

**Corporate Payout, Cash Retention, and the Supply of Credit:
Evidence from the 2008-09 Credit Crisis***

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March, 2013

JEL classification: G01, G31, G35

Keywords: Cash, Corporate investment, Payout policy, Crisis, Financing constraints

* We thank Christa Bouwman, Diane Denis, Shawn Thomas and seminar participants at Case Western Reserve University, Rice University, University of Amsterdam, University of Exeter, Wayne State University and Xiamen University for helpful comments and suggestions.

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Abstract

Using the financial crisis as a natural experiment, we analyze the extent to which firms adjust financial policies on the margin in response to a credit supply shock. 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 a credit supply 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 an exogenous shock to the supply of credit during the financial crisis increased the marginal benefit of cash retention, leading some firms to reallocate funds that would otherwise be distributed to shareholders.

1. Introduction

Recent studies present evidence consistent with the view that firms weigh the relative costs and benefits of internal and external financing sources in arranging their financial structure so as to preserve flexible access to capital. For example, many firms maintain low, long-run leverage ratios and use debt financing to meet unexpected needs (DeAngelo, DeAngelo, and Whited, 2011; Daniel, Denis, and Naveen, 2012). Consistent with this behavior, firms make heavy use of transitory debt sources such as lines of credit (Sufi, 2009) and commercial paper (Kahl, Shivdasani, and Wang, 2010). By contrast, other firms facing more costly external finance (e.g., greater financial constraints) are more likely to build larger cash balances to fund future growth opportunities (e.g., Almeida, Campello, and Weisbach, 2011; Faulkender and Wang, 2006; Denis and Sibilkov, 2010).

We use the credit crisis of 2008-2009 as a natural experiment to study how (if at all) firms adjust their financial policies in response to an exogenous shift in the relative costs and benefits of internal and external financing sources. Our goal is to gain further insights into how firms weigh these relative costs and benefits in forming their cash retention, investment, and payout policies.

Several prior studies argue that the 2008-2009 period was characterized by a shock to the supply of credit in the aftermath of the sharp decline in housing prices and subsequent subprime mortgage defaults.¹ 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 the governmental responses arguably further increased the cost of external funds. Further consistent with an abrupt change in the supply of credit, a large proportion of the CFOs surveyed in

¹ See, for example, the analyses contained in Gorton (2009) and Acharya, Philippon, Richardson, and Roubini (2009).

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.

If the costs of holding cash (i.e. agency costs) are unchanged, we expect firms to respond to the crisis and the associated restriction in credit supply by reducing corporate payouts and retaining a greater portion of their operating cash flows. Alternatively, a restricted supply of credit could be correlated with diminished growth opportunities. 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. We provide evidence on these predictions 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 2008-09 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 appears to be driven 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 *ex ante* financial constraints are more affected by the credit supply shock and turn to payout reductions as a substitute financing source. Moreover, our evidence indicates that the cash savings from payout reductions 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 propensity score matching procedure and a difference-in-difference analysis, we find that the change in investment for firms that eliminate payouts to shareholders during the financial crisis is greater than that of matched firms that continue to make positive shareholder payouts. Third, in firm fixed effect regressions, we find that, after controlling for investment opportunities, cash flow, and leverage, 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 (2009) 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 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.²

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 et al. (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 obtained by payout reductions during the financial crisis is obtained primarily by reductions in share repurchases.³ 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 describes background and develops hypotheses. Section 3 briefly describes the data. Section 4 presents evidence of changes

² Almeida et al. (2010) do 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.

³ Floyd, Li, and Skinner (2012) also report that dividends are more persistent through the financial crisis than are share repurchases.

in payout policy. Section 5 examines cash levels and investment following payout reduction and section 6 concludes.

2. Background and hypothesis development

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, Williamson, and Stulz (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.⁴ 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 holdings in mitigating potential underinvestment, other studies highlight the potential agency costs of cash retention. For example, Jensen (1986), Stulz (1990), La Porta et al. (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

⁴ Riddick and Whited (2008) question the interpretation of some of this evidence on the grounds that the studies inadequately control for measurement error in measures of investment opportunities.

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 to \$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. Our objective is to gain greater insight into this process by analyzing how these policies change in response to an exogenous shock to these costs and benefits.

The credit crisis of 2008-09 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 et al. (2010) 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 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.

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 et al. (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 et al. (2010) 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.

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.

To the extent that the credit crisis is associated with a sharp reduction in the supply of credit and a sharp increase in the cost of borrowing, 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 predict that firms 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 et al. (2011), 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 greater reductions in share repurchases than in ordinary dividends.

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

An alternative view, of course, is that shocks to the supply of credit are correlated with diminished growth opportunities. Because diminished growth opportunities are associated with greater agency costs of cash retention, this alternative implies that, if anything, the crisis period

should be associated with higher payouts to equity holders, lower cash retention, lower cash balances and less investment.

Ultimately, 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 appear to 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 et al. (2010) find evidence consistent with the view that firms cut payout (mostly repurchases) to meet required debt payments following the credit supply shock.

3. Sample and Data Description

Our initial sample includes all firms listed on Compustat from 1990 to 2010. We exclude financial firms and utilities (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 net number of preferred stocks outstanding (Item 56, PSTKRV). If the repurchase amount is less than one percent of the previous year's market capitalization, the repurchase amount is set to zero. Dividends are obtained from CRSP and are measured as the total amount of regular quarterly dividends declared on the common/ordinary equity of the company. 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.

Figure 1 plots the time-series of aggregate earnings for the sample firms between 1990 and 2010. Earnings are calculated as earnings before interest and taxes (EBIT) and are converted to 2004 dollars using the Consumer Price Index (CPI). Consistent with the onset of the financial crisis in late 2007, aggregate earnings decrease 7.3% and 19.5% in 2008 and 2009, respectively. Figure 1 also plots earnings separately for firms with positive dividends (Dividend Payers) and positive share repurchases (Share Repurchasers). The data indicate that dividend payers have an increase in earnings of 1.2% in 2008 and then experience a reduction in earnings of 24.4% in 2009, while repurchasers experience the sharpest decline in earnings; 18.4% and 61.6% in 2008 and 2009, respectively.

