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Corporate payout, cash retention, and the supply of credit: Evidence from the 2008–2009 credit crisis ☆

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ABSTRACT

We document significant reductions in corporate payouts-both dividends and (to a larger extent) share repurchases-during the 2008–2009 financial crisis. Payout reductions are more likely in firms with higher leverage, more valuable growth options, and lower cash balances, i.e., those more susceptible to the negative consequences of an external financing shock. Moreover, firms appear to use the proceeds from the reduction in payout to maintain cash levels and to fund investment. These findings are consistent with the view that a shock to the supply of credit (net of demand effects) during the financial crisis increased the marginal benefit of cash retention, leading some firms to turn to payout reductions as a substitute form of financing.

1. Introduction

Several prior studies argue that the 2008–2009 period was characterized by a shock to the cost and supply of credit in the aftermath of the sharp decline in housing prices and subsequent subprime mortgage defaults.[3] Consistent with such a shock, Cornett, McNutt, Strahan, and Tehranian (2011) and Ivashina and Scharfstein (2010) report significant declines in lending from liquidity constrained banks. In addition, increases in uncertainty over the duration of the crisis and over the governmental responses arguably increased the cost of external funds. Further consistent with an abrupt change in the supply of credit and/or the cost of external funds, a large proportion of the chief financial officers surveyed in Campello, Graham, and Harvey (2010) conclude that they experienced credit rationing, higher costs of borrowing, and difficulties in initiating or renewing credit lines during the crisis.

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[3] See, for example, the analyses contained in Gorton (2009) and Acharya, Philippon, Richardson, and Roubini (2009).

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We use the credit crisis of 2008–2009 as an experimental setting in which to study two related issues. First, to what extent do firms adjust their payout policies in response to a shock to the relative costs and benefits of internal and external financing sources? Second, what roles do share repurchases and dividends play in the process of managing cash and internal capital?

The predicted effects of the crisis on payout policy are unclear. If the costs of holding cash (i.e., agency costs) are unchanged, we expect firms to respond to the crisis and the associated increase in external financing costs by reducing corporate payouts and retaining a greater portion of their operating cash flows. This substitution from external to internal capital could, therefore, attenuate any adverse impacts of an external financing shock on investment and internal resources (cash balances), particularly for firms facing greater external financing frictions. Moreover, to the extent that repurchases represent a more flexible form of payout, we expect firms to sequence payout reductions such that repurchases are reduced prior to any reductions in dividends and that reductions in repurchases will be greater than dividend reductions.

However, the crisis is also associated with a large shock to demand due to the general reduction in wealth caused by falling housing prices (Mian and Sufi, 2010). Such a demand shock reduces firm growth opportunities and, consequently, the demand for funds. Because the diminished growth opportunities are associated with greater agency costs of cash retention, this alternative view predicts that, if anything, the crisis period will be associated with greater payouts and lower cash retention.

A third possibility is that the crisis is associated with a sharp increase in uncertainty. An increase in uncertainty might increase the precautionary demand for cash, thus leading firms to reduce payout and retain the cash for future investment.

Because these possibilities are not mutually exclusive, the net impact on payout policy (if any) is an empirical issue. We provide evidence on this issue by analyzing changes in corporate payout policy, investment, and cash retention before and during the recent financial crisis.

Our analysis reveals a sharp increase in the percentage of firms that either reduce or eliminate dividends during the 2008–2009 crisis period. For example, this percentage increases from 6% in 2006 to 25% in 2009. Similarly, we find that the fraction of firms that reduce repurchases increases from 52% in 2006 to 89% in 2009. Payout ratios also significantly decline, indicating that the decline in payout is not simply due to reduced earnings. This decline is driven primarily by a large reduction in the repurchase payout ratio; the dividend payout ratio exhibits only a small decline. Similarly, the aggregate dollar amount of payout also declines 58% from 2006 to 2009 and this is also driven by reductions in repurchases.

We find in panel regressions that firms that are more highly levered, have lower cash balances, and greater investment opportunities are more likely to reduce payouts during the financial crisis. These findings fit with the view that those firms with greater susceptibility to an external financing shock are more likely to turn to payout reductions as a substitute financing source during the recent crisis. By contrast, we find no such evidence during a placebo period (1999–2003) that is characterized by a recession, but not a corresponding shift in the supply of external finance. At the same time, we find traces of a demand shock effect on payouts in that there is a significant reduction in the association between lagged investment and payout reductions that is similar in magnitude for the 2008–2009 financial crisis and the 2001 recession.

Our evidence also indicates that the cash savings from payout reductions during the recent crisis are economically meaningful, representing 31% of the firm's pre-crisis cash balance and 53% of its pre-crisis level of investment. In fact, we show through a pro forma analysis that in the absence of payout reductions, a large proportion of the sample firms would have been unable to implement their chosen operating plans unless they were able to access (particularly costly) external financing.

Finally, we report several findings consistent with the view that firms use the cash savings from payout reductions to either increase cash reserves or to fund corporate investment. First, we find in panel regressions that the magnitude of cash savings from reductions in payout is more strongly associated with cash balances during the crisis than prior to the crisis. Second, using a matching estimator, we find that reductions in investment during the crisis are less severe for firms that reduce payouts to shareholders during the crisis than for firms that do not reduce payouts. Third, in firm fixed-effect regressions, we find that, after controlling for investment opportunities, cash flow, leverage, and prior capital expenditures, the cash savings from payout reductions are associated with higher levels of investment. Finally, we compare changes in cash holdings and in investment for firms that reduce their payout during the crisis with those that made no payouts in the years prior to the crisis. For the latter group, payout reductions are obviously not a feasible source of funds through the crisis period. Consistent with payout reductions being used as a source of funds, we find that reductions in cash balances and in investment during the crisis are significantly greater for zero-payout firms than for firms that reduce payout.

Overall, these findings are consistent with the view that the financial crisis increased the cost of external financing sufficiently that a number of firms turned to payout reductions as a substitute form of financing. These findings complement and extend those of several recent papers that study the real effects of the financial crisis. For example, Campello, Graham, and Harvey (2010) survey chief financial officers (CFOs) and report that firms bypass attractive investment opportunities due to borrowing constraints during the financial crisis. Almeida, Campello, Laranjeira, and Weisbenner (2012) and Duchin, Ozbas, and Sensoy (2010) empirically analyze the impact of the credit crisis on investment by focusing on ex ante heterogeneity in the firm's financial policies; specifically, the maturity structure of long-term debt and cash holdings, respectively. The identifying assumption in these studies is that the firm's financial policies are pre-determined, thereby allowing the authors to identify a causal link that runs from a shock to the supply of credit to investment. Our

study differs from the above studies in that we study changes in payout policy to analyze the extent to which certain financial policies themselves adjust on the margin in response to the credit supply shock of the financial crisis. In this sense, our study complements that of Garcia-Appendini and Montoriol-Garriga (2013) who report evidence consistent with high liquidity suppliers altering their trade credit policies in response to a credit supply shock, and Kahle and Stulz (2013) who analyze whether cross-sectional variations in financing policies during the crisis are consistent with a bank lending shock (as opposed to a demand shock) being a first-order determinant of these policies.[4]

In focusing on payout policy, our study also relates to a long list of studies that document the reluctance of firms to reduce dividends. Brav, Graham, Harvey, and Michaely (2005) report that CFOs state they would rather cut investment than cut dividends. Similarly, Daniel, Denis, and Naveen (2012) report that even those firms facing cash shortfalls exhibit a strong reluctance to cut dividends. By contrast, several studies note that share repurchases represent a much more flexible form of payout. In the Brav, Graham, Harvey and Michaely (2005) survey, CFOs view the flexibility of repurchases as one of its primary attributes. This flexibility is supported by the findings in Guay and Harford (2000) and Jagannathan, Stephens, and Weisbach (2000) regarding the distribution of transitory earnings, and is consistent with Leary and Michaely's (2011) observation that, unlike the case with dividends, managers do not appear to make any attempt to smooth share repurchases through time. Our findings fit well with these general observations in that we find that the financial flexibility afforded by payout reductions during the financial crisis is obtained primarily by reductions in share repurchases.[5] Although we do observe an increased frequency of dividend reductions during the crisis period, our findings generally reinforce the view that dividend cuts are one of the more costly sources of financial flexibility.

The rest of the paper is organized as follows. Section 2 discusses the possible effects of the crisis on payout policy and related literature. Section 3 briefly describes the data. Section 4 presents evidence of changes in payout policy. Section 5 examines cash levels and investment following payout reductions and Section 6 concludes.

2. Possible effects of the financial crisis on payout policy

In recent years, a large literature argues that there are both costs and benefits associated with cash retention. Under the so-called precautionary motive for holding cash, firms build cash reserves as a valuable buffer against shocks to its cash flows or investment opportunities. Thus, firms will tend to hold greater cash balances when they face more costly external finance, when their cash flows are more volatile, and when their investment opportunities are more valuable. Several studies report evidence consistent with these predictions. For example, Opler, Pinkowitz, Stulz, and Williamson (1999) find that cash balances are positively related to cash flow variability, market-to-book ratios, and measures of constrained access to external capital. Similarly, Almeida, Campello, and Weisbenner (2004) find that firms exhibit a greater propensity to save cash from their cash flow when they face higher costs of external finance.[6] Finally, Faulkender and Wang (2006) find that the marginal value of cash is greater in firms with limited access to external capital markets than in firms that are less financially constrained, while Denis and Sibilkov (2010) find that this cash 'premium' is linked to the role of cash in allowing firms to invest in valuable projects that would otherwise go unfunded.

Although the above studies ascribe a valuable role to cash retention in mitigating potential underinvestment, other studies highlight the potential agency costs of cash retention. For example, Jensen (1986), Stulz (1990), and La Porta, Lopez-de-Silanes, Shleifer and Vishny (2000) argue that managers have the incentive to over-retain cash because this enables them to divert resources in a way that benefits themselves at the expense of outside investors. Additionally, the excess cash can reduce the pressure on management to operate efficiently. Consistent with such agency costs of cash retention, Harford, Mansi, and Maxwell (2008) find that firms with weaker governance spend excess cash on capital expenditures and acquisitions more quickly than do firms with better governance. Moreover, Dittmar and Mahrt-Smith (2007) find that $1.00 of cash in poorly governed firms is valued at only $0.42–$0.88.

The above studies imply that firms weigh a wide set of relative costs and benefits of internal and external financing sources in arriving at their optimal cash retention, investment, and payout policies. One objective of our study is to gain greater insight into how (if at all) firms adjust their payout policies in response to a shock to the relative costs and benefits of internal and external financing sources.

The credit crisis of 2008–2009 arguably represents such a shock. Several authors argue that the onset of the credit crisis in late 2007 represents a negative shock to the supply of credit. Consistent with such a shock, Almeida, Campello, Laranjeira, and Weisbenner (2012) report a dramatic increase in credit spreads in late 2007 for both short-term and longer-term credit instruments across the credit quality spectrum. Moreover, Ivashina and Scharfstein (2010) examine bank lending during the financial crisis and find that lending fell across all types of loans: investment grade and non-investment grade; term loans and credit lines; and those used for corporate restructuring as well as those used for general corporate purposes and working capital. These findings support the

[4] Almeida, Campello, Laranjeira, and Weisbenner (2012) also provide some indirect evidence on this issue. For the set of 77 firms that had a large fraction of their long-term debt maturing soon after the onset of the crisis, they compute changes in other policy variables as a fraction of the amount of long-term debt maturing in 2008.

[5] Floyd, Li, and Skinner (2012) also report that dividends are more persistent through the financial crisis than are share repurchases.

