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The real effects of share repurchases ☆

Heitor Almeida [a], Vyacheslav Fos [b], Mathias Kronlund [a,*]

[a] The University of Illinois at Urbana-Champaign; 1206 S Sixth St., 340 Wohlers Hall, Champaign, IL 61820, United States
[b] Boston College, Carroll School of Management; 140 Commonwealth Avenue, Fulton Hall 330, Chestnut Hill, MA 02467, United States

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ABSTRACT

We employ a regression discontinuity design to identify the real effects of share repurchases on other firm outcomes. The probability of share repurchases that increase earnings per share (EPS) is sharply higher for firms that would have just missed the EPS forecast in the absence of the repurchase, when compared with firms that "just beat" the EPS forecast. We use this discontinuity to show that EPS-motivated repurchases are associated with reductions in employment and investment, and a decrease in cash holdings. Our evidence suggests that managers are willing to trade off investments and employment for stock repurchases that allow them to meet analyst EPS forecasts.

1. Introduction

This paper studies the consequences of share repurchases for firm investment and employment. Understanding the consequences of share repurchases is specially important, given the high levels of cash on US company balance sheets. Companies face intense pressure from activist shareholders, institutional investors, the government, and the media to put their cash to good use. Existing evidence appears to suggest that a share repurchase is a good way for companies to return cash to investors, as cash-rich companies tend to generate greater abnormal announcement returns when starting new repurchase programs (Grullon and Michaely, 2004). However, some observers note that the cash that is spent in repurchase programs should instead be used to increase research and employment, and that the recent increase in share repurchases is undermining both the recovery from the recent recession and the economy's long-term prospects.[1] Repurchases have also been cited as a possible explanation for why the increase in corporate profitability following the recent financial crisis has not led to growth in employment, and overall economic prosperity (Lazonick, 2014).[2] Is there any ground for these claims? Do share repurchases have real effects on other corporate policies such as employment and research and development (R&D)?

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* Corresponding author. Tel.: +1 217 244 2631; fax: +1 217 244 3102.
E-mail addresses: halmeida@illinois.edu (H. Almeida), vyacheslav.fos@bc.edu (V. Fos), kronlund@illinois.edu (M. Kronlund).

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[1] See, for example, "As layoffs rise, stock buybacks consume cash," *The New York Times*, November 21, 2011.
[2] See also "The repurchase revolution," *The Economist*, September 13, 2014.

Previous studies show a negative correlation between share repurchases and investment, but the standard interpretation for this correlation is that it is driven by variation in growth opportunities (Grullon and Michaely, 2004). That is, firms with poor growth opportunities reduce investment and direct resources towards share repurchases. If this standard interpretation is correct, then claims that repurchases reduce economic growth are incorrect—the reductions in investment would have occurred irrespective of the amount of repurchases. To test whether repurchases have causal effects on firm outcomes, we need to measure variation in repurchases that is not related to unobservable variation in growth opportunities.

Our paper proposes such a test. It does so by exploiting a discontinuity in the likelihood of share repurchases that is caused by earnings management considerations. As first shown by Hribar, Jenkins, and Johnson (2006), there is a strong discontinuity in the probability of accretive share repurchases around the threshold at which the firm would narrowly miss the analyst earnings consensus, without conducting share repurchases (see Fig. 1 for an illustration). Thus, companies that would just miss their earnings per share (EPS) forecasts by a few cents absent executing a repurchase are significantly more likely to repurchase shares than companies that beat their EPS forecasts by a few cents.

To estimate the causal effect of repurchases on investments (Capital expenditures (Capex), employment, and R&D), we regress changes in investment on share repurchases, instrumented with an indicator for whether or not a firm would announce a negative EPS surprise without a repurchase. These regressions compare firms that "just miss" the EPS consensus forecast (the treatment group) with firms that "just beat" the consensus forecast (the control group). To ensure that we are identifying off the discontinuity in the likelihood of share repurchases, we limit the sample to a small window around zero pre-repurchase EPS surprises. In addition, we control throughout for any linear association between pre-repurchase EPS surprises and the outcome variables.

We find that an increase in share repurchases made by firms that would have a small negative EPS surprise is associated with significant changes in other corporate policies. These companies tend to decrease employment, Capex, and R&D in the four quarters following increases in EPS-induced repurchases, relative to companies that just meet analyst EPS forecasts. The effects correspond to approximately 10% of the mean capital expenditures, 3% of the mean R&D expenses, and 5% of the average number of employees in our sample. Fig. 2 shows evidence that these outcome variables are discontinuous at the threshold of zero pre-repurchase EPS surprises. In addition, we find a significant decrease in cash holdings, but no significant changes in debt or equity issuance. The results support anecdotal and survey evidence that companies are willing to trade off employment and investment for stock repurchases.

The key identification assumption behind this exercise is as follows: in the absence of a discontinuous jump in share repurchases around zero pre-repurchase EPS surprises, there are no other discontinuous changes in firm policies around zero pre-repurchase EPS surprises that directly affect our outcome variables. Our specification controls for time-invariant observable or unobservable characteristics, since the outcome variable is defined in differences. Because we control for the level of earnings surprise, our test set-up also addresses the possibility that earnings surprises may proxy for stronger future economic fundamentals. A violation of the identification assumption would not only require an unobservable time-varying characteristic that independently predicts the outcome, but also a

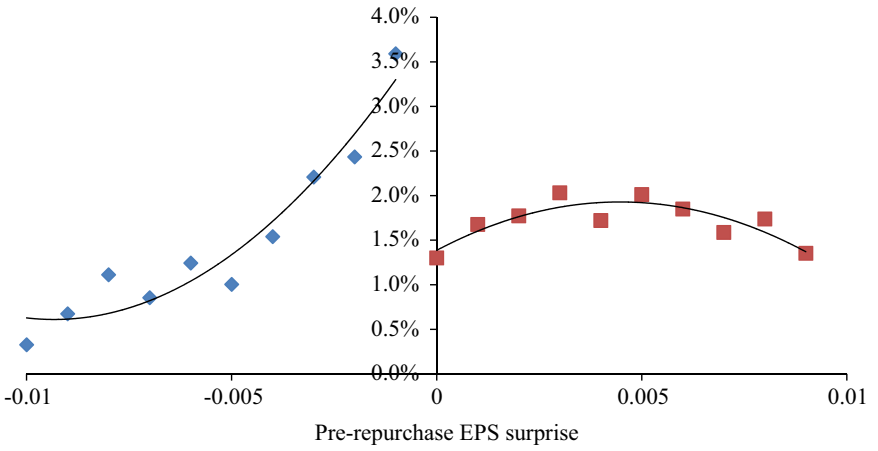

Fig. 1. Probability of accretive share repurchases. This figure plots the probability of doing an accretive share repurchase as a function of a pre-repurchase earnings surprise. For every earnings surprise bin, the dots represent the probability of an accretive share repurchase—the fraction of firm-quarters with an accretive repurchase out of all firm-quarters in that bin. The lines are second-order polynomials fitted through the estimated probabilities on each side of the zero pre-repurchase earnings surprise. We define a share repurchase as accretive if it increases EPS by at least one cent. The pre-repurchase earnings surprise is the difference between the repurchase-adjusted ("pre-repurchase") earnings per share (EPS) and the median EPS forecast at the end of the quarter; this difference is normalized by the end-of-quarter stock price. The pre-repurchase EPS is calculated as follows: $EPS_{adj} = \frac{E_{adj}}{S_{adj}} = \frac{E+I}{S+\Delta S}$ where E is reported earnings, I is the estimated forgone interest due to the repurchase, S is the number of shares at the end of the quarter, and ΔS is the estimated number of shares repurchased (the repurchase amount divided by the average daily share price). The forgone interest is the after-tax interest that would be earned on an amount of funds equal to that used to repurchase shares if it were instead invested in a 3-month T-bill.

