagion, the positive interaction may instead reflect that firms extract larger and more immediate performance benefits from promising and favorable industry conditions, and that such performance increases result in greater cash holdings (assuming firms maintain their payout ratios). Because I do not directly test the effect of peer firms' bankruptcies on operating performance, this interpretation is mostly speculative. Future research will have to further explore this possibility.

Table 2.4: Cash holding policy - Effects of industry conditions.

The table presents estimates from the regressions of firms' cash ratios during the period from 1970 to 2006. Firms are included in the sample if they have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). The dependent variable is the natural log of cash over net assets. Explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

	All	HHI	
	firms	Competitive	Concentrated
	(1)	(2)	(3)
Number of intra-industry bankruptcy filings	0.017**	0.016**	-0.043*
	(2.348)	(1.963)	(-1.845)
Number of intra-industry bankruptcy filings *Industry sales growth rate	0.057***	0.058***	0.308*
	(2.769)	(2.641)	(1.811)
Firm size	-0.340***	-0.368***	-0.396***
	(-41.146)	(-32.435)	(-24.135)
Cash flow	0.005	-0.002	0.111***
	(0.575)	(-0.246)	(2.626)
Net working capital	-0.058***	0.014	-0.206***
	(-2.831)	(0.668)	(-3.810)
R&D expenditure	0.494***	0.471***	0.560***
	(16.766)	(15.203)	(3.598)
Market to book	0.029***	0.019***	0.056***
	(9.768)	(5.763)	(7.266)
Leverage	-0.422***	-0.325***	-0.641***
	(-12.603)	(-8.779)	(-10.528)
Dividend dummy	0.176***	0.134***	0.174***
	(14.588)	(8.077)	(6.207)
Capital expenditure	1.179***	1.181***	1.127***
	(20.756)	(17.016)	(7.446)
Industry sale growth rate	0.097*	0.149**	0.047
	(1.679)	(1.994)	(0.452)
GDP growth rate	0.214	0.206	0.107
	(0.718)	(0.570)	(0.200)
Constant	-1.272***	-1.056***	-1.051***
	(-34.699)	(-22.253)	(-12.268)
Firm fixed effects	Yes	Yes	Yes
Observations	161,410	102,596	30,132
R-squared	0.681	0.721	0.672

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.4.4 Firm cash holdings and geographic proximity

We next investigate the geographic dimensions of bankruptcy information spillover effects. Regardless of the overall industry level of competition, firms that are located in the same location with the bankrupt firms can potentially enjoy greater competitive effects, all else equal. Being in close proximity, surviving firms can potentially utilize the expertise of skilled human resources that are dismissed from the bankrupt rivals and additionally take over local supply sources and capture the local demand, negating any need for increasing cash holdings due to contagion. On the other hand, local firms can suffer worse contagion effects if the bankruptcy was caused at least partially by local factors, suggesting an increased positive effect on cash holdings.

We employ metro division codes in the 2000 US Census data to group firms by geographic areas based on where the corporate headquarters are located. The results in table 2.3 show that firms in geographical proximity to the bankrupt firms do not appear to increase their cash holdings more as compared with non-local firms. Although the coefficient on local bankruptcies is not significant, the difference in coefficient estimates between local and non-local bankruptcies is not significant. Thus, the evidence does not support that local contagion or competitive factors matter. The reason for the coefficient on the local bankruptcy variable not being significantly different form zero may very well be a question of power. Very few firms experience bankruptcies by local peers: the average number of bankruptcy filings in the same industry and location is 0.0038 whereas the average number of bankruptcy filings that are not in the same location with surviving firms is 0.38.

Table 2.5: Cash holding policy - Effects of geographic proximity.