[6] Riddick and Whited (2009) question the interpretation of some of this evidence on the grounds that the studies inadequately control for measurement errors in measures of investment opportunities.

view that the credit crisis is associated with a substantial increase in the cost of debt financing and a decline in the supply of available credit in the subsequent period. In addition, Gorton (2009) argues that the credit crisis led to a more general upheaval in capital markets, resulting in a flight to quality. Such a flight to quality might increase the costs of all forms of external capital, not just bank or other forms of debt.[7]

To the extent that the credit crisis is associated with a sharp reduction in the supply of credit and/or a general increase in the cost of external funds, we hypothesize that this increases the marginal benefit of cash retention during the financial crisis. If the costs of holding cash remain unchanged (or at least do not increase), we expect firms to respond by reducing corporate payout and retaining a greater portion of their operating cash flows in order to enhance financial flexibility. Following the intuition of Almeida, Campello, Laranjeira and Weisbenner (2012), this should be particularly true for firms with greater financing frictions and those that are more dependent on external capital. Moreover, to the extent that repurchases represent a more flexible form of payout, we expect firms to sequence payout reductions so that repurchases are reduced prior to any reductions in dividends. As a consequence, this should lead to greater reductions in share repurchases than in ordinary dividends.

The predictions for cash and investment levels are less clear. If a firm increases cash retention in order to undertake investment opportunities that would otherwise go unfunded because of an increase in external financing costs, we expect no change in the firm's cash holdings or its investment. On the other hand, if the crisis period raises uncertainty about the future supply of credit, this might lead to an increase in the precautionary demand for internal funds. Thus, firms might respond by using payout reductions to not only fund current investment, but to build cash reserves for future investment.

Of course, the crisis period is associated with not only a shock to the supply of financing, but also a shock to the demand for financing. As described in Kahle and Stulz (2013), there are many reasons why demand would have decreased during the crisis, including (i) a contraction in consumer credit associated with the demise of the subprime lending market, (ii) the general decline in household wealth, (iii) a shift away from consumption and towards saving following the bankruptcy of Lehman Brothers, and (iv) a shock to the net worth of firms that reduced collateral against which they could borrow. In addition, Kahle and Stulz (2013) point out that the crisis was arguably associated with a sharp increase in uncertainty, as evidenced by the evolution of the Chicago Board Options Exchange Market Volatility Index (VIX).

Because diminished growth opportunities are associated with greater agency costs of cash retention, a general shock to demand implies that, if anything, the crisis period should be associated with higher payouts to equity holders and lower cash retention. Investment would naturally be lower, and cash balances would decline. However, if the increase in uncertainty is large enough, some of these effects could be reversed. Specifically, as noted earlier, firms might elect to retain more cash in order to increase cash holdings for future investment.

Ultimately, therefore, the impact of the crisis period on corporate payout policy and, therefore, cash and investment policy is an empirical issue that our study addresses. To date, we are aware of only limited evidence on these issues in the literature. Floyd, Li, and Skinner (2012) investigate corporate payouts over the past 30 years to analyze whether firms behave as if share repurchases now dominate dividends as a form of payout. Though not the primary focus of their study, Floyd, Li, and Skinner (2012) find that industrial firms are more likely to cut repurchases than to cut dividends during the credit crisis. However, they do not investigate whether firms use payout cuts as a substitute source of funds. Similarly, for a limited set of 77 firms with long-term debt maturing in the first year of the crisis, Almeida, Campello, Laranjeira, and Weisbenner (2012) find evidence consistent with the view that firms cut payout (mostly repurchases) to meet required debt payments following the credit supply shock. Kahle and Stulz (2013) analyze net equity issuance (aggregate equity issuance minus aggregate equity repurchase) throughout the crisis and report a sharp decline in net equity issuance in the early part of the crisis, followed by a rebound in 2009. However, they do not separate repurchases from equity issues and do not analyze dividend payments.[8]

Other studies report that the credit supply shock is associated with real effects. In a survey of CFOs in December 2008, Campello, Graham, and Harvey (2010) report that financially constrained firms planned to substantially reduce investment and employment. Similarly, Duchin, Ozbas, and Sensoy (2010) find direct evidence of a decline in corporate investment during the onset of the crisis, with the decline being greatest for firms with low cash reserves. Finally, Almeida, Campello, Laranjeira, and Weisbenner (2012) report that firms whose debt was maturing shortly after the onset of the crisis reduced investment much more substantially than those whose debt matured after 2008.

As noted earlier, our study differs from these prior studies in an important respect. In analyzing the real effects of the credit crisis, the above studies assume that the firm's financial policies are largely pre-determined, then ask whether real outcomes are associated with differences in ex ante financial policies. By contrast, our study is more concerned with how the financial policies themselves are adjusted by firms in response to the credit crisis. Specifically, we focus on the firm's payout policy. Unlike the firm's debt level, its maturity structure, or the firm's cash holdings, there is considerable flexibility in the amount that the firm chooses to pay out to its shareholders each quarter. This flexibility is arguably much greater for payouts in the form of share repurchases than for those that are dividends. As a result, any impact of a shock to the supply of external capital can potentially be attenuated by adjustments in payout policy.

[7] See Caballero and Krishnamurthy (2008) for a model of how crisis-related uncertainty can lead to such a flight to quality.

[8] Kahle and Stulz (2013) also analyze net debt issuance and changes in cash holdings throughout the crisis.

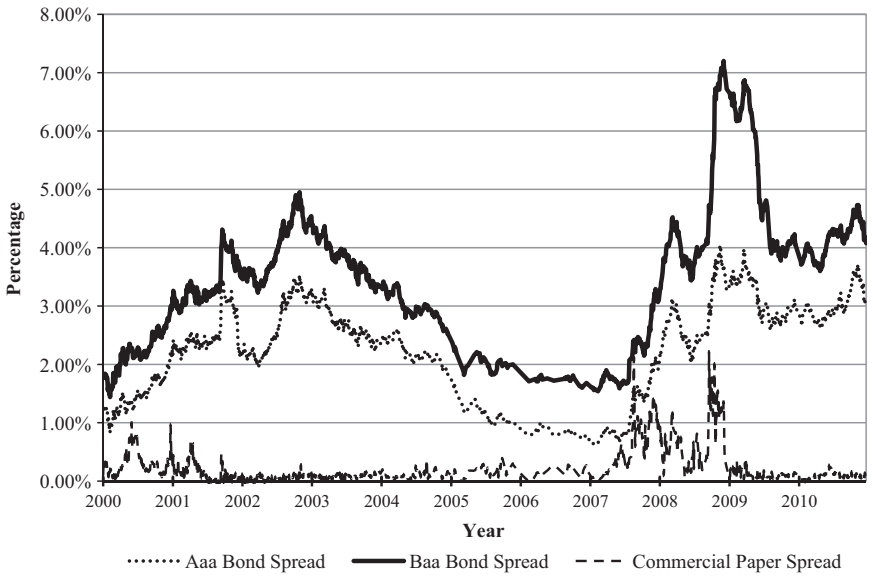

Fig. 1. Time-series of commercial paper and corporate bond spreads. From 2000–2010, the spread of Aaa bonds, Baa bonds, and commercial paper are plotted. Aaa bond spread is calculated as the yield of Moody's Aaa bonds with respect to the 5-year Treasury rate. Baa bond spread is calculated as the yield of Moody's Baa bonds with respect to the 5-year Treasury rate. Commercial paper spread is calculated as the 3-month commercial paper yield for nonfinancial companies with respect to 3-month Treasury rate. The data is obtained from the Federal Reserve (http://www.federalreserve.gov/datadownload/).

3. Sample and data description

Our initial sample includes all firms listed on Compustat from 1990 to 2010. We exclude financial firms and utilities (Standard Industrial Classification (SIC) codes 4900–4949 and 6000–6999) because of their statutory capital requirements and other regulatory restrictions. We also exclude firms with missing data for total assets (Item 6, AT), dividends (Item 21, DVC), and market capitalization (Item 25, CSHO and Item 199, PRCC_F).

We compute share repurchases as the purchase of common and preferred stock (Item 115, PRSTKC) minus any reduction in the value of the net number of preferred stocks outstanding (Item 56, PSTKRV). If the repurchase amount is less than 1% of the previous year's market capitalization, the repurchase amount is set to zero. Dividends are obtained from the Center for Research in Security Prices (CRSP) and are measured as the total amount of regular quarterly dividends declared on the common/ordinary equity of the company for the fiscal year. Total payout is then defined as the sum of dividends and share repurchases. The Appendix contains a complete list of variable names and corresponding calculations.

To illustrate changes in short-term and long-term financing costs, Fig. 1 plots the time-series of commercial paper and corporate bond spreads from 2000 to 2010.[9] Consistent with the onset of the financial crisis in late 2007, commercial paper and corporate bond spreads begin to rise in August 2007. Compared to pre-crisis levels of 0.5%, commercial paper spreads reach levels as high as 2.19% during the financial crisis. Similarly, Brunnermeier (2009) argues that the short-term commercial paper market began drying up in July 2007 as financial institutions became concerned about their "toxic" asset holdings. The data in Fig. 1 also illustrate that increases in spreads during the crisis extend beyond short-term financing instruments. Investment grade (Aaa) bond spreads peak at 4.04% in November 2008 and medium grade (Baa) spreads peak at 7.14% in December 2008.

Fig. 2 plots the Federal Reserve Bank of Chicago's Adjusted National Financial Conditions Index (ANFCI) from 1990 to 2010. ANFCI measures financial conditions uncorrelated with economic conditions, where positive values of ANFCI indicate "tighter" lending conditions than what would be typically suggested by current economic conditions.[10] According to this measure, lending conditions started to tighten in 2008 and continued to reach their highest levels in 2009.

Overall, the data in Figs. 1 and 2 indicate that during the period from late 2007 to 2010, firms experienced a significant increase in short-term and long-term financing

[9] Corporate bond spreads are calculated with respect to the 5-year Treasury rate. Commercial paper spreads are calculated as the 3-month commercial paper yield for nonfinancial companies with respect to the 3-month Treasury rate.

[10] The Federal Reserve Bank of Chicago's National Financial Conditions Index (NFCI) reports the U.S. financial conditions in money markets, debt and equity markets, and banking systems. The NFCI is a weighted average of 105 measures of financial activity, each expressed relative to their sample averages and scaled by their sample standard deviations. Due to the high correlation between economic and financial conditions, the adjusted NFCI (ANFCI) isolates a component of financial conditions uncorrelated with economic conditions to provide an update on financial conditions relative to current economic conditions. The ANFCI removes variation in the individual indicators attributed to economic activity and inflation before computing the index (http://chicagofed.org/webpages/publications/nfci/index.cfm).

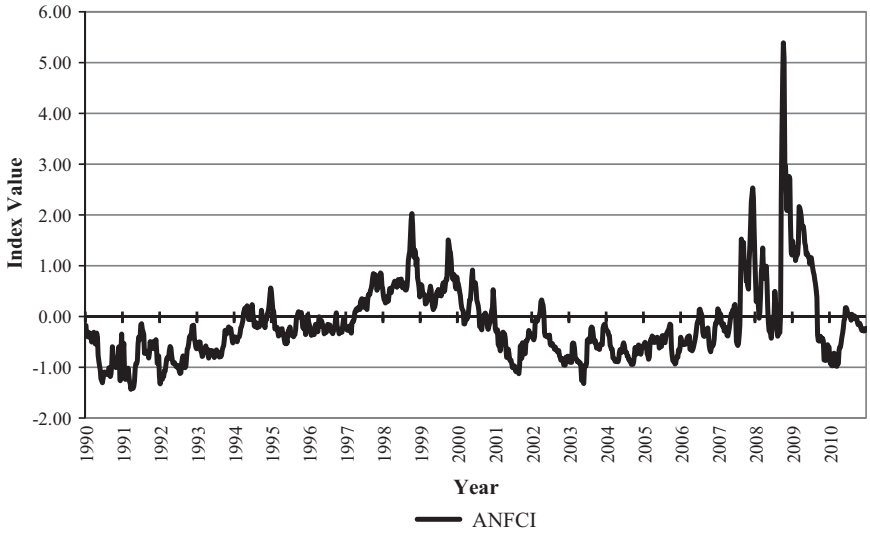

Fig. 2. Time-series of Adjusted National Financial Conditions Index (ANFCI). This figure plots the magnitude of how "tight" or "loose" financial markets are operating given current economic conditions from 1990 to 2010. Positive values indicate that financial conditions are tighter on average than what would be suggested by current economic conditions, while negative values indicate the opposite. Data are obtained from the Web site of the Federal Reserve Bank of Chicago (www.chicagofed.org).

costs and tightened lending conditions. Based on these findings and those of others, we define the crisis period as 2008–2009. In some of our subsequent tests, we compare financial policies during the financial crisis with those during a period prior to the crisis during which there are fewer financing frictions. In these tests, we define the pre-crisis period to be 2005–2006.