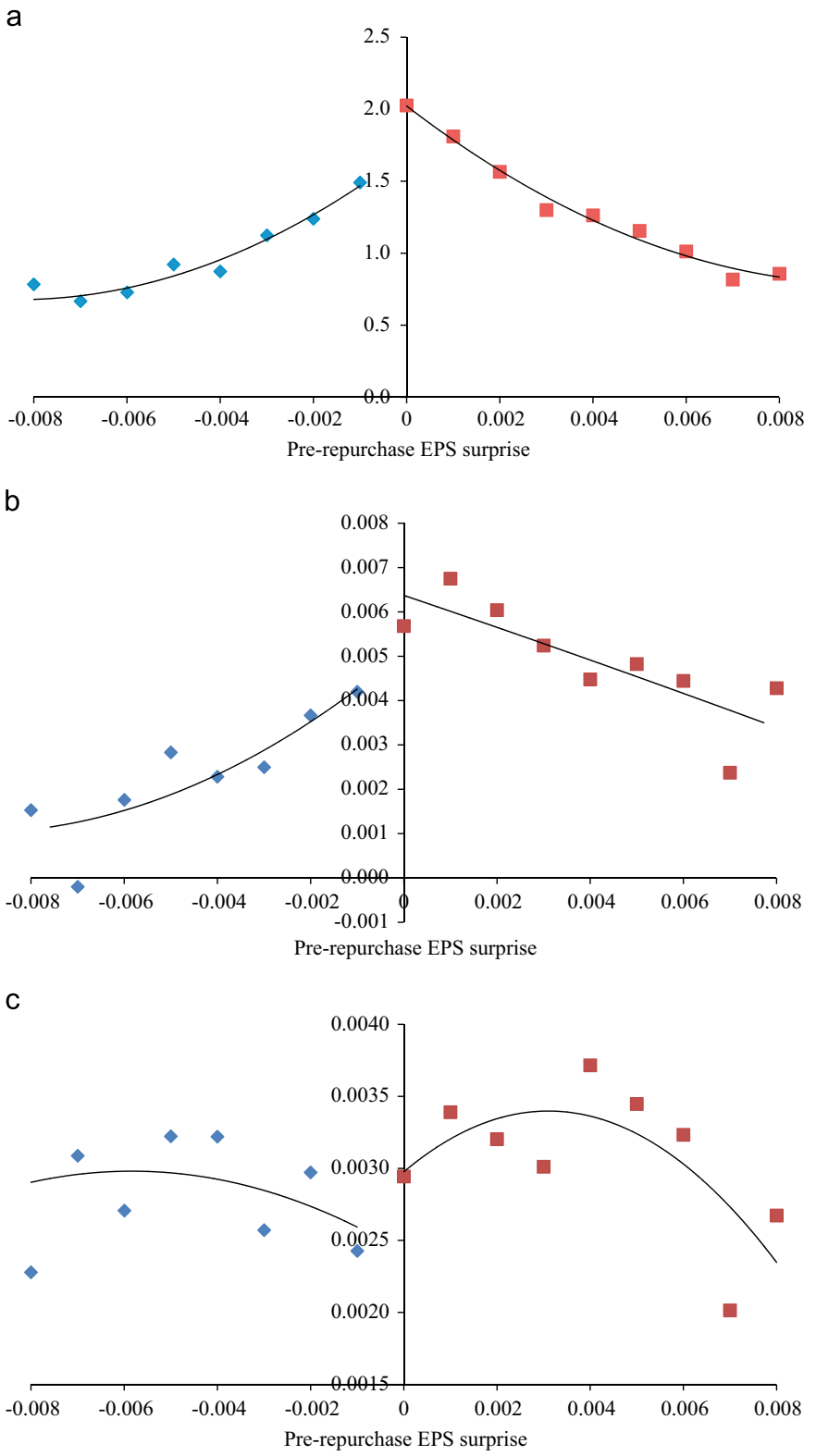

Fig. 2. Pre-repurchase EPS and investment: graphical evidence. This figure plots investment variables as a function of the pre-repurchase earnings surprise. Panel A plots the result for changes in employment, Panel B for changes in capital expenditures, and Panel C for changes in R&D. For every earnings surprise bin, the dots represent the change in the outcome variable as in Table 5. The lines are second-order polynomials fitted on each side of the zero pre-repurchase earnings surprise. The pre-repurchase earnings surprise is defined as in Fig. 1. All other variables are defined in Table 1.

discontinuity in such a characteristic. Consistent with our identification assumption, we find that firms that fall on either side of the pre-repurchase EPS surprise behave similarly to each other in the period prior to the earnings announcement date (e.g., they follow parallel trends).

We further exploit cross-sectional heterogeneity in the magnitude of the discontinuity in share repurchases around the zero surprise threshold, to weaken the assumptions that are required to interpret our results causally. If the effect on outcomes is due to an unobservable variable that jumps right at the zero earnings surprise threshold, then we should still observe differences in outcomes across firms that miss or beat EPS forecasts, even in the absence of a discontinuity in repurchases. We show that the discontinuity in repurchases is much weaker or absent among firms that are financially constrained, and among firms that do not mention "EPS" or "Earnings Per Share" in their proxy statements. Financially constrained firms are less able to engage in large share repurchases to manage EPS, and firms that do not mention EPS in their proxy statement arguably care less about managing EPS. Among these firms, there is little or no relationship between having a negative pre-repurchase EPS surprise and future employment/investment. These results help confirm that the *channel* through which having a negative pre-repurchase EPS surprise affects outcomes is share repurchases, and not some other discontinuous difference across this threshold.

Lastly, we study the consequences of EPS-induced repurchases for firm valuation and performance. First, we study how the market reacts to managing earnings through share repurchases. We find that firms that change the sign of EPS surprise from negative to positive by using repurchases have an earnings announcement cumulative abnormal return (CAR) that is positive and significant, and is virtually identical to the earnings announcement CAR for firms that report positive surprises without repurchasing shares. Second, further analysis uncovers interesting cross-sectional variation in stock price reactions. Firms that cut some type of real variable (either Capex, or employment, or R&D) in the same quarter of the earnings announcement show a stock price reaction that is on average 0.23% lower than that of firms that can change the sign of the surprise without cutting real investments (e.g., these firms could be using internal cash to do so). Third, using the same identification strategy as above, we find that companies that repurchase shares because they would just miss EPS forecasts have operating performance (measured by return on assets (ROA)) that is on average similar to the performance of firms that just beat the forecast. Consistent with the valuation results, firms that cut investments in the same quarter of the earnings announcement have more adverse subsequent performance consequences than firms that finance repurchases with cash or internal cash flow.

How should we interpret these results? It is clear that EPS-induced repurchases are on average not detrimental to shareholder value or subsequent performance. The interpretation of the cross-sectional evidence is a bit trickier. First, the choice of how to finance a repurchase is endogenous, and may be driven by factors that also influence stock price reactions to earnings announcements. Second, since we are trying to infer the market reaction to investment cuts from the reaction to earnings announcements, the results may be confounded by the market's perception about the earnings announcement itself. With these caveats in mind, these results provide suggestive evidence that some firms are willing to sacrifice valuable investments to finance share repurchases.