Coincident with the sharp decline in earnings, Figure 2 documents changes in the supply of credit over the sample period. Specifically, Figure 2 plots the monthly outstanding commercial paper by non-financial firms. (These data are available from the Federal Reserve Bank of St. Louis only from 2001). As shown in Figure 2, the outstanding balance of commercial paper peaks during 2007, then quickly declines through the 2008 to 2010 period. Similarly, Brunnermeir (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.

Finally, Figure 3 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. According to this measure, lending conditions started to tighten in 2008 and continued to reach their highest levels in 2009.

Overall, therefore, the data in Figures 1, 2, and 3 indicate that during the period from late 2007 to 2010, firms experienced a significant decline in earnings, a sharp contraction in the

supply of credit, and tightened lending conditions. Based on these findings and those of others, we define the crisis period as 2008-09. 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 2005-06.

[Insert Figure 1, 2, & 3]

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 payout 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 6.8% of the sample in 2007 to 3.0% in 2009.

[Insert Table 1]

To provide further evidence on changes in payouts during the financial crisis, Figure 4 plots aggregate dividends, repurchases, and total payout over the period from 1990 to 2010. Again, all dollar values are converted to 2004 dollars. The data indicate that prior to the financial crisis, aggregate payout increases substantially between 2002 and 2007. This increase coincides with the contemporaneous increase in earnings previously documented in Figure 1 and is present for both dividends and share repurchases. The increase is much larger for aggregate repurchase volume, however. The dramatic growth in repurchases relative to that of dividends has prompted speculation that repurchases would eventually replace dividends (Skinner, 2008).

Figure 4 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. Figure 4 shows that aggregate share repurchases decline by 37.1% in 2008 and an additional 65.2% in 2009. 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.

[Insert Figure 4]

Similarly, Figure 5 plots the mean ratios of dividends-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 a decline in the repurchase-to-earnings ratio. The dividend-to-earnings ratio actually increases during the 2003 to 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, Figures 4 and 5 suggest that, at the aggregate level, firms reduce payouts to shareholders during the financial 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.

[Insert Figure 5]

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 (Figure 2), 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 10.5% in 2009, as compared to 1.9% and 3.3% in 2005 and 2006.⁵

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 twenty year time span, fiscal year 2009 experiences the largest percentage of firms that reduce their repurchasing activity (89.2%).⁶

[Insert Table 2]

Finally, there is indirect evidence that among the 498 firms that both pay dividends and repurchase shares in the pre-crisis period (2005-06), repurchases are cut prior to dividends being cut. Specifically, of the 498 firms, 133 (26.7%) reduce dividends during the crisis. Of these 133, 131 (98.5%) also reduce repurchases. By contrast, of the 365 firms that do not reduce dividends during the crisis, 348 (95.3%) reduce repurchases. (These results are not reported in the paper).

⁵ 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.

⁶ 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.

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 to 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 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 predict that more financially constrained firms will be more susceptible to the credit supply shock of the crisis period and, therefore, will be more likely to use payout reductions as a substitute source of funds. Specifically, we estimate the following model:

$$\begin{aligned} \text{Payout Reduction}_{i,t} = & \beta_1 + \beta_2(\text{Age})_{i,t-1} + \beta_3(\text{Log}(\text{assets}))_{i,t-1} + \beta_4(\text{Losses})_{i,t-1} + \beta_5((\text{R\&D} + \text{CapEx})/\text{TA})_{i,t-1} + \\ & \beta_6(\text{Market Leverage})_{i,t-1} + \beta_7(\text{Cash Flow}/\text{TA})_{i,t} + \beta_8(\text{Cash}/\text{TA})_{i,t-1} + \beta_9(\text{Tobin's } Q)_{i,t} + \beta_{10}(\text{Volatility})_{i,t-1} + \\ & \beta_{11}(\text{Total Payout}/\text{TA})_{i,t-1} + \beta_{12}(\text{Financial Crisis})_{i,t} + \beta_{13}(\text{Financial Crisis} * \text{Leverage Ratio})_{i,t} + \beta_{14}(\text{Financial} \\ & \text{Crisis} * (\text{Cash}/\text{TA})_{i,t} + \beta_{15}(\text{Financial Crisis} * \text{Tobin's } Q)_{i,t} + \text{Industry fixed effects} + \mu_{i,t} \end{aligned} \quad (1)$$

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. 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 interaction terms test 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.

Table 3 reports marginal effects for each variable along with robust standard errors in parentheses. Consistent with our expectations, the results in columns 1, 3, and 5 of Table 3

indicate that the likelihood of reductions in total payout, dividends, and repurchases are positively associated with leverage and the existence of negative earnings, and are negatively related to cash flows and firm size.

Our primary variable of interest, the financial crisis dummy, is significantly positive in columns 1, 3, and 5, implying that the propensity to reduce both dividends and share repurchases is significantly greater during the financial crisis. Moreover, the magnitude of the coefficients implies that this effect is stronger for share repurchases.

In columns 2, 4, and 6, we add the interaction terms of the financial crisis dummy with measures of the firm's susceptibility to the credit supply shock. The coefficient on the interaction terms involving cash are significant in columns 2 and 6, while those involving leverage are statistically significant in column 2. These findings imply that the impact of the financial crisis on the likelihood of a reduction in total payout is greater for firms with higher leverage. For firms with smaller cash holdings, the financial crisis appears to increase the likelihood of reductions in repurchases and total payout. Finally, the interaction term *Financial Crisis * Tobin's Q* is significantly positive in columns 2 and 6. These findings support the view that firms that are more likely to require external financing are more likely to adjust discretionary payouts during the financial crisis as a substitute source of funds.⁷

[Insert Table 3]

5. Payout reductions as a source of funds

Our findings in Table 3 indicate that, during the financial crisis, firms exhibit an increased propensity to retain cash flow rather than pay it out to shareholders. Such a propensity is consistent with the view that firms use payout reductions as an alternative source of funds in response to increased financing frictions during the crisis. In this section, we explore how firms use the funds that would otherwise have been paid out to shareholders. We first document the

⁷ We find similar results if we estimate ordinary least squares regressions in which the dependent variable is the percentage change in payout.

magnitude of cash savings from payout reductions and compare this magnitude with levels of cash and investment. We then investigate whether the sample firms increase cash reserves or use the funds for corporate investment that would otherwise have gone unfunded.

5.1. Cash savings from payout reductions

In Table 4, we report evidence on the magnitude of the cash savings from payout reductions relative to levels of current cash holdings and investment. In the first row of Table 4, 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.

