Leveraged Buybacks

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Abstract

Debt-financed share buybacks generate positive short-term and long-run abnormal stock returns. Leveraged buyback firms have more debt capacity, higher marginal tax rate, lower excess cash and lower growth prospects ex ante, increase leverage and reduce investments more sharply ex post than cash-financed buyback firms. Firms that are over-levered ex-ante are associated with lower returns and real investments following leveraged buybacks. The lower announcement returns of over-levered firms are concentrated on firms with weaker corporate governance. The evidence is consistent with leveraged buybacks enabling firms to optimize their leverage, on average benefiting shareholders. The benefits decrease with a firm's leverage ex ante.

JEL Classification: G32; G33; G35

Keywords: Share Repurchases; Leverage Adjustments; Debt-for-Equity Swap; Sources of Financing

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1. Introduction

"Corporate America is increasingly turning to debt to fund stock repurchases. Some investors view even debt-financed stock buybacks as a form of returning cash to shareholders—except, it isn't!" - *CNBC (8th November 2011)*

Share repurchases have become a dominant payout method for firms to return excess cash to shareholders (Skinner (2008)). Previous research shows that share repurchases are value-enhancing for shareholders, both in the short-term and the long-run (Vermaelen (1981), Ikenberry, Lakonishok, and Vermaelen (1995), Gong, Louis, and Sun (2008), Peyer and Vermaelen (2009)). One of the key explanations is that managers convey favorable information to the market by buying back undervalued stocks (Vermaelen (1981), Jagannathan, Stephens, and Weisbach (2000)). Another explanation is that payouts in the form of share repurchases from firms with declining investment opportunities reduce the agency cost of free cash-flows (Jensen (1986), Grullon and Michaely (2004)).[1]

Over the past decade it has been increasingly popular for firms to finance their share repurchase programs by issuing debt, which generates controversy. In leveraged buybacks the cash paid out to shareholders is raised from debtholders, which has a larger impact on a firm's leverage than cash-financed buybacks. On the one hand, share buybacks from undervalued firms may convey favorable information to the market even if they are financed by debt, mitigating problems of information asymmetry or market undervaluation. Issuing debt to finance share buybacks also reduces the agency cost of free cash-flows as money borrowed is paid back over time. In addition, it may save taxes for companies as interest payments are tax-deductible, or because it is costly to repatriate cash trapped overseas.[2]

[1] Other motives of share repurchases include wealth expropriation from bondholders (Bradley and Wakeman (1983), Maxwell and Stephens (2003)), takeover defenses (Bagwell (1991), Billett and Xue (2007)), inflation of earnings per share (Fenn and Liang (2001), Kahle (2002)), and capital structure adjustment (Bonaime, Oztekin, and Warr (2014)).

[2] For example, Ebay was criticized by investors for repatriating cash trapped overseas to repurchase shares and paying $3 billion in taxes. (The Wall Street Journal, 29th April, 2014).

Hence from a standard tradeoff view of optimal capital structure, ex-ante under-levered firms with substantial debt capacity, high marginal tax rate, or declining future growth options may conduct leveraged buybacks to increase tax benefits or reduce agency costs of free cash-flows.[3] Therefore, we hypothesize that firms conduct leveraged buybacks to optimize their leverage, which in turn benefits shareholder value. For example, Jim Turner, head of debt capital markets at BNP Paribas, said in an interview: "If a company has debt capacity at its current ratings, and it makes sense from a capital optimization point of view, share repurchases with bond proceeds still make good sense." (Reuters, 6th September 2013).

On the other hand, the informational, agency and tax benefits of leveraged buybacks may decrease with ex-ante leverage of a firm. It is likely that leveraged buybacks lead to excessive debt, which is detrimental to firm value. The adjustment in capital structure associated with leveraged buybacks, which is akin to a debt-for-equity swap, may increase a firm's debt beyond its optimal level and raise the probability of bankruptcy sub-optimally.[4] It may also lead to investment-related agency issues such as the debt overhang problem, where a positive net-present-value project is not invested in and firm value is destroyed (Myers (1977)). Hence we hypothesize that ex-ante over-levered firms are associated with lower returns and sharper decline in real investments following leveraged buybacks. In an article titled "Share buybacks: corporate cocaine", the Economist magazine argues in its 13th September 2014 issue "Some firms may be borrowing too much to pay for their buyback habit… Shareholder capitalism is about growth and creation, not just dividing the spoils."

This paper studies whether or not leveraged buybacks are consistent with shareholder value maximization and economic efficiency. We collect a comprehensive sample of debt-

[3] For example, Lang, Ofek, and Stulz (1996) show that leverage is negatively associated with future growth and does not reduce growth for firms with good investment opportunities.

[4] Moody's Investor Service reports that rating agencies often reacted leveraged buybacks or debt-financed dividends less favorably than debt used for other corporate purposes (CFO Journal, Wall Street Journal, 25th March 2013). For instance, Moody's Investor Service downgraded Lowe Cos.'s debt two levels after the leverage increase was announced to facilitate repurchasing shares (Bloomberg, 17th April 2012).

financed open-market share repurchases in the U.S. from 1994 to 2012. For comparison we also construct a sample of open-market share repurchases that explicit state that they are cash-financed for the same period. In addition, we match them to samples of non-repurchasing firms with similar characteristics to calculate abnormal changes in firm performance, and collect a sample of open-market share repurchases that do not disclose the source of financing to account for potential non-random disclosure. Our cash-financed buyback firms have comparable firm characteristics to those reported in the buyback literature (Lie (2005), Massa, Rehman, and Vermaelen (2007), Grullon and Michaely (2004)). We find positive short-term market reactions for debt-financed repurchases. The average three-day abnormal return for debt-financed repurchases is 2.2%, which suggests that leveraged buybacks send a positive signal to the stock market initially. In addition, there are significantly negative abnormal returns in the six months prior to the repurchase announcements. We also find positive long-term stock performance following leveraged buybacks. For the next three years following the announcements, the abnormal return for leveraged buybacks is 76 basis points per month (9.1% per annum). This suggests that leveraged buybacks, on average, benefit shareholders.

We next examine whether the benefits from leveraged buybacks depend on ex-ante firm characteristics such as leverage, free cash-flows and excess cash, after controlling for takeover risk and other firm characteristics that may affect buyback performance. In our sample, 74% of leveraged buyback firms have substantial unused debt capacity and 81% are estimated to be under-levered ex ante. For those under-levered firms, the average pre-repurchase debt ratio (12%) is substantially below the average target debt ratio (27%). This suggests that under-levered firms utilize their unused debt capacity to repurchase shares. Four years after the buyback announcements, the debt ratio is 6.4% higher than that before

repurchase announcements. The permanent increase in leverage is consistent with our leverage optimization hypothesis.

We find that the average three-day abnormal returns and long-run stock performance of over-levered firms are lower than those of under-levered firms, supporting that the benefits of leveraged buybacks decrease with a firm's leverage ex ante. However, firms are over-levered ex-ante in a small segment of the leveraged buyback market (19% of our sample). In addition, 73% of leveraged buyback firms have ex-ante cash holdings below the estimated optimal level. But free cash-flows and excess cash do not explain the differences in market reactions to leveraged buybacks and to cash-financed buybacks.

After share buybacks, firms experience a decline in real investments, similar to those reported by Grullon and Michaely (2004). More importantly, the decline in real investments is larger for leveraged buybacks than that for cash-financed ones. The reduction is also sharper for firms that are over-levered ex ante. More specifically, we find a 5.5% (1.1%) decline in abnormal investments for over-levered (under-levered) firms, and the difference is statistically significant at the 1% level.

Firms with lower future growth options may conduct leveraged buybacks from a leverage optimization point of view. To examine whether the sharper reduction in investments is related to declines in future growth options, we then follow Rhodes-Kropf, Robinson, and Viswanathan (2005) to measure a firm's growth prospects. We find that the growth prospects for leveraged buyback firms are significantly lower and decline more sharply than those for cash-financed repurchasing firms. However, changes in growth prospects following leveraged buybacks do not explain the lower announcement returns and sharper decline in ex-post real investments that are associated with over-levered firms. Instead, we find that weaker corporate governance explains the lower announcement returns for over-levered firms. In

addition, we do not find significant differences in ex-post operating performance, financial distress risk, and the completion rate between debt- and cash-financed buybacks.

Our paper contributes to the following strands of literature. First, we contribute to the share repurchase literature (Vermaelen (1981), Ikenberry, Lakonishok, and Vermaelen (1995), Grullon and Michaely (2004)) by showing that leveraged buybacks on average benefit shareholders. Firms with higher marginal tax rate, declining growth prospects and substantial debt capacity optimize leverage by conducting leveraged buybacks. The informational, agency and tax benefits decrease with a firm's leverage ex ante. To our best knowledge our study is the first paper analyzing leveraged buybacks. Second, our paper adds to the literature on debt-for-equity swap. Cornett and Travlos (1989) analyze a sample of 40 firms proposing debt-for-equity exchanges and find positive market reactions. We report positive abnormal returns for leveraged buybacks in which a firm simultaneously increases debt and reduces equity. Third, our study is also related to the literature on sources of financing of corporate financial transactions such as takeovers (Schlingemann (2004), Martynova and Renneboog (2009)).[5] We show that the sources of financing matter for share buybacks.

The remainder of the paper is organized as follows. Section 2 describes our data and methodology. Section 3 reports our empirical results and Section 4 concludes.

2. Data

We collect our initial sample of open-market stock repurchases from the Securities Data Company (thereafter SDC) US Mergers and Acquisitions database. Our sample contains open-market share buybacks announced between January 1, 1994 and December 31, 2012.

[5] Schlingemann (2004) analyzes the relation between the source of funds available before a takeover and the potential bidder gains. Martynova and Renneboog (2009) show that bidder's pecking order preference, the corporate governance environment and firm's potential growth opportunities together determine the financing decision in takeovers.

The time period is chosen from 1994 as SEC's EDGAR Database starts providing comprehensive filings for buyback firms. SDC reports the "source of funds used to finance deal" if firms disclose relative information via corporate filings, news or other related sources. A share repurchase is defined as a debt-financed one if it is partially or fully financed by debt.

To verify the reliability of the data, we collect information from SEC's EDGAR Database and manually check the corporate filings i.e. 8-K, 10-Q, and 10-K for each repurchase. We classify a repurchase as a debt-financed one only if the filings explicitly say that the firm expects to use debt to fund the share repurchase.[6] Several categories of debt financing are mentioned to finance buybacks in the filings, including revolving credit facility, bridge loan, borrowing, line of credit or debt offering etc. However, details of the exact source of financing for each leveraged buyback are unavailable. Similarly, we define a repurchase as a cash-financed one if the firm explicitly states that cash or internal fund is used to finance the repurchase program.[7] The above procedures lead to 277 debt-financed open-market share repurchases and 433 cash-financed open-market share repurchases. As firms voluntarily disclose the sources of financing in share repurchases, we also collect a sample of 7,860 open-market share repurchases that do not disclose the source of financing to account for potential non-random disclosure (see Section 2.6 for details). [8]

[6] For example, we define the following repurchase as a debt-financed repurchase. Below is extracted from the Current-Event (8-K) filing of Dollar General Corp: "In connection with its previously announced $500 million common stock repurchase program, on March 25, 2012 Dollar General Corporation entered into an agreement with Buck Holdings, L.P. to repurchase from it approximately $300 million in shares of common stock concurrent with, and conditional upon, the completion of a contemplated underwritten secondary offering of shares by certain selling shareholders. *Dollar General expects to fund the share repurchase with borrowings under its asset-based revolving credit facility*."

[7] For example, we define the following buyback as a cash-financed repurchase. Below is derived from the Current-Event (8-K) filing of Extreme Networks Inc.:"Extreme Networks, Inc. (Nasdaq: EXTR) today announced its Board of Directors has authorized the repurchase of common stock worth up to $75 million which may be purchased over the next three years from time to time in the open market or in privately negotiated transactions. *Extreme Networks will fund the share repurchases from cash on hand*, which was approximately $200 million as of September 30, 2012. As of August 6, 2012, there were approximately 95 million shares of common stock outstanding."

[8] Our samples of debt-financed and cash-financed buybacks are smaller than what SDC reports. This is because we rely on the disclosure from SEC filings to avoid misclassification of sources of financing and to remove duplicated deals from SDC. We assign 795 buybacks that SDC classifies as debt-financed or cash-

We obtain stock returns from the Center for Research in Securities Prices (CRSP) files. Accounting variables are collected form Compustat and we require that financial variables of each firm are available in Compustat in the year prior to the share repurchase. We winsorise all control variables of firm characteristics at the 1st and 99th percentiles. Our summary statistics of firm characteristics are comparable to the literature (Lie (2005), Massa, Rehman, and Vermaelen (2007)). The summary statistics will be discussed in Section 2.7. The sample for cross-sectional analysis consists of 218 debt-financed open-market share repurchases and 357 cash-financed open-market share repurchases from 1994 to 2012.