This paper is related to the extensive finance literature on share repurchases. This literature suggests that firms repurchase stock when their stock price is undervalued (Ikenberry, Lakonishok, and Vermaelen, 1995; Brockman and Chung, 2001; Peyer and Vermaelen, 2007), when they lack future growth opportunities (Grullon and Michaely, 2004), to signal strong future performance (Lie, 2005), to boost employee incentives (Babenko, 2009), to mitigate the dilutive effect of stock option exercises (Kahle, 2002; Bens, Nagar, Skinner, and Wong, 2003), and to distribute excess capital (Dittmar, 2000). We contribute to this literature by providing evidence pertaining to the real consequences of repurchases for investment, employment, and R&D.

Our paper is also related to the literature that studies earnings management to meet analyst forecasts. Surveys of real-world managers find that EPS management is an important driver of payout policy and equity issuance decisions (Brav, Graham, Harvey, and Michaely, 2005; Graham and Harvey, 2001; Graham, Harvey, and Rajgopal, 2005). Hribar, Jenkins, and Johnson (2006) are the first to show a discontinuity in the probability of share repurchases around zero earnings surprises, but they do not study the consequences of EPS-induced repurchases for other policies as we do in this paper.

The real effects of repurchases that we show in the paper are estimated by examining firms that are close to the threshold of zero earnings surprise. A downside of focusing on this sample is that we cannot speak to the real consequences of other motives to conduct share repurchases, such as undervaluation and signaling. This limitation is standard in papers that employ instrumental variables or other related identification strategies. Having said that, we believe that EPS-motivated repurchases are interesting in their own right. First, they appear to be quantitatively important. For example, our evidence suggests that 37% of repurchased dollars represent repurchases by firms in the small region just to the left of zero pre-repurchase EPS surprise (see Section 2 for further details and discussion). Second, EPS management is at the heart of the popular debate about repurchases, since EPS management is one of the most controversial motives to conduct repurchases. Evidence that firms reduce R&D and fire employees to meet EPS forecasts through repurchases is thus particularly interesting.

The paper is organized as follows. Section 2 describes the data. Section 3 describes the main results and identification strategy. Section 4 studies the performance and valuation consequences of share repurchases. Section 5 presents final remarks.

2. Data description

2.1. Sample selection

Our main data source is Standard and Poor's Compustat. We start with all firm-quarter observations in the Compustat quarterly file between 1988 and 2010. We exclude regulated utility firms (Standard Industrial Classification (SIC) codes 4800–4829 and 4910–4949) and financials (SIC 6000–6999) as well as firm-quarters with missing or non-positive assets. Next, we merge these observations with stock-level data from Center for Research in Security Prices (CRSP) and analyst forecast data from Institutional Brokers' Estimate System (IBES). The final sample consists of 385,488 firm-quarter observations for which we can match the firm's identifier in Compustat to the identifiers in both CRSP and IBES.

2.2. Definition of variables and summary statistics

This paper studies the incentive to execute share repurchases to change a firm's EPS surprise, and the relationship between such repurchases, investment (employment, capital expenditures, and R&D), financial policies (cash and leverage), and firm performance. Table 1 presents summary statistics for the main variables employed in the analysis across all firm-quarters. The definitions for these variables are listed in Table 1. In particular, Net repurchases are measured following Fama and French (2001), i.e., as the increase in common Treasury stock if Treasury stock is not zero or missing. If Treasury stock is zero in the current and prior quarter, we measure repurchases as the difference between stock purchases and stock issuances from the statement of cash flows. If either of these amounts is negative, repurchases are set to zero.

Panel A describes firms' repurchase activity. Firms repurchase shares (have positive net repurchases) in 23% of all firm-quarters. If we condition on firm-quarters with positive net repurchases, the average dollar amount of share repurchases is $21.65 million. This represents 1% of all shares outstanding as of the end of the previous quarter (median 0.4%), and 1.2% of total lagged book assets (median 0.4%). Panel B reports statistics on earnings surprises and earnings announcement returns. These statistics show that earnings forecasts are generally very accurate (median surprise is zero), and that firms are more likely to report positive surprises (48% of the sample) when compared to negative ones (40% of the sample). The unconditional abnormal return around earnings announcements is slightly positive (0.1%). All these statistics are consistent with previous research. Panel C reports summary statistics on other firm characteristics in our sample, which are consistent with other papers using Compustat data.

3. The effect of share repurchases on firms' investment

3.1. OLS results

We begin by presenting Ordinary Least Squares (OLS) results on the relationship between repurchases and investment, in Table 2:

$$\overline{Y}_{i,(t+1,t+4)} - \overline{Y}_{i,(t-4,t-1)} = \alpha + \beta_1 Repurchases_{it} + controls + \theta_t + \epsilon_{it}. \quad (1)$$

The investment outcome variables we consider are employment, Capital expenditures, and R&D. The regression relates repurchases at $t=0$, normalized by $Assets_{t-4}$, to a change in outcome variables. The change in outcome variables is measured as the difference between the average level of the outcome variables over the next four quarters after the quarter of the share repurchase, compared with the average over the four quarters before the repurchase, where this difference is normalized by $Assets_{t-4}$.[3] The regressions control for year-quarter fixed effects.

In univariate OLS regressions, we find that repurchases are associated with a negative change in employment as well as Capital expenditures, but no change in R&D (Panel A). Following Rauh (2006), we add two common controls in these investment regressions: Q and Cash flow (Panel B). We find that adding these controls makes the relation between repurchases and investment variables stronger, and the effect on R&D now also becomes negative and significant. However, these results are subject to standard endogeneity concerns. For example, suppose a firm does not have profitable investment opportunities, and therefore decides both to cut investments and increase share repurchases (omitted variables). In that case, Table 2 would not capture a causal relationship. Or suppose a firm decides to ramp up investment; then there will be less money left for payouts (reverse causality). To address these concerns, we need a strategy that can identify a causal effect of repurchases on investment.

3.2. Identification strategy

To address these endogeneity concerns, we exploit a discontinuity in the level of share repurchases. In this section, we show evidence that there is a discontinuity in the propensity to execute share repurchases around having a zero pre-repurchase EPS surprise. This discontinuity is originally documented by Hribar, Jenkins, and Johnson (2006). Our paper is the first to build on this discontinuity to study the consequences of these repurchases for firm investment policy, which we do in the following section.

To understand the discontinuity, consider the following example. Suppose that the existing analyst EPS consensus forecast is $3.00 a share, and that the company has one billion shares outstanding. A manager learns that the actual reported EPS number is going to be $2.99 a share. The manager can meet the forecast by increasing share repurchases. For example, using $600 million to repurchase stock at an assumed price of $60 a share would reduce shares outstanding to 990 million. The company's earnings would also tend to decrease because the company forgoes

[3] We exclude the outcome variable in the quarter concurrent with the repurchase ($t=0$) when calculating the average outcome variables before and after the quarter of the repurchase; this will be important for identification purposes (see further discussion in Section 4.3).

Table 1
Descriptive statistics.