To provide additional perspective on the magnitude of the cash savings from payout reductions, the bottom panel of Table 4 computes 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. Thus, for example, to compute pro-forma 2010 cash, we assume that the company made its actual operating and financing decisions in 2010, 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 4, the median pro-forma cash-to-asset ratio is 0.090 for the firms that reduce total payout. This compares with 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 4 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 have accessed external financing that appeared to be 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 finance, 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, 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 views, we examine whether firms increase their cash holdings despite deteriorating credit conditions and declining earnings during the crisis.

Figure 6 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-asset ratios exhibit a sharp increase during the crisis year of 2009. For dividend payers and repurchasers, the median cash-to-assets ratio starts to increase in 2008 and dramatically spikes during 2009. Consistent with payout reductions being most prevalent among repurchasing firms, the increase in cash balance is greatest for repurchasing firms; increasing 8.5% and 64.8% in 2008 and 2009. It appears, therefore, that firms respond to increased external financing frictions during the crisis by increasing their cash holdings.

[Insert Figure 6]

5.3. The association between cash balances and payout reductions

In Table 5, we test directly the association between the cash savings from payout reductions and cash reserves. We are interested in the extent to which firms appear to use payout reductions as a means of building cash reserves during the crisis period, and whether this behavior is different during the crisis than during the pre-crisis years. Towards this end, for the sample of firms with positive average payout in 2005-06, 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-lag 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 lag total assets, *Financial Crisis*, a binary variable that is set to one if observations are in fiscal years 2008, 2009, or ends in 2008 calendar time and zero otherwise, and the interaction of these two binary variables. Specifically, the model is specified as follows:

$$\begin{aligned} \text{Cash and Short-Term Assets-to-Lag Total Assets}_{i,t} = & \beta_1 + \beta_2(\text{Financial Crisis})_{i,t} + \beta_3(\text{Cash Savings} \\ & \text{From Payout})_{i,t} + \beta_4(\text{Financial Crisis} * \text{Cash Savings From Payout})_{i,t} + \beta_5(\text{Tobin's } Q)_{i,t} + \beta_6(\text{Cash} \\ & \text{Flow/TA})_{i,t} + \beta_7(\text{Market Leverage})_{i,t-1} + \text{firm fixed effects} + \mu_{i,t} \end{aligned} \quad (3)$$

The results of the model in Column 1 and 5 indicate that, after controlling for investment opportunities, contemporaneous cash flow, leverage, cash savings from payout, 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 models 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. In this model, 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 results in Table 5 are consistent with the view that during the crisis, 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.

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 levels 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. Difference-in-Difference Matched Estimator

In the first approach we begin by estimating the likelihood of a positive payout during the 2008-09 crisis period. For this estimate, we include all firms that have the necessary data available, excluding financials and utilities. The dependent variable is set to one if the firm has a positive average total payout for fiscal years 2008 and 2009, and zero otherwise. To control for profitability and firm performance, we include return on equity, free cash flow-to-total assets, the firm's buy-and-hold returns over the prior two years, and non-operating income-to-total assets. To control for financial constraints, we include cash-to-assets, short-term debt-to-assets, and long-term debt-to-assets. To control for investments and investment opportunities, we include market-to-book, R&D-to-total assets, capital expenditures-to-total assets, and Tobin's Q. We also include firm size (log of total assets), age, and industry dummies. All independent variables are the averages from fiscal year 2005 and 2006, other than industry dummies.⁸

⁸ Note that these models are similar to those that we estimated earlier in Table 3. The primary differences are that in the models estimated in Table 3, the sample is limited to firms with positive payouts in 2005-06 and tests for the likelihood of a subsequent payout reduction. In Table 6, we include all firms and test for the likelihood of a positive payout during the crisis period.

Table 6 reports the estimated coefficients and standard errors from the probit model. Not surprisingly, we find that larger and more mature firms with higher cash holdings and greater free cash flow are more likely to distribute a positive payout to their shareholders during the financial crisis, whereas firms with higher long-term debt and larger investment (capital expenditures and R&D) are less likely to pay the shareholders during the financial crisis.

[Insert Table 6]

Based on the estimated coefficients as reported in Table 6, we then derive the propensity score, i.e., the probability of a firm having positive payout during the crisis. For each firm with a positive payout, we identify a matching non-paying firm within the same industry that has the closest propensity score to the paying firm. In other words, we seek to identify a set of firms with similar recent performance, financial resources, financial constraints, and investment opportunities that elects not to make a positive payout during the crisis period. This process results in a sample of 1,215 firms that have a positive payout during the financial crisis and a matching set of 1,215 firms that do not make a payout to shareholders.

In Table 7, we report the mean values of the annual average capital expenditures-to-assets and (R&D + capital expenditures)-to-total assets for the time period before the crisis (fiscal year 2005-2006) and during the financial crisis (fiscal year 2008-2009) for paying firms and their propensity score matched non-paying firms. In the pre-crisis period, capital expenditures-to-total assets are not statistically different for paying firms and matched non-paying firms. However, during the financial crisis, the capital expenditure-to-total asset ratio for the non-paying firms is significantly greater than that for the payers. Moreover, both the percentage change in capital expenditure-to-total assets and the change in the capital expenditure-to-total asset ratio is statistically higher for non-paying firms than for paying firms. If we examine the combined sum of R&D and capital expenditures, we again find that non-paying firms have higher investment rates than paying firms during the crisis period. However, this is also true prior to the crisis.

Moreover, the difference in investment rates from the pre-crisis to the crisis period is no different for the two samples.

[Insert Table 7]

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 & capital expenditures-to-lag total assets) regressions for all firms that have a positive payout average during 2005-2006. The model is specified as following:

$$(R\&D \ \& \ CapEx)/lag \ TA_{i,t} = \beta_1 + \beta_2(Financial \ Crisis)_{i,t} + \beta_3(Cash \ Savings \ From \ Payout)_{i,t} + \beta_4(Cash \ Savings \ from \ Payout * Financial \ Crisis)_{i,t} + \beta_5(Tobin's \ Q)_{i,t} + \beta_6(Cash \ Flow/TA)_{i,t} + \beta_7(Market \ Leverage)_{i,t-1} + firm \ fixed \ effects + \mu_{i,t} \quad (4)$$

Financial Crisis is a binary variable that is set to one if observations are in fiscal years 2008, 2009, or ends in 2008 calendar time, and zero otherwise. *Cash Savings From Payout* is the previous payout minus current payout, scaled by lag total assets. *Tobin's Q* is used to control for investment opportunities. *Cash flow* and *Leverage Ratio* are used to control for financial constraint. *Tobin's Q* and *Cash Flow* are contemporaneous values. 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. 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 weak evidence that that the positive impact of cash savings from payout reductions on investment is greater during the crisis period for the total payout sample. However, the coefficient on the interaction term is significant at just the ten percent level. In the dividend and repurchase samples, the coefficient on the interaction term is statistically insignificant. 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.