2.1 Measuring Abnormal Stock Returns

We measure the short-term market reaction using the three-day cumulative abnormal return (CAR) from day -1 to day 1 where day 0 is the announcement date of a share repurchase. We use the market model to measure expected returns and the CRSP value-weighted market index as the benchmark. The estimation period ends 46 days before the repurchase announcement and we require the minimum (maximum) estimation length to be 15 (255) days.

We estimate the long-run abnormal returns after the buyback announcement using the calendar-time portfolio approach and Ibbotson's (1975) Returns Across Time and Securities (RATS) method. For the calendar-time portfolio approach, we form an equally-weighted portfolio which includes firms in our sample that made a buyback announcement in the previous 12, 24 or 36 months in each calendar month. The composition of the portfolio varies each month and the average monthly abnormal return of the portfolio (the intercept) is estimated based on the Fama-French three-factor model:

$$R_t - R_{ft} = \alpha + \beta_1\left(R_{mt} - R_{ft}\right) + \beta_2 HML_t + \beta_3 SMB_t + \varepsilon_t \qquad (1)$$

financed deals to our non-disclosure sample, given that their relevant SEC filings do not contain the sources of financing used to conduct buybacks.

Where R_t stands for the portfolio return in month *t*, *HML* and *SMB* denote the returns on book-to-market and size factor-mimicking portfolios. R_{mt} is the stock market benchmark return, R_{ft} is the monthly risk-free return, and α captures the monthly risk-adjusted return.

Ibbotson's (1975) RATS method allows firm risk to change over time. Following the literature (Peyer and Vermaelen (2009)), cross-sectional regressions are estimated for each month after buyback announcements:

$$R_{it} - R_{ft} = \alpha_t + \beta_{1t}(R_{mt} - R_{ft}) + \beta_{2t}HML_t + \beta_{3t}SMB_t + \varepsilon_{it} \quad t = 1, \ldots\ldots, 36 \quad (2)$$

Where *i* stands for each buyback firm, *t* denotes the number of months following an announcement date. α_t captures risk-adjusted abnormal return in time *t*.

2.2 Measuring Abnormal Investment & Operating Performance

We measure a firm's investment as the capital expenditure (item 145 in Compustat) divided by total assets (item 6). We construct a control sample of non-repurchasing firms matched by investment, industry and size. For each repurchasing firm, the matched non-repurchasing firm is of the same two-digit SIC code, and with both pre-repurchase investment and book value of assets in year -1 within $\pm$20% of those of the repurchasing firm. Among those firms satisfying the above criteria, the matched firm is the one with the least deviations from the repurchasing firm.[9] If no firms meet the criteria, we relax the industry criterion to one-digit SIC code. The *abnormal investment* of a repurchasing firm is defined as its capital-expenditure-to-assets ratio minus that of its matched firm.

Operating performance is measured as return on assets (ROA), which is defined as operating income before depreciation (item 13) divided by book assets at the beginning of the year (item 6). This is calculated over the eight quarters after the repurchase announcement

[9] The score function is defined as:
$(|\text{Investment}_{\text{year}-1,\text{sample firm}} - \text{Investment}_{\text{year}-1,\text{matched firm}}|)/\text{Investment}_{\text{year}-1,\text{sample firm}} +$
$(|\text{Total Assets}_{\text{year}-1,\text{sample firm}} - \text{Total Assets}_{\text{year}-1,\text{matched firm}}|)/\text{Total Assets}_{\text{year}-1,\text{sample firm}}$

quarter (Lie (2005), Gong, Louis, and Sun (2008), Chen and Wang (2012)). Prior research (Fama and French (2000), Jagannathan, Stephens, and Weisbach (2000)) shows that pre-announcement performance characteristics and market-to-book ratio predict future operating performance. Hence we select the matched sample of non-repurchasing firms based on prior operating performance, market-to-book ratio, industry and size.

The non-repurchasing firm is of the same two-digit SIC code, and with both operating performance and market-to-book ratio in year -1 within $\pm$20% of those of the repurchasing firm. In addition, the book value of assets for the matched firm in year -1 is also within $\pm$ 20% of that of the repurchasing firm. If no firms meet the above criteria, we relax the industry criterion to one-digit SIC code or disregard the industry criterion if there is still no match. Among firms satisfying the above criteria, we select the matched firm as the one with the least deviations from the repurchasing firm.[10] The *abnormal operating performance* for a repurchasing firm is defined as its ROA minus that of the matched firm.

2.3 Measuring Growth Prospects

To measure firms' growth prospects, we follow Rhodes-Kropf, Robinson, and Viswanathan (2005) to decompose the market-to-book ratio into three components:

$$m_{it} - b_{it} = \underbrace{m_{it} - v_{it}(\alpha_{jt})}_{firm-specific\ error} + \underbrace{v_{it}(\alpha_{jt}) - v_{it}(\alpha_j)}_{time-series\ sector\ error} + \underbrace{v_{it}(\alpha_j) - b_{it}}_{long-run\ value\ to\ book} \quad (3)$$

i stands for each firm, *t* denotes year and *j* accounts for industry. *m* is the market value of equity, *b* is the book value and *v* is a measure of fundamental value, all expressed in logs. α is the regression coefficient. The fundamental value $v_{it}(\alpha_{jt})$ is to be estimated for firm *i* on

[10] This score function is defined as:
$(|\mathrm{ROA}_{\mathrm{year-1,sample\ firm}} - \mathrm{ROA}_{\mathrm{year-1,matched\ firm}}|)/\mathrm{ROA}_{\mathrm{year-1,sample\ firm}} + (|\mathrm{TA}_{\mathrm{year-1,sample\ firm}} - \mathrm{TA}_{\mathrm{year-1,matched\ firm}}|)/\mathrm{TA}_{\mathrm{year-1,sample\ firm}} + (|\mathrm{M/B}_{\mathrm{year\text{-}1,\ sample\ firm}} - \mathrm{M/B}_{\mathrm{year\text{-}1,\ matched\ firm}}|)/\mathrm{M/B}_{\mathrm{year\text{-}1,\ sample\ firm}}$

time *t* in industry *j* and $v_{it}(\alpha_j)$ is an industry-specific long-run value that equals the industry average of $v_{it}(\alpha_{jt})$.

The first term in equation (3) is the difference between the market value and the estimated fundamental value. It captures firm-specific error in market valuation. The second term reflects the difference between the estimated fundamental value on time *t* and industry *j* and the long-run sector-specific value. Hence it captures the time-series sector error. Our variable of interest is the third component: long-run value to book $v_{it}(\alpha_j) - b_{it}$. It is the difference between the long-run sector-specific fundamental value and the observed book value. It measures a firm's growth prospects.

To measure the last component, we follow Rhodes-Kropf, Robinson, and Viswanathan (2005), and estimate α via the following regression based on Fama-French 12 industries:

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \varepsilon_{it} \quad (4)$$

Equation (4) is estimated annually for each industry *j* so that we have estimated coefficients α_{0jt} and α_{1jt} for each industry-year. $\bar{\alpha}_{0j}$ and $\bar{\alpha}_{1j}$ are the average α_{0jt} and α_{1jt} respectively over the sample period for each industry *j*. They are used to calculate the long-run sector-specific fundamental value:

$$v_{it}(\bar{\alpha}_{0j}, \bar{\alpha}_{1j}) = \bar{\alpha}_{0j} + \bar{\alpha}_{1j} b_{it} \quad (5)$$

The long-run value to book, i.e. the difference between v_{it} and b_{it}, is our measure of a firm's growth prospects. The higher the measure, the better the growth prospects.

2.4 Measuring Target Leverage, Debt Capacity, Optimal Cash Ratio and Financial Distress Risk

The target leverage ratios vary across firms and over time. Following Flannery and Rangan (2006) and Faulkender, Flannery, Hankins, and Smith (2012), we estimate the target leverage ratio for each firm per year using the following model:

$$MDR_{i,t+1} = \beta X_{i,t} + \varepsilon_{it} \quad (6)$$

Where $MDR_{i,t+1}$ is firm i's market debt ratio, i.e. the book value of debt divided by the sum of the book value of debt and the market value of equity, at year *t+1*, $X_{i,t}$ is a vector of firm characteristics related to costs and benefits of adjusting the leverage ratio. They include EBIT_TA, MB, DEP_TA, LnTA, FA_TA, R&D_TA, R&D_DUM and Ind_median. EBIT_TA is earnings before interest and taxes, as a proportion of total assets. MB is market-to-book ratio of assets. DEP_TA is depreciation as a proportion of total assets. LnTA is log of asset size, measured in 1983 dollars. FA_TA is fixed assets proportion to total assets. R&D_TA is R&D expenses as a proportion of total assets. R&D_DUM is a dummy variable that equals one if firm did not report R&D expenses. Ind_median is median industry market debt ratio calculated for each year based on the industry groupings in Fama and French (2002). After β is estimated, the predicted value of $MDR_{i,t+1}$ is the *target leverage ratio* for firm *i* at year *t+1*. A firm is defined as over-levered (under-levered) if its actual market debt ratio is higher (lower) than the target debt ratio before the repurchase announcement.

Following Lemmon and Zender (2010), our measure of debt capacity is based on the likelihood that a firm has access to public debt market. We estimate a logit model in which the dependent variable is one if a firm has debt rating in a given year and zero otherwise. Debt rating data are available in Compustat and our sample period is from 1994 to 2012. The explanatory variables include Ln_TA, ROA, PPE, MB, Leverage, Ln_Firm Age and Standard deviation of daily stock returns. Ln_TA is natural log of asset size. ROA is the ratio of operating profits to total assets. PPE is the ratio of property, plant and equipment to total assets. MB is market-to-book ratio of assets. Ln_Firm Age is the natural log of firm age where firm age is measured as the age of the firm relative to the first year the firm appears on Compustat. The estimated coefficients from the logit model are used to derive an estimated probability that a given firm could get a bond rating for each year during the sample period.

We divide our sample firms into three groups based on their estimated likelihood of gaining access to public debt market.[11] Firms in the lowest (highest) tercile are defined as firms with low (high) debt capacity.

Following Opler, Pinkowitz, Stulz, and Williamson (1999), we estimate the optimal cash level for each firm in each year and define the excess cash of a firm as its cash holdings in excess of its optimal level of cash. In the regression to estimate the optimal cash level, the dependent variable is the logarithm of cash and short-term investments (item 1) divided by net assets, where net assets are defined as total assets (item 6) minus cash and short-term investments (item 1). The explanatory variables are those that affect firms' cash expenditure and revenue, including the market-to-book ratio, size, cash flow, net working capital, capital expenditure, leverage, industry sigma (a measure of the volatility of an industry's cash flow), R&D and a dividend dummy. Cash flow, net working capital and capital expenditure are divided by net assets. After the regression model is estimated, we calculate excess cash by taking the antilog of the residual of the regression model.

A firm's credit risk is measured by using Altman's (1968) methodology. In particular, Altman's Z-score is computed as:

$$Z\ score = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.4X_4 + 0.999X_5 \quad (7)$$

where X_1 is working capital divided by book assets; X_2 is retained earnings divided by book assets; X_3 is earnings before interest and taxes divided by book assets; X_4 is the market value of equity divided by total liabilities; and X_5 is net sales divided by book assets. A lower Z-score indicates a higher financial distress risk.

The *abnormal Z-score* for a repurchasing firm is its Z-score minus that of a matched non-repurchasing peer. The matched firm is of the same two-digit SIC code, and both the pre-announcement Z-score and book value of assets in year -1 within $\pm$20% of those of the

[11] We also divide our sample firms into two groups based on the ranking of their debt ratings. The results are similar to those reported here.

repurchasing firm. These factors are important in explaining the cross-sectional variation in corporate distress risk (Fama and French (1993)). If no firms meet these criteria, we relax the industry criterion to one-digit SIC code or disregard the industry criterion. Among these firms, the matched firm is selected as the one with the least deviations from the repurchasing firm.[12]

2.5 Measuring Takeover Probability

Bagwell (1991) suggests that repurchases might be used as a takeover deterrent. More recently, Bargeron, Bonaime and Thomas (2016), Lin, Stephens and Wu (2014) and Dittmar and Dittmar (2008) have shown a correlation between takeover risk, share repurchases and stock returns.