This table reports summary statistics. The observations are at the firm-quarter level. Panel A reports summary statistics on share repurchases. Net repurchases are measured following Fama and French (2001), i.e., as the increase in common Treasury stock if Treasury stock is not zero or missing. If Treasury stock is zero in the current and prior quarter, we measure repurchases as the difference between stock purchases and stock issuances from the statement of cash flows. If either of these amounts is negative, repurchases are set to zero. The quantity of repurchased shares is measured as the repurchase amount divided by the average daily share price during the quarter. Panel B reports summary statistics on earnings surprises and abnormal returns around earnings announcements. An earnings surprise is the difference between the reported EPS and the median EPS forecast at the end of the quarter, and this difference is normalized by the end-of-quarter stock price. The abnormal return around an earnings announcement is the cumulative return within three trading days around the earnings announcement minus the cumulative return of the CRSP market portfolio over the same period. Panel C reports statistics on additional firm characteristics employed in the study. All asset-scaled measures use lagged assets from the end of the previous quarter. ROA is defined as net income (times 4) divided by lagged assets. Q is defined as the book value of liabilities plus the market value of common equity divided by the book value of assets [(atq − ceqq + marketcap)/atq]. Cash flow is defined as net income plus depreciation, and is divided by lagged assets. Market-to-book is defined as the market value of common equity divided by the book value of common equity [marketcap/(seqq − pstkq)]. Total accruals are measured as the absolute value of total accruals divided by lagged assets. Discretionary accruals are measured using the modified Jones (1991) model of Dechow, Sloan, and Sweeney (1995). The guidance indicators capture whether the firm issues positive, negative, or any (including unsigned) earnings guidance during the quarter (from First Call). The measure of Financial constraints follows Hadlock and Pierce (2010). Stock return is the quarterly raw stock return from CRSP. Dividend payer indicates whether the firm has paid any dividends in the last four quarters (including the current quarter). Equity issuance is prstkcy (Purchase of common and preferred stock) − Net Repurchases. Debt issuance is the change in total debt.

Panel A: Repurchase statistics	Mean	SD	p1	p5	p25	p50	p75	p95	p99	*N*
Positive net repurchases (indicator)	0.23	0.42	0	0	0	0	0	1	1	341,483
If repurchases > 0:										
Repurchases ($M)	21.65	49.52	0.00	0.00	0.13	1.25	11.99	178.69	205.15	77,457
Repurchased shares/Shares outstanding	1.0%	1.4%	0.0%	0.0%	0.1%	0.4%	1.4%	5.0%	5.6%	69,740
Repurchases/Assets	1.2%	1.8%	0.0%	0.0%	0.1%	0.4%	1.5%	6.2%	6.8%	75,137

Panel B: Earnings surprise statistics	Mean	SD	p1	p5	p25	p50	p75	p95	p99	*N*
Earnings surprise/Stock price	−0.3%	1.6%	−10.7%	−2.6%	−0.2%	0.0%	0.2%	1.1%	3.5%	140,805
Positive earnings surprise (indicator)	0.48	0.50	0.00	0.00	0.00	0.00	1.00	1.00	1.00	140,805
Negative earnings surprise (indicator)	0.40	0.49	0.00	0.00	0.00	0.00	1.00	1.00	1.00	140,805
Zero earnings surprise (indicator)	0.12	0.33	0.00	0.00	0.00	0.00	0.00	1.00	1.00	140,805
Abnormal return around earnings announcement (%)	0.1%	3.0%	−9.0%	−4.8%	−1.4%	0.0%	1.5%	5.2%	10.3%	345,310

Panel C: Firm characteristics	Mean	SD	p1	p5	p25	p50	p75	p95	p99	*N*
Market capitalization ($M)	1,622	5,249	2	8	42	164	741	7,549	39,544	367,995
Assets ($M)	1,563	4,838	2	8	42	159	727	7,622	34,848	385,488
Cash and cash equivalents/Assets	19.8%	24.4%	0.0%	0.3%	2.3%	9.2%	28.9%	73.2%	116.1%	365,631
Total debt/Assets	22.3%	21.9%	0.0%	0.0%	2.2%	18.0%	35.1%	63.8%	100.5%	368,752
Capital expenditures/Assets	1.7%	2.3%	−0.4%	0.0%	0.4%	1.0%	2.0%	6.1%	13.9%	352,041
R&D/Assets	1.5%	3.2%	0.0%	0.0%	0.0%	0.0%	1.8%	7.7%	18.5%	366,651
Employees/Assets (per $M)	9.70	12.27	0.10	0.64	2.77	5.787	11.53	32.06	78.25	357,915
ROA	−4.1%	29.0%	−153.1%	−62.1%	−5.2%	3.3%	8.8%	21.6%	45.7%	365,837
Q	2.17	1.95	0.59	0.80	1.12	1.52	2.38	5.85	12.86	366,557
Market-to-book	3.4	4.3	0.3	0.6	1.2	2.1	3.6	10.3	30.3	353,149
Cash flow/Assets	0.35%	7.14%	−35.97%	−13.88%	−0.04%	2.02%	3.58%	6.97%	13.26%	328,425
Total accruals (absolute)	0.04	0.05	0.00	0.00	0.01	0.02	0.05	0.13	0.26	310,692
Discretionary accruals (absolute)	0.07	0.12	0.00	0.00	0.01	0.03	0.08	0.22	0.47	242,926
Positive guidance	0.08	0.27	0.00	0.00	0.00	0.00	0.00	1.00	1.00	249,856
Negative guidance	0.08	0.27	0.00	0.00	0.00	0.00	0.00	1.00	1.00	249,856
Any guidance	0.27	0.44	0.00	0.00	0.00	0.00	1.00	1.00	1.00	249,856
Financial constraints (Hadlock and Pierce)	−3.09	0.77	−4.64	−4.48	−3.57	−3.08	−2.58	−1.78	−1.20	367,992
Stock return (quarter)	3.3%	30.4%	−63.1%	−41.6%	−14.3%	0.6%	16.5%	56.8%	125.0%	355,526
Dividend payer	0.35	0.48	0	0	0	0	1	1	1	385,488
Equity issuance/Assets	1.4%	7.1%	0.0%	0.0%	0.0%	0.0%	0.2%	3.5%	57.9%	319,214
Debt issuance/Assets	0.7%	6.6%	−20.3%	−6.7%	−0.8%	0.0%	0.9%	10.3%	37.5%	346,329

interest payments on its cash holdings. Assuming, for example, that the interest rate is 5%, the firm's marginal tax rate is 30%, and the company forgoes one quarter of interest, the forgone interest is 1.25%*(1–30%)*$600 million = $5.25 million. Thus, total earnings would decrease from $2.99 billion to $2.98475 billion, resulting in a new EPS equal to $3.01 (rounded to the nearest cent). This example illustrates how firms can move from a pre-repurchase EPS of $2.99 to an actual EPS of $3.01, or equivalently, moving the EPS surprise (relative to the analyst consensus) from −1 cent to +1 cent. Note that the required repurchases are economically large: changing EPS by just two cents involves spending cash representing 1% of the firm's equity value—this is more than four times larger than firms' average quarterly repurchases in our sample.

Fig. 1 shows evidence that managers do appear to use accretive share repurchases to meet earnings forecasts. We define an accretive share repurchase as a repurchase that increases the EPS by at least one cent, as in Hribar, Jenkins,

Table 2
Share repurchases and investment: OLS regressions.