The table presents estimates from the regressions of firms' cash ratios during the period from 1970 to 2006. Firms are included in the sample if they have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). The dependent variable is the natural log of cash over net assets. Explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

	(1)
Number of bankruptcy filings in the same industry but not in the same location	0.020***
	(2.724)
Number of bankruptcy filings in the same industry and in the same location	0.018
	(0.434)
Firm size	-0.339***
	(-41.177)
Cash flow	0.005
	(0.586)
Net working capital	-0.058***
	(-2.839)
R&D expenditure	0.494***
	(16.760)
Market to book	0.029***
	(9.776)
Leverage	-0.422***
	(-12.606)
Dividend dummy	0.176***
	(14.550)
Capital expenditure	1.182***
	(20.830)
Industry sale growth rate	0.131**
	(2.455)
GDP growth rate	0.178
	(0.596)
Constant	-1.276***
	(-35.020)
Firm fixed effects	Yes
Observations	161,410
R-squared	0.681

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.4.5 The effect of firms' specific incentives for precautionary savings

The contagion effects of intra-industry bankruptcies should not necessarily affect all firms within an industry equally. Firms that are more financially vulnerable to begin with, or firms that

have greater investment opportunities or riskier operations should have more incentives to increase their cash holdings in response to any negative signals they infer from peer firms' bankruptcies. In table 2.6, I examine if the spillover impacts are stronger for these types of firms. To measure financial vulnerability I use a firm's leverage ratio. Growth opportunities are captured by the firm's market-to-book ratio, Finally, I use R&D expenditure over assets as a proxy for the riskiness of the firms line of business. I define firms as having high/low indicators when the own value is higher/lower than the median of all firm-year observations.

The results in table 2.6 show that the impact of bankruptcy filings on firm cash holding policy is only robust for the firms with more precautionary saving incentives. Firms with high leverage, high investment opportunities and risky business do increase their cash significantly. An increase of one bankruptcy filings induces high leverage firms to accumulate more cash by 2% while the coefficient for low-leverage firms is not economically and statistically significant. Similarly firms that are R&D intensive increase cash reserves by 3.3% and the coefficient is significant at 1% level. The difference between the high and low precautionary incentive groups is also highly significant.

The findings are highly in line with the prior literature on cash holdings and firms' precautionary motives. Morellec and Nikolov (2008) show that corporate cash holdings are associated with the intensity of product market competition. Almeida et al. (2004) offer a theoretical argument and Opler et al. (1999) provide empirical evidence that firms with limited access to capital markets or better investment opportunities have a propensity to hoard more cash to avoid underinvestment and/or liquidation.

Table 2.6: Cash holding policy - Precautionary motives.

The table presents estimates from the regressions of firms' cash ratios during the period from 1970 to 2006. Firms are included in the sample if they have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). The dependent variable is the natural log of cash over net assets. "ICR" stands for industry concentration ratio and is defined as the percentage of the sum of the four biggest firms' sales value among the sales of all firms in Compustat in the same industry for a given year. Leverage is the debt-to-assets ratio which equals to the total of long-term debt and short-term debt over book value of assets. Investment opportunities is based on tobin Q which is (total assets + market capitalization common equity) /total assets. Risky business is based on the ratio of research and development expenditure over total assets. I define firm as having a high/(low) indicator when its variable is higher/(lower) than the median of all firm-year observations. Explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

	Leverage		Investment opportunities		R&D intensive	
	Low	High	Low	High	No	Yes
	(1)	(2)	(3)	(4)	(5)	(6)
Number of intra-industry bankruptcy filings	0.006	0.020**	0.008	0.029***	0.015*	0.033***
	(0.658)	(2.432)	(0.966)	(3.603)	(1.868)	(2.795)
Firm size	-0.337***	-0.274***	-0.415***	-0.291***	-0.400***	-0.249***
	(-34.327)	(-28.508)	(-39.691)	(-31.817)	(-46.511)	(-20.244)
Cash flow	0.044***	0.019	0.074***	-0.013	-0.007	0.058***
	(4.151)	(1.139)	(3.110)	(-1.226)	(-0.495)	(4.654)
Net working capital	-0.277***	0.242***	-0.545***	0.030	-0.174***	0.050**
	(-9.295)	(9.604)	(-11.779)	(1.454)	(-6.703)	(2.073)
R&D expenditure	0.492***	0.407***	0.634***	0.474***		0.726***
	(16.098)	(5.902)	(9.079)	(14.231)		(18.634)
Market to book	0.028***	0.003	0.454***	0.023***	0.044***	0.018***
	(8.858)	(0.565)	(14.938)	(7.019)	(10.209)	(5.029)
Leverage	-0.958***	0.681***	-0.930***	-0.250***	-0.481***	-0.347***
	(-8.348)	(20.869)	(-13.435)	(-8.955)	(-12.814)	(-8.194)
Dividend dummy	0.226***	0.069***	0.131***	0.179***	0.200***	0.149***
	(14.485)	(3.815)	(7.792)	(9.713)	(12.901)	(7.603)
Capital expenditure	1.217***	0.830***	0.660***	1.247***	0.935***	1.484***
	(17.618)	(9.474)	(6.906)	(17.692)	(13.244)	(17.064)
Industry sales growth rate	0.066	0.185***	-0.103	0.249***	0.233***	0.040
	(1.030)	(3.421)	(-1.416)	(3.976)	(3.625)	(0.522)
GDP growth rate	0.003	0.329	-0.153	0.036	-0.189	0.650
	(0.007)	(1.209)	(-0.498)	(0.102)	(-0.674)	(1.382)
Constant	-0.839***	-2.629***	-1.076***	-1.475***	-1.308***	-1.335***
	(-19.416)	(-55.057)	(-20.482)	(-35.047)	(-31.804)	(-25.438)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	99,708	61,702	82,229	79,181	88,032	73,378
R-squared	0.716	0.654	0.727	0.714	0.636	0.722