We collect takeover data from SDC US Mergers and Acquisitions database to estimate the ex-ante takeover probability from 1993 to 2011. Following Cremers, Nair, and John (2009), we estimate a logit model where the dependent variable equals one if a firm is announced as a target in that year. The explanatory variables include an industry dummy that equals one if a takeover attempt occurred in the same industry in the year prior to the acquisition and zero otherwise, the return on assets, leverage, cash, firm size, Tobin's Q, fixed assets, and a blockholder dummy that equals one when an institutional blockholder exists at the end of the previous year and zero otherwise. The estimated coefficients from the logit model are used to derive the ex-ante *takeover probability* that a firm could be acquired in a given year during our sample period.

2.6 Buybacks Without Disclosed Sources of Financing

[12] This score function is

$$(|\text{Z\_score}_{\text{year}-1,\text{sample firm}} - \text{Z\_score}_{\text{year}-1,\text{matched firm}}|)/\text{Z\_score}_{\text{year}-1,\text{sample firm}} + (|\text{Total Assets}_{\text{year}-1,\text{sample firm}}$$

Our sample includes share repurchases that explicitly state in the SEC filings that they use debt or cash to finance repurchases. As it is voluntary for firms to disclose their sources of financing, we collect 7,860 open-market share repurchases that do not disclose the sources of financing used to repurchase shares to account for the possibility that the disclosure is not random.[13] We follow Heckman (1979) and conduct our multivariate analysis in a two-stage framework. First, we estimate a probit regression on firms' decision to disclose the financing method used to repurchase shares based on a sample of both disclosing and non-disclosing repurchases. We use simulated marginal tax rate for each firm-year to capture a company's tax motivation (Lin, Stephens, and Wu (2014). [14] We also control for other firm characteristics, including firm age, prior *CAR*, Market-to-Book ratio, *ROA*, firm size, standard deviation of daily stock returns, the volatility of industry cash flows, and takeover probability. Bonaime (2012) shows that firms disclose more about repurchase transactions after 17 December 2003 when SEC Rule 10b-18 became effective.[15] Hence we include a binary variable that equals one if the repurchase announcement is made from 17 December 2003 onwards. We also include industry and time dummies. In the second-stage regression, we include the inverse Mills ratio (*Lambda*) estimated from the first-stage probit model as an additional explanatory variable in our multivariate regressions.

2.7 Summary Statistics

The distribution of our sample of share repurchases over time is presented in Table 1. There is relative small numbers of repurchases in the 1990's.[16] In most years of our sample

[13] We thank an anonymous referee for suggesting this.

[14] We obtain marginal tax rates of individual firms from the website of John Graham. The link is https://faculty.fuqua.duke.edu/~jgraham/taxform.html

[15] Rule 10b-18 of SEC became effective on 17 December 2003, which requires more detailed disclosure on the total number of shares purchased and the average price paid per share.

[16] Our sample is smaller than that of previous research on repurchases (Grullon and Michaely (2004), Gong, Louis, and Sun (2008), Chen and Wang (2012)) as we require that the sources of financing of buybacks are disclosed. It is voluntary for firms to disclose the sources of financing used to repurchase shares.

period, the median deal size of debt-financed repurchases is larger than that of cash-financed ones.

Table 2 reports the difference of pre-repurchase firm characteristics between debt- and cash-financed buybacks. Debt-financed repurchasing firms have higher capital expenditure ratios, lower cash, higher debt ratio and financial distress risk than cash-financed ones. Those firms are more mature with more assets in place, higher dividend payment, larger firm size, and better operating performance before conducting leveraged buybacks. The differences are statistically significant at, at least, the 10% level. Our summary statistics of firm characteristics are comparable to the literature (Lie (2005), Massa, Rehman, and Vermaelen (2007)).

3. Empirical Results

3.1 Stock Performance Around Repurchases

Table 3 presents the short-term market reaction and long-run stock return following share repurchase announcements for debt-financed, cash-financed, and non-disclosing repurchases. Panels A reports average CAR using value-weighted market index as the benchmark. We observe positive market reactions for both debt- and cash-financed repurchases. The average three-day announcement-period abnormal returns for debt-financed repurchases are 2.19%, which is lower than the average abnormal returns of 2.72% for cash-financed repurchases. Our three-day abnormal returns for cash-financed repurchases are comparable to those in Grullon and Michaely (2004), who report an average 2.71% three-day CAR using value-weighted market index as the benchmark for cash-financed repurchases. The average three-day abnormal returns are not statistically different between disclosing and non-disclosing repurchases.

The long-term price drift prior to and following repurchase programs is listed in Panels B and C. Long-term stock returns in Panel B are measured via a calendar-time portfolio approach where the Fama-French three factors are used as the benchmark. We observe negative monthly calendar-time alphas six months prior to buyback announcements for debt-financed buybacks and the returns are significant (-46 basis points per month). Consistent with previous research (Ikenberry, Lakonishok, and Vermaelen (1995), Peyer and Vermaelen (2009)), we find positive post-repurchase abnormal returns. The average monthly abnormal returns for debt-financed buybacks range from 76 basis points to 95 basis points per month, while cash-financed repurchases experience average abnormal returns of 55 basis points to 78 basis points per month. For all repurchases that don't disclose the sources of financing, the average post-repurchase monthly abnormal returns are 21 to 45 basis points lower than those of disclosing repurchases.

To the extent that the calendar-time portfolio approach does not allow the factor loadings to change over time (Peyer and Vermaelen (2009)), the observed positive abnormal return may be due to higher systematic risk ex post. Hence we re-estimate the long-term price drift using Ibbotson's (1975) RATS method, which allows for risk changes through time.

Panel C exhibits negative monthly abnormal return six months prior to buyback announcements for debt-financed, cash-financed, and non-disclosing repurchases (-55 basis points, -103 basis points, and -77 basis points per month respectively). The results are consistent with Information/Timing hypothesis that underpriced firms initiate share repurchase (Peyer and Vermaelen (2009)). After buybacks, the monthly abnormal returns are between 39 (44) basis points and 82 (67) basis points over 36 months for debt-financed (cash-financed) repurchases. The positive abnormal returns suggest that debt-financed repurchases on average add value to shareholders.

3.2 Changes in Firm Performance Around Repurchases

Panel A of Table 4 shows the average changes in investment, cash, leverage, net leverage, ROA and Z-score before repurchase announcements. Firms exhibit significant declines in cash and significant increases in operating performance before leveraged buyback announcements. Cash-financed buyback firms experience significant declines in investment and improved operating performance before buyback announcements.

Panel B of Table 4 shows the average changes in investment, cash, leverage, net leverage, ROA and Z-score between year -1 (the year before the repurchase announcement) and years +1, +2, +3, and +4 (i.e. the years after the repurchase announcement). Debt-financed buyback firms experience significant declines in investment, and operating performance and significant increases in leverage, net leverage and financial distress risk ex post. After the initial mechanical increases following buyback announcements, the debt ratio begins levelling off and remains 6.4% higher in four years than that before repurchase announcements. Cash-financed repurchasing firms experience significant declines in cash, and operating performance and significant increases in financial distress risk following buyback announcements. Consistent with Lie (2005) and Gong, Louis, and Sun (2008), we observe a decline in ex-post operating performance for all buyback firms, before taking into account that of matched non-repurchasing peers. Figure 1 depicts changes of cash and leverage prior to and after repurchase announcements.

3.3 Ex-ante Firm Characteristics: Leverage, Free Cash-Flows and Excess Cash

The section studies how the effects of leveraged buybacks depend on ex-ante firm characteristics. First, ex-ante under-levered firms may adjust the debt ratio towards its optimal level via leveraged buybacks. We estimate the target debt ratio and find that 81% of debt-financed repurchasing firms are under-levered ex ante. For those under-levered firms,

the average pre-repurchase debt ratio (12%) is substantially below the average target debt ratio (27%). As a small segment of our sample, 19% of leveraged buybacks are conducted by firms that are estimated to be over-levered ex ante.

Second, we divide our sample of leveraged buybacks into two subsamples: ex-ante over-levered firms and under-levered ones. Table 5 reports the difference in firm performance and firm characteristics. Both over-levered firms and under-levered ones experience positive three-day abnormal returns (0.6% and 2.0% respectively), while those of over-levered firms are insignificant. Over-levered firms have negative but insignificant long-run stock performance, while that of under-levered firms is significantly positive under both the calendar-time portfolio approach and Ibbotson's (1975) RATS method (90 basis points and 80 basis points, respectively). The difference in long-run stock performance is statistically significant at the 1% level, suggesting that the benefits of leveraged buybacks decrease with a firm's leverage ex ante.

Third, we relate the market reactions to ex-ante firm characteristics in a multivariate regression framework using Heckman's (1979) selection model. Panel A of Table 6 reports the coefficient estimates of the first-stage regression. We find that firms are more likely to voluntarily disclose the financing method after Dec 2003 when more detailed disclosure for repurchases became effective. Younger and smaller firms with lower prior returns, return volatility, marginal tax rate and ex-ante takeover probability are also more likely to disclose the source of financing.

Panel B of Table 6 reports results of the second-stage regression. The *LBB Dummy* equals one for debt-financed repurchases and zero otherwise. The coefficient on the *LBB Dummy* in column (1) is positive but insignificant, which suggests that the short-term abnormal returns between debt-financed and cash-financed repurchases are not different statistically. Consistent with the agency cost of free cash-flows (Jensen (1986)), there is a less favorable

market reaction if the firm has substantial free cash-flows. Smaller and more levered firms with lower prior abnormal returns experience higher market reactions.

The financial leverage increases mechanically following leveraged buybacks. We study whether the benefits from leveraged buybacks depend on the ex-ante debt ratio. In column (2), we interact the *LBB Dummy* with the *Market Leverage*. The coefficient on this interaction term is significantly negative at the 1% level. The *LBB Dummy* is significantly positive at the 5% level, which suggests that market reacts favorably to debt-financed repurchasing firms with low debt ratio, In addition, for leveraged buybacks, firms with ex-ante high debt ratio experience lower abnormal returns than those with low debt ratio, consistent with the leverage optimization hypothesis.

A firm with high debt ratio is not necessarily over-levered. The optimal capital structure varies across firms. In column (3), we add an interaction term, *LBB Dummy* × *Over-levered Dummy* to the regression, where *Over-levered Dummy* is a binary variable that equals one if the firm is over-levered before the repurchase announcement and zero otherwise. For leveraged buybacks, we find that the average three-day abnormal return is lower if the firm is ex-ante over-levered.

Fourth, we examine how free cash-flows and excess cash in a firm affect the impact of debt financing on the market reaction to repurchases. We include an interaction term, *LBB Dummy* × *Free Cash Flow* in column (4). The coefficient on the interaction term is insignificant. As the optimal cash holdings vary across firms, following Opler, Pinkowitz, Stulz, and Williamson (1999), we estimate the target cash holdings for each firm-year. We include an interaction term in column (5), *LBB Dummy* × *Excess Cash Dummy*, where *Excess Cash Dummy* is a binary variable that equals one if a firm's cash ex ante is above the optimal level and zero otherwise. The coefficient on the interaction term is insignificant. This suggests that free cash-flows or excess cash does not affect the impact of debt financing on

three-day abnormal returns. The coefficient of the inverse Mills ratio is insignificant across all specifications.

Our results suggest that the market reacts favorably for ex-ante under-levered leveraged buyback firms. We find lower three-day announcement returns and poorer long-run stock performance for firms that are ex-ante over-levered.

3.4 Ex-Post Real Investments

Grullon and Michaely (2004) find that firms reduce their capital expenditures and R&D following repurchases. Table 7 shows the second-stage results of the cross-sectional analysis of changes in real investments ex post. The dependent variable is changes of *abnormal investment*, where *abnormal investment* is the capital expenditure of a repurchasing firm minus that of the matched peer with similar pre-buyback characteristics, from the end of year -1 to the end of year +2. In column (1), the coefficient of the *LBB Dummy* is significantly negative at the 10% level, which shows that debt-financed repurchasing firms experience sharper decline in ex-post abnormal investments than cash-financed ones. Post-repurchase capital expenditures are higher for firms with higher growth opportunities as proxied by Tobin's Q, similar to findings in previous studies (Jagannathan, Stephens, and Weisbach (2000)). Leverage is negatively associated with changes of abnormal investment (Lang, Ofek, and Stulz (1996)). Firms with more cash ex ante have higher post-repurchase real investments.

In column (2), we include an interaction term, *LBB Dummy* × *Leverage*, to examine how leverage affects the impact of debt financing on post-repurchase real investments. The coefficient on the *LBB Dummy* is no longer significant but the coefficient on the interaction term is significantly negative at the 1% level. This suggests that leveraged buybacks lead to a sharper decline in ex-post abnormal investment only for highly-levered firms, not for firms with ex-ante low leverage.