This table reports the relationship between share repurchases and changes in future employment/investment outcomes. The outcome variables are changes in employment (EMP), capital expenditures (CAPEXY), and R&D (XRNDQ, set to zero if missing). To measure the changes we take the average of each of these variables over four quarters after the quarter of repurchases minus the average over four quarters before repurchases, and scale the difference by assets lagged by four quarters. Repurchases are defined as in Fama and French (2001) and scaled by lagged assets. Panel A reports the univariate regression, and Panel B adds the most common control variables. All variables are defined in Table 1. The regressions are at the firm-quarter level. We control for year-quarter fixed effects throughout. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by firm are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	Employment (1)	Capex (2)	R&D (3)
Panel A: Basic regression			
Repurchases / Assets	−9.189***	−0.045***	0.002
	(−6.29)	(−8.35)	(0.68)
N	75,699	73,939	77,065
Panel B: Basic regression with controls			
Repurchases / Assets	−17.729***	−0.083***	−0.020***
	(−11.32)	(−12.69)	(−5.77)
Q	17.070***	0.138***	0.017***
	(10.10)	(14.12)	(5.40)
Cash flow / Assets	0.344***	0.001***	0.001***
	(7.48)	(2.61)	(11.88)
N	70,311	68,874	71,562
Year-quarter fixed effects	Yes	Yes	Yes

and Johnson (2006).[4] The figure shows that companies with slightly negative pre-repurchase EPS surprises are more likely to engage in accretive share repurchases. For example, the probability of executing an accretive share repurchase increases from less than 1.5% to around 3.5% when the sign of the pre-repurchase EPS surprise changes from positive to negative. That is, there is a discontinuity in the probability of executing an accretive share repurchase around the zero surprise threshold.[5]

To analyze this relationship more formally, we estimate the following regression:

$$I_{accr.rep.,it} = \alpha + \beta_1 I_{Negative\ Sue_{adj},it} + \beta_2 Sue_{adj,it} + \beta_3 Sue^2_{adj,it} + \beta_4 Sue^3_{adj,it} + \beta_5 Sue_{adj,it} I_{Negative\ Sue_{adj},it} + \beta_6 Sue^2_{adj,it} I_{Negative\ Sue_{adj},it} + \beta_7 Sue^3_{adj,it} I_{Negative\ Sue_{adj},it} + \beta_8 X_{it} + \eta_i + \theta_t + \epsilon_{it}, \quad (2)$$

where $I_{accr.rep.}$ is an indicator for executing an accretive repurchase, Sue_{adj} is the pre-repurchase EPS surprise, $I_{Negative\ Sue_{adj}}$ is an indicator of having a negative pre-repurchase EPS surprise, X is a vector of controls (an indicator of whether the firm paid a dividend in the previous year, ROA, quarterly stock returns, and the ratio of cash to assets), η_i are firm fixed effects, and θ_t are year-quarter fixed effects.

Table 3 reports the result. The evidence, reported in Panel A of Table 3, suggests that having a negative pre-repurchase EPS surprise significantly predicts an accretive share repurchase.[6] Specifically, the probability of an accretive share repurchase increases by 3–5% around the zero pre-repurchase EPS surprise threshold. When we consider a small window around a zero pre-repurchase EPS surprise (Panel B), $-0.003 \le Sue_{adj} \le 0.003$, the discontinuity is even stronger (Table A1 in the Appendix shows that the main results are not sensitive to the choice of bandwidth for this small window). As Panel B indicates, the probability of an accretive share repurchase increases by 5–10% when companies experience a negative pre-repurchase EPS surprise. Given that the unconditional likelihood of a positive net repurchase is 23%, the effect constitutes a significant economic effect on the probability of share repurchase.[7]

Next we show that having a small negative pre-repurchase EPS surprise has a significant impact on the total size of share repurchases, by estimating the following regression:

$$Repurchases_{it} = \alpha + \beta_1 I_{Negative\ Sue_{adj},it} + \beta_2 Sue_{adj,it} + \beta_3 Sue^2_{adj,it} + \beta_4 Sue^3_{adj,it} + \beta_5 Sue_{adj,it} I_{Negative\ Sue_{adj},it} + \beta_6 Sue^2_{adj,it} I_{Negative\ Sue_{adj},it} + \beta_7 Sue^3_{adj,it} I_{Negative\ Sue_{adj},it} + \beta_8 X_{it} + \eta_i + \theta_t + \epsilon_{it}. \quad (3)$$

Results are reported in Panel C and Panel D of Table 3. The ratio of net share repurchases to assets is 0.13–0.37% higher when companies would narrowly miss the target EPS without a repurchase. Given that the unconditional ratio of net share repurchases to assets is around 0.28%, this effect on share repurchases is economically important.[8]

To exploit this discontinuity to analyze the effect of share repurchases on outcome variables of interest (employment, Capex, and R&D), we need to make the following identifying assumption: in the absence of a jump in share repurchases around a zero pre-repurchase EPS surprise, there are no other discontinuous differences in firm characteristics around the zero pre-repurchase EPS surprise. In Section 3.4, we further weaken this assumption by exploiting cross-sectional heterogeneity: here, we need only assume that any other discontinuity around this

[4] The exact formula used to calculate the pre-repurchase EPS surprise is described in Fig. 1.

[5] As in Hribar, Jenkins, and Johnson (2006), we also find no discontinuity in the probability of a *decretive* share repurchase around a zero earnings surprise (Fig. A1 in the Appendix).

[6] In untabulated results, we also find that having a negative pre-repurchase EPS surprise predicts initiations of new repurchase programs. The increase in share repurchases is thus driven both by increased use of existing programs (intensive margin) and new programs (extensive margin).

[7] The *t*-statistic is also very large, which enables this discontinuity to serve as a strong instrument. In untabulated results, we also compute Kleibergen-Paap *F*-statistics of this first-stage regression and find extremely high *F*-statistics (above 100), which supports the strength of the instrument.

[8] The unconditional ratio of net share repurchases to assets is the product of the unconditional likelihood of a positive net repurchase (23%) and the net share repurchases to assets among firms conditional on positive net repurchases (1.2%).

Table 3
Negative EPS surprises and share repurchases.

Panel A reports the relationship between having a negative pre-repurchase EPS surprise and the probability of doing a share repurchase in a firm-quarter. The calculation of the pre-repurchase EPS surprise is as described in Fig. 1, and share repurchases are measured as described in Table 1. Each column reports results using distinct sets of controls, which include linear or third-order polynomials of the pre-repurchase EPS surprise, interacted with the indicator of a negative pre-repurchase EPS surprise, firm and year-quarter fixed effects, and time-varying firm characteristics (ROA, stock returns, cash/assets, dividend payer; these variables are defined in Table 1). Panel B reports the relationship between having a negative pre-repurchase EPS surprise and the probability of doing a repurchase in a firm-quarter among firms that are in a small window around the zero pre-repurchase EPS surprise threshold (the pre-repurchase EPS surprise normalized by share price between −0.003 and 0.003). Panels C and D report the relationship between having a negative pre-repurchase EPS surprise and the *amount* of net repurchases in a firm-quarter, in the full sample (Panel C) and in a small window around the threshold (Panel D). *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered at the firm level are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Probability of stock repurchase						
Negative pre-repurchase	0.0343***	0.0365***	0.0439***	0.0475***	0.0442***	0.0422***
EPS surprise	(7.23)	(6.78)	(9.50)	(10.51)	(7.79)	(7.33)
R^2	0.00114	0.00786	0.00247	0.04442	0.04473	0.04886
N	66,325	66,325	66,325	66,325	66,325	64,607
Panel B: Probability of stock repurchase (small window)						
Negative pre-repurchase	0.0471***	0.0954***	0.0498***	0.0511***	0.0628***	0.0623***
EPS surprise	(8.15)	(9.53)	(5.72)	(6.02)	(3.02)	(2.95)
R^2	0.00196	0.00682	0.00254	0.04961	0.04974	0.05431
N	44,638	44,638	44,638	44,638	44,638	43,584
Panel C: Level of stock repurchases						
Negative pre-repurchase	0.0013***	0.0015***	0.0020***	0.0021***	0.0023***	0.0023***
EPS surprise	(10.56)	(10.09)	(14.28)	(14.95)	(12.87)	(12.56)
R^2	0.00258	0.00884	0.00658	0.04101	0.04192	0.04928
N	65,895	65,895	65,895	65,895	65,895	64,607
Panel D: Level of stock repurchases (small window)						
Negative pre-repurchase	0.0019***	0.0033***	0.0027***	0.0027***	0.0037***	0.0037***
EPS surprise	(11.33)	(10.26)	(9.31)	(9.35)	(5.20)	(5.23)
R^2	0.00442	0.00866	0.00819	0.05093	0.05114	0.06170
N	44,411	44,411	44,411	44,411	44,411	43,584
Pre-repurchase EPS surprise (polynomial)	No	1-order	1-order	1-order	3-order	3-order
Firm fixed effects	No	No	Yes	Yes	Yes	Yes
Year-quarter fixed effects	No	No	No	Yes	Yes	Yes
Controls	No	No	No	No	No	Yes