[Insert Table 8]

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. Specifically, if payout reductions are used by some firms as a source of funds through during the crisis, we expect zero payout firms to turn 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 Table 9, mimics the regressions in Table 5 and is specified as follows:

$$Cash/TA_{i,t} = \beta_1 + \beta_2(Financial\ Crisis)_{i,t} + \beta_3(Zero\ Payout)_{i,t} + \beta_4(Financial\ Crisis * Zero\ Payout)_{i,t} + Controls + industry\ fixed\ effects + \mu_{i,t} \quad (5)$$

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 assets) 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 coefficient on the financial crisis dummy indicates that both cash and investment levels are reduced during the crisis. More importantly, the significant negative coefficients on the interactions 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.⁹ 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 et al. (2009) and Duchin et al. (2010) in that they report real consequences of the financial crisis for firms whose *ex ante* financial policies left them with less flexibility for adjustment.

6. Conclusion

We use the 2008-2009 financial crisis as a natural experiment to analyze how firms respond to changes in the relative cost of internal and external funds. Our study differs from prior

⁹ 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.

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 supply of credit – i.e., firms most likely to require external capital. 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 firms use these cash savings to build cash reserves and preserve investment. Specifically, we find that while payout reductions are associated with reduced cash balances in non-crisis periods, this pattern is reversed during the crisis period. Moreover, the cash savings associated with payout reductions are positively associated with 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 financial policies themselves adjust on the margin in response to the credit supply shock of the financial 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.

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Appendix

All variables are annual, unless otherwise noted.

Variable Name	Description
Age	First annual appearance in Compustat subtracted from current fiscal year.
BHR	Previous 12-month market adjusted buy-hold return from fiscal end date.
CapEx/TA	Capital Expenditures (Item 128, CAPX) divided by 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 lag total assets (Item 6, AT).
Cash Savings From Payout	Previous payout minus payout, then scaled by lag 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.
Free Cash Flow/TA	Operating income before depreciation (Item 13, OIBDP) minus total interest related expenses (Item 15, XINT) minus total income taxes (Item 16, TXT) divided by total assets (Item 6, AT).
Market Leverage	Long term debt (Item 9, DLTT) plus current liabilities (Item 34, DLC) divided by market capitalization (annual fiscal year price close (Item, PRCC_F) times common shares outstanding (Item 25, CSHO)). (Item 6, AT).
Log (Assets)	Natural logarithm of total assets (Item 6, AT)
Long-term debt/TA	Total long term debt (Item 9, DLTT) divided by 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-to-book	Annual fiscal year price close (Item 199, PRCC_F) times common shares outstanding (Item 25, CSHO), divided by total common/ordinary equity (Item 60, CEQ).
Non-Operating Income/TA	Non-operating income (Item 61, NOPI) divided by total assets (Item 6, AT).

R&D/TA	Research and Development Expenses (Item 46, XRD) divided by total assets (Item 6, AT). If research and development expenses are missing, value is set to zero.
(R&D and 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
Return on Equity	Net income (Item 172, NI) divided by common/ordinary equity (Item 60, CEQ).
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 one percent of previous year's market capitalization, repurchase amount is set to zero.
Short-term debt/TA	Total debt in current liabilities (Item 34, DLC) divided by total assets (Item 6, AT)
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 one percent 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).

Table 1

Time-series of the percentage of dividend paying and repurchasing firms

This table presents 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 one percent 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%

Table 2

Time-series of the percentage of firms reducing payout

This table presents 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 dividend if they have a positive dividend payout in the prior year and reduced dividend payout but 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 one percent 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%

Table 3

Logit regression of payout reduction

This table reports the marginal effects from the logit regression of payout reductions in 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. Financial Crisis is a binary variable equal to one if fiscal year is 2008, 2009, or the fiscal year ends in 2008 calendar time, 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. The mean interaction term effects are reported using the Norton, Wang, and Ai (2004) method. All independent variables are winsorized at the 1% and 99% level. Standard errors (in parentheses) are heteroskedasticity-consistent and clustered by firm. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	Reduction in Total Payout	Reduction in Total Payout	Reduction in Dividends	Reduction in Dividends	Reduction in Repurchases	Reduction in Repurchases
Age	-0.001** (0.000)	-0.001** (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.001* (0.000)	0.001* (0.000)
Log(Assets)	-0.016*** (0.005)	-0.018*** (0.005)	-0.010*** (0.002)	-0.011*** (0.002)	-0.047*** (0.005)	-0.049*** (0.005)
Losses	0.022*** (0.008)	0.021*** (0.008)	0.012*** (0.003)	0.012*** (0.003)	0.006 (0.009)	0.005 (0.009)
(R&D and CapEx)/TA	0.859*** (0.145)	0.858*** (0.146)	0.173** (0.073)	0.173** (0.073)	0.761*** (0.146)	0.776*** (0.148)
Market Leverage	0.445*** (0.053)	0.356*** (0.071)	0.103*** (0.020)	0.099*** (0.032)	0.564*** (0.067)	0.470*** (0.088)
Cash Flow/TA	-0.939*** (0.101)	-0.956*** (0.103)	-0.405*** (0.051)	-0.408*** (0.052)	-0.639*** (0.093)	-0.658*** (0.095)
Cash/TA	-0.191*** (0.056)	-0.022 (0.069)	0.017 (0.031)	0.021 (0.044)	-0.244*** (0.055)	-0.073 (0.069)
Tobin's Q	-0.042*** (0.012)	-0.073*** (0.015)	0.001 (0.007)	0.007 (0.010)	-0.026** (0.011)	-0.062*** (0.014)
Volatility	1.124*** (0.160)	1.056*** (0.162)	0.498*** (0.075)	0.488*** (0.073)	1.086*** (0.184)	1.050*** (0.188)
Total Payout/TA	2.266*** (0.136)	2.295*** (0.135)	0.246*** (0.049)	0.251*** (0.049)	0.958*** (0.094)	0.989*** (0.094)
Financial Crisis	0.170*** (0.016)	0.115*** (0.043)	0.014* (0.007)	0.029 (0.025)	0.150*** (0.017)	0.079* (0.047)
Financial Crisis*Market Leverage	---	0.137* (0.077)	---	0.068 (0.065)	---	0.102 (0.117)
Financial Crisis*Cash/TA	---	-0.320*** (0.080)	---	-0.004 (0.072)	---	-0.362*** (0.089)
Financial Crisis*Tobin's Q	---	0.053*** (0.019)	---	-0.018 (0.019)	---	0.076*** (0.019)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.170	0.174	0.372	0.373	0.141	0.148
Obs.	6,910	6,910	4,086	4,086	4,986	4,986