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.4.6 The effect on debt and equity issuance

In table 2.7, I examine the impact of intra-industry bankruptcy filings on other activities including debt and equity issuance, policies on net working capital and retained earnings. Equity issuance is the difference between the sale of common and preferred stock and the purchase of common and preferred stock divided by total assets. Debt ratio change is the change between the current year's total debt ratio and the previous year's one. Net working capital/(retained earnings) change is defined as the change of the current year's net working capital (net of cash)/(retained earnings) and the previous year's ratio.

Consistent with the conservatism observed in cash holding policy, columns (1) and (2) in table 2.7 show a tendency of deleveraging. Firms seems to issue equity after observing their peers' distress events. The coefficient on industry bankruptcy filings is statistically significant at the 1% level. The higher frequency of filings during the year, the more equity issuance a firm undertakes. The effect on debt issuance is negative but not significant (column (2)). The evidence also suggests that at least part of the increase in cash holdings comes from new equity issues.

Regarding the impact on net working capital (column (3)), the effect is negative and significant. This evidence is consistent with firms converting less liquid assets (e.g., inventory or account receivables) into more liquid assets (e.g,. cash and short-term investments). In other words, following bankruptcy events of their industry peers, it appears firms have a tendency to reduce their investment in net working capital in order to create a larger financial buffer for their companies.

In column (4), I examine the change in retained earnings. The effect is not significant suggesting that firms do not increase their cash holdings from the retained earnings.

Table 2.7: Information spillover effects on debt, equity issuance, net working capital and retained earnings.

The table presents estimates from the regressions of firms' cash ratios during the period from 1970 to 2006. To be included in the sample, firms need to have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). Equity issuance is the difference between the sale of common and preferred stock and the purchase of common and preferred stock divided by total assets. Debt ratio change is the change between the current year's total debt ratio and the previous year's one. Net working capital/(retained earnings) change is defined as the change of the current year's net working capital (net of cash)/(retained earnings) and the previous year's ratios. Number of bankruptcy filings are the total number of bankruptcy filings in the same three digit Standard Industry Code (SIC) in a given year. Other explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

VARIABLES	Equity issuance	Debt ratio	Net working capital	Retained earnings
	(1)	(2)	(3)	(4)
Number of intra-industry bankruptcy filings	0.006***	-0.000	-0.123*	0.013
	(3.302)	(-0.303)	(-1.780)	(1.256)
Firm size	-0.001	0.001***	0.010	0.170***
	(-0.817)	(3.653)	(0.216)	(9.968)
Return on Assets	-0.010	-0.011***	3.904***	4.024***
	(-1.155)	(-4.374)	(4.576)	(32.125)
Leverage ratio	-0.065***	0.004*	-5.650***	-0.793***
	(-8.717)	(1.661)	(-3.297)	(-7.869)
Market to book ratio	0.013***	-0.000*	-0.522***	0.047***
	(12.926)	(-1.698)	(-3.335)	(3.570)
Industry sale growth rate	-0.021	-0.003	0.061	0.158
	(-1.480)	(-1.493)	(0.064)	(1.221)
GDP growth rate	-0.114	0.024	4.775**	0.616*
	(-1.180)	(1.622)	(2.248)	(1.816)
Constant	-0.011	-0.009***	2.025***	-0.851***
	(-1.371)	(-4.904)	(3.723)	(-8.503)
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	142,442	149,980	166,670	160,139
R-squared	0.131	0.094	0.180	0.374