We then investigate whether over-levered buybacks are associated with sharper decline in ex-post real investment than under-levered ones. Table 5 shows that both over-levered leveraged buyback firms and under-levered ones experience significant declines in investment after controlling for matched non-repurchasing peers. We observe a 5.5% (1.1%) decline in abnormal investments for over-levered (under-levered) firms, and the difference is statistically significant at the 1% level. Similarly in column (3) of Table 7, we include an interaction term *LBB Dummy* × *Over-levered Dummy* and the coefficient is significantly negative at the 10% level. For leveraged buybacks, post-repurchase abnormal investment declines more sharply for firms with leverage above the optimal ratio ex ante.

To examine whether free cash-flows or excess cash affects the impact of debt financing on post-repurchase real investments, we first interact *LBB Dummy* with *Free Cash Flow* in column (4). The coefficient on the interaction term is significantly positive at the 10% level while *LBB Dummy* itself is significantly negative at the 1% level. This suggests that leveraged buyback firms with more free cash-flows ex ante have higher post-repurchase real investments. We interact *LBB Dummy* with *Excess Cash Dummy* in column (5) and it does not have a significant impact. Our results indicate that leveraged buybacks experience a steeper decline in abnormal investments ex post than cash-financed ones. The reduction in real investments is sharper for ex-ante over-levered firms.

3.5 Growth Prospects

We analyze whether the reduction in real investments ex post is driven by declining growth prospects. For each repurchasing firm, the matched non-repurchasing firm is of the same two-digit SIC code, and with both pre-repurchase investment and book value of assets in year -1 within ±20% of those of the repurchasing firm.

Table 8 and Figure 1 report changes of growth prospects, measured by long-run value to book, prior to and following buyback announcements for debt-, cash-financed repurchases and their matched non-repurchasing peers. The average change in the long-run value to book from the end of year -1 to the end of year 0 is insignificant for both leveraged buybacks and their matched peers. From the end of year 0 to the end of year +4, only the change for leveraged buybacks is significantly negative, and the difference between the changes for leveraged buybacks and matched peers is statistically significant at the 1% level. Then we compare the changes in long-run value to book of debt-financed repurchases with those of cash-financed ones. Debt-financed buyback firms experience a significantly sharper decline in growth prospects than cash-financed buyback firms from the end of year 0 to the end of year +4.

We next examine whether changes in growth prospects explain the lower returns and sharper decline in ex-post real investments for over-levered firms. Table 5 reports the changes in growth prospects from the end of year -1 to the end of year +2 for the subsamples of over-levered and under-levered firms. While under-levered firms experience significant decline in growth prospects following repurchase announcements, post-repurchase growth prospects for over-levered firms do not change significantly. Furthermore, we include growth prospects in our return and post-repurchase real investment regressions. We interact *Growth Prospect* with *LBB Dummy* in columns (1) and (3) of Table 9 and interact *Change in Growth Prospect* with *LBB Dummy* in columns (2) and (4). From columns (1) to (4), the *LBB Dummy* and *Leverage* interactions remain significant after controlling for growth prospects. These results suggest that growth prospects do not explain the lower announcement returns and ex-post investments for firms with high leverage ex ante.

Overall, our results suggest that the growth prospects decline significantly for all repurchasing firms ex post after controlling for non-repurchasing matched peers. The effect is

stronger for debt-financed buyback firms. Hence lower growth prospects may contribute to the post-repurchase reduction in real investments for leveraged buybacks. However, they do not explain the results for over-levered firms where announcement returns and ex-post real investments are lower.

3.6 Can Corporate Governance Explain the Lower Returns of Over-Levered Firms?

We next examine whether corporate governance explains the lower announcement returns and sharper decline in ex-post real investments for over-levered firms. Following Gompers et al. (2003), we use *G-Index* to control for differences in corporate governance across firms. Gompers et al. (2003) construct an equally-weighted index based on 24 governance provisions provided by the Investor Responsibility Research Center (IRRC). Higher *G-Index* proxies for weaker corporate governance. Among our sample of 575 repurchasing firms, data on *G-Index* is available for 357 firms.

Table 5 reports *G-Index* at the end of year -1 for the subsamples of over-levered and under-levered firms. Over-levered firms have significantly weaker corporate governance than under-levered firms, and the difference is statistically significant at the 5% level. In Table 10 we then control for corporate governance in our regressions for announcement returns (columns (1) and (2)) and post-repurchase real investment (columns (3) and (4)). We interact *G-Index* with *LBB Dummy* in all columns and interact *Leverage* with *LBB Dummy* in columns (2) and (4). In column (1) of Table 10, the LBB and *G-Index* interaction is significantly negative, suggesting that weaker corporate governance is associated with lower abnormal returns for leveraged buyback firms. In column (2), *LBB Dummy*G-Index* remains significant, while *LBB Dummy*Leverage* becomes insignificant. This implies that weaker corporate governance explain the lower announcement returns for over-levered firms.

In our investment regressions in columns (3) and (4), the LBB and leverage interactions remain significant, while all interaction terms with *G-Index* are insignificant. This shows that weaker corporate governance do not explain the sharper decline in ex-post investments for over-levered firms.

3.7 Motives and Completion Rates of Leveraged Buybacks

We study why firms use debt to finance repurchases by employing logit and probit regressions. The dependent variable is a dummy variable that equals one if firms use debt to fund repurchases and zero otherwise. The explanatory variables include one-year lagged firm characteristics. We include both industry and year dummies to account for potential industry-specific and year-specific differences. Standard errors are clustered by firm.

Table 11 shows that firms with higher marginal tax rate are more likely to issue debt to repurchase shares as the tax advantage of debt is higher for these firms. Firms with lower excess cash are more likely to use debt to finance share buybacks. As the optimal cash holdings vary across firms, following Opler, Pinkowitz, Stulz, and Williamson (1999), we estimate the target cash holdings for each firm-year. 73% of debt-financed repurchasing firms have ex-ante cash holdings below the estimated optimal cash level. This result supports a pecking order of financing where the firm raises external debt if internal cash is insufficient (Myers and Majluf (1984)).

Furthermore, firms with more unused debt capacity are more likely to use debt to finance repurchases. In our sample, 74% of leveraged buyback firms belong to the substantial debt capacity group, while 48% of cash-financed buyback firms have substantial debt capacity ex ante. These results show that firms with lower cash but substantial unused debt capacity ex ante are more prone to take advantage of tax shield of debt via leveraged buybacks.

Unlike repurchases via Dutch auction or tender offers, open-market repurchase programs do not commit to completing a pre-specified buyback program. Hence managers may use repurchase programs for their own interest (Fenn and Liang (2001), Chan, Ikenberry, Lee, and Wang (2010)).[17] For leveraged buybacks, existing bondholders may deter the execution of repurchases due to an increased leverage.[18]

We then examine the completion rate of debt-financed repurchases after repurchase announcements. To measure the completion rate of share repurchases, we use the purchase of common and preferred stock (item 115) minus any decrease in redeemable preferred stock (item 175) from Compustat, divided by the market value of equity (Grullon and Michaely (2004), Gong, Louis, and Sun (2008)).[19]

In column (1) of Table 12, we employ the Tobit model where the dependent variable is the actual buyback ratio two years after the repurchase announcement. We include intended buyback ratio as additional explanatory variable in our regression. Intended buyback ratio is defined as the intended buyback size disclosed in the Current-Event (8-K) filing over the market value of equity (Chen and Wang (2012)). The coefficient on the *LBB Dummy* is statistically insignificant, which suggests that the completion rate between debt- and cash-financed repurchases are not different statistically. Firms have higher completion rates after Dec 2003 when more detailed disclosure for repurchases became effective (Bonaime, 2015).

[17] Bonaime (2012) finds a reputation effect where the lagged completion rate predicts future completion rates of buybacks.

[18] This is possibly due to interventions from debtholders. For example, Bloomberg reports on 17 April 2012: "Lowe's Cos. (LOW) is raising $2 billion in the bond market to finance stock repurchases as the second-biggest U.S. home-improvement retailer boosts leverage to reward shareholders even as its profitability wanes. That raises concern among bondholders and bondholders are somewhat skeptical of the company given that the firm changed its financial policies. Debtholders tend to negotiate with the senior officials in order to avoid worsen financial position of the company."

[19] Several proxies are proposed by previous research to measure actual buyback ratio. Fama and French (2001) select changes in treasury stock from Compustat to proxy for actual repurchase rate. Stephens and Weisbach (1998) and Guay and Harford (2000) use decreases in shares outstanding from CRSP to measure actual buyback ratio. Banyi, Dyl, and Kahle (2008) show that purchase of common and preferred stock minus any decrease in redeemable preferred stock from Compustat is considered a better measure.

Firms with ex-ante higher takeover probability are more likely to complete ex post, which is consistent with share repurchases act as a takeover defense (Billett and Xue, 2007).

In column (2), we interact *LBB Dummy* with *Over-levered Dummy* and find that the interaction term is significantly positive at the 1% level while *LBB Dummy* itself is significantly negative at the 10% level. This suggests that for leveraged buybacks, ex-ante over-levered firms have higher completion rate ex post. The results are similar when we use Heckman's (1979) selection model in columns (3) and (4).

3.8 Operating Performance, Financial Distress Risk and Robustness Checks

We first examine whether operating performance improves following debt-financed repurchases. Figure 2 depicts changes of operating performance following repurchase announcements for debt- and cash-financed buybacks and their matched peers. Consistent with Lie (2005) and Gong, Louis, and Sun (2008), we find lower reductions in operating performance ex post for debt- and cash-financed repurchases than matched non-repurchasing firms. We then test whether the abnormal post-repurchase operating performance differs between debt- and cash-financed buybacks, controlling for other factors in a regression setting. The dependent variable is changes of *abnormal operating performance* from the end of year -1 to the end of year +2. We do not find significant difference in ex-post *abnormal operating performance* between debt- and cash-financed buybacks (Tables are available upon request).

We next analyze whether debt-financed buyback firms face higher financial distress risk ex post than their matched non-repurchasing peers. Shareholders may use buybacks to expropriate wealth from debtholders (Bradley and Wakeman (1983), Maxwell and Stephens (2003)). For instance, Greenberg reports on 8th November 2011: "Fitch Rating downgraded Amgen the day when the firm announced that it would use debt to finance the repurchase."

Figure 2 plots changes of Z-score following buyback announcements for debt-financed, cash-financed repurchases and their matched non-repurchasing peers. Debt-financed buyback firms do not exhibit higher financial distress risk than their matched peers. We also run regression where the dependent variable is changes of *abnormal Z-score* from the end of year -1 to the end of year +2. The coefficient of the *LBB Dummy* is negative but insignificant. We do not find significant difference of abnormal changes of financial distress risk ex post between debt- and cash-financed buybacks (Tables are available upon request).

We also conduct several robustness checks to our main results. First, we use an alternative definition of debt-financed repurchases. We define a repurchase as a debt-financed one only if the corporate filings explicitly state that the firm expects to use only debt to finance the share repurchase. In our sample, 83 out of 218 leveraged buybacks are fully financed by debt. We investigate short-term market reaction to those fully-debt financed repurchases. We find similar results to those reported before.

Second, we use alternative measures of abnormal returns. For example, we use a five-day window in CAR. We also use alternative models such as the CRSP equally-weighted market index as the benchmark or market-adjusted returns where equity beta is assumed to be 1. The results are very similar to those reported in Table 6.

Third, an alternative measure of the completion rate is employed. Following Bonaime (2012), we use the purchase of common and preferred stock minus any decrease in redeemable preferred stock, all scaled by the announced size of repurchase plan to measure the completion rate.[20] Results remain unchanged.

4. Conclusion

[20] Results are similar when we drop the decrease in redeemable preferred stock item.

This paper studies the performance of leveraged buybacks. We propose that firms conduct leveraged buybacks to optimize their capital structures. Consistent with our hypothesis, under-levered firms with substantial debt capacity, high marginal tax rate, low excess cash, and low growth prospects conduct leveraged buybacks to take advantage of tax shield of debt. We find positive short-term abnormal returns and long-term price drift for debt-financed repurchases. Leveraged buyback firms experience a steeper decline in real investments ex post than cash-financed buyback firms, which may relate to their differences in growth prospects.

The stock market reacts less favorably to ex-ante over-levered firms, consistent with the informational, agency and tax benefits of leveraged buybacks decreasing with a firm's leverage. Lower growth prospects do not explain the lower announcement returns and ex-post real investments that are associated with ex-ante over-levered firms. Instead, we find that the lower announcement returns for over-levered firms are concentrated on firms with weaker corporate governance. Debt-financed buyback firms do not have significantly different financial distress risk, operating performance, or completion rate ex post than cash-financed ones.