Table 4

Actual and pro forma ratios

This table presents the median cash-to-total assets, median R&D & CapEx-to-total assets, pro forma cash-to-total assets and pro forma R&D & 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 from the prior two fiscal repurchase average during the financial crisis. For total payout, 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 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 reduce 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	11.358	31.744	33.981
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

Table 5

Cash holdings before and during the crisis.

This table presents 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-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 and current liabilities-to-market capitalization. Tobin's Q is the ratio of market value of assets to book value of assets following Kaplan and Zingales (1997). Cash flow is contemporaneous operating income before depreciation and amortization-to-lag total assets. All regressions include firm fixed effects. Standard errors (in parentheses) are heteroskedasticity-consistent 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.

	Total Payout	Total Payout	Dividends	Dividends	Repurchases	Repurchases
Financial Crisis	-0.010*** (0.002)	-0.010*** (0.002)	-0.001 (0.003)	0.002 (0.003)	-0.016*** (0.003)	-0.017*** (0.003)
Cash Savings from Payout	0.084*** (0.015)	-0.016 (0.021)	-0.145 (0.170)	-0.911*** (0.258)	0.116*** (0.017)	0.039* (0.023)
Financial Crisis*Cash Savings from Payout	--	0.244*** (0.035)	--	1.356*** (0.344)	--	0.192*** (0.040)
Tobin's Q	0.030*** (0.003)	0.030*** (0.003)	0.017*** (0.004)	0.017*** (0.004)	0.035*** (0.003)	0.034*** (0.003)
Cash Flow/Lag TA	0.157*** (0.015)	0.162*** (0.015)	0.164*** (0.021)	0.165*** (0.021)	0.140*** (0.017)	0.143*** (0.017)
Market Leverage	-0.043*** (0.011)	-0.048*** (0.011)	0.040*** (0.014)	0.031** (0.014)	-0.056*** (0.014)	-0.059*** (0.014)
Intercept	0.116*** (0.005)	0.114*** (0.005)	0.069*** (0.007)	0.069*** (0.007)	0.127*** (0.006)	0.125*** (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

Table 6

Probit model of payout in crisis

This table presents the estimates from a probit regression explaining payout during the financial crisis. The sample includes all Compustat firms except financials and utilities. The dependent variable is set to one if the firm had a positive average total payout (dividends and repurchases) for fiscal years 2008-2009, zero otherwise. Independent variables are the averages from fiscal year 2005-2006. If R&D data is missing, it is set to zero. Industry firm fixed effects based on Fama-French 48-industry definitions are included. All continuous variables are winsorized at the 1% and 99% level. Standard errors (in parentheses) are heteroskedasticity-consistent and clustered by firm. ***, **, or * indicates that the coefficient estimate is significant at the 1%, 5%, or 10% level respectively.

	Payout in the Financial Crisis
Cash/TA	0.839*** (0.224)
Return on Equity	0.087* (0.052)
Market-to-Book	0.016*** (0.006)
Short-term Debt/TA	-0.636 (0.469)
Long-term Debt/TA	-0.959*** (0.187)
Free Cash Flow/TA	3.084*** (0.345)
Log(Assets)	0.233*** (0.019)
R&D/TA	-1.951*** (0.673)
CapEx/TA	-2.514*** (0.626)
Tobin's Q	0.093* (0.051)
Non-Operating Income/TA	1.692 (1.551)
Age	0.017*** (0.003)
BHR '05	-0.310*** (0.076)
BHR '06	-0.003 (0.078)
Industry Effects	Yes
Intercept	-1.522*** (0.199)
Pseudo R ²	28.15%
Obs.	2,221

Table 7

Comparison of investment for paying firms and matched non-paying firms

This table presents the difference-in-means estimates for firm-level investments (measured as the ratio of capital expenditure-to-total assets and R&D and capital expenditure-to-total assets). The sample includes the firm who paid out during the financial crisis and matched firms who did not payout during the financial crisis using propensity score matching based on probability and industry. “Before” variables are defined as the averages in fiscal years 2005-2006. “During” variables are defined as the averages in fiscal years 2008-2009. If R&D data is missing, it is set to zero. All continuous variables are winsorized at the 5% and 95% level. ***, **, or * indicates significance at the 1%, 5%, or 10% level, respectively.

	Paying Firms	Matched Non-Paying Firms	T-statistic
Before:			
CapEx/TA	0.048	0.048	-0.067
(R&D & CapEx)/TA	0.074	0.079	-2.894***
During:			
CapEx/TA	0.045	0.048	-2.032**
(R&D & CapEx)/TA	0.073	0.080	-3.530***
%Δ CapEx/TA	3.89%	12.86%	-3.481***
%Δ R&D & CapEx/TA	6.44%	8.73%	-1.098
Δ CapEx/TA	-0.004	-0.001	-2.571***
Δ R&D & CapEx/TA	-0.001	0.000	-1.160
Obs.	1,215	1,215	

Table 8

Investment before and during the crisis.