threshold does not differ systematically across groups of firms.

A standard way to test the assumption is to evaluate whether there are systematic pre-existing differences or trends in the policies of firms that fall on either side of a pre-repurchase EPS surprise. To perform the test, we examine the characteristics of firms with small negative and small positive pre-repurchase EPS surprises. To isolate any differences around the threshold, we limit the sample to a small window around a zero pre-repurchase EPS surprise, $-0.003 \leq Sue_{adj} \leq 0.003$, and in addition control for any linear association between the pre-repurchase EPS surprise and firm characteristics.

Table 4 reports the results. When we compare firms with small negative and small positive pre-repurchase EPS surprises, firms on either side of the pre-repurchase EPS surprise have very similar characteristics. We find no systematic pre-existing differences in either changes in or levels of employment, Capex, or R&D.[9]

Overall, firms on either side of a pre-repurchase EPS surprise have very similar characteristics, which supports the use of the regression discontinuity framework. This allows us to use $I_{Negative\ Sue_{adj,it}}$ (i.e., having a negative pre-repurchase EPS surprise) to identify the effect of EPS-driven repurchases on employment and investment using a fuzzy regression discontinuity (RD) framework.

3.3. Main results

This section estimates the effect of share repurchases on firms' employment/investment policies, employing a fuzzy regression discontinuity (RD) framework. We begin by reporting the reduced-form relation between having a small negative pre-repurchase EPS surprise and investment policies, by estimating the following equation:

[9] Because the ability to complete an accretive repurchase depends on a firm's price-to-earnings (P/E) ratio, we further test for pre-trends and pre-existing level differences in P/E ratios (these results are not reported). We find no differences in P/E levels or pre-trends between firms shown on the left and the right, which further supports the notion of no discontinuous difference between firms with slightly negative and slightly positive pre-repurchase EPS surprises.

Table 4
Pre-existing differences in investment variables among firms with slightly negative/positive pre-repurchase EPS surprises.

This table reports results for pre-existing differences in outcome variables around the zero pre-repurchase EPS surprise threshold. Panel A reports results for differences in pre-existing levels and Panels B–E report results for changes ("trends") in these variables. Each column reports results for a different outcome variable. The test is performed in a sample that consists of observations in a small window around the zero pre-repurchase EPS surprise threshold (between −0.003 and 0.003). We control throughout for the level of the pre-repurchase EPS surprise, interacted with the sign of the surprise, as well as firm- and year-quarter fixed effects. All variables are defined in Table 1. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered at the firm level are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	*Employment* (1)	*Capex* (2)	*R&D* (3)
Panel A: Levels (t−1)			
Negative pre-repurchase EPS surprise	−0.0093 (−0.10)	0.0003 (1.11)	0.0001 (0.46)
Panel B: Changes (t−2 to t−1)			
Negative pre-repurchase EPS surprise	−0.0408 (−1.09)	−0.0004 (−1.36)	0.0003* (1.72)
Panel C: Changes (t−3 to t−1)			
Negative pre-repurchase EPS surprise	0.0345 (0.61)	−0.0004 (−1.55)	0.0002 (1.00)
Panel D: Changes (t−4 to t−1)			
Negative pre-repurchase EPS surprise	0.0408 (0.61)	−0.0005* (−1.67)	0.0003 (1.33)
Panel E: Changes (t−5 to t−1)			
Negative pre-repurchase EPS surprise	0.0763 (1.09)	−0.0001 (−0.30)	0.0000 (0.34)
Linear control in pre-repurchase EPS surprise	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year-quarter fixed effects	Yes	Yes	Yes

$$\overline{Y}_{i,(t+1,t+4)} - \overline{Y}_{i,(t-4,t-1)} = \alpha + \beta_1 I_{Negative\ Sue_{adj},it} + \beta_2 Sue_{adj,it} + \beta_3 Sue_{adj,it} I_{Negative\ Sue_{adj},it} + \theta_t + \epsilon_{it}. \quad (4)$$

Panels A and B of Table 5 present the reduced-form results. These coefficients represent the differences in outcome variables across firms with negative pre-repurchase EPS surprises and those that just meet their EPS forecast without repurchasing stock. They can be directly compared with the coefficients reported in the parallel trends test in Table 4. Firms that are on the left reduce employment by 0.5 employees per million dollars in assets, invest on average 0.10–0.22% of assets less in capital expenditures, and invest around 0.03–0.06% of assets less in R&D, relative to firms that are on the right of the threshold. These figures represent around 5% of the average number of employees, 10% of the mean capital expenditures, and 3% of the mean R&D expenses in our sample (Table 1). Overall, the evidence suggests that repurchases result in significant decreases in employment, Capex, and R&D spending. Fig. 2 presents the reduced-form evidence in graphical form, illustrating the discontinuity around the zero pre-repurchase EPS surprise.

Table 5
Share repurchases and investment: IV regressions.

This table reports the relationship between share repurchases and changes in future employment and investment outcomes. We report results from reduced-form (Panels A and B) and IV regressions (Panels C and D) in a small window around the zero pre-repurchase surprise threshold (between −0.003 and 0.003). We instrument the repurchase amount with an indicator of whether the pre-repurchase EPS surprise is negative. The outcome variables are the same as in Table 3, and the regressions are at the firm-quarter level. We control for year-quarter effects throughout. In Panels B and D, we additionally control for the level of the pre-repurchase EPS surprise, interacted with the sign of the surprise. All variables are defined in Table 1. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by firm are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	*Employment* (1)	*Capex* (2)	*R&D* (3)
Panel A: Reduced form			
Negative pre-repurchase EPS surprise	−0.4824*** (−8.32)	−0.0022*** (−9.67)	−0.0006*** (−6.46)
N	37,230	36,344	37,772
Panel B: Reduced form (linear control)			
Negative pre-repurchase EPS surprise	−0.5085*** (−5.52)	−0.0010*** (−3.30)	−0.0003** (−2.14)
N	37,230	36,344	37,772
Panel C: IV			
Repurchases/Assets (instrumented)	−222.2*** (−6.90)	−0.981*** (−7.49)	−0.265*** (−5.59)
N	37,230	36,344	37,772
Panel D: IV (linear control)			
Repurchases/Assets (instrumented)	−155.8*** (−4.84)	−0.301*** (−3.15)	−0.087** (−2.09)
N	37,230	36,344	37,772