Our results suggest that leveraged buybacks on average add value to shareholders. Firms with declining growth prospects and substantial debt capacity repurchase shares via issuing debt to generate tax benefits or reduce agency costs of free cash-flows, therefore optimizing their leverage. However, the evidence does not imply that *all* leveraged buybacks are consistent with value maximization and economic efficiency. In a small segment of the leveraged buyback market where firms are over-levered ex-ante, leveraged buybacks lead to lower market reactions and sharper reductions in ex-post investments than under-levered firms.

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Table 1 The Distribution of Share Repurchases Over Time

This table lists the number of debt- and cash-financed repurchases each year over the period 1994-2012. Debt-financed repurchases are share buybacks that use external debt to buyback stocks. We define a share repurchase as a debt-financed one if the transaction is partially or fully financed by debt. Cash-financed repurchases are repurchase programs that use internal funds to finance share buybacks. We also report the mean (median) deal value for both debt- and cash-financed repurchases.

	Debt-Financed Repurchases			Cash-Financed Repurchases		
Year	N	Mean Deal Value ($million)	Median Deal Value ($million)	N	Mean Deal Value ($million)	Median Deal Value ($million)
1994	12	81.30	25.75	13	41.93	9.40
1995	19	115.85	34.68	6	13.25	9.09
1996	14	133.78	43.67	12	113.81	24.53
1997	17	229.30	47.81	10	124.42	6.32
1998	16	36.16	17.76	10	401.69	19.22
1999	17	48.41	15.70	6	53.47	63.89
2000	4	91.47	47.50	4	9.80	8.15
2001	7	114.23	53.28	7	78.64	11.49
2002	8	104.84	33.00	13	297.15	9.60
2003	3	70.02	38.50	4	46.69	41.65
2004	7	869.66	100.00	28	318.55	101.38
2005	13	361.70	300.00	26	311.76	57.5
2006	12	411.37	250.00	27	228.59	25.52
2007	35	1001.39	150.00	62	253.43	55.00
2008	29	146.48	46.30	102	390.16	20.00
2009	10	161.65	63.00	27	167.49	25.00
2010	6	300.40	212.50	9	348.38	15.00
2011	31	470.91	100.00	37	132.09	50.00
2012	17	426.47	200.00	30	756.96	250.00
Total	277	335.21	70.00	433	291.39	30.00

Table 2 Sources of Financing and Firm Characteristics

The sample consists of 218 debt-financed open-market share repurchases and 357 cash-financed open-market share repurchases over the period 1994-2012. *Investment* is defined as capital expenditure (item 145 in Compustat) divided by total assets (item 6). *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Market Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Net Market Leverage* is the book value of debt (item 9+ item 34) minus cash and cash equivalents (item 1), all divided by the sum of book value of debt (item 9+ item 34) and market value of equity(item 25* item 24). *Intended Buyback Ratio* is the intended buyback size disclosed in the 8-k filing over the market value of equity (item 25* item 24). *Z-score* is Altman's (1968) measure of credit risk. *Dividend* is the sum of common (item 21) and preferred (item 19) dividend paid to shareholders over total assets (item 6). *Tobin's Q* is defined as the book value of assets (item 6) minus book value of equity (item144) plus market value of equity (item 25* item 24), all divided by book value of assets (item 6). *Size* is defined as the log of asset size (item 6), measured in 1983 dollars. *ROA* is defined as operating income (item 13) divided by book assets (item 6). *FA_TA* is the property, plant and equipment (item 14) over total book assets (item 6). *Takeover Probability* is the predicted probability of being acquired one year before the repurchase announcement from the probit regression. The last column reports the difference in mean test. ***, **and * represent statistical significance at the 1%, 5% and 10% level, respectively.

	Debt-Financed Repurchases			Cash-Financed Repurchases			Difference
	N	Mean	Median	N	Mean	Median	Debt - Cash
Investment	210	0.066	0.038	336	0.045	0.032	0.021***
Cash	212	0.093	0.040	341	0.250	0.223	-0.157***
Market Leverage	210	0.196	0.145	339	0.136	0.070	0.060***
Net Market Leverage	210	0.140	0.107	339	-0.036	-0.047	0.176***
Intended Buyback Ratio	211	0.120	0.077	337	0.130	0.068	-0.010
Z-score	199	4.476	3.761	325	6.237	4.147	-1.761***
Dividend	218	0.010	0.002	357	0.008	0.000	0.002*
Tobin's Q	211	1.994	1.688	341	2.186	1.673	-0.192
Size	218	6.350	6.223	357	5.848	5.876	0.502***
ROA	212	0.174	0.153	340	0.129	0.125	0.045***
FA_TA	218	0.287	0.200	357	0.199	0.112	0.088***
Takeover Probability	218	0.095	0.093	357	0.095	0.094	0.000

Table 3: Short-Term and Long-Run Stock Performance

This table shows the short-term market reaction and long-term price drift for debt-financed, cash-financed, and non-disclosing repurchases. Panel A shows the cumulative abnormal return based on different event windows. We use market model and select value-weighted (VW) market index as the benchmark. Panel B reports the monthly calendar-time alphas 6-month prior to and 12-, 24-, and 36-month following the repurchase announcement date, where portfolios are formed monthly in calendar time. Panel C shows the monthly abnormal returns 6-month prior to and 12-, 24-, and 36-month following the repurchase announcement using Ibbotson's (1975) Return Across Time and Securities (RATS) method. The last column reports the difference between disclosing repurchases and non-disclosing repurchases in mean test. ***, **and *represent the 1%, 5% and 10% significance level, respectively.

Panel A: Short-term CAR

	Debt-Financed Repurchases		Cash-Financed Repurchases		All disclosing Repurchases		Non-disclosing Repurchases		Difference
	N	VW	N	VW	N	VW	N	VW	ALL-Non
(-1,0)	269	1.04%***	403	1.30%***	672	1.19%***	7,548	1.33%***	-0.14%
(0,1)	269	2.21%***	403	2.90%***	672	2.63%***	7,548	2.39%***	0.24%
(-1,+1)	269	2.19%***	403	2.72%***	672	2.50%***	7,548	2.20%***	0.30%

Panel B: Fama-French Calendar-Time Long-term AR

	Debt-Financed Repurchases		Cash-Financed Repurchases		All disclosing Repurchases		Non-disclosing Repurchases		Difference
	N	Calendar-time Approach	N	Calendar-time Approach	N	Calendar-time Approach	N	Calendar-time Approach	ALL-Non
(-6,0)	273	-0.46%*	409	-0.68%**	682	-0.69%**	7,684	-0.37%***	-0.32%***
(0,+12)	273	0.95%***	409	0.78%***	682	0.79%***	7,684	0.34%***	0.45%***
(0,+24)	273	0.80%***	409	0.59%***	682	0.64%***	7,684	0.33%***	0.32%***
(0,+36)	273	0.76%***	409	0.55%***	682	0.56%***	7,684	0.35%***	0.21%***

Panel C: Fama-French IRATS Long-term AR

	Debt-Financed Repurchases		Cash-Financed Repurchases		All disclosing Repurchases		Non-disclosing Repurchases		Difference
	N	Ibbotson RATS	N	Ibbotson RATS	N	Ibbotson RATS	N	Ibbotson RATS	ALL-Non
(-6,0)	273	-0.55%**	409	-1.03%***	682	-0.73%***	7,684	-0.77%***	0.04%
(0,+12)	273	0.82%***	409	0.67%***	682	0.73%***	7,684	0.50%***	0.23%***
(0,+24)	273	0.49%**	409	0.51%***	682	0.51%***	7,684	0.46%***	0.05%***
(0,+36)	273	0.39%**	409	0.44%***	682	0.43%***	7,684	0.44%***	-0.01%

Table 4 Changes in Investment, Cash, Leverage, Net Leverage, ROA and Z-score Around Buybacks

This table reports average changes in investment, cash, leverage, net leverage, ROA and Z-score before and after repurchase announcements. Panel A shows changes ex ante and Panel B displays changes ex post. Year 0 is defined as the fiscal year when share repurchase is announced. Period (x, y) measures changes from the end of year y to the end of year x. *Investment* is defined as capital expenditure (item 145) divided by total assets (item 6). *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Market Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Net Market Leverage* is the book value of debt (item 9+ item 34) minus cash and cash equivalents (item 1), all divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *ROA* is defined as operating income (item 13) divided by book assets (item 6). *Z-score* is Altman's (1968) measure of credit risk. ***, **and * represent statistical significance at the 1%, 5% and 10% level, respectively.

Panel A: Ex-ante changes

Category	Period	Change in *INV*	Change in *CASH*	Change in *LEV*	Change in *NLEV*	Change in *ROA*	Change in *Z-score*
Debt-Financed Repurchases	(-2,-1)	0.001	-0.004**	-0.007	-0.004	0.007*	0.127
	(-3,-1)	-0.000	-0.012**	-0.022*	-0.008	0.010**	0.274
	(-4,-1)	-0.000	-0.015***	-0.022	-0.012	0.018**	0.141
	(-5,-1)	-0.002	-0.025***	-0.001	0.011	0.017**	-0.356
Cash Financed Repurchases	(-2,-1)	-0.002	0.004	-0.001	-0.007	0.010*	0.205
	(-3,-1)	-0.005**	-0.001	-0.004	-0.012	0.018**	0.213
	(-4,-1)	-0.009***	0.007	-0.010	-0.030**	0.028***	-0.204
	(-5,-1)	-0.006**	-0.003	-0.028***	-0.042***	0.019**	-1.572***

Panel B: Ex-post changes

Category	Period	Change in *INV*	Change in *CASH*	Change in *LEV*	Change in *NLEV*	Change in *ROA*	Change in *Z-score*
Debt-Financed Repurchases	(-1,+1)	-0.012**	-0.001	0.084***	0.068***	-0.003	-0.884***
	(-1,+2)	-0.021***	0.002	0.061***	0.044***	-0.013*	-1.016***
	(-1,+3)	-0.020***	0.008	0.064***	0.038**	-0.019**	-1.093***
	(-1,+4)	-0.020***	0.013*	0.064***	0.033	-0.031***	-1.354***
Cash-Financed Repurchases	(-1,+1)	0.001	-0.028***	0.021**	0.011	-0.018**	-1.469***
	(-1,+2)	-0.001	-0.032***	0.014	0.001	-0.014*	-1.418***
	(-1,+3)	-0.005*	-0.035***	0.036***	-0.008	-0.022**	-2.068***
	(-1,+4)	-0.001	-0.035***	0.026*	-0.022	-0.017*	-2.163***

Table 5 Leveraged Buybacks and Firm Performance: Over-levered vs Under-levered Firms

This table disentangles over-levered leveraged buyback firms from under-levered ones. The leveraged buyback firm is defined as over-levered if its market leverage exceeds the optimal level one year before the repurchase announcement. Following Flannery and Rangan (2006) and Faulkender, Flannery, Hankins, and Smith (2012), we estimate the target leverage ratio for each firm per year. *CAR* is the three-day cumulative abnormal return (-1, +1) where day 0 is the repurchase announcement date. *Fama-French Calendar-time AR* is the monthly calendar-time alphas 12 months following the repurchase announcement date, where portfolios are formed monthly in calendar time. *Ibbotson RATS AR* is the monthly abnormal returns 12 months following the repurchase announcement using Ibbotson's (1975) Return Across Time and Securities (RATS) method. *Debt Capacity* is the likelihood that a firm has access to public debt market. *Excess Cash* is a dummy variable that equals one if the firm has excess cash prior to the buyback announcement and zero otherwise. We follow Gompers et al. (2003) and construct *G-Index* based on 24 governance provisions provided by Investor Responsibility Research Center (IRRC). High *G-Index* indicates weak corporate governance. We calculate *Changes in Abnormal Investment, Abnormal Operating Performance, Abnormal Z-score,* and *Growth Prospect* from the end of year -1 to the end of year +2. *Abnormal Investment* is a repurchasing firm's capital expenditure (item 145) divided by total assets (item 6), minus that of its matched firm. The *Abnormal Operating Performance* for a repurchasing firm is its ROA, which is defined as operating income (item 13) divided by book assets (item 6) minus that of the matched firm. The *Abnormal Z-score* for the repurchasing firm is the firm specific *Z-score* minus that of the matched firm. *Growth Prospect* is the difference between long-run value and observed book value. The last column reports the difference in mean test. ***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