4. Changes in corporate payout

4.1. Descriptive evidence

We begin our analysis by reporting the number of firms that pay dividends, repurchase shares, and payouts in both forms during each year between 1990 and 2010. The data, reported in Table 1, indicate that while the proportion of firms that pay dividends remains relatively constant throughout the financial crisis, the proportion of firms that repurchase is much more variable. After a slight increase in the proportion of firms that repurchase shares in 2006–2008, there is a sharp decrease in 2009 from 21% to 12% of the sample firms. We find a similarly sharp decline when we consider the set of firms that both pay dividends and repurchase shares. This set declines from 6.9% of the sample in 2007 to 3.0% in 2009.

To provide further evidence on changes in payouts during the financial crisis, Fig. 3 plots aggregate dividends, repurchases, and total payout over the period from 1990 to 2010. All dollar values are converted to 2004 dollars. The graph indicates that prior to the financial crisis, aggregate payout increases substantially between 2002 and 2007. The increase is mainly driven by the change in aggregate repurchase volume. Fig. 3 shows, however, that this trend is reversed during the financial crisis. During the crisis period, aggregate payout drops dramatically. This drop is driven almost completely by a sharp reduction in share repurchase volume. Fig. 3 shows that aggregate share repurchases decline by 37.1% in 2008 and an additional 65.2% in 2009.[11] By contrast, aggregate dividends change very little between 2007 and 2009. These latter findings are consistent with those of Daniel, Denis, and Naveen (2012) who find that very few firms reduce dividends even when faced with a cash squeeze. Between 2006 and 2009, aggregate dividends actually *increase* by 3.8%, whereas aggregate repurchases decline by 73.9%. As a consequence, aggregate repurchases comprise only 49.4% of total payout in 2009, relative to approximately 80.4% of total payout in 2006 and 2007.

Similarly, Fig. 4 plots the median ratios of dividend-to-earnings, repurchase-to-earnings, and total payout-to-earnings for paying firms in each year from 1990 to 2010. Consistent with the aggregate payout evidence, payout ratios decline substantially during the crisis, with the decline being driven by the reduction in the repurchase-to-earnings ratio. The dividend-to-earnings ratio actually increases during the 2003–2009 period, including the financial crisis. The repurchase-to-earnings ratio is more volatile, experiencing its highest peak in 2007 and its lowest point in 2009 since 2001. Taken together, Figs. 3 and 4 suggest that, at the aggregate level, firms reduce payouts to shareholders during the financial

[11] It is possible that the large reduction in repurchases in 2008 and 2009 represents a reversion back to steady-state levels that existed prior to the large increase in repurchase volume between 2002 and 2007. However, we find that aggregate repurchases increase by 97% in 2010 and another 52% in 2011 before falling by 33% in 2012. Thus, we conclude that the drop in repurchases in 2008–2009 does not represent a return to steady-state levels.

Table 1
Time-series of the percentage of dividend paying and repurchasing firms.

This table reports the percentage of firms that pay dividends, repurchase, or pay dividends and repurchase for the given year. The sample includes all Compustat firms except financial firms and utilities from 1990 to 2010. Dividend payers are firms that have a positive dividend amount in the given year. Repurchasers are firms that have a positive value for share repurchases during the given year. Share repurchases is computed as the purchase of common and preferred stock (PRSTKC) minus any reduction in the value of net number of preferred stocks outstanding (PSTKRV). If the repurchase amount is less than 1% of the previous year's market capitalization, the repurchase amount is set to zero.

Year	Number of firms	Dividend payers	%	Repurchasers	%	Dividend payers and repurchasers	%
1990	5,006	1,086	21.69%	782	15.62%	356	7.11%
1991	5,066	1,055	20.83%	524	10.34%	210	4.15%
1992	5,308	1,084	20.42%	513	9.66%	205	3.86%
1993	5,806	1,098	18.91%	493	8.49%	199	3.43%
1994	6,225	1,123	18.04%	611	9.82%	263	4.22%
1995	6,939	1,134	16.34%	754	10.87%	307	4.42%
1996	7,583	1,110	14.64%	908	11.97%	378	4.98%
1997	7,706	1,069	13.87%	1,101	14.29%	410	5.32%
1998	7,672	1,017	13.26%	1,450	18.90%	459	5.98%
1999	7,904	937	11.85%	1,529	19.34%	449	5.68%
2000	7,913	843	10.65%	1,412	17.84%	428	5.41%
2001	7,482	776	10.37%	1,016	13.58%	244	3.26%
2002	7,095	731	10.30%	918	12.94%	206	2.90%
2003	6,781	808	11.92%	932	13.74%	256	3.78%
2004	6,712	877	13.07%	864	12.87%	301	4.48%
2005	6,576	899	13.67%	1,030	15.66%	372	5.66%
2006	6,587	889	13.50%	1,118	16.97%	426	6.47%
2007	6,512	847	13.01%	1,205	18.50%	448	6.88%
2008	6,196	833	13.44%	1,292	20.85%	399	6.44%
2009	5,974	757	12.67%	735	12.30%	179	3.00%
2010	5,923	774	13.07%	882	14.89%	297	5.01%

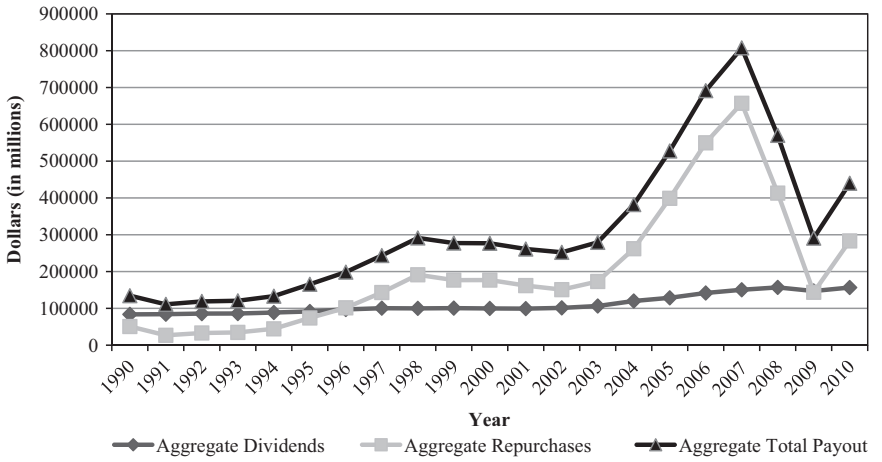

Fig. 3. Time-series of aggregate dividend, repurchases, and total payout. Aggregate dividend, repurchases, and total payout are plotted from 1990 to 2010. All dollar amounts are converted into 2004 dollars using the consumer price index (CPI). The sample contains all Compustat firms except financial and utility firms. Dividends are calculated as the total amount of dividends declared on the common/ordinary capital of the company by fiscal year. Repurchases are calculated as the total expenditures on the purchase of common and preferred stocks (PRSTKC) minus any reduction in the value of net number of preferred stocks outstanding (PSTKRV). If repurchase is less than 1% of the market capitalization, value is set to zero. Total payout is calculated as the sum of dividends and repurchases.

crisis. This reduction is much greater for share repurchases than for dividends. Moreover, the fact that total payout ratios decline during the crisis implies that firms cut shareholder payouts by a greater amount than the decline in earnings during the crisis.

Table 2 further explores payout reductions during the financial crisis by reporting for each year between 1990 and 2010 the percentage of firms that (i) reduce dividends but still pay a positive dividend; (ii) eliminate dividends; and (iii) reduce repurchases by more than 5%. The results indicate that, despite little evidence of decreases in the proportion of firms paying dividends (Table 1) and in aggregate dividends (Fig. 3), there is a significant increase in the percentage of firms that reduce dividends during the financial crisis. During 2008 and 2009, 9.1% and 15.0% of dividend paying firms reduce their dividend per share, compared to 3.2% in 2005 and 2006. Moreover, the percentage of firms that eliminate dividends increases to

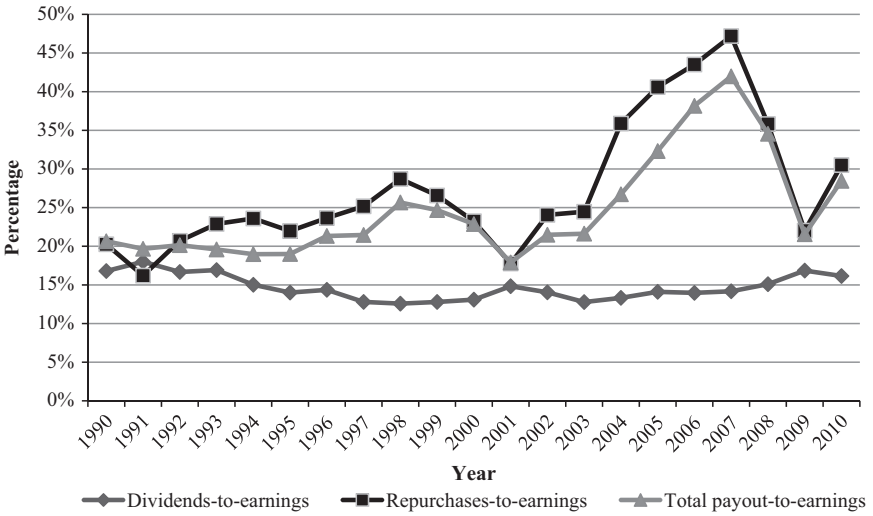

Fig. 4. Time-series of payout ratios. The median dividend-to-earnings, repurchase-to-earnings, and total payout-to-earnings ratios for paying firms are plotted from 1990 to 2010. All Compustat firms are included except financial and utility firms. Dividends are calculated as the total amount of dividends declared on the common/ordinary capital of the company. Repurchases are calculated as the total expenditures on the purchase of common and preferred stocks (PRSTKC) minus any reduction in the value of net number of preferred stocks outstanding (PSTKRV). If repurchase is less than 1% of the market capitalization, value is set to zero. Total payout is calculated as the sum of dividends and repurchases. Earnings are defined earnings before interest and taxes (EBIT).