This table presents 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 and current liabilities-to-market capitalization. Tobin's Q is the ratio of market value of assets to book value of assets following Kaplan and Zingales (1997). Cash flow is contemporaneous operating income before depreciation and amortization-to-lag total assets. All regressions include firm fixed effects. Standard errors (in parentheses) are heteroskedasticity-consistent and clustered by firm. All variables are winsorized at the 1% and 99% level. ***, **, 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	-0.002* (0.001)	-0.002* (0.001)	-0.003*** (0.001)	-0.003** (0.001)	-0.001 (0.001)	-0.001 (0.001)
Cash Savings from Payout	0.031*** (0.007)	0.020** (0.009)	0.177** (0.075)	0.073 (0.114)	0.031*** (0.007)	0.024** (0.010)
Financial Crisis*Cash Savings from Payout	--	0.026* (0.015)	--	0.185 (0.153)	--	0.017 (0.016)
Tobin's Q	0.006*** (0.001)	0.006*** (0.001)	-0.003* (0.002)	-0.003* (0.002)	0.006*** (0.001)	0.006*** (0.001)
Cash Flow/Lag TA	0.077*** (0.007)	0.078*** (0.007)	0.148*** (0.009)	0.148*** (0.010)	0.054*** (0.007)	0.054*** (0.007)
Market Leverage	-0.094*** (0.005)	-0.094*** (0.005)	-0.079*** (0.006)	-0.080*** (0.006)	-0.103*** (0.006)	-0.103*** (0.006)
Intercept	0.082*** (0.002)	0.082*** (0.002)	0.069*** (0.003)	0.069*** (0.003)	0.088*** (0.003)	0.088*** (0.003)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.056	0.056	0.128	0.126	0.055	0.054
Obs.	8,298	8,298	4,017	4,017	6,409	6,409

Table 9

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

This table presents 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 column 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 following Kaplan and Zingales (1997). Cash flow is contemporaneous operating income before depreciation and amortization-to-lag total assets. Market Leverage is the lag of the sum of long and current liabilities-to-market capitalization. Industry fixed effects are based on the Fama-French 48-industry definitions. Standard errors (in parentheses) are heteroskedasticity-consistent 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	Cash Holdings	Investment	Investment
Financial Crisis	-0.088*** (0.006)	-0.011** (0.005)	-0.037*** (0.004)	-0.007*** (0.002)
Zero Payout	0.053*** (0.008)	0.104*** (0.010)	0.034*** (0.005)	0.054*** (0.006)
Financial Crisis*Zero Payout	--	-0.117*** (0.010)	--	-0.045*** (0.006)
Tobin's Q	-0.018*** (0.005)	-0.018*** (0.005)	0.002 (0.004)	0.002 (0.004)
Cash Flow/Lag TA	-0.173*** (0.013)	-0.172*** (0.013)	-0.138*** (0.011)	-0.138*** (0.011)
Market Leverage	-0.383*** (0.017)	-0.385*** (0.017)	-0.112*** (0.013)	-0.113*** (0.013)
Intercept	0.240*** (0.034)	0.205*** (0.034)	0.063*** (0.017)	0.050*** (0.017)
Industry Fixed Effects	Yes	Yes	Yes	Yes
R ²	0.252	0.255	0.330	0.331
Obs.	18,047	18,047	18,023	18,023

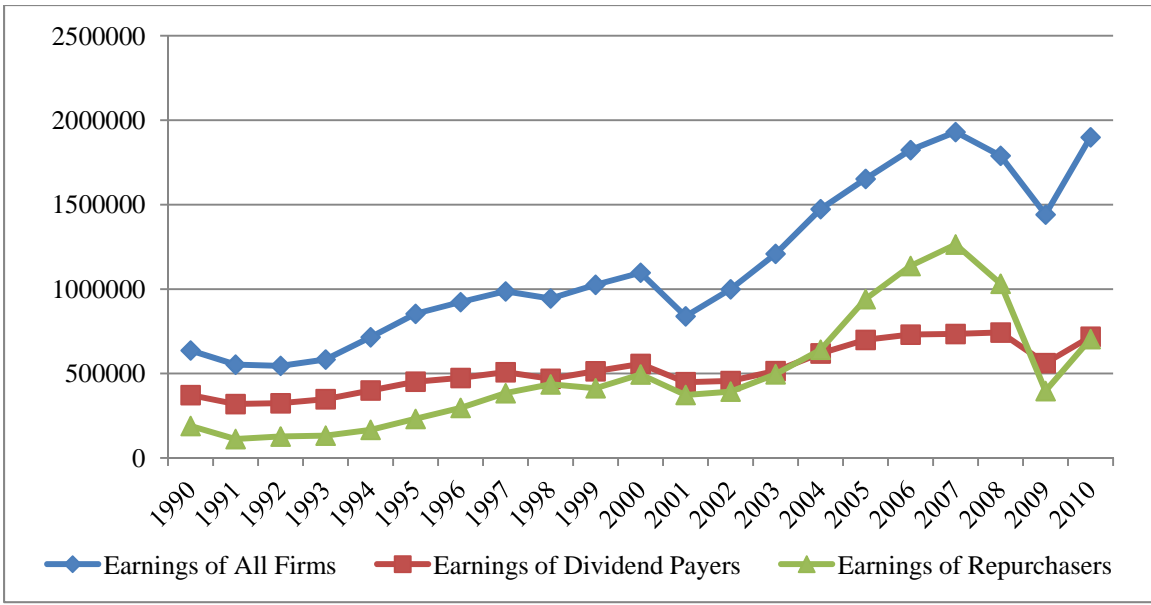


Fig. 1. Time-series of aggregate earnings. For 1990-2010, aggregate earnings, earnings of dividend paying firms, and earnings of share repurchasing firms are plotted. All dollar amounts are converted to 2004 dollars using the consumer price index (CPI). The sample contains all Compustat firms except financial and utility firms. Earnings are calculated as earnings before interest and taxes (EBIT).