We next estimate the corresponding two-stage least squares regression, where in the first stage we include $I_{Negative\ Sue_{adj},it}$ as a predictor of the level of share repurchases (based on Eq. (3))

$$\overline{Y}_{i,(t+1,t+4)} - \overline{Y}_{i,(t-4,t-1)} = \alpha + \gamma_1 Repurchases_{it} + \gamma_2 Sue_{adj,it} + \gamma_3 Sue_{adj,it} I_{Negative\ Sue_{adj},it} + \theta_t + \epsilon_{it}. \quad (5)$$

Under the identification assumption discussed in the previous section, the coefficients of these regressions can be interpreted causally. As in every instrumental variables (IV) research design, we identify the Local Average Treatment Effect (LATE) of these repurchases on investment. The two-stage results are reported in Panels C and D of Table 5. Consistent with the reduced-form effects, we show that repurchases made by firms that would have a negative pre-repurchase EPS surprise result in lower employment, Capex, and R&D. In these results, we limit the sample to firm-quarters for which a repurchase would be accretive, because the discontinuity only predicts repurchases among these firms. [10]

[10] As a robustness test, in Table A2 in the Appendix, we additionally include firms for which a repurchase would have a decretive impact on EPS. We find that the results are qualitatively and quantitatively similar to those in Table 5 where we only include firms for which repurchases are accretive.

The economic interpretation of the coefficients is similar to those in the reduced-form regressions. Table 1 shows that the average repurchase by firm-quarter is $21.65 million, while 37% of these repurchase dollars are spent by firms in the small region just to the left of zero pre-repurchase EPS surprise. For example, given the estimated average effect on capital expenditures in Table 5, column 2 (−0.301), the predicted impact on capital expenditures would be a reduction of 37%∗21.65∗0.301 = $2.4 million. This figure represents 9% of the average firm's quarterly capital expenditures ($26.57 million), which is close to the 10% figure that we obtain in the reduced-form regressions.

Our identification strategy is robust to several potential concerns.

First, to fully exploit the RD design, we focus specifically on results in a small window around the threshold rather than the full sample. The reason for limiting the sample in this way is that the results for the full sample may be driven by companies that have large negative or positive surprises away from the threshold, rather than companies that are close to the threshold (Bakke and Whited, 2012). In Table A1, we show that the results reported in Table 5 are not sensitive to the choice of bandwidth for the small window. Our base result uses a window between $-0.003 \leq Sue_{adj} \leq 0.003$, while Table A1 further presents results for window sizes varying between 0.001 and 0.005.

Second, another potential concern with the identification assumption might be that firms that just miss or just beat the analyst consensus are discontinuously different in some time-invariant observable or unobservable characteristic (for example, the firm's management team). To address this concern, the outcome variable is defined in differences and therefore controls for any such time-invariant characteristics that might affect the outcome variables. A related concern is that the earnings surprise threshold may be related to some time-varying characteristic that affects the outcome variables. As discussed in the previous section, we find no systematic pre-existing differences or trends in the policies of firms that fall on either side of the pre-repurchase EPS surprise. Thus, firms on either side of the pre-repurchase EPS surprise have very similar characteristics and therefore are likely to be distributed around the threshold as if randomly assigned.

A third potential concern is that firms use other ways to manage earnings in addition to share repurchases. This is an omitted variable concern, and thus, to affect our results, would have to both directly affect the outcome variables and be discontinuous around the zero pre-repurchase EPS surprise. We address this concern in two complementary ways. Two of the main methods for managing earnings are accruals and guidance. In Table A3 (in the Appendix), we therefore explicitly control for several measures of accruals (Panels A–B) and guidance (Panel C). These results show that our results are not affected by controlling for other earnings management strategies.[11] In addition to controlling for accruals and guidance, we measure our outcome variables only as the difference between four quarters after and four quarters before the quarter of repurchases, and *exclude* the quarter concurrent with the repurchase ($t=0$). Our concern is that to beat analyst EPS forecasts, a firm could both employ share repurchases and reclassify R&D expenses as capital expenditures: this would result in abnormally high capital expenditures and abnormally low R&D expenses in the same quarter as the earnings-management-motivated repurchase. By excluding the quarter concurrent with the repurchase $t=0$, we eliminate this concern about the contemporaneous reclassification of R&D expenses as capital expenditures.

Finally, another possible omitted variable concern is that having a negative *pre-repurchase* EPS surprise might be correlated with having an *actual* negative EPS surprise (even after controlling for the magnitude of the EPS surprise), and that having an actual negative surprise might have a direct discontinuous effect on investment, for example, by increasing the cost of raising capital. To address this concern, we limit the sample to only firms that have a small positive *actual* EPS surprise—some of which would have had a negative surprise without executing a repurchase—and analyze the relationship between instrumented share repurchases and changes in future employment/investment outcomes among these firms. Because we include only firms with an actual positive surprise, we thus eliminate any omitted variable concern based on having a negative actual surprise. Results are reported in Table A4 (in the Appendix). The results are similar to the results in Table 5, which indicate that the main results are unlikely to be driven by companies that have an actual negative surprise.

3.4. Cross-sectional variation tests

In the preceding sections, we assume that in the absence of a discontinuous jump in share repurchases around a zero pre-repurchase EPS surprise there are no other discontinuous changes in firm characteristics around the zero pre-repurchase EPS surprise. In this section, we further weaken this assumption by exploiting cross-sectional heterogeneity in the magnitude of the discontinuity in share repurchases around the zero surprise. To understand this idea, suppose that we can observe a sample of firms that do not conduct repurchases in response to a negative surprise. If the effects that we show above are due to repurchases, then we should not observe a relationship between negative surprises and employment, Capex, or R&D for this sample of firms. If, however, the effect is due to an unobservable variable that jumps precisely at the zero earnings surprise level, then we should still observe effects on outcomes, even in the absence of repurchases.

[11] The point estimates are smaller in Panel C where we control for guidance. However, this happens not because the guidance variables (*footnote continued*) mediate the relation between repurchases and investment, but because the relationship between share repurchases and our outcome variables is somewhat lower in the time period for which we have data on guidance (1995–2009) compared with the other years in the sample.

Which firms are more likely to repurchase shares to change the sign of the EPS surprise? Cheng, Harford, and Zhang (2015) show that the likelihood and magnitude of repurchases increase when the bonus of the Chief Executive Officer (CEO) is directly tied to earnings per share (EPS). Managers who are explicitly evaluated based on EPS should be more likely to care about the sign of the earnings surprise. To test this hypothesis in our sample, we collect data on whether "EPS" or "Earnings Per Share" occur in firms' proxy statements, by "scraping" all proxy statements for the firm-years in our sample. On average, around 35% of all firm-years explicitly mention EPS or Earnings Per Share. Fig. 3 supports the hypothesis by showing that the firms that mention EPS or Earnings Per Share in their annual proxy statement display a much stronger discontinuous jump in the probability of executing a share repurchase around the zero surprise threshold.

Panel A of Table 6 further supports this hypothesis by showing that the jump in the size of repurchases around the threshold is significantly larger for firms that mention EPS in their proxy compared with firms that don't mention EPS. Panel A in Table 7 completes the analysis by showing that the reduced-form relationship between having a negative pre-repurchase EPS surprise and employment/investment is mainly driven by firms that mention EPS in the proxy statement.