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.4.7 Robustness test

It is still possible that underlying industry business conditions could be an alternative explanation for the findings. For example, a risky industry business or deterioration of industry conditions can give rise to a larger number of bankruptcy filings and consequently lead to a stronger

tendency of managerial financial prudence. I have already controlled for the industry sales growth rate in the regressions. To further ensure that I mitigate the concern of spurious causality caused by unobserved and underlying trends of industry effects, I also include alternative proxies for industry business conditions and riskiness, such as industry stock return and cash flow volatility.

Table 2.8 presents the modified regression results. Industry stock return is defined as the median of industry annual stock returns. Industry cash flow volatility is the industry median of standard deviation of EBITDA/Assets for the past five years. The coefficients on industry bankruptcy filings from columns (1) and (2) remain positive and statistically significant after controlling for these alternative proxy variables for time-variant industry conditions. Also, the magnitude does not change much from the original result presented in table 2.2. The results suggest that the core finding is less likely to be driven by the effect of time varying industry prospects. In column (3), I additionally control for the percentage of bankruptcy filings in the whole economy. In addition to GDP growth rate that controls for the underlying macro economic conditions, this control variable takes into account any inherent or latent trend of distress events from the whole economy. The result in column (3) shows that the main finding remains robust to this additional modification. As can be seen in column (4), the effect of intra-industry bankruptcies is also robust when simultaneously controlling for all alternative proxies of industry and macro economic conditions.

Table 2.8: Robustness test - Controlling for alternative measures of time-variant industry and macro economic conditions.

The table presents estimates from the regressions of firms' cash ratios during the period from 1970 to 2006. To be included in the sample, firms need to have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). The dependent variable is the natural log of cash over net assets. Number of bankruptcy filings are the total number of bankruptcy filings in the same three digit Standard Industry Code (SIC) in a given year. Other explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

	(1)	(2)	(3)	(4)
Number of intra-industry bankruptcy filings	0.017**	0.018**	0.015**	0.014**
	(2.549)	(2.388)	(2.050)	(1.979)
Firm size	-0.338***	-0.349***	-0.340***	-0.349***
	(-41.416)	(-44.766)	(-41.047)	(-45.211)
Cash flow	0.002	0.015	0.007	0.010
	(0.172)	(1.601)	(0.735)	(1.106)
Net working capital	-0.055***	-0.049**	-0.056***	-0.049**
	(-2.729)	(-2.167)	(-2.760)	(-2.214)
R&D expenditure	0.493***	0.507***	0.492***	0.507***
	(16.620)	(16.751)	(16.718)	(16.709)
Market to book	0.026***	0.030***	0.030***	0.026***
	(8.576)	(9.540)	(9.918)	(8.331)
Leverage	-0.418***	-0.428***	-0.424***	-0.422***
	(-12.673)	(-12.547)	(-12.670)	(-12.500)
Dividend dummy	0.173***	0.175***	0.176***	0.170***
	(14.254)	(14.293)	(14.577)	(13.884)
Capital expenditure	1.217***	1.236***	1.197***	1.228***
	(21.197)	(21.339)	(20.879)	(21.445)
Industry stock return	0.134***			0.123***
	(4.145)			(4.297)
Industry cash flow volatility		0.113***		0.110***
		(7.235)		(7.240)
Percentage of bankrupt firms in the economy			3.249*	5.723***
			(1.690)	(3.273)
Industry sale growth rate				0.095*
				(1.795)
GDP growth rate	0.540*	0.405	0.536*	0.752**
	(1.954)	(1.448)	(1.765)	(2.534)
Constant	-1.284***	-1.308***	-1.292***	-1.374***
	(-35.376)	(-35.204)	(-33.617)	(-35.814)
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	161,382	157,776	161,410	157,753
R-squared	0.682	0.683	0.681	0.684