10.5% in 2009, as compared to 1.9% and 3.3% in 2005 and 2006.[12]

Because firms do not typically repurchase annually, it is more difficult to make year-to-year comparisons of repurchasing activity at the firm level. Therefore, for each repurchase, we compare the repurchase amount for the current fiscal year to the average repurchase amount from the previous two fiscal years. The sporadic repurchasing behavior causes the percentage of firms that reduce repurchasing to be much larger and more volatile than that of dividends. Nonetheless, over the 20-year time span, fiscal year 2009 experiences the largest percentage of firms that reduce their repurchasing activity (89.2%).[13]

Finally, there is indirect evidence that among the 603 firms that both pay dividends and repurchase shares in the pre-crisis period (2005–2006), repurchases are cut prior to dividends being cut. Specifically, of the 603 firms, 410 (68%) reduce repurchases, but not dividends, 161 (27%) reduce both dividends and repurchases during the crisis, five (1%) reduce dividends, but not repurchases, and 27 (4%) reduce neither. Put differently, among the 166 firms that reduce dividends, 161 (97%) also reduce repurchases, while among the 437 firms that do *not* reduce dividends, 410 (94%) reduce their repurchases. (These results are not tabulated). We also identify 76 firms that reduced dividends in 2009, but did not reduce dividends in either 2007 or 2008. Among these 76 firms, 16 reduced repurchases in late 2007, 56 reduced repurchases in 2008, and four reduced repurchases in 2009. Overall, therefore, these patterns support the idea that when cutting payout, firms first cut repurchases, then cut dividends if further payout reductions are still necessary.[14]

4.2. Determinants of payout reductions

To understand the determinants of payout reduction at the firm level, we estimate logit models of whether firms reduce total payout, dividends, or repurchases during the 2005–2009 period. For any given year in 2005–2009, any firm with a positive average payout amount from the previous two years is included in the sample. We then estimate the likelihood of a payout reduction as a function

[12] If anything, our dividend measure understates the incidence of dividend reductions because we include only regular quarterly dividends and count as a reduction only those cases in which the total regular quarterly dividend decreases and there is a decrease in the dividend per share. If we include extra dividends along with regular quarterly dividends and measure dividend reductions as any decline in the aggregate dividend paid by the company, we observe a greater frequency of dividend reductions, but similar overall patterns. Specifically, we find that the percentage of firms that reduce their dividend increases from 12.8% and 10.4% in 2005 and 2006 to 20.2% and 24.5% in 2008 and 2009. Similarly, the percentage of firms that eliminate all dividends increases from 4.6% and 6.2% in 2005 and 2006 to 7.7% and 13.7% in 2008 and 2009.

[13] Our results are nearly identical if we place no minimum size limit on the repurchase reduction or if we measure 'net' share repurchases as the difference between share repurchases and share issuances. Kahle and Stulz (2013) report findings consistent with ours in that they document a significant rebound in net equity issues (issuance – repurchase) in 2009.

[14] In untabulated results, we also analyze the factors that drive the decision to cut repurchases rather than dividends. In conducting such an analysis, we would ideally compare firms reducing repurchases, but not dividends with those that reduce dividends, but not repurchases. However, since the latter group consists of only five firms, we instead examine what drove firms to reduce both repurchases and dividends instead of only reducing repurchases. We find that firms with higher leverage, less cash flow, and lower stock returns are more likely to also cut dividends in the financial crisis. In other words, consistent with prevailing wisdom, it is the firms facing the greatest financial difficulties and exhibiting the poorest performance that cut dividends (in addition to cutting repurchases). This reinforces the view that in managing internal resources during the crisis, firms first reduce repurchases, then cut dividends only if necessary.

Table 2
Time-series of the percentage of firms reducing payout.

This table reports the percentage of firms that reduce dividends, eliminate dividends, and reduce repurchases for the given year. The sample includes all Compustat firms except financial firms and utilities from 1990 to 2010. Firms are classified as reducing dividends if they have a positive dividend payout in the prior year and reduced dividend payout by less than 100% during the given year. Firms that have positive dividend payout in the prior year and have zero dividend payout in the given year are classified as firms that eliminate dividends. Firms are classified as repurchasing firms if they have a positive two-year average repurchase amount. Repurchases are calculated as the total expenditures on the purchase of common and preferred stocks (PRSTKC) minus any reduction in the value of net number of preferred stocks outstanding (PSTKRV). If repurchase is less than 1% of the market capitalization, value is set to zero. If repurchasing firms reduce repurchasing by 5% or more from their previous two-year average repurchase amount, firms are classified as reducing repurchases.

Year	Number of firms	Reduced dividends	Eliminated dividends	Reduced repurchases
1990	5,006	5.35%	4.78%	72.18%
1991	5,066	8.26%	6.10%	85.03%
1992	5,308	7.37%	4.59%	81.81%
1993	5,806	7.15%	4.80%	79.10%
1994	6,225	3.81%	4.74%	70.84%
1995	6,939	6.20%	3.05%	68.76%
1996	7,583	5.60%	3.67%	63.63%
1997	7,706	4.95%	3.90%	62.32%
1998	7,672	5.18%	2.99%	58.99%
1999	7,904	7.99%	4.15%	65.02%
2000	7,913	8.28%	6.21%	68.47%
2001	7,482	10.33%	5.79%	81.78%
2002	7,095	6.19%	7.64%	77.27%
2003	6,781	4.32%	2.65%	71.02%
2004	6,712	2.53%	2.02%	66.56%
2005	6,576	3.24%	1.92%	57.12%
2006	6,587	3.15%	3.26%	52.08%
2007	6,512	3.75%	3.15%	52.24%
2008	6,196	9.12%	3.28%	65.48%
2009	5,974	14.98%	10.48%	89.16%
2010	5,923	4.05%	4.86%	71.37%

of several firm characteristics, a dummy variable denoting the crisis period, and the interaction of the crisis period dummy with various firm characteristics associated with costly external finance. We expect that firms that are more susceptible to the credit supply shock of the crisis period will be more likely to use payout reductions as a substitute source of funds. In addition, we also include the interaction of the crisis period dummy with lagged investment and contemporaneous cash flow to further test the impact of a crisis-period demand shock on the likelihood of payout reductions. Specifically, we estimate the following model:

$$\begin{aligned}\text{Payout reduction}_{i,t} &= \beta_1 + \beta_2(\text{Age})_{i,t-1} + \beta_3(\text{Log(assets)})_{i,t-1} \\ &+ \beta_4(\text{Losses})_{i,t-1} + \beta_5\left((\text{R\&D}+\text{CapEx})/\text{TA}\right)_{i,t-1} \\ &+ \beta_6(\text{Market leverage})_{i,t-1} + \beta_7\left(\text{Cash flow}/\text{Lag TA}\right)_{i,t} \\ &+ \beta_8\left(\text{Cash}/\text{TA}\right)_{i,t-1} + \beta_9(\text{Tobin's Q})_{i,t} + \beta_{10}(\text{Volatility})_{i,t-1} \\ &+ \beta_{11}(\text{Cash flow volatility})_{i,t} + \beta_{12}\left(\text{Total payout}/TA\right)_{i,t-1} \\ &+ \beta_{13}(\text{Payout reduction})_{i,t-1} + \beta_{14}(\text{Financial crisis})_{i,t} + \\ &+ \beta_{15}(\text{Financialcrisis}*\text{Marketleverage})_{i,t-1} \\ &+ \beta_{16}(\text{Financial crisis}*\text{Cash}/\text{TA})_{i,t-1} \\ &+ \beta_{17}(\text{Financial crisis}*\text{Tobin's } Q)_{i,t} \\ &+ \beta_{18}(\text{Financial crisis}*\text{Cash flow}/\text{Lag } TA)_{i,t} \\ &+ \beta_{19}(\text{Financial crisis}*((R\&D+\text{CapEx})/\text{TA})_{i,t-1} \\ &+ \text{Industry fixed effects} + \mu_{i,t}. \end{aligned} \quad (1)$$

We expect the likelihood of a payout reduction to be positively associated with the company's investment opportunities, volatility, and the existence of negative earnings, but negatively associated with cash flow, cash balance, and firm size. We also control for serial dependence in payout reductions by including a dummy variable equal to one if the firm had a reduction in payout in the prior fiscal year.

The financial crisis dummy tests whether the likelihood of a payout reduction increases during the crisis period after controlling for other determinants of payout reductions. The first set of interaction terms tests whether the impact of the crisis on the likelihood of payout reductions is stronger for firms that would appear, ex ante, to be more susceptible to the effects of a credit supply shock; specifically, firms with higher leverage, lower cash balances, and more profitable investment opportunities. The second set of interaction terms tests whether the demand shock during the crisis period reduces the need for funds and, therefore, attenuates the associations between payout reductions and investment, and payout reductions and cash flow.

Table 3 reports marginal effects for each variable along with robust standard errors in parentheses. The mean interaction term effects are reported using the Norton, Wang, and Ai (2004) method. Consistent with our expectations, the results in columns 1, 2, and 3 of Table 3 indicate that the likelihood of reductions in total payout, dividends, and repurchases is positively associated with leverage, the existence of negative earnings, and the existence of a payout reduction in the prior year, and is negatively related to cash flow and firm size.

Our primary interest is in the coefficient on the financial crisis dummy and the interaction of this variable with measures of the firm's susceptibility to the credit supply shock. Consistent with our results in Table 2, we find in column 1 that the likelihood of a reduction in total payout is significantly greater during the financial crisis. More importantly, we find that the impact of the crisis on the likelihood of a payout reduction is significantly greater for firms with higher leverage, lower cash balances, and higher Tobin's *Q*. We find qualitatively identical results on the interaction terms for reductions in repurchases. Finally, we find that dividend reductions are more likely during the crisis and that the impact of the crisis on the likelihood of a dividend cut is significantly greater for high leverage firms. However, for dividend cuts, the interaction terms involving cash and Tobin's *Q* are statistically insignificant.[15]

[15] We find similar results if we estimate ordinary least squares regressions in which the dependent variable is the percentage change in payout. In addition, our results are robust to a broader definition of repurchase reductions. Specifically, because some firms may repurchase shares only very occasionally, the two-year window that we use to define the prior repurchase level might not be long enough. In untabulated results, we replicate our tests but include any firm that has repurchased shares at least once within the last ten years as a repurchaser. The results are qualitatively identical.

Table 3
Logit regression of payout reduction.

This table reports the marginal effects from the logit regression of payout reductions in 1999–2003 and 2005–2009. The sample includes all firms who have a positive payout average from the previous two years. For total payout and repurchases, the dependent variable is equal to one if the payout decreases 5% or more from the previous two-year average payout, zero otherwise. For dividends, the dependent variable is equal to one if the dividend amount decreases from the previous year's dividend amount. Crisis is a binary variable equal to one if fiscal year is 2001, 2008, 2009, has a fiscal year end date in 2008, zero otherwise. Independent variables are lagged except contemporaneous Cash flow/Lag TA and Tobin's *Q*. Industry fixed effects are based on the Fama-French 48-industry definitions. Payout Reduction is a binary variable equal to one if the firm had a reduction in payout in the prior year. The mean interaction term effects are reported using the Norton, Wang, and Ai (2004) method. *F*-statistics (*p*-value) are reported in columns 7–9. All independent variables are winsorized at the 1% and 99% level. Standard errors (in parentheses) are heteroskedasticity-robust and clustered by firm. Please see the Appendix for variable definitions. ***,**, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	2008–2009 Financial crisis			2001 Recession			*F*-stat (difference)		
	Reduction in total Payout	Reduction in dividends	Reduction in repurchases	Reduction in total payout	Reduction in dividends	Reduction in repurchases	Total payout (4-1)	Dividends (5-2)	Repurchases (6-3)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Firm age	−0.001**	−0.000	0.001	−0.002***	0.000	−0.000			
	(0.001)	(0.000)	(0.001)	(0.001)	(0.003)	(0.000)			
Log(Assets)	−0.013***	−0.013***	−0.041***	−0.021***	−0.016***	−0.020***			
	(0.005)	(0.002)	(0.005)	(0.004)	(0.003)	(0.004)			
Losses	0.016**	0.014***	0.006	0.032***	0.032***	0.027***			
	(0.007)	(0.003)	(0.009)	(0.007)	(0.005)	(0.007)			
(R&D+CapEx)/TA	0.879***	0.177**	0.803***	0.550***	0.151**	0.310***			
	(0.145)	(0.077)	(0.159)	(0.094)	(0.071)	(0.083)			
Market leverage	0.310***	0.128***	0.429***	0.246***	0.141***	0.229***			
	(0.067)	(0.033)	(0.085)	(0.038)	(0.025)	(0.036)			
Cash flow/TA	−0.883***	−0.399***	−0.583***	−0.729***	−0.531***	−0.551***			
	(0.128)	(0.095)	(0.119)	(0.088)	(0.084)	(0.073)			
Cash/TA	0.004	0.008	−0.069	−0.081	−0.132***	−0.105**			
	(0.073)	(0.043)	(0.073)	(0.053)	(0.051)	(0.045)			
Tobin's *Q*	−0.151***	0.012	−0.123***	−0.019	0.006	0.013			
	(0.022)	(0.015)	(0.019)	(0.013)	(0.014)	(0.011)			
Volatility	0.910***	0.166***	1.191***	0.252**	0.347***	0.195*			
	(0.184)	(0.066)	(0.225)	(0.115)	(0.082)	(0.108)			
Cash flow volatility	0.286**	0.149**	0.151	0.195	0.416***	0.036			
	(0.130)	(0.074)	(0.125)	(0.130)	(0.136)	(0.100)			
Total payout/TA	3.271***	0.270***	1.754***	2.616***	0.522***	0.888***			
	(0.172)	(0.047)	(0.123)	(0.177)	(0.072)	(0.099)			
Payout reduction	0.319***	0.037***	0.210***	0.229***	0.037***	0.159***			
	(0.014)	(0.008)	(0.015)	(0.011)	(0.009)	(0.011)			
Crisis	0.111**	0.088**	0.076	0.231***	0.041	0.218***	3.340	1.640	8.090
	(0.053)	(0.040)	(0.055)	(0.044)	(0.051)	(0.034)	(0.067)	(0.199)	(0.005)
Crisis*Market leverage	0.144**	0.256**	0.147	−0.064	0.099	−0.169***	3.820	0.080	5.250
	(0.071)	(0.133)	(0.112)	(0.067)	(0.085)	(0.067)	(0.050)	(0.774)	(0.022)
Crisis*Cash/TA	−0.340***	−0.047	−0.375***	−0.273***	−0.218	−0.241**	0.220	0.330	0.180
	(0.084)	(0.090)	(0.097)	(0.098)	(0.234)	(0.097)	(0.642)	(0.568)	(0.672)
Crisis*Tobin's *Q*	0.076***	−0.038	0.114***	−0.030	0.041	−0.036*	12.100	1.910	15.860
	(0.027)	(0.030)	(0.028)	(0.022)	(0.051)	(0.020)	(0.001)	(0.167)	(0.000)
Crisis*Cash flow	−0.003	−0.560	−0.097	0.300**	−0.321	0.367***	0.250	1.740	0.470
	(0.132)	(0.409)	(0.166)	(0.132)	(0.391)	(0.132)	(0.615)	(0.188)	(0.494)
Crisis*(R&D+CapEx)/TA	−0.543***	−0.098	−0.528***	−0.375***	−0.420*	−0.232*	2.710	0.290	2.500
	(0.148)	(0.175)	(0.190)	(0.150)	(0.243)	(0.137)	(0.099)	(0.592)	(0.114)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes			
Pseudo R^2	0.219	0.356	0.183	0.135	0.307	0.114			
Obs.	6,886	4,057	5,020	7,866	3,970	6,004			