	Over-levered Firms		Under-levered Firms		Difference
	N	Mean	N	Mean	Over - Under
CAR	40	0.006	141	0.020***	-0.014
Fama-French Calendar-time AR (+1,+12)	40	-0.001	143	0.009***	-0.008***
Ibbotson RATS AR (+1,+12)	40	-0.002	143	0.008***	-0.010***
Debt Capacity	41	0.461***	127	0.368***	0.093
Excess Cash	42	0.238***	132	0.265***	-0.027
G-Index	24	9.167***	112	7.848***	1.319**
Changes in Abnormal Investment	37	-0.055***	131	-0.011**	-0.044***
Changes in Abnormal Operating Performance	36	0.014	131	0.058**	-0.044
Changes in Abnormal Z-score	34	0.116	123	-1.004***	1.120*
Changes in Growth Prospect	36	-0.003	135	-0.048***	0.045***

Table 6 Cross-Sectional Analysis of Short Term Reaction to Buyback Announcements

This table reports Heckman's (1979) two-stage results to correct for potential selection bias due to the non-randomness of our repurchase sample. In the first stage (Panel A), we investigate which firms are more likely to disclose their source of financing to repurchase shares. In the second stage (Panel B), we include the inverse Mills ratio estimated from the first-stage probit model and report the cross-sectional results of short-term market reaction to repurchase announcements. In Panel A, the dependent variable is a dummy variable that equals one if the firm discloses the source used to finance share repurchase and zero otherwise. *Marginal Tax Rate* is the simulated corporate marginal tax rate based on income after interest expense has been deducted. *High Disclosure Dummy* is a binary variable that equals one if the repurchase announcement is made from Dec 2003 onwards and zero otherwise. *Firm Age* is the natural log of firm age where firm age is measured as the age of the firm relative to the first year the firm appears on Compustat. *Prior CAR* is the stock returns on the firm minus returns on the value-weighted CRSP index, calculated from 44 days prior to the announcement until 4 days prior to the announcement. *MB* is the book value of debt (item 9+item 34) plus preferred stock liquidating value (item10) plus market value of equity (item 25*item 24), all divided by book value of assets (item 6). *ROA* is the operating income (item 13) divided by book assets (item 6). *Size* is defined as the log of asset size (item 6), measured in 1983 dollars. *SD of Stock Return* is the standard deviation of daily stock returns. *Industry Sigma* is a measure of the volatility of an industry's cash flow. *Takeover Probability* is the percentage of the predicted probability of being acquired one year before the repurchase announcement from the probit regression. In Panel B, the dependent variable is the three-day CAR (-1, +1) where day 0 is the repurchase announcement date. *LBB Dummy* is a dummy variable that equals one if the repurchase is debt-financed and zero otherwise. We define a share repurchase as a debt-financed one if the transaction is partially or fully financed by debt. *Tobin's Q* is defined as the book value of assets (item 6) minus book value of equity (item144) plus market value of equity (item 25* item 24), all divided by book value of assets (item 6). *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Free Cash Flow* is the gross operating income (item 13) minus the sum of depreciation (item 14), tax paid (item 16), interest expenses (item 15) and dividends paid (item19+item 21). *Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Fixed Assets* is the property, plant and equipment (item 14) over total book assets (item 6). *Dividend* is the sum of common (item 21) and preferred (item 19) dividend paid to shareholders over total assets (item 6). *Over-levered Dummy* is a binary variable that equals one if the firm is over-levered before the repurchase announcement and zero otherwise. *Excess Cash Dummy* is a dummy variable that equals one if the firm has excess cash prior to the buyback announcement and zero otherwise. We include two time dummies capturing the Dot-com bubble from 1997 to 2000 and the financial crisis from 2007 to 2012. We also include 11 industry dummy variables based on Fama-French 12 industries and cluster standard errors by firm. ***, **and *represent 1%, 5% and 10% significance level, respectively.

Panel A: First-Stage Regressions

	Probit	**Logit**
Marginal Tax Rate	**-1.432**	**-2.617**
	[6.77]***	[6.74]***
High Disclosure Dummy	**0.354**	**0.613**
	[2.76]***	[2.65]***
Firm Age	**-0.189**	**-0.339**
	[3.69]***	[3.67]***
Prior CAR	**-0.402**	**-0.681**
	[2.23]**	[2.10]**
MB	**0.007**	**0.013**
	[0.23]	[0.24]
ROA	**0.210**	**0.361**
	[0.56]	[0.55]
Size	**-0.044**	**-0.074**
	[1.95]*	[1.82]*
SD of Stock Return	**-7.847**	**-13.014**
	[3.01]***	[2.75]***
Industry Sigma	**0.112**	**0.163**
	[0.55]	[0.45]
Takeover Probability	**-0.067**	**-0.141**
	[1.91]*	[2.22]**
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
Constant	**0.666**	**1.462**
	[1.72]*	[2.10]**
N	2,968	2,968

Panel B: Second-Stage Regressions

	(1)	(2)	(3)	(4)	(5)
LBB Dummy	**0.006**	**0.029**	**0.022**	**-0.007**	**-0.008**
	[0.54]	[2.04]**	[1.91]*	[0.56]	[0.60]
High Disclosure Dummy	**0.010**	**0.010**	**0.022**	**0.009**	**0.022**
	[0.47]	[0.44]	[0.95]	[0.41]	[0.87]
Prior CAR	**-0.147**	**-0.143**	**-0.153**	**-0.146**	**-0.166**
	[5.92]***	[5.77]***	[6.00]***	[5.86]***	[6.23]***
Tobin's Q	**-0.007**	**-0.006**	**-0.006**	**-0.007**	**-0.009**
	[1.62]	[1.47]	[1.40]	[1.62]	[1.77]*
Size	**-0.006**	**-0.006**	**-0.009**	**-0.005**	**-0.008**
	[1.75]*	[2.01]**	[2.86]***	[1.75]*	[2.16]**
Cash	**0.027**	**0.030**	**0.043**	**0.024**	**0.067**
	[0.82]	[0.91]	[1.22]	[0.72]	[1.48]
Free Cash Flow	**-0.120**	**-0.126**	**-0.080**	**-0.165**	**-0.086**
	[1.70]*	[1.80]*	[1.11]	[2.18]**	[1.15]
Leverage	**0.098**	**0.148**	**0.252**	**0.103**	**0.129**
	[3.19]***	[4.00]***	[4.92]***	[3.33]***	[3.76]***
Fixed Assets	**-0.010**	**-0.014**	**-0.046**	**-0.012**	**-0.020**
	[0.38]	[0.52]	[1.66]*	[0.45]	[0.70]
Dividend	**0.460**	**0.429**	**0.586**	**0.462**	**0.527**
	[1.56]	[1.46]	[1.95]*	[1.57]	[1.69]*
Takeover Probability	**0.004**	**0.004**	**0.006**	**0.003**	**0.005**
	[0.60]	[0.56]	[0.98]	[0.55]	[0.77]
LBB Dummy Leverage*		**-0.126**			
		[2.40]***			
Over-levered Dummy			**-0.032**		
			[1.41]		
LBB Dummy Over-levered*			**-0.079**		
			[3.24]***		
*LBB Dummy*Free Cash Flows*				**0.217**	
				[1.60]	
Excess Cash Dummy					**-0.019**
					[1.21]
LBB Dummy Excess Cash*					**0.017**
					[0.75]
Lambda	**-0.003**	**-0.005**	**-0.008**	**-0.006**	**-0.007**
	[0.14]	[0.23]	[0.31]	[0.25]	[0.25]
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Constant	**0.012**	**0.014**	**-0.016**	**0.020**	**0.012**
	[0.18]	[0.22]	[0.23]	[0.29]	[0.17]
N	523	523	471	523	455

Table 7 Cross-Sectional Analysis of Changes in Post-Repurchase Real Investments

We conduct Heckman's (1979) two-stage analysis to correct for potential selection bias due to the non-randomness of our repurchase sample. This table shows the second-stage results which we include the inverse Mills ratio estimated from the first-stage probit model and report results of the cross-sectional analysis of post-announcement changes in abnormal investment. The dependent variable is changes in abnormal investment from the end of year -1 to the end of year +2. Abnormal investment is a repurchasing firm's capital expenditure (item 145) divided by total assets (item 6), minus that of its matched firm. *LBB Dummy* is a dummy variable that equals one if the repurchase is debt-financed and zero otherwise. We define a share repurchase as a debt-financed one if the transaction is partially or fully financed by debt. *High Disclosure Dummy* is a binary variable that equals one if the repurchase announcement is made from Dec 2003 onwards and zero otherwise. *Prior CAR* is the stock returns on the firm minus returns on the value-weighted CRSP index, calculated from 44 days prior to the announcement until 4 days prior to the announcement. *Tobin's Q* is defined as the book value of assets (item 6) minus book value of equity (item144) plus market value of equity (item 25* item 24), all divided by book value of assets (item 6). *Size* is defined as the log of asset size (item 6), measured in 1983 dollars. *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Free Cash Flow* is the gross operating income (item 13) minus the sum of depreciation (item 14), tax paid (item 16), interest expenses (item 15) and dividends paid (item19+item 21). *Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Takeover Probability* is the percentage of the predicted probability of being acquired one year before the repurchase announcement from the probit regression. *Industry Sigma* is a measure of the volatility of an industry's cash flow. *Over-levered Dummy* is a binary variable that equals one if the firm is over-levered before the repurchase announcement and zero otherwise. *Excess Cash Dummy* is a dummy variable that equals one if the firm has excess cash prior to the buyback announcement and zero otherwise. We include two time dummies capturing the Dot-com bubble from 1997 to 2000 and the financial crisis from 2007 to 2012. We also include 11 industry dummy variables based on Fama-French 12 industries and cluster standard errors by firm. ***, **and *represent 1%, 5% and 10% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)
LBB Dummy	**-0.012**	**0.005**	**-0.006**	**-0.022**	**-0.005**
	[1.74]*	[0.56]	[0.72]	[2.56]***	[0.56]
High Disclosure	**0.005**	**0.004**	**0.011**	**0.003**	**0.012**
Dummy	[0.32]	[0.25]	[0.71]	[0.23]	[0.74]
Prior CAR	**-0.044**	**-0.039**	**-0.044**	**-0.041**	**-0.049**
	[2.38]**	[2.12]**	[2.22]**	[2.21]**	[2.38]**
Tobin's Q	**0.005**	**0.005**	**0.006**	**0.005**	**0.005**
	[1.99]**	[2.08]**	[1.99]**	[1.97]**	[1.86]*
Size	**0.001**	**0.000**	**-0.001**	**0.001**	**0.000**
	[0.52]	[0.17]	[0.37]	[0.54]	[0.18]
Cash	**0.099**	**0.102**	**0.126**	**0.097**	**0.130**
	[4.58]***	[4.74]***	[5.30]***	[4.50]***	[4.28]***
Free Cash Flow	**-0.121**	**-0.122**	**-0.145**	**-0.155**	**-0.152**
	[2.90]***	[2.94]***	[3.30]***	[3.42]***	[3.43]***
Leverage	**-0.043**	**-0.006**	**-0.023**	**-0.040**	**-0.056**
	[2.08]**	[0.25]	[0.69]	[1.96]*	[2.40]**
Takeover Probability	**-0.007**	**-0.007**	**-0.005**	**-0.007**	**-0.005**
	[1.74]*	[1.69]*	[1.29]	[1.74]*	[1.23]
Industry Sigma	**-0.003**	**-0.005**	**-0.013**	**-0.005**	**-0.017**
	[0.18]	[0.26]	[0.64]	[0.27]	[0.77]
*LBB Dummy**		**-0.096**			
Leverage		[2.69]***			
Over-levered			**-0.000**		
Dummy			[0.03]		
*LBB Dummy*Over-*			**-0.028**		
levered Dummy			[1.86]*		
*LBB Dummy*Free*				**0.170**	
Cash Flow				[1.89]*	
Excess Cash Dummy					**0.000**
					[0.05]
*LBB Dummy*Excess*					**-0.020**
Cash Dummy					[1.38]
Lambda	**-0.002**	**-0.005**	**-0.005**	**-0.005**	**-0.003**
	[0.15]	[0.36]	[0.31]	[0.34]	[0.17]
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Constant	**0.116**	**0.118**	**0.108**	**0.122**	**0.104**
	[2.72]***	[2.79]***	[2.37]**	[2.86]***	[2.20]**
N	496	496	456	496	445

Table 8 Changes of Growth Prospects After Share Buybacks

This table reports average changes of growth prospects, measured by long-run value to book (Rhodes-Kropf, Robinson, and Viswanathan, 2005). Year 0 is defined as the fiscal year when share repurchase is announced. Period (x, y) measures changes from the end of year y to the end of year x. *Long-run value to book* is the difference between long-run value and observed book value and accounts for firm's growth prospects. Both debt- and cash-financed repurchases are matched to non-repurchasing peers with similar pre-repurchase firm characteristics. For each repurchasing firm, the matched non-repurchasing firm is of the same two-digit SIC code, and with both pre-repurchase investment and book value of assets in year -1 within ±20% of those of the repurchasing firm. Tests of differences and difference-in-difference are reported. ***, **and * represent statistical significance at the 1%, 5% and 10% level, respectively.