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In table 2.9, I analyze the robustness of the main result to using alternative functional forms

of intra-industry bankruptcy filings. To control for a potentially decreasing effect in the number of intra-industry bankruptcies, in column (1), I use the natural logarithm of one plus the number of the bankruptcy filings. In column (2), I use a binary dummy which equals one if there is at least one intra-industry filing and zero otherwise. In column (3), to take into account the size of an industry (i.e., number of firms in an industry), I compute the percentage of the number of the filings over the total number of firms in the industry. One bankruptcy filing in an industry of a few firms will possibly have stronger effects than one in a more populated industry. The results across three different specifications remain qualitatively unchanged and statistically significant at the 1% level. Regardless of the functional form used to capture the effects of intra-industry bankruptcy filings, there is consistently strong evidence that managers of surviving firms become more financially conservative by increasing their cash holdings.

Table 2.9: Robustness test - Alternative functional forms of intra-industry bankruptcies

The table presents estimates from the regressions of firms' cash ratios during the period from 1970 to 2006. To be included in the sample, firms need to have non-missing values in total assets, cash, sales and earning before interest, tax and depreciation (EBITDA). I also remove utility (SIC from 4910 to 4939) and financial firms (SIC from 6000 to 6999). The dependent variable is the natural log of cash over net assets. Number of bankruptcy filings are the total number of bankruptcy filings in the same three digit Standard Industry Code (SIC) in a given year. Other explanatory variables are defined in Appendix A. All regressions include firm fixed effects. t-statistics (in brackets) are heteroscedasticity-consistent. Standard errors are clustered at industry-year level.

	(1)	(2)	(3)
Log(1+the number of intra-industry bankruptcy filings)	0.047***		
	(3.084)		
Intra-industry bankruptcy filings - Dummy		0.034***	
		(2.590)	
Percentage of bankrupt firms in industry			0.285**
			(2.144)
Firm size	-0.339***	-0.339***	-0.339***
	(-41.200)	(-41.188)	(-41.156)
Cash flow	0.005	0.005	0.006
	(0.587)	(0.601)	(0.611)
Net working capital	-0.057***	-0.058***	-0.058***
	(-2.826)	(-2.841)	(-2.865)
R&D expenditure	0.494***	0.494***	0.494***
	(16.766)	(16.782)	(16.767)
Market to book	0.029***	0.029***	0.029***
	(9.757)	(9.738)	(9.744)
Leverage	-0.422***	-0.422***	-0.421***
	(-12.611)	(-12.609)	(-12.588)
Dividend dummy	0.176***	0.176***	0.176***
	(14.580)	(14.594)	(14.582)
Capital expenditure	1.181***	1.178***	1.177***
	(20.745)	(20.638)	(20.627)
Industry sales growth rate	0.128**	0.122**	0.119**
	(2.400)	(2.271)	(2.209)
GDP growth rate	0.208	0.219	0.203
	(0.698)	(0.733)	(0.681)
Constant	-1.278***	-1.274***	-1.269***
	(-35.124)	(-35.028)	(-34.987)
Firm fixed effects	Yes	Yes	Yes
Observations	161,410	161,410	161,410
R-squared	0.681	0.681	0.681

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.5 Conclusion

I find that firms on average significantly increase their cash holdings following the incidence of bankruptcy filings by their industry peers. This result is generally consistent with managers hedging against potential contagion from these bankruptcies. However, for a subsample of firms in highly concentrated industries I do not find an effect on cash holdings from intra-industry bankruptcies. This particular result is consistent with firms in concentrated industries expecting to capture sufficient competitive benefits from their competitors' financial distress that it outweighs any needs to hedge against contagion. Further supporting a precautionary motive for the increase in cash holdings, the increase is larger for firms with high leverage or greater growth opportunities. These are the firms that potentially will suffer the most from negative spillover effects in terms of increased risk of financial distress or underinvestment. Although the cash increase is consistent with precautionary behavior on part of the managers, it is not necessarily the case that this represent optimal behavior from a firm value perspective. The evidence in Chapter 1 of this dissertation in fact suggest that the managers' response, no matter how well-intended, may very well be suboptimal due to agency costs of cash.

Overall, the evidence suggests that not only creditors reassess their perceived default risk of surviving firms as empirically documented in the prior literature, but so do also the managers of these firms. It emphasizes the importance of the network effects on firm behavior. Experiences of competitors are important reference points for managers' financial decision making.