Although these findings are consistent with the view that firms that are more susceptible to an external financing shock are more likely to adjust discretionary payouts during the financial crisis as a substitute source of funds, it is possible that our findings could be explained by a demand shock. Specifically, firms might be more likely to cut payouts during any recession and this likelihood may be higher for firms with higher leverage and lower cash balances going into the recession. Payout reductions might also be more likely for high-growth firms if those firms experience the largest demand shocks.

It is useful, therefore, to conduct a similar analysis over the 1999–2003 period. During this period, the economy experienced recession in 2001 (as defined by the National Bureau of Economic Research (NBER)), but did not experience an external financing shock. In columns 4, 5, and 6, we replicate our tests on the 1999–2003 period, but now define the 'Crisis' dummy to be equal to one in 2001 and

zero otherwise. For this period, we find different results. Not surprisingly, the likelihood of a payout reduction is higher during the 2001 recession than in other years during the 1999–2003 period. However, unlike the recent financial crisis, we find no evidence that more highly levered firms or firms with higher Tobin's *Q* are more likely to cut payouts during the recession. Similar to the recent financial crisis, we do find that firms with higher cash balances are less likely to cut payouts during the 2001 recession. (Columns 7, 8, and 9 report the significance of the differences in the coefficients.) We conclude from this analysis that payout policy decisions of firms during the 2008–2009 financial crisis are more consistent with firms using payout reductions as an alternative source of funds in response to increased financing frictions during the crisis.

Finally, we test for the impact of demand shocks on the likelihood of payout reductions by including the interaction of the crisis dummy with lagged investment and with contemporaneous cash flow. In non-recession years, investment is persistent, so the likelihood of a payout reduction is positively associated with lagged investment and negatively associated with cash flow. However, if the crisis is associated with a demand shock, there will be a significant reduction in expected investment and, therefore, the demand for funds for investment. This reduced need for funds should lead to a significant attenuation of the associations between lagged investment and payout reductions and between cash flow and payout reductions. Consistent with such a demand shock, we find that both associations are significantly attenuated during the 2001 recession. We find similar evidence of a significant reduction in the association between lagged investment and payout reductions during the 2008–2009 crisis period. These findings are consistent with a demand shock effect on payouts during the crisis. By contrast, we do not observe a significant attenuation in the negative association between cash flow and payout reductions during the 2008–2009 crisis. One possible explanation is that supply effects are also present during the crisis so that firms with lower cash flow are still more likely to use payout reductions as a source of funds despite the large demand shock.

4.3. Payout reductions and changes in external finance

If increased financing frictions during the crisis lead some firms to turn to payout reductions as a substitute source of funds, we expect an association between changes in payout and changes in the frequency of external financing. To provide evidence on this issue, Table 4 reports changes in net debt issuance (Panel A) and changes in gross equity issuance (Panel B) between the pre-crisis period (2005–2006) and the crisis period (2008–2009) for subsamples based on whether or not the firm reduced payout during the crisis. For dividend payers, we include firms that had a positive dividend payout in the year prior to the crisis, while for repurchasers we include firms that had positive repurchases over the prior two-year period. Net debt issuance is defined as the change in long-term debt (dltt) and debt in current liabilities (dlc) divided by the lagged book value of total assets. Gross equity issuance is defined as aggregate equity issuance (sstk) divided by the lagged book value of total assets. We focus on gross, rather than net equity issuance because net issuance is confounded by the repurchase of shares.

The results in Panel A indicate that firms that reduce dividends or share repurchases during the crisis exhibit a significant reduction in net debt issuance over the same period. Moreover, this reduction in debt financing is significantly greater than that of firms that do not reduce dividends or share repurchases. By contrast, our findings in Panel B show little evidence of differences in gross equity issuance behavior between firms reducing payout and those not reducing payout. We observe that firms reducing repurchases actually exhibit a smaller average reduction in gross equity issues than that of firms not reducing repurchases. However, this appears to be driven by outliers; there is no significant difference in median changes in gross equity issues. Similarly, among dividend payers, both those firms that do not reduce dividends and those that do exhibit significant reductions in gross equity issuance; the differences are statistically insignificant.

5. Payout reductions as a source of funds

Our previous findings indicate that during the financial crisis, firms exhibit an increased propensity to retain cash flow rather than pay it out to shareholders. In this section, we explore how firms use the funds that would otherwise have been paid out to shareholders. We first document the magnitude of cash savings from payout reductions and compare this magnitude with levels of cash and investment. We then investigate whether changes in cash reserves and investment are consistent with payout reductions being used as a source of funds.

5.1. Cash savings from payout reductions

In Table 5, we report evidence on the magnitude of the cash savings from payout reductions relative to levels of current cash holdings and investment. As previously reported in Bates, Kahle, and Stulz (2009), dividend paying firms tend to hold less cash than repurchasers. Consistent with this evidence, firms that reduce dividends in our sample exhibit median cash-to-assets ratios of 4.4% in the year prior to the crisis, while those firms reducing repurchases exhibit median cash-to-assets ratios of 10.7%.

In the first row of Table 5, we show that among firms reducing dividends or repurchases (or both), the median reduction amounts to cash savings of $34.0 million. These savings are economically meaningful; they represent 31% of the firm's 2007 cash balance and 53% of its 2007 level of capital expenditures and research and development (R&D) expenditures.

Similarly, we find large savings if we restrict the sample to either those firms that just reduce dividends or those that just reduce repurchases. For dividend reducers, the median savings is $11.4 million, which amounts to 22% of the company's cash balance and 24% of its combined capital expenditures and R&D. For firms that reduce repurchases, the median savings is $31.7 million, which amounts to 29% of the company's cash balance and 50% of its level of investment.

Table 4
Net debt and gross equity issuance.

Panel A shows the average (median) net debt issuances during the Pre-crisis and Crisis for subgroups of firms that either reduced repurchases or dividends or did not reduce repurchases or dividends during the financial crisis. Net debt issuance is calculated as the change in long-term debt (dltt) and debt in current liabilities (dlc) divided by lagged assets. Panel B shows the average (median) gross equity issuances during the Pre-crisis and Crisis for subgroups of firms that either reduced repurchases or dividends or did not reduce repurchases or dividend during the financial crisis. Gross equity issuance is calculated as the aggregate equity issuance (sstk) divided by lagged assets. The sample includes all Compustat firms between 2005 and 2011 except financial firms and utilities that have positive payouts in the prior fiscal year. Pre-crisis is defined as the average from fiscal years 2005 and 2006. Crisis is defined as the average from fiscal years 2008 and 2009. Post-crisis is defined as the average from fiscal years 2010 and 2011. Crisis–Pre–crisis is computed by taking the average from 2008 to 2009 and then subtracting the average from 2005 to 2006 for each firm. Firms that had a positive dividend payout in the prior year and had (did not have) reductions in the dividend amount during the financial crisis are classified as Reduced (Do not reduce). Firms that had a positive repurchase average from the prior two fiscal years and have (do not have) repurchase reductions greater than 5% during the financial crisis are classified as Reduced (Do not reduce). All variables are winsorized at the 1% and 99% level. ***,**, or * indicates significant at the 1%, 5%, or 10% levels, respectively.

	Reduce	Do not reduce	*t*-Statistic (*p*-value)	Kruskal–Wallis statistic (*p*-value)
Panel A: Net debt issuances				
Repurchases:				
Pre-crisis	0.027	0.014	1.181	2.692
	(0.000)	(0.000)	(0.238)	(0.101)
	$N=1{,}417$	$N=98$		
Crisis	−0.001	0.004	−0.684	0.125
	(0.000)	(0.000)	(0.493)	(0.724)
	$N=1{,}417$	$N=98$		
Crisis–Pre-crisis	−0.028***	−0.011	−1.322	2.960
	(−0.000)	(0.000)	(0.186)	(0.085)
	$N=1{,}417$	$N=98$		
Dividends:				
Pre-crisis	0.032	0.020	−1.979	1.607
	(0.000)	(0.000)	(0.048)	(0.205)
	$N=243$	$N=560$		
Crisis	−0.014	0.006	4.840	23.624
	(−0.007)	(0.000)	(0.000)	(0.000)
	$N=243$	$N=560$		
Crisis - Pre-crisis	−0.046***	−0.014***	4.101	14.039
	(−0.015)	(0.000)	(0.000)	(0.000)
	$N=243$	$N=560$		
Panel B: Gross equity issuance				
Repurchases:				
Pre-crisis	0.046	0.103	−3.937	5.992
	(0.012)	(0.019)	(0.000)	(0.014)
	$N=1{,}414$	$N=112$		
Crisis	0.012	0.014	−0.984	4.264
	(0.003)	(0.005)	(0.325)	(0.039)
	$N=1{,}414$	$N=112$		
Crisis–Pre-crisis	−0.035***	−0.089***	3.827	1.574
	(−0.006)	(−0.006)	(0.000)	(0.209)
	$N=1{,}414$	$N=112$		
Dividends:				
Pre-crisis	0.021	0.018	−0.755	11.643
	(0.006)	(0.009)	(0.450)	(0.001)
	$N=227$	$N=549$		
Crisis	0.006	0.008	1.348	51.371
	(0.001)	(0.003)	(0.178)	(0.001)
	$N=227$	$N=549$		
Crisis–Pre-crisis	−0.014***	−0.011***	1.193	0.002
	(−0.005)	(−0.005)	(0.233)	(0.967)
	$N=227$	$N=549$		

To provide additional perspective on the magnitude of the cash savings from payout reductions, we also compute pro forma 2010 cash and investment levels. Following a process similar to that in DeAngelo, DeAngelo, and Stulz (2010), we calculate 2010 pro forma cash-to-asset ratios and pro forma investment-to-total asset ratios for firms that reduce payout during the crisis period. To calculate these pro forma ratios, we assume that the firms did *not* reduce payout during the crisis, but maintained all other operating and financing decisions. For example, to compute pro forma 2010 cash, we assume that the company made its actual operating and financing decisions in 2010,

Table 5
Actual and pro forma ratios.