Category	**(-1,0)**	**(0,+1)**	**(0,+2)**	**(0,+3)**	**(0,+4)**
Debt-financed Repurchases	**-0.004**	**-0.007**	**-0.017**	**-0.027**	**-0.038**
	[1.52]	[3.57]***	[3.84]***	[4.25]***	[5.31]***
Matched Non-repurchasing Firms	**0.006**	**0.014**	**0.016**	**0.011**	**-0.006**
	[1.11]	[1.09]	[1.00]	[0.48]	[0.46]
Difference (1)	**-0.010**	**-0.021**	**-0.033**	**-0.038**	**-0.044**
	[0.83]	[2.42]***	[2.79]***	[3.64]***	[4.71]***
Cash-financed Repurchases	**-0.003**	**-0.005**	**-0.012**	**-0.015**	**-0.026**
	[1.51]	[2.78]***	[3.43]***	[2.41]***	[4.26]***
Matched Non-repurchasing Firms	**0.001**	**-0.002**	**-0.003**	**-0.007**	**-0.005**
	[0.21]	[0.38]	[0.50]	[0.82]	[0.49]
Difference (2)	**-0.004**	**-0.003**	**-0.009**	**-0.008**	**-0.021**
	[1.02]	[2.39]***	[3.11]***	[2.25]**	[3.73]***
Diff-in-Diff (1)-(2)	**-0.006**	**-0.018**	**-0.024**	**-0.030**	**-0.023**
	[0.77]	[2.51]***	[2.86]***	[2.38]***	[3.04]***

Table 9 The Effect of Growth Prospect on Market Reaction and Post-Repurchase Investments

We conduct Heckman's (1979) two-stage analysis to correct for potential selection bias due to the non-randomness of our repurchase sample. This table shows the second-stage results which we include the inverse Mills ratio estimated from the first-stage probit model and report the effect of growth prospects on short-term market reaction to repurchase announcements and post-repurchase real investments. The dependent variable in columns (1) and (2) is the three day CAR (-1, +1) where day 0 is the repurchase announcement date. The dependent variable in columns (3) and (4) is changes in abnormal investment from the end of year -1 to the end of year +2. *Abnormal investment* is a repurchasing firm's capital expenditure (item 145) divided by total assets (item 6), minus that of its matched firm. *LBB Dummy* is a dummy variable that equals one if the repurchase is debt-financed and zero otherwise. We define a share repurchase as a debt-financed one if the transaction is partially or fully financed by debt. *High Disclosure Dummy* is a binary variable that equals one if the repurchase announcement is made from Dec 2003 onwards and zero otherwise. *Prior CAR* is the stock returns on the firm minus returns on the value-weighted CRSP index, calculated from 44 days prior to the announcement until 4 days prior to the announcement. *Tobin's Q* is defined as the book value of assets (item 6) minus book value of equity (item144) plus market value of equity (item 25* item 24), all divided by book value of assets (item 6). *Size* is defined as the log of asset size (item 6), measured in 1983 dollars. *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Free Cash Flow* is the gross operating income (item 13) minus the sum of depreciation (item 14), tax paid (item 16), interest expenses (item 15) and dividends paid (item19+item 21). *Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Takeover Probability* is the percentage of the predicted probability of being acquired one year before the repurchase announcement from the probit regression. *Fixed Assets* is the property, plant and equipment (item 14) over total book assets (item 6). *Dividend* is the sum of common (item 21) and preferred (item 19) dividend paid to shareholders over total assets (item 6). *Industry Sigma* is a measure of the volatility of an industry's cash flow. *Growth Prospect* is the difference between long-run value and observed book value one year prior to the repurchase announcement. *Change in Growth Prospect* is changes in growth prospects from the end of year -1 to the end of year +2. We include two time dummies capturing the Dot-com bubble from 1997 to 2000 and the financial crisis from 2007 to 2012. We also include 11 industry dummy variables based on Fama-French 12 industries and cluster standard errors by firm. ***, **and *represent 1%, 5% and 10% significance level, respectively.

	(1)	(2)	(3)	(4)
LBB Dummy	**0.042**	**0.034**	**-0.000**	**-0.006**
	[2.27]**	[2.35]**	[0.02]	[0.70]
High Disclosure Dummy	**0.007**	**0.011**	**0.011**	**0.009**
	[0.36]	[0.55]	[0.81]	[0.68]
Prior CAR	**-0.137**	**-0.139**	**-0.040**	**-0.039**
	[5.77]***	[5.79]***	[2.34]**	[2.29]**
Tobin's Q	**-0.008**	**-0.007**	**0.006**	**0.007**
	[1.99]**	[1.53]	[2.40]**	[2.68]***
Size	**-0.006**	**-0.007**	**0.001**	**-0.000**
	[0.56]	[2.26]**	[0.13]	[0.07]
Cash	**0.046**	**0.058**	**0.103**	**0.105**
	[1.48]	[1.80]*	[5.14]***	[5.26]***
Free Cash Flow	**-0.095**	**-0.060**	**-0.118**	**-0.105**
	[1.43]	[0.88]	[3.01]***	[2.64]***
Leverage	**0.150**	**0.155**	**-0.012**	**-0.016**
	[4.17]***	[4.29]***	[0.51]	[0.69]
Takeover Probability	**0.001**	**0.004**	**-0.007**	**-0.006**
	[0.03]	[0.16]	[1.78]*	[1.76]*
Fixed Assets	**0.430**	**0.485**		
	[1.52]	[1.71]*		
Dividend	**0.004**	**0.005**		
	[0.61]	[0.86]		
Industry Sigma			**-0.021**	**-0.023**
			[1.33]	[1.45]
Growth Prospect	**0.005**		**0.006**	
	[0.07]		[0.13]	
Change in Growth Prospect		**0.185**		**0.104**
		[2.13]**		[1.88]*
*LBB Dummy*Leverage*	**-0.134**	**-0.136**	**-0.086**	**-0.071**
	[2.61]***	[2.48]**	[2.53]**	[2.08]**
LBB Dummy Growth Prospect	**-0.017**		**0.002**	
	[0.54]		[0.09]	
*LBB Dummy*Change in Growth Prospect*		**-0.196**		**-0.180**
		[1.48]		[2.18]**
Lambda	**-0.009**	**-0.011**	**-0.004**	**-0.006**
	[0.42]	[0.51]	[0.31]	[0.43]
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Constant	**0.020**	**0.009**	**0.109**	**0.121**
	[0.16]	[0.14]	[1.47]	[3.14]***
R^2	0.15	0.17	0.37	0.37
N	531	527	526	525

Table 10 The Effect of Corporate Governance on Market Reaction and Post-Repurchase Investments

We conduct Heckman's (1979) two-stage analysis to correct for potential selection bias due to the non-randomness of our repurchase sample. This table shows the second-stage results which we include the inverse Mills ratio estimated from the first-stage probit model and report the effect of corporate governance on short-term market reaction to repurchase announcements and post-repurchase real investments. The dependent variable in columns (1) and (2) is the three day CAR (-1, +1) where day 0 is the repurchase announcement date. The dependent variable in columns (3) and (4) is changes in abnormal investment from the end of year -1 to the end of year +2. *Abnormal investment* is a repurchasing firm's capital expenditure (item 145) divided by total assets (item 6), minus that of its matched firm. *LBB Dummy* is a dummy variable that equals one if the repurchase is debt-financed and zero otherwise. We define a share repurchase as a debt-financed one if the transaction is partially or fully financed by debt. *High Disclosure Dummy* is a binary variable that equals one if the repurchase announcement is made from Dec 2003 onwards and zero otherwise. *Prior CAR* is the stock returns on the firm minus returns on the value-weighted CRSP index, calculated from 44 days prior to the announcement until 4 days prior to the announcement. *Tobin's Q* is defined as the book value of assets (item 6) minus book value of equity (item144) plus market value of equity (item 25* item 24), all divided by book value of assets (item 6). *Size* is defined as the log of asset size (item 6), measured in 1983 dollars. *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Free Cash Flow* is the gross operating income (item 13) minus the sum of depreciation (item 14), tax paid (item 16), interest expenses (item 15) and dividends paid (item19+item 21). *Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Takeover Probability* is the percentage of the predicted probability of being acquired one year before the repurchase announcement from the probit regression. *Fixed Assets* is the property, plant and equipment (item 14) over total book assets (item 6). *Dividend* is the sum of common (item 21) and preferred (item 19) dividend paid to shareholders over total assets (item 6). *Industry Sigma* is a measure of the volatility of an industry's cash flow. We follow Gompers et al. (2003) and construct *G-Index* based on 24 governance provisions provided by Investor Responsibility Research Center (IRRC). High *G-Index* indicates weak corporate governance. We include two time dummies capturing the Dot-com bubble from 1997 to 2000 and the financial crisis from 2007 to 2012. We also include 11 industry dummy variables based on Fama-French 12 industries and cluster standard errors by firm. ***, **and *represent 1%, 5% and 10% significance level, respectively.

	(1)	(2)	(3)	(4)
LBB Dummy	**0.058**	**0.062**	**0.009**	**0.022**
	[2.01]**	[2.09]**	[0.42]	[0.98]
High Disclosure Dummy	**-0.001**	**-0.001**	**0.009**	**0.010**
	[0.07]	[0.06]	[0.57]	[0.67]
Prior CAR	**-0.093**	**-0.092**	**-0.049**	**-0.043**
	[3.79]***	[3.75]***	[2.38]**	[2.13]**
Tobin's Q	**-0.014**	**-0.013**	**-0.000**	**0.001**
	[2.81]***	[2.75]***	[0.07]	[0.23]
Size	**0.000**	**-0.000**	**-0.003**	**-0.005**
	[0.09]	[0.04]	[1.09]	[1.68]*
Cash	**0.089**	**0.088**	**0.099**	**0.098**
	[2.71]***	[2.69]***	[3.86]***	[3.89]***
Free Cash Flow	**0.159**	**0.158**	**-0.089**	**-0.094**
	[1.99]**	[1.97]**	[1.58]	[1.68]*
Leverage	**0.008**	**0.022**	**-0.115**	**-0.063**
	[0.23]	[0.54]	[4.47]***	[1.97]**
Takeover Probability	**0.007**	**0.007**	**-0.007**	**-0.006**
	[1.25]	[1.26]	[1.55]	[1.35]
Fixed Assets	**0.028**	**0.027**		
	[1.15]	[1.10]		
Dividend	**0.608**	**0.612**		
	[2.06]**	[2.07]**		
Industry Sigma			**0.021**	**0.019**
			[0.97]	[0.87]
G Index	**0.002**	**0.002**	**-0.001**	**-0.001**
	[0.85]	[0.79]	[0.51]	[0.68]
*LBB Dummy*G Index*	**-0.007**	**-0.006**	**-0.002**	**-0.001**
	[1.99]**	[1.93]*	[0.70]	[0.47]
*LBB Dummy*Leverage*		**-0.032**		**-0.111**
		[0.60]		[2.73]***
Lambda	**-0.011**	**-0.011**	**0.001**	**0.000**
	[0.51]	[0.53]	[0.05]	[0.01]
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Constant	**-0.077**	**-0.075**	**0.162**	**0.158**
	[1.08]	[1.06]	[3.08]***	[3.05]***
R	0.12	0.12	0.35	0.37
N	357	357	339	339

Table 11 Motives of Leveraged Buybacks

This table shows results of the motives of leveraged buybacks. We conduct logit analysis in column (1) and probit regression in column (2). The dependent variable is a dummy variable that equals one if the repurchase is debt-financed and zero otherwise. We define a share repurchase as a debt-financed one if the transaction is partially or fully financed by debt. *Marginal Tax Rate* is the simulated corporate marginal tax rate based on income after interest expense has been deducted. *Prior CAR* is the stock returns on the firm minus returns on the value-weighted CRSP index, calculated from 44 days prior to the announcement until 4 days prior to the announcement. *Tobin's Q* is defined as the book value of assets (item 6) minus book value of equity (item144) plus market value of equity (item 25* item 24), all divided by book value of assets (item 6). *ROA* is the operating income (item 13) divided by book assets (item 6). *Size* is defined as the log of asset size (item 6), measured in 1983 dollars. *Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Free Cash Flow* is the gross operating income (item 13) minus the sum of depreciation (item 14), tax paid (item 16), interest expenses (item 15) and dividends paid (item19+item 21). *Dividend* is the sum of common (item 21) and preferred (item 19) dividend paid to shareholders over total assets (item 6). *Z-score* is Altman's (1968) measure of credit risk. *SD of Stock Return* is the standard deviation of daily stock returns. *Industry Sigma* is a measure of the volatility of an industry's cash flow. *Takeover Probability* is the percentage of the predicted probability of being acquired one year before the repurchase announcement from the probit regression. *Excess Cash* is a dummy variable that equals one if the firm has excess cash prior to the buyback announcement and zero otherwise. *Debt Capacity* is a binary variable that equals one if the firm is in the highest tercile based on their estimated likelihood of gaining access to public debt market and zero otherwise. We include two time dummies capturing the Dot-com bubble from 1997 to 2000 and the financial crisis from 2007 to 2012. We also include 11 industry dummy variables based on Fama-French 12 industries and cluster standard errors by firm. ***, **and *represent 1%, 5% and 10% significance level, respectively.