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Appendix A

Chapter 1

Appendix A - Variable Definitions

Variable	Description
Industry-adjusted cash ratio	Cash ratio (i.e, cash and short term investments over total assets) minus SIC3 industry median of cash ratio.
Low/(High) cash holding indicator	The low/(high) cash holdings indicator equals 1 if firm's cash ratio is lower/(higher) than the bottom/(top) three deciles of its industry ratio for a given year and zero if otherwise.
Excess cash	The difference between predicted and actual cash ratio. See Opler et al. (1999). I estimate the following specification: $$cash_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 CF_{i,t} + \beta_3 NWC_{i,t} + \beta_4 (IndustryCFvolatility)_{i,t} + \beta_5 M/B_{i,t} + + \beta_6 DEBT_{i,t} + \beta_7 CAPEX_{i,t} + + \beta_1 (Dividenddummy)_{i,t} + YearDummies + \epsilon_{i,t}$$ Then I take the residuals from this regression to compute excess cash.
Cash flow volatility	The volatility of an industry's cash flow for the past 10-year period
Assets sales	The binary indicator equals one if a company has a decline in annual NPPE value of more than 15% and zero otherwise.
Firm size	Log of total assets.
Return on Assets	EBITDA over total assets.
Leverage	Total debt over total assets.
R&D/Assets	Research and development expenditure over total assets
Industry Concentration Ratio ICR	ICR is the sum of the four biggest firms' sales value among all firms in Compustat in the same industry for a given year. Firms are classified as having high/low ICR when its industry ICR is higher/lower than the median of all firm-year observations.
Financial constraints	The classification is based the existence of firm's payout (cash dividends and repurchases) in a given year and the magnitude of firm total assets. Firms with size smaller than the median of the size distribution of all COMPUSTAT firms or with no payout in a given year are classified as "Constrained" firms. Firms with size higher than the median of the size distribution of all COMPUSTAT firms or with payout in a given year are classified as "Unconstrained" firms.
Whited-Wu index	The index is estimated by: WW index = -0.091*Cash flow + 0.062*Dividend dummy + 0.021*Long-term leverage - 0.044*Size + 0.102*Industry sales growth - 0.035*Sales growth

Appendix B

Chapter 2

Appendix A - Variable Definitions

Variable	Description
Cash ratio	Natural logarithm of cash plus market securities over net assets.
Net assets	Total asset minus cash minus market securities.
Firm size	Natural logarithm of the book value of net assets.
ROA - Return on Assets	Earnings before interest tax and depreciation (EBITDA) over net assets.
Leverage	Long-term debt plus short-term debt divided by book value of net assets.
Cash flow volatility	The volatility of an industry's cash flow for a 10-year period
Market to book ratio	Book value of assets, less book value of equity, plus arket value of equity, divided by net assets
Cash flow	The total of income before extraordinary items and Deprecation minus total dividend over net assets
ROA - Return on Assets	Earnings after interest, dividends, and taxes, but before depreciation, divided by net assets.
Dividend dummy	Dividend dummy equals one if firm pays a dividend in that year and zero if otherwise.
Capital expenditure ratio	Capital expenditure over net assets.
Tobin Q	Total assets plus market capitalization minus common equity and then divided by net assets.
Industry distress	The indicator equals one when an industry whose median 12-month stock return is less than -30% and zero otherwise.
Net working capital	(Current Assets minus Current Liabilities minus Cash & Marketable Securities) divided by net assets
Industry cash flow volatility	Industry (SIC3) median of standard deviation of EBITDA/Assets for the past five years
Industry sales growth rate	Industry median (SIC3) of annual sales growth rate
Industry median stock return	Industry median (SIC3) of annual stock return
Equity issuance	(Sale of common and preferred stock minus purchase of common and preferred stock) divided by total assets
Debt issuance	Current year's total debt ratio (ie. total debts over total assets) minus previous year total debt ratio
Net working capital change rate	Current year's net working capital ratio (ie. net working capital over total assets) minus previous year's net working capital ratio
Retained earnings change rate	Current year's retained earnings ratio (ie. retained earnings over total assets) minus previous year's retained earnings ratio