This table reports the median cash-to-total assets, median R&D and CapEx-to-total assets, pro forma cash-to-total assets, and pro forma R&D and CapEx-to-total assets ratios surrounding the financial crisis for firms that reduce dividends, repurchases, and total payout. The sample includes all Compustat firms except financial and utility firms that have a positive payout. For Reduced dividends in crisis, the firm must have a positive dividend payout in the prior year and reduce dividend amount during the financial crisis. For Reduced repurchases in crisis, the firms must have a positive payout average from the prior two fiscal years and have a repurchase reduction greater than 5% from the prior two fiscal years' repurchase average during the financial crisis. For Reduced total payout in crisis, firms must have a positive payout average from the prior two fiscal years and have a total payout reduction greater than 5% from the prior two fiscal years' total payout average during the financial crisis. Financial crisis is classified as fiscal year 2008, 2009, and fiscal year end dates that end in 2008 calendar year. If a firm has a reduction during the financial crisis and has a fiscal year end date that ends in 2008, cash savings from reduction is scaled by fiscal year 2006. Pro forma values of cash-to-total assets are the values if the firm had not reduced dividends, repurchases, or total payout and all operating and other financing decisions remain unchanged. Pro forma values of R&D and CapEx-to-total assets are the values if the cash savings in payout reduction is subtracted from future R&D and CapEx and all operating and other financing decisions remain unchanged.

	Reduced dividend in crisis	Reduced repurchase in crisis	Reduced total payout in crisis
Median cash savings from reduction ($mill.)	11.358	31.744	33.981
Median cash/TA (2007)	0.044	0.107	0.103
Median cash savings from reduction/TA in 2007	0.011	0.029	0.031
Median cash savings from reduction/Cash in 2007	0.223	0.291	0.313
Median cash savings from reduction/R&D & CapEx in 2007	0.238	0.500	0.529
Median pro forma Cash/TA in 2010	0.071	0.092	0.090
Median actual Cash/TA in 2010	0.089	0.132	0.131
Percent with pro forma Cash/TA $\leq$ 0 in 2010	16.60%	17.91%	18.95%
Median pro forma R&D+CapEx/TA in 2010	0.019	0.018	0.018
Median R&D+CapEx/TA in 2010	0.033	0.051	0.051
Percent with pro forma R&D+CapEx/TA $\leq$ 0 in 2010	30.29%	35.95%	36.38
Number of observations	241	1,552	1,546

but did not have the cash savings from the payout reduction. Similarly, for pro forma investment (capital expenditures+R&D), we assume that the firm made its actual operating and financing decisions, but did not have the cash savings from the payout reductions available for investment.

As shown in Table 5, the median pro forma cash-to-asset ratio is 0.090 for the firms that reduce total payout. This is substantially lower than the firm's actual cash-to-total asset ratio of 0.131 in 2010. Perhaps more importantly, we show that without the cash savings from the payout reduction, nearly 19% of the payout reducers would have been unable to implement their chosen operating plans without running out of cash. The results are similar for the subsamples of firms that reduce dividends and that reduce repurchases separately.

Similarly, when we compute pro forma investment rates, we observe a median pro-forma ratio of investment-to-total assets of 0.018, well below the median actual investment rate of 0.051. Conditional on their chosen financing plans, over 36% of the firms would have been unable to undertake any capital expenditures or R&D without the cash savings from the payout reductions. Again, the results are similar for the subsamples of firms that reduce dividends and those that reduce repurchases.

Taken together, the findings in Table 5 imply that the payout reductions are economically large enough to have a meaningful impact on the firm's cash reserves or investment policy. Put differently, for the firm to have followed its chosen liquidity and investment policies in the absence of payout reductions, it would have had to access external financing that was particularly costly during the crisis period.

5.2. Cash holdings over time

The precautionary motive for holding cash asserts that in the presence of costly external financing, firms hold cash as a buffer against adverse shocks to cash flows. To the extent that the financial crisis represents an exogenous shock to the cost and supply of finance or to general uncertainty, the precautionary motive predicts that firms should react to such a shock by building up their cash reserves. Alternatively, it is possible that firms turn to reductions in cash balances along with payout reductions as sources of funds during a period of restricted supply of credit. To explore these possibilities, we examine whether firms increase their cash holdings despite deteriorating credit conditions and declining earnings during the crisis.

Fig. 5 plots the median cash-to-assets ratio from 1990–2010 for the full sample, as well as subsamples of dividend paying firms and repurchasing firms. Consistent with the findings in Bates, Kahle, and Stulz (2009), the sample firms exhibit an increase in cash holdings between 1990 and 2005, with median cash-to-assets ratios increasing from 6% of total assets in 1990 to over 14% of total assets in 2005. Between 2005 and 2008, there is a slight dip in cash holdings, but median cash-to-assets ratios exhibit a sharp increase during the crisis year of 2009.[16] For dividend payers and repurchasers, the median cash-to-assets ratio starts to increase in 2008 and dramatically spikes during

[16] Kahle and Stulz (2013) also report a sharp increase in cash holdings from the second quarter of 2009 through the first quarter of 2010.

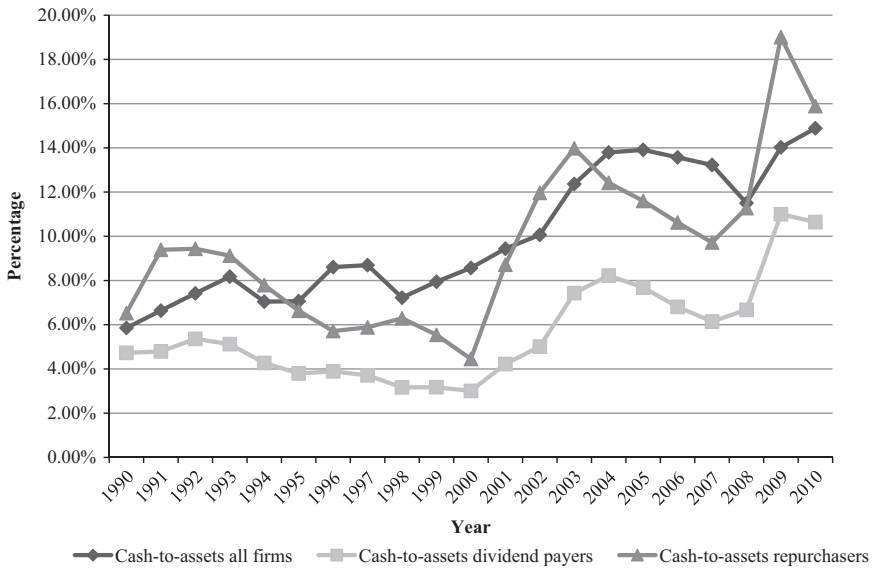

Fig. 5. Time-series of cash-to-total assets. The median cash-to-total assets for all firms, dividend payers, and repurchasers are plotted from 1990 to 2010. All Compustat firms are included except financials and utility firms. Dividend payers are those firms who have a positive dividend payout for the given year. Repurchasers are firms with a positive repurchase amount for the given year. Cash-to-assets is defined as cash and short-term investments (CHE) divided by total assets (AT).

2009. Consistent with payout reductions being most prevalent among repurchasing firms, the increase in cash balance is greatest for repurchasing firms; increasing by 8.5% and 64.8% in 2008 and 2009. It appears, therefore, that firms respond to increased external financing frictions and uncertainty during the crisis by increasing their cash holdings.

5.3. The association between cash balances and payout reductions

In Table 6, we test directly the association between the cash savings from payout reductions and cash reserves. We are interested in the extent to which firms use payout reductions as a means of building cash reserves during the crisis period. Towards this end, for the sample of firms with positive average payout in 2005–2006, we estimate multivariate panel regressions over the period 2005 to 2009, in which the dependent variable is the firm's ratio of cash and short-term assets-to-lagged total assets. The regressions control for investment opportunities (Tobin's *Q*), contemporaneous cash flow, leverage, and firm fixed-effects. Our primary variables of interest are *Cash savings from payout*, a continuous variable that is the previous payout minus current payout, and then scaled by lagged total assets, *Financial crisis*, a binary variable that is set to one if observations are in fiscal years 2008, 2009, or if their fiscal year ends in 2008 calendar time, and zero otherwise, and the interaction of these two binary variables. Specifically, the model is specified as follows:

$$\begin{aligned}\text{Cash and short}-\text{term assets}-\text{to}-\text{lag total assets}_{i,t} &= \beta_1+\beta_2(\text{Financial crisis})_{i,t}\\ &+\beta_3(\text{Cash savings from payout})_{i,t}\\ &+\beta_4(\text{Financial crisis}*\text{Cash savings from payout})_{i,t}\\ &+\beta_5(\text{Tobin's } Q)_{i,t}+\beta_6(\text{Cash flow/Lag TA})_{i,t}\\ &+\beta_7(\text{Market leverage})_{i,t-1}+\text{firm fixed effects}+\mu_{i,t}.\end{aligned} \quad (2)$$

The results of the model in columns 1, 3, and 5 indicate that, after controlling for investment opportunities, contemporaneous cash flow, leverage, cash savings from payout reductions, and firm fixed effects, cash balances are reduced, on average, during the financial crisis period for the total payout and repurchase samples, but unchanged in the dividend sample. Similarly, the coefficient on *Cash savings from payout* is positively associated with cash balances for total payout and repurchases, but insignificant for dividend paying firms. This finding is consistent with the general view that dividends are cut as a last resort when cash flows are poor and that during such times, firms are not building cash reserves.

In columns 2, 4, and 6, we include the interaction term of *Cash savings from payout* and *financial crisis* to test whether the impact of the cash savings from payout reductions on cash reserves is different during the financial crisis. The coefficient on the interaction term is significantly positive for total payout, dividends, and repurchases. These findings suggest that, all else equal, cash savings from payout reductions have a greater positive impact on cash reserves in the crisis period than in prior years. The findings in column 2 imply that for every dollar of cash savings from a payout reduction during the crisis, the company's cash balance is increased by $0.228 (0.244–0.016). With a median cash savings from payout reductions equal to $34 million, or 3.1% of total assets, the implied change in cash translates into a change in the firm's cash ratio of 0.007 ($0.228 \times 3.1\%$). This compares with median cash-to-total assets ratio of 0.131. The results

Table 6
Cash holdings before and during the crisis.