	Logit	**Probit**
Marginal Tax Rate	**1.680**	**1.048**
	[1.72]*	[1.89]*
Prior CAR	**0.604**	**0.365**
	[0.90]	[0.92]
Tobin's Q	**-0.010**	**-0.001**
	[0.05]	[0.01]
ROA	**6.309**	**3.429**
	[2.12]**	[2.06]**
Size	**-0.091**	**-0.055**
	[0.82]	[0.86]
Leverage	**0.156**	**0.173**
	[0.15]	[0.28]
Free Cash Flow	**-0.388**	**-0.138**
	[0.14]	[0.08]
Dividend	**-14.640**	**-8.000**
	[1.18]	[1.13]
Z-score	**-0.091**	**-0.051**
	[2.02]**	[2.15]**
SD of Stock Return	**-1.143**	**-2.150**
	[0.09]	[0.28]
Industry Sigma	**-0.324**	**-0.170**
	[0.48]	[0.42]
Takeover Probability	**-0.631**	**-0.314**
	[1.31]	[1.15]
Excess Cash	**-1.682**	**-0.985**
	[5.60]***	[5.77]***
Debt Capacity	**0.921**	**0.527**
	[2.48]**	[2.39]**
Constant	**1.486**	**0.830**
	[1.33]	[1.28]
Industry Dummies	Yes	Yes
Year Dummies	Yes	Yes
N	501	501

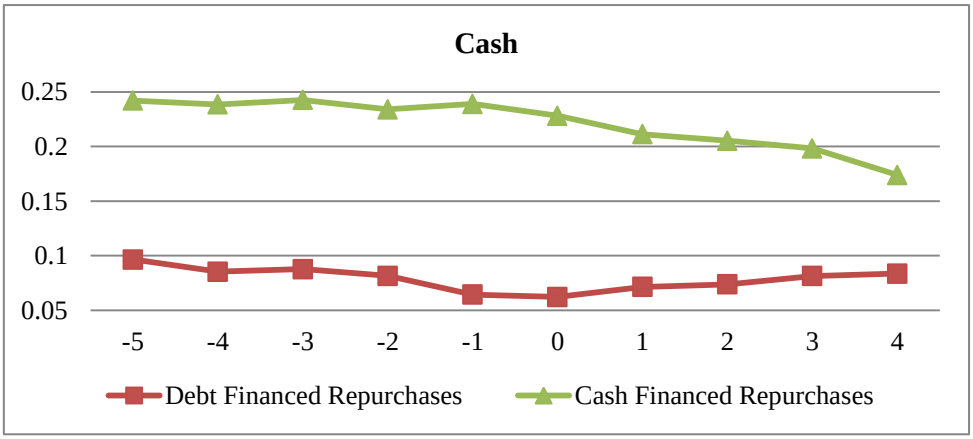
Table 12 Completion Rate of Leveraged Buybacks

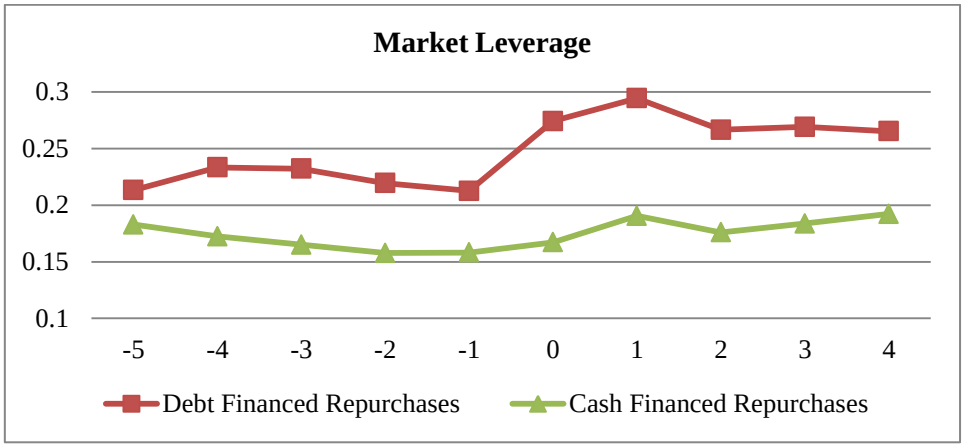
This table displays results of the completion rate of share repurchases. We conduct Tobit analysis in columns (1) and (2) and Heckman's (1979) two-stage analysis in columns (3) and (4). We report the second-stage results in columns (3) and (4) which include the inverse Mills ratio estimated from the first-stage probit model. The dependent variable is the *actual buyback ratio* two years after the repurchase announcement. The *actual buyback ratio* is defined as purchase of common and preferred stock (item 115) minus any decrease in redeemable preferred stock (item 175), all divided by market value of equity (item 25* item 24). *LBB Dummy* is a dummy variable that equals one if the repurchase is debt-financed and zero otherwise. We define a share repurchase as a debt-financed one if the transaction is partially or fully financed by debt. *High Disclosure Dummy* is a binary variable that equals one if the repurchase announcement is made from Dec 2003 onwards and zero otherwise. *Prior CAR* is the stock returns on the firm minus returns on the value-weighted CRSP index, calculated from 44 days prior to the announcement until 4 days prior to the announcement. *Tobin's Q* is defined as the book value of assets (item 6) minus book value of equity (item144) plus market value of equity (item 25* item 24), all divided by book value of assets (item 6). *Size* is defined as the log of asset size (item 6), measured in 1983 dollars. *ROA* is the operating income (item 13) divided by book assets (item 6). *Industry Sigma* is a measure of the volatility of an industry's cash flow. *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Free Cash Flow* is the gross operating income (item 13) minus the sum of depreciation (item 14), tax paid (item 16), interest expenses (item 15) and dividends paid (item19+item 21). *Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Fixed Assets* is the property, plant and equipment (item 14) over total book assets (item 6). *Dividend* is the sum of common (item 21) and preferred (item 19) dividend paid to shareholders over total assets (item 6). *Intended buyback ratio* is the intended buyback size disclosed in the 8-k filing over the market value of equity (item 25* item 24). *Takeover Probability* is the percentage of the predicted probability of being acquired one year before the repurchase announcement from the probit regression. *Over-levered Dummy* is a binary variable that equals one if the firm is over-levered before the repurchase announcement and zero otherwise. We include two time dummies capturing the Dot-com bubble from 1997 to 2000 and the financial crisis from 2007 to 2012. We also include 11 industry dummy variables based on Fama-French 12 industries and cluster standard errors by firm. ***, **and *represent 1%, 5% and 10% significance level, respectively.

	Tobit	**Tobit**	**Heckman**	**Heckman**
LBB Dummy	**-0.005**	**-0.013**	**-0.005**	**-0.011**
	[0.81]	[1.75]*	[1.03]	[1.85]*
High Disclosure Dummy	**0.042**	**0.042**	**0.023**	**0.022**
	[3.37]***	[3.00]***	[2.00]**	[1.80]*
Prior CAR	**0.023**	**0.021**	**0.026**	**0.027**
	[1.74]*	[1.45]	[2.16]**	[2.08]**
Tobin's Q	**-0.000**	**-0.002**	**-0.000**	**-0.002**
	[0.08]	[0.55]	[0.17]	[0.68]
Size	**0.002**	**0.003**	**0.001**	**0.001**
	[1.01]	[1.22]	[0.40]	[0.59]
ROA	**0.091**	**0.096**	**0.097**	**0.106**
	[1.56]	[1.58]	[2.06]**	[2.14]**
Industry Sigma	**0.012**	**0.017**	**0.016**	**0.018**
	[0.93]	[1.17]	[1.17]	[1.20]
Cash	**0.014**	**0.005**	**0.004**	**-0.003**
	[0.82]	[0.27]	[0.26]	[0.14]
Free Cash Flow	**0.005**	**0.015**	**-0.028**	**-0.035**
	[0.08]	[0.26]	[0.52]	[0.64]
Leverage	**0.015**	**0.019**	**0.011**	**0.018**
	[0.84]	[0.79]	[0.74]	[0.92]
Fixed Assets	**0.016**	**0.018**	**0.015**	**0.014**
	[0.87]	[0.92]	[1.07]	[0.92]
Dividend	**-0.235**	**-0.259**	**-0.263**	**-0.310**
	[1.19]	[1.24]	[1.50]	[1.69]*
Intended Buyback Ratio	**0.004**	**-0.001**	**-0.003**	**-0.004**
	[0.25]	[0.06]	[0.26]	[0.34]
Takeover Probability	**0.006**	**0.006**	**0.005**	**0.004**
	[1.80]*	[1.69]*	[1.46]	[1.20]
Over-levered Dummy		**-0.015**		**-0.013**
		[1.31]		[1.37]
*LBB Dummy*Over-levered*		**0.035**		**0.021**
		[2.59]***		[1.72]*
Lambda			**-0.012**	**-0.012**
			[1.07]	[1.02]
Industry Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Constant	**-0.067**	**-0.064**	**-0.005**	**0.007**
	[1.65]*	[1.50]	[0.14]	[0.18]
R2	NA	NA	0.16	0.17
N	444	405	444	405

Figure 1 Changes in Cash, Leverage and Growth Prospects around Buyback Announcements

This figure shows average changes in cash, market leverage and growth prospects prior to and following buyback announcements for both debt- and cash-financed repurchases. Year 0 is defined as the fiscal year when share repurchase is announced. *Cash* is the cash and cash equivalents (item 1) over total assets (item 6). *Market Leverage* is defined as book value of debt (item 9+ item 34) divided by the sum of book value of debt (item 9+ item 34) and market value of equity (item 25* item 24). *Growth Prospects* is measured by long-run value to book, which is the difference between long-run value and observed book value.





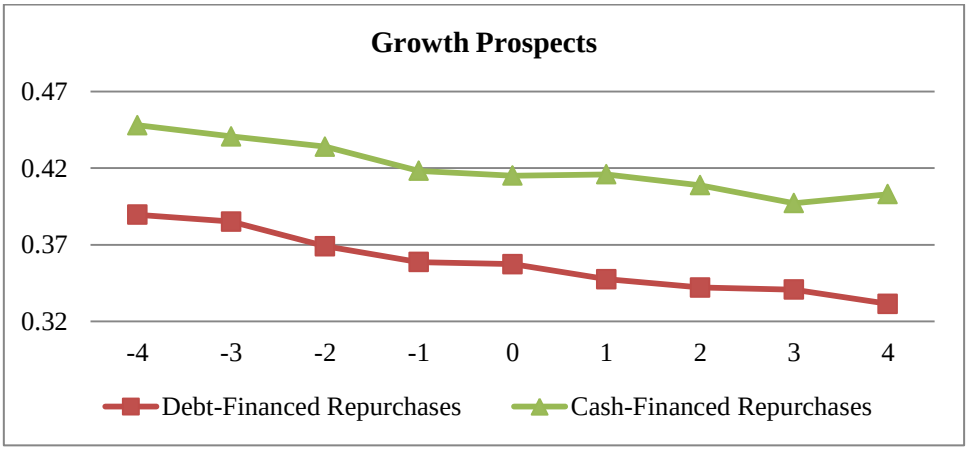


Figure 2 Changes in Investment, ROA and Z-score around Buyback Announcements

This figure reports average change in investment, ROA and Z-score after repurchase announcements for both debt- and cash-financed buyback firms and their matched non-repurchasing peers. Year 0 is defined as the fiscal year when share repurchase is announced. *Investment* is defined as capital expenditure (item 145) divided by total assets (item 6). *ROA* is defined as operating income (item 13) divided by book assets (item 6). *Z-score* is Altman's (1968) measure of credit risk.