Our second cross-sectional variation test is based on the hypothesis that financially unconstrained firms will be better able to execute share repurchases to manage earnings around the threshold, because share repurchases require spending a lot of cash—on the order of 1% of a firm's total equity value—to move EPS by even one or a couple of cents (as illustrated in our example in Section 3.2). Supporting this hypothesis, Fig. 4 shows that firms that are financially unconstrained display a much stronger discontinuous jump in the probability of executing a share repurchase around the zero surprise threshold. We classify firms as financially unconstrained (constrained) based on whether the Hadlock and Pierce (2010) measure of financial constraints is below (above) median.

Table 6
Negative EPS surprises and share repurchases: cross-sectional variation in the first stage.

This table reports results for the cross-sectional variation in the relationship between having a negative pre-repurchase EPS surprise and the probability of executing a share repurchase in a firm-quarter. In Panel A, we interact the indicator of having a negative pre-repurchase EPS surprise with an indicator of whether the firm explicitly mentions "EPS" or "Earnings Per Share" in the annual proxy statement. In Panel B, we represent this interaction with an indicator of whether the firm is financially constrained or not (the median split is based on the Hadlock-Pierce, 2010 index). The dependent variable is the amount of net share repurchases to assets. These variables are calculated as described in Fig. 1 and Table 1. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered at the firm level are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable: Net repurchases to assets	(1)	(2)	(3)
Panel A: EPS in proxy statement			
Negative pre-repurchase EPS surprise	0.0032***	0.0024***	0.0024***
	(7.00)	(5.77)	(5.88)
Negative pre-repurchase EPS surprise * EPS in proxy	0.0011***	0.0011***	0.0010**
	(2.62)	(2.79)	(2.53)
EPS in proxy	0.0019***	0.0009***	0.0002
	(7.08)	(3.24)	(0.81)
N	32,912	32,912	32,912
Panel B: Financially unconstrained vs. constrained firms			
Negative pre-repurchase EPS surprise	0.0030***	0.0028***	0.0028***
	(9.20)	(9.40)	(9.55)
Negative pre-repurchase EPS surprise * Constrained	−0.0006*	−0.0013***	−0.0011***
	(−1.68)	(−3.90)	(−3.25)
Constrained	−0.0026***	−0.0015***	0.0003
	(−11.89)	(−5.00)	(1.05)
N	44,411	44,411	44,411
Linear control in pre-repurchase EPS surprise	Yes	Yes	Yes
Firm fixed effects	No	Yes	Yes
Year-quarter fixed effects	No	No	Yes

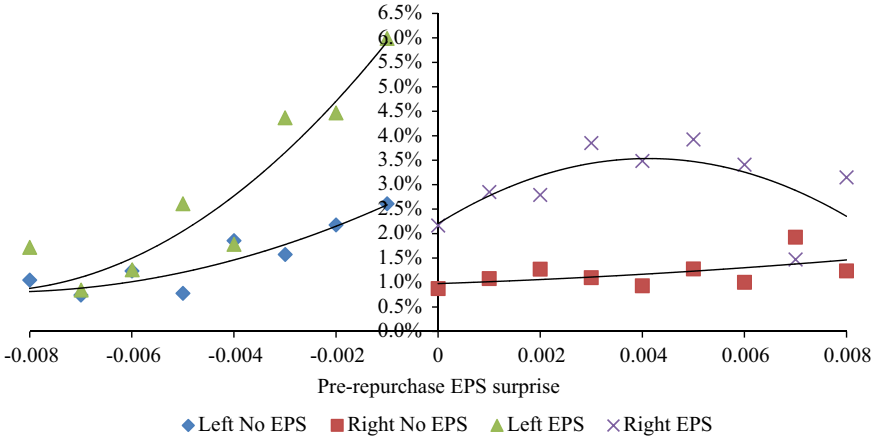

Fig. 3. Probability of accretive share repurchases: EPS in proxy statement. This figure plots the probability of doing an accretive share repurchase as a function of a pre-repurchase earnings surprise. The data and axes are as described in Fig. 1. The figure shows a split in the probability of doing an accretive share repurchase between firms that have "EPS" or "Earnings Per Share" explicitly mentioned in the proxy statement for the year and firms that do not.

Table 7
Share repurchases and investment: cross-sectional variation in reduced form.

This table reports results for the cross-sectional variation in the relationship between having a negative pre-repurchase EPS surprise and changes in future employment and investment outcomes. In Panel A, we interact the indicator of having a negative pre-repurchase EPS surprise with an indicator of whether the firm explicitly mentions "EPS" or "Earnings Per Share" in the annual proxy statement. This corresponds to the reduced form (Panel A and B) of the regressions in Table 5, plus the new interactions. In Panel B, we represent this interaction with an indicator of whether the firm is financially constrained [the median split is based on the Hadlock-Pierce (2010) index]. All other variables are defined in Table 1. We control for year-quarter fixed effects throughout and for the level of the pre-repurchase EPS surprise, interacted with the sign of the surprise. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by firm are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	*Employment* (1)	*Capex* (2)	*R&D* (3)
Panel A: EPS in proxy			
Negative pre-repurchase EPS surprise	−0.3569***	−0.0010***	−0.0003*
	(−3.74)	(−2.82)	(−1.67)
* EPS in proxy			
Negative pre-repurchase EPS surprise	−0.2858**	−0.0006	−0.0001
	(−1.98)	(−1.08)	(−0.55)
* No EPS in proxy			
N	28,914	28,376	29,165
Panel B: Financial constraints			
Negative pre-repurchase EPS surprise	−0.3157***	−0.0008***	−0.0003**
	(−4.06)	(−2.76)	(−2.11)
* Unconstrained			
Negative pre-repurchase EPS surprise	−0.0656	−0.0006	0.0005
	(−0.16)	(−0.41)	(1.07)
* Constrained			
N	37,230	36,344	37,772
Linearcontrol in pre-repurchase EPS surprise	Yes	Yes	Yes
Year-quarter fixed effects	Yes	Yes	Yes

Furthermore, Panel B in Table 6 shows that the jump in the size of repurchases around the threshold is significantly larger for firms that are financially unconstrained. Panel B in Table 7 completes the analysis by showing that the reduced-form relationship between having a negative pre-repurchase EPS surprise and employment/investment is driven by firms that are financially unconstrained. In fact, there is no significant relationship between earnings surprises and outcomes for constrained firms.

The main benefit of these cross-sectional tests is that the identification assumption that underlies these tests is even weaker than that in our base results. In the base results, we assume that—except for the jump in share repurchases—there are no other discontinuous characteristics around the threshold that directly affect our outcome variables. By additionally exploiting this cross-sectional variation, we can allow for even such discontinuous jumps in other characteristics. We need only assume that any other discontinuity around this threshold—one that would directly affect our outcome variables—does not differ systematically across these groups of firms. Thus, a strong (weak) first-stage result (Table 6) combined with corresponding strong (weak) reduced-form results (Table 7) supports the identification assumption that the *channel* through which having a negative pre-repurchase EPS surprise affects investment is share repurchases and not some other discontinuous difference across this threshold.

3.5. Share repurchases and financial policies

The evidence found above suggests that firms that execute share repurchases to manage EPS subsequently reduce investments and employment. An alternative way of financing these repurchases is to change financial policies. For example, companies could decrease cash holdings, or raise external financing (debt or equity). In this section, we analyze the effect of share repurchases on cash, equity issuance, and debt issuance.