This table reports estimates from panel regressions explaining firm-level cash reserves from 2005 to 2009 for firms with a positive payout average in 2005–2006. Dependent variable is calculated as cash and short-term assets-to-lagged total assets. Financial crisis is a binary variable if fiscal year is 2008, 2009, or has a fiscal year end date in 2008, zero otherwise. Cash savings from payout is the previous payout minus current payout, and then scaled by lagged total assets. Previous payout is calculated as the average total payout from the prior two years for total payout, the average repurchase amount from the prior two years for repurchases, and prior year's dividend amount for dividends. Market leverage is the lag of the sum of long-term and current liabilities-to-market capitalization. Tobin's Q is the ratio of market value of assets to book value of assets. Cash flow is contemporaneous operating income before depreciation and amortization-to-lagged total assets. All regressions include firm fixed effects. Standard errors (in parentheses) are heteroskedasticity-robust and clustered by firm. All variables are winsorized at the 99% and 1% levels. ***,**, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	Total payout (1)	Total payout (2)	Dividends (3)	Dividends (4)	Repurchases (5)	Repurchases (6)
Financial crisis	−0.010***	−0.010***	−0.001	0.002	−0.016***	−0.017***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Cash savings from payout	0.084***	−0.016	−0.145	−0.911***	0.116***	0.039*
	(0.015)	(0.021)	(0.170)	(0.258)	(0.017)	(0.023)
Financial crisis*Cash savings from payout	–	0.244***	–	1.356***	–	0.192***
		(0.035)		(0.344)		(0.040)
Tobin's Q	0.030***	0.030***	0.017***	0.017***	0.035***	0.034***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Cash flow/Lag TA	0.157***	0.162***	0.164***	0.165***	0.140***	0.143***
	(0.015)	(0.015)	(0.021)	(0.021)	(0.017)	(0.017)
Market leverage	−0.043***	−0.048***	0.040***	0.031**	−0.056***	−0.059***
	(0.011)	(0.011)	(0.014)	(0.014)	(0.014)	(0.014)
Intercept	0.116***	0.114***	0.069***	0.069***	0.127***	0.125***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.052	0.057	0.019	0.032	0.060	0.062
Obs.	8,306	8,306	4,022	4,022	6,417	6,417

in Table 6 are thus consistent with the view that firms use payout reductions as a means of preserving their cash balances during a period in which there is a restricted supply of external capital.

It is also notable that the coefficient on *Cash savings from payout* is significantly negative for dividend payers in column 4 and significantly positive for repurchasers in column 6. These findings highlight the differences between how dividends and repurchases are used to manage cash during normal (i.e., non-crisis) periods. The negative coefficient for the dividend sample is consistent with the inflexible nature of dividend payouts. That is, in non-crisis years, dividends are cut only as a last resort. During such times, firms tend to draw down on cash balances prior to dividend cuts. By contrast, the positive coefficient for the repurchase sample is consistent with the flexible nature of repurchases in that firms reduce repurchases as a means of preserving funds.

5.4. Payout reductions and investment

In addition to building or maintaining cash reserves, the cash savings from payout reductions during the crisis period could be used to invest in projects that might otherwise have gone unfunded due to restricted credit supply during the crisis. To explore this possibility, we would ideally compare the actual level of investment for firms with payout reductions with what that level of investment would have been in the absence of a payout reduction. Because the latter is unknown, we adopt two approaches. In the first, we use a difference-in-difference matching estimation approach, while in the second, we estimate panel regression models with firm fixed effects.

5.4.1. Matching estimator

We follow the approach of Almeida, Campello, Laranjeira, and Weisbenner (2012) and Kahle and Stulz (2013) in implementing the Abadie and Imbens (2006) matching estimator. Specifically, under this approach, we first identify a set of 'treated' observations-i.e., firms that have a reduction in total payout during the financial crisis. From the remaining population of non-treated observations, we then search for control observations that best match the treated ones along multiple dimensions. In our estimations, we select one match control for each treated firm and allow control firms to serve as matches more than once.[17] We match on Fama-French industry (exact match), cash-to-assets, size, leverage, Tobin's Q, cash flow volatility, and cash flow.[18] The Abadie-Imbens estimator applies a bias-correction to the estimates of interest and produces heteroskedastic-robust standard errors. For purposes of analyzing the impact of payout reductions on investment, we perform estimations in which we compare changes in the ratio of capital expenditures-to-assets and (R&D + capital expenditures)-to-assets between the treated and control groups to control for the fact that the levels of the treated and control groups could be different prior to the event and continue to be different after the event.

[17] Allowing control firms to serve as matches more than once lowers the estimation bias (but can increase the variance) compared to matching without replacement.

[18] The six non-categorical variables (cash-to-assets, size, market leverage, Tobin's Q, cash flow, and cash flow volatility) are calculated as the average values from fiscal years 2005 and 2006.

In Panel A of Table 7, we report the pre-crisis average values of the variables used in our matching procedure. Not surprisingly, as shown in the first two rows, the treated firms (those with payout reductions) differ significantly from the non-treated group on all of the dimensions that we use for matching: cash-to-assets, size, leverage, Tobin's *Q*, cash flow volatility, and cash flow. However, as shown in the next two rows, once we implement the matching procedure, we find no statistical differences in the average values of the covariates we consider between the treated and control firms.

As a measure of the differential change in investment for firms reducing payout (treated firms) and their matched control firms, we report in Panel B of Table 7 the Abadie-Imbens (AI) matching estimator of the average effect of the treatment on the treated (ATT). When investment is measured as the ratio of capital expenditures-to-total assets, the ATT difference is equal to 0.006 and is significant at the 0.01 level. Similarly, if we measure investment as the sum of capital expenditures and R&D, we again find that the ATT is 0.006, which is significant at the 0.05 level. These findings support the view of payout reductions being used as a substitute source of funds during the financial crisis to fund investment that would otherwise have gone unfunded. To provide further support for that interpretation, we again consider the 2001 recession as a placebo period characterized by a recession and greater incidence of payout reductions, but arguably no external financing shock. As shown in Panel B, we find no evidence during this placebo period of differential investment between firms with payout reductions and a matched set of firms that elect not to cut their payout.

5.4.2. Fixed effects estimation

To provide additional evidence on the link between payout reductions and investment rates prior to and during the crisis, we estimate firm-level investment (sum of R&D and capital expenditures-to-lagged total assets) regressions for all firms that have a positive payout average during 2005–2006. The model is specified as following:

$$\begin{aligned}(R\&D\ \&\ \text{CapEx})/lag\ TA_{i,t} &= \beta_1 + \beta_2(\text{Financial crisis})_{i,t} \\ &+ \beta_3(\text{Cash savings from payout})_{i,t} \\ &+ \beta_4(\text{Cash savings from payout}*\text{Financial crisis})_{i,t} \\ &+ \beta_5(\text{Tobin's } Q)_{i,t} \\ &+ \beta_6(\text{Cash flow/Lag TA})_{i,t} + \beta_7(\text{Market leverage})_{i,t-1} \\ &+ \beta_8(\text{CapEx/Lag TA})_{i,t-1} + \text{firm fixed effects} + \mu_{i,t}. \end{aligned} \quad (3)$$

We estimate the model using firm fixed effects to control for time-invariant firm characteristics. Thus, the model tests for within-firm changes in investment policy during the financial crisis period, and whether these changes are a function of the firm's payout decision.

The results are reported in Table 8. The significantly negative coefficient on *Financial crisis* indicates that the level of investment declines during the financial crisis for the total payout and dividend samples. However, for the repurchasing sample, the coefficient on *Financial crisis* is statistically insignificant. While these findings are consistent with a greater demand shock for dividend payers, we note that the difference between the coefficients on *Financial crisis* for the dividend payers and repurchasers is statistically insignificant.

The positive coefficient on *Cash savings from payout* indicates that payers, on average, have higher investment rates when payout is reduced. This result holds when payout is measured as total payout (dividends + repurchases), dividends, or repurchases. When we interact the financial crisis dummy with the cash savings from payout variable (*Financial crisis*∗*Cash savings from payout*), we find evidence (at the 10% significance level) that the positive impact of cash savings from payout reductions on investment is greater during the crisis period for the total payout sample and for the repurchase sample. In the dividend sample, the coefficient is positive, but statistically insignificant. We note, however, that that the net effect of cash savings from payout is significantly positive for both dividend payers and repurchasers during the crisis period (as measured by the sum of the coefficient on *Cash savings from payout* and the interaction term).[19] For these samples, payout reductions appear to be used as a source of funds for investment in both the pre-crisis and crisis periods. Of course, as we documented earlier, the likelihood of a payout reduction is much greater during the crisis period. Thus, on net, the importance of payout reductions as a source of funds is much greater during the financial crisis period.

5.5. Evidence from zero-payout firms

As a final test, we contrast the behavior of firms that reduce payout with those that made no payouts in the years prior to the crisis. For the latter group, payout reductions are obviously not a feasible source of funds through the crisis period. Therefore, their behavior during the crisis represents a useful counterfactual.[20] Specifically, if payout reductions are used by some firms as a source of funds during the crisis, we expect zero-payout firms to either turn towards other sources of funds (i.e., cash reductions) or be forced to make greater cuts in investment during the crisis period.

To test these conjectures, we estimate two sets of regressions on a sample that includes all firms with zero-payout in the 2005–2006 period and firms that had a positive payout in 2005–2006 followed by a reduction in total payout during the crisis period of 2008–2009. The first set of regressions, reported in columns 1 and 2 of

[19] Specifically, for dividend payers, the sum of the coefficient on *Cash savings from payout* and the interaction of this variable with the crisis dummy is significant at the 0.01 level (*F*-statistic = 6.67). Similarly, the *F*-statistic for the repurchasers is 24.11, which is also significant at the 0.01 level. The insignificance of the interaction term for dividend payers appears to be due, in part, to a very large standard error on that coefficient, perhaps due to the much smaller proportion of firms that generate savings from dividend reductions than from repurchase reductions.

[20] We recognize, of course, that this experimental design does not represent a true counterfactual in that there are likely to be systematic differences between firms with positive payouts and those with no payouts. Ideally, we would compare firms reducing payout to those payers that were somehow prevented from reducing payout. Nonetheless, a comparison of the two groups is useful since for the zero-payout group, payout reductions are not a feasible source of funds.

Table 7
Estimation from AI matching.

Panel A compares the mean values of characteristics of treated, non-treated, and control firms during the pre-crisis period (averages from fiscal years 2005 and 2006). The treated firms are defined as those firms that had a reduction in total payout during the financial crisis. The non-treated firms are the remaining firms that did not have a reduction in payout (including those who do not have a previous payout history). Control firms are a subset of the non-treated firms selected as the closest match to the treated firms based on industry, cash-to-assets, size, leverage, Tobin's *Q*, cash flow volatility, and cash flow. The test for a difference in the mean of a firm characteristic across two groups is conducted by calculating the *t*-statistic. Panel B reports the AI matching estimator of the average effect of the treatment on the treated (ATT). All variables are winsorized at the 1% and 99% levels. ***,**, or * indicates significance at the 1%, 5%, or 10% level, respectively.

	Cash/TA	Size	Market leverage	Tobin's *Q*	Cash flow volatility	Cash flow/Lag TA
Panel A: Pre-crisis characteristics						
Treated	0.190	6.894	0.276	1.808	0.113	0.198
Non-treated	0.268	4.381	0.602	2.427	2.285	−0.326
t-Statistic	−9.610***	29.150***	2.28***	−12.480***	−3.800***	2.870***
Treated	0.190	6.894	0.276	1.808	0.113	0.198
Control *t*-statistic	0.189	6.955	0.315	1.810	0.118	0.155
	0.150	−0.510	−1.090	−0.050	−0.080	1.090
			Financial crisis (2008–2009)			2001 Recession (Placebo period)
Panel B: Matching estimator (ATT)						
ΔCapEx/TA			0.006***			−0.001
			(0.002)			(0.003)
Δ(R&D+CapEx)/TA			0.006**			−0.003
			(0.003)			(0.004)

Table 8
Investment before and during the crisis.