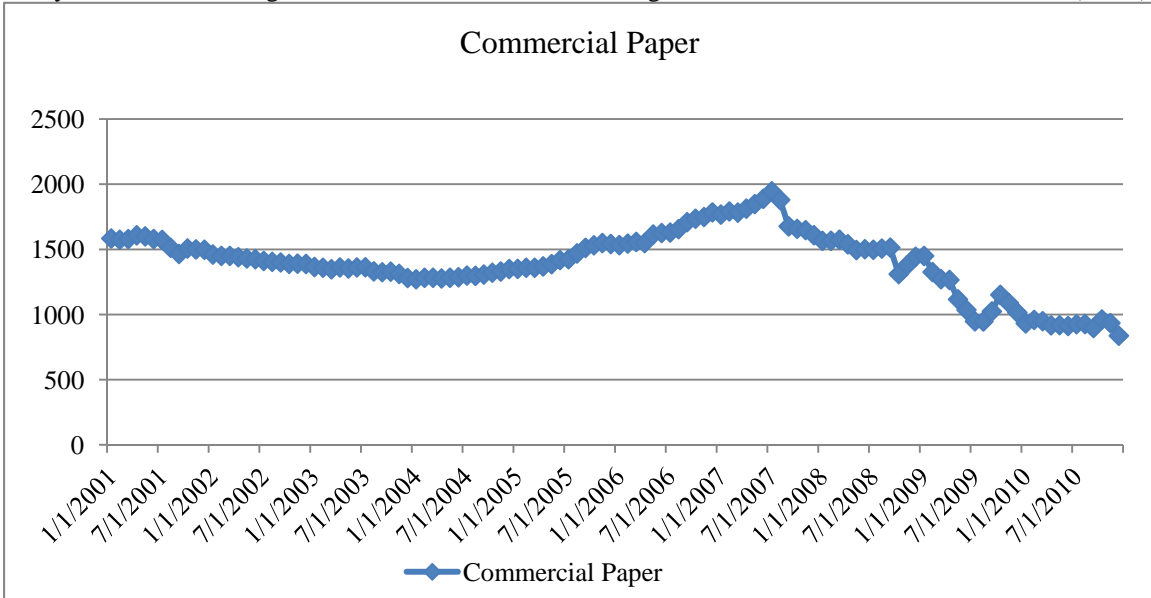


Fig. 2. Time-series of outstanding commercial paper by non-financial firms. This figure shows the outstanding commercial paper from 2001 to 2010. Aggregate figures are computed in 2003 dollars using the consumer price index (CPI). Data are obtained from the website of the Federal Reserve Bank of St. Louis (www.stlouisfed.org).

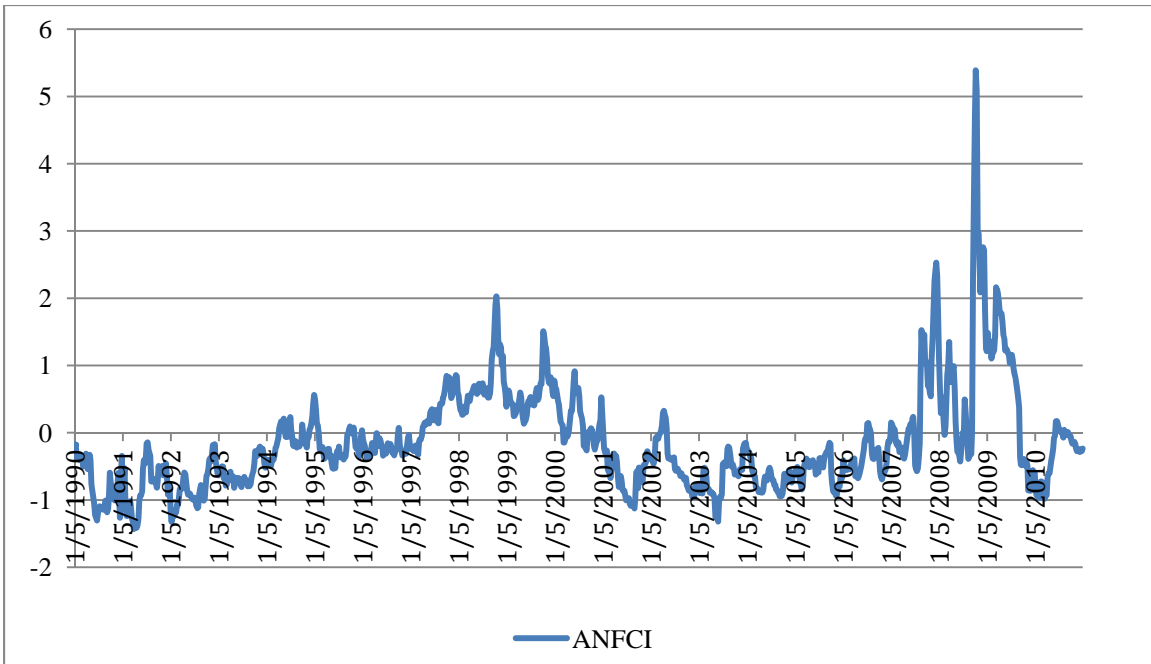


Fig. 3. Time-series of Adjusted National Financial Conditions Index (ANFCI). This figure plots magnitude of how “tight” or “loose” financial markets are operating given current economic conditions from 1990 to 2010. Positive values indicate that financial conditions are tighter on average than what would be suggested by current economic conditions, while negative values indicate the opposite. Data are obtained from the website of the Federal Reserve Bank of Chicago (www.chicagofed.org)