This table reports estimates from panel regressions explaining firm-level investment from 2005 to 2009 for firms with a positive payout average in 2005–2006. Dependent variable is calculated as R&D and capital expenditures-to-lag total assets. Financial crisis is a binary variable if fiscal year is 2008, 2009, or has a fiscal year end date in 2008, zero otherwise. Cash savings from payout is the previous payout minus current payout, and then scaled by lag total assets. Previous payout is calculated as the average total payout from the prior two years for total payout, the average repurchase amount from the prior two years for repurchases, and prior year's dividend amount for dividends. Market leverage is the lag of the sum of long-term and current liabilities-to-market capitalization. Tobin's *Q* is the ratio of market value of assets to book value of assets. Cash flow is contemporaneous operating income before depreciation and amortization-to-lag total assets. $(\text{CapEx/LagTA})_{t-1}$ is the lag of Capital expenditure-to-Lag total assets. All regressions include firm fixed effects. Standard errors (in parentheses) are heteroskedasticity-robust and clustered by firm. All variables are winsorized at the 1% and 99% levels. ***,**, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	Total payout	Total payout	Dividends	Dividends	Repurchases	Repurchases
Financial crisis	−0.003**	−0.003**	−0.004***	−0.003***	−0.002	−0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Cash savings from payout	0.032***	0.016	0.173*	0.047	0.031***	0.017
	(0.009)	(0.015)	(0.097)	(0.144)	(0.009)	(0.014)
Financial crisis∗Cash savings from payout	–	0.046**	–	0.226	–	0.039*
		(0.023)		(0.183)		(0.022)
Tobin's *Q*	0.006***	0.006***	−0.002	−0.002	0.007***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Cash flow/Lag TA	0.076***	0.077***	0.145***	0.145***	0.054**	0.054**
	(0.022)	(0.022)	(0.015)	(0.015)	(0.023)	(0.023)
Market leverage	−0.093***	−0.093***	−0.074***	−0.076***	−0.099***	−0.099***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
$(\text{CapEx/LagTA})_{t-1}$	0.128***	0.129***	0.123***	0.124***	0.126***	0.126***
	(0.033)	(0.034)	(0.005)	(0.033)	(0.034)	(0.034)
Intercept	0.075***	0.074***	0.060***	0.060***	0.080***	0.080***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.145	0.144	0.248	0.245	0.141	0.140
Obs	8,061	8,061	3,992	3,992	6,400	6,400

Table 9, is specified as follows:

$$\begin{aligned}\text{Cash/Lag(TA)}_{i,t} &= \beta_1 + \beta_2(\text{Financial crisis})_{i,t} \\ &+ \beta_3(\text{Zero payout})_{i,t} + \beta_4(\text{Financial crisis}*\text{Zero payout})_{i,t} \\ &+ \text{Controls} + \text{industry fixed effects} + \mu_{i,t}. \qquad (4)\end{aligned}$$

In other words, we test whether cash holdings are affected by the financial crisis and whether the impact of the crisis differs for zero-payout firms. We estimate similar regressions in which the dependent variable is investment (R&D+capital expenditures scaled by lagged total assets) and include prior capital expenditure levels as an independent variable in columns 3 and 4.

The results in columns 1 and 3 indicate that, on average, both the level of cash and the level of investment are higher in zero payout firms. Moreover, the negative

Table 9
Cash holdings and investment before and during the crisis for zero-payout firms.

This table reports coefficient estimates from panel regressions explaining firm-level cash reserves from 2005 to 2009 for firms with zero-payout from 2005–2009 and firms that have a positive payout average in 2005–2006 but reduce payout during the financial crisis. Dependent variable, Cash Holdings, is calculated as cash and short-term assets-to-lag total assets in columns 1 and 2. Dependent variable, Investment, is calculated as R&D & capital expenditures-to-lag total assets in column 3 and 4. Financial crisis is a binary variable that equals one if the fiscal year is 2008, 2009, or has a fiscal year end date in 2008, and zero otherwise. Zero payout is a binary variable that equals one if the firm does not have any payout from 2005–2009, and zero if the firm had a positive payout average in 2005–2006 and reduced payout during the financial crisis. Tobin's *Q* is the contemporaneous ratio of market value of assets to book value of assets. Cash flow is contemporaneous operating income before depreciation and amortization-to-lag total assets. Market leverage is the lag of the sum of long-term and current liabilities-to-market capitalization. $(\text{CapEx/LagTA})_{t-1}$ is the lag of Capital expenditure-to-Lag total assets. Industry fixed effects are based on the Fama-French 48-industry definitions. Standard errors (in parentheses) are heteroskedasticity-robust and clustered by firm. All variables are winsorized at the 99% and 1% level. ***,**, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	Cash holdings (1)	Cash holdings (2)	Investment (3)	Investment (4)
Financial crisis	−0.088***	−0.011**	−0.028***	−0.007***
	(0.006)	(0.005)	(0.004)	(0.002)
Zero payout	0.053***	0.104***	0.020***	0.034***
	(0.008)	(0.010)	(0.004)	(0.005)
Financial crisis*Zero payout	–	−0.117***	–	−0.031***
		(0.010)		(0.005)
Tobin's *Q*	−0.018***	−0.018***	0.004	0.004
	(0.005)	(0.005)	(0.004)	(0.004)
Cash flow/Lag TA	−0.173***	−0.172***	−0.135***	−0.135***
	(0.013)	(0.013)	(0.011)	(0.011)
Market leverage $(\text{CapEx/Lag TA})_{t-1}$	−0.383***	−0.385***	−0.092***	−0.093***
	(0.017)	(0.017)	(0.013)	(0.013)
	–	–	0.387***	0.386***
			(0.024)	(0.024)
Intercept	0.240***	0.205***	0.046***	0.036**
	(0.034)	(0.034)	(0.015)	(0.015)
Industry fixed effects	Yes	Yes	Yes	Yes
R^2	0.252	0.255	0.363	0.364
Obs.	18,047	18,047	17,563	17,563

coefficient on the financial crisis dummy indicates that both cash and investment levels are reduced during the crisis. More importantly, the significant and negative coefficients on the interaction terms (*Financial crisis*Zero payout*) in models 2 and 4 indicate that the crisis is associated with much greater reductions in cash and in investment in zero-payout firms than in firms that reduce payout during the crisis.[21] These findings are consistent with the view that firms with positive payouts use payout reductions as a source of funds while firms without this option (zero-payout firms) are forced to either turn to other sources of funds (cash reductions) or to reduce investment. The findings for zero-payout firms thus complement the findings in Almeida, Campello, Laranjeira and Weisbenner (2012) and Duchin, Ozbas and Sensoy (2010) in that they are consistent with the existence of real consequences of the financial crisis for firms whose ex ante financial policies left them with less flexibility for adjustment.[22]

6. Conclusion

We study the 2008–2009 financial crisis to analyze how firms respond to changes in the relative cost of internal and external funds. Our study differs from many prior studies of firm behavior during the financial crisis in that we study the extent to which certain financial policies themselves adjust on the margin in response to the credit supply shock of the financial crisis. Specifically, we analyze how (if at all) firms alter corporate payout policy and whether such changes in payout policy appear to be prompted by a desire for firms to seek a substitute source of funds following a shock to the cost of external funds.

Our evidence indicates that payout reductions are larger and more pervasive during the crisis period, particularly for those firms that we expect to be most susceptible to shocks to the cost of external funds. Moreover, the cash savings resulting from such payout reductions are large relative to pre-crisis cash balances and investment levels. Our panel regressions indicate that cash savings from payout reductions are positively associated with both

[21] At first glance, it may appear surprising that the coefficient on cash flow is significantly *negative* in all four models since prior literature generally documents a positive association between cash flow and both cash holdings and investment. The reason for this is that much of the prior literature focuses on firm fixed effects models when estimating cash-cash flow and investment-cash flow sensitivities. By contrast, Table 9 is cross-sectional in nature and firms with zero-payout tend to have higher investment rates and cash holdings, but lower cash flow.

[22] As further evidence consistent with the crisis having greater real consequences for firms unable to adjust their payout policies, we analyze changes in performance from the pre-crisis period through the end of the crisis. We find that the zero-payout firms exhibit significantly lower buy-and-hold stock returns (adjusted for the CRSP value-weighted index) and significantly more negative changes in operating performance (as measured by return-on-assets). Nonetheless, because of the possibility that other systematic differences between the two sets of firms might be influencing the overall impact of the crisis, these findings should only be viewed as suggestive.

(*footnote continued*)

cash balances and investment during the crisis period. Such findings are consistent with firms using these cash savings to build cash reserves and preserve investment.

Overall, these findings support the hypothesis that the financial crisis increased the cost of external financing sufficiently that a number of firms turned to payout reductions as a substitute form of financing. Thus, we extend prior findings on the real effects of the financial crisis by showing that at least one financial policy–corporate payout-adjusts on the margin in response to the credit supply shock of the financial crisis. In this sense, our findings fit well with Kahle and Stulz (2013), who find little evidence in support of theories that hypothesize a direct link between the credit supply shock of the crisis and corporate investment. Kahle and Stulz (2013) note that one reason why such a supply shock might have little impact on investment is that firms can access substitute sources of funds. Our findings are consistent with payout reductions serving exactly this role during the crisis.

Our evidence also confirms prior evidence on the flexibility of share repurchases. Although we document an unusual increase in dividend reductions, we show that firms primarily turn to reductions in share repurchases as a source of funds during the financial crisis. These findings are similar to those in Floyd, Li, and Skinner (2012) who, like us, report that dividends are more persistent through the financial crisis than are share repurchases. Such findings complement those of Brav, Graham, Harvey, and Michaely (2005), who report that CFOs state they would rather cut investment than cut dividends, and Daniel, Denis, and Naveen (2012), who report that even those firms facing cash shortfalls exhibit a strong reluctance to cut dividends. Apparently, even during a period of constrained access to external capital, dividend reductions continue to be viewed by firms as being a particularly costly source of funds.

Appendix

All variables are annual, unless otherwise noted.

Variable name	Description
CapEx/Lag TA	Capital expenditures (Item 128, CAPX) divided by lagged total assets (Item 6, AT).
Cash/TA	Cash and short-term investments (Item 1, CHE) divided by total assets (Item 6, AT).
Cash flow/Lag TA	Operating income before depreciation (Item 13, OIBDP) divided by lagged total assets (Item 6, AT).
Cash flow volatility	The standard deviation of cash flow-to-assets from the previous ten fiscal years. The firm is required to have at least three observations. Cash flow-to-assets is calculated as operating income before depreciation (Item 13, OIBDP) divided by total assets (Item 6, AT).
Cash savings from payout	Previous payout minus payout, then scaled by lagged total assets. Previous payout is calculated as the average total payout from the prior two years for total payout (repurchases plus dividends), the average repurchase amount from the prior two years for repurchases, and prior year's dividend amount for dividends.
Dividends	Dividends paid on ordinary/common shares by fiscal year obtained by CRSP.\
Financial crisis	Binary variable set to one if fiscal year is 2008, 2009, or has a fiscal year end date in 2008 calendar time.
Firm age	First annual appearance in Compustat subtracted from current fiscal year.
Log (assets)	Natural logarithm of total assets (Item 6, AT).
Losses	Number of times the firm has experienced negative net income (Item 172, NI) from the previous five fiscal years.
Market leverage	Long term debt (Item 9, DLTT) plus current liabilities (Item 34, DLC) divided by market capitalization (annual fiscal year price close (Item 24, PRCC_F) times common shares outstanding (Item 25, CSHO)).
Payout reduction	Payout reduction is a binary variable equal to one if the firm had a reduction in payout in the prior year.
(R&D+CapEx)/TA	Research and development expenses (Item 46, XRD) plus capital expenditures (Item 128, CAPX) divided by total assets (Item 6, AT). If research and development expenses are missing, R&D value is set to zero.
Repurchases	Purchase of common and preferred stock (Item 115, PRSTKC) minus any reduction in the value of net number of preferred stocks outstanding (Item 56, PSTKRV). If repurchase amount is less than 1% of previous year's market capitalization, repurchase amount is set to zero.
Tobin's Q	Market value of assets [(total assets (Item 6, AT) plus market value of common equity ((Item 25, CSHO)*(Item 199, PRCC_F)) minus common equity (Item 60, CEQ) minus deferred taxes (Item 74, TXDB)] divided by 0.90*book value of assets (Item 6, AT) plus 0.10*market value of assets.
Total payout	Dividends plus repurchases. Repurchases is calculated as the purchase of common and preferred stock (Item 115, PRSTKC) minus any reduction in the value of net number of preferred stocks outstanding (Item 56, PSTKRV). If repurchase amount is less than 1% of previous year's market capitalization, repurchase amount is set to zero.
Total payout/TA	Dividends plus repurchases, divided by total assets (Item 6, AT).
Volatility	The standard deviation of monthly market-adjusted returns for the fiscal year.

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