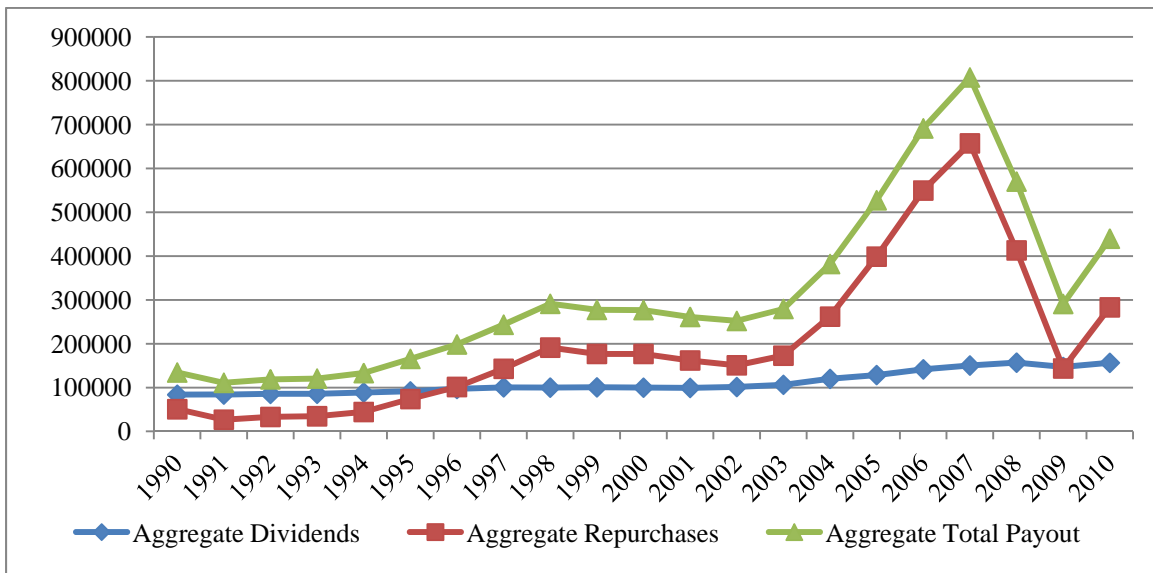


Fig. 4. Time-series of aggregate dividend, repurchases, and total payout. Aggregate dividend, repurchases, and total payout are plotted from 1990 to 2010. All dollar amounts are converted into 2004 dollars using the consumer price index (CPI). The sample contains all Compustat firms except financial 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 one percent of the market capitalization, value is set to zero. Total payout is calculated as the sum of dividends and repurchases.

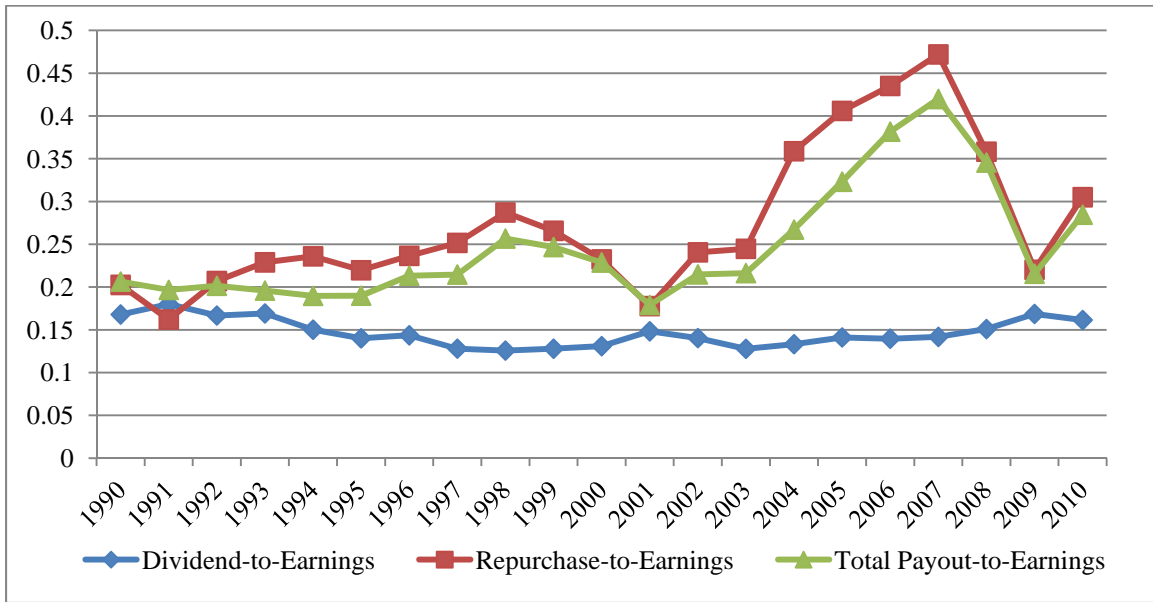


Fig 5. Time-series of payout ratios. The median dividend-to-earnings, repurchase-to-earnings, and total payout-to-earnings ratio for paying firms are plotted from 1990 to 2010. All Compustat firms are included except financial and utility firms. Dividends are calculated as the total amount of dividends 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 one percent 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).

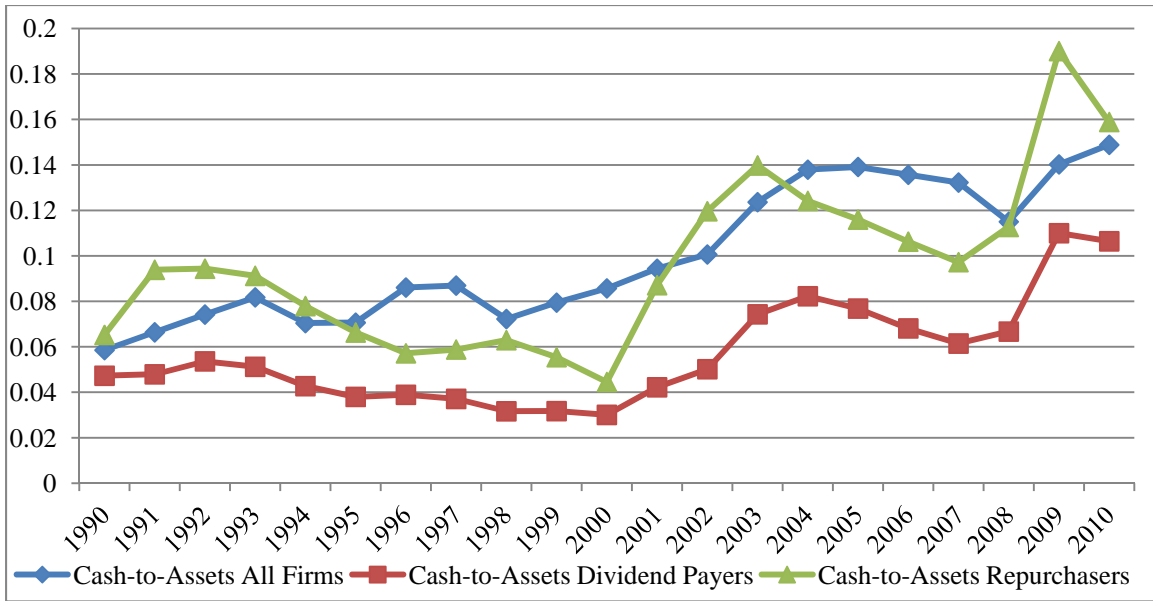


Fig. 6. Time-series of cash-to-total assets. The median cash-to-total assets for all firms, dividend payers, and repurchasers are plotted from 1990 to 2010. All Compustat firms are included except financials and utility firms. Dividend payers are those firms who have a positive dividend payout for the given year. Repurchasers are firms with a positive repurchase amount for the given a year. Cash-to-assets is defined as cash and short term investments (CHE) divided by total assets (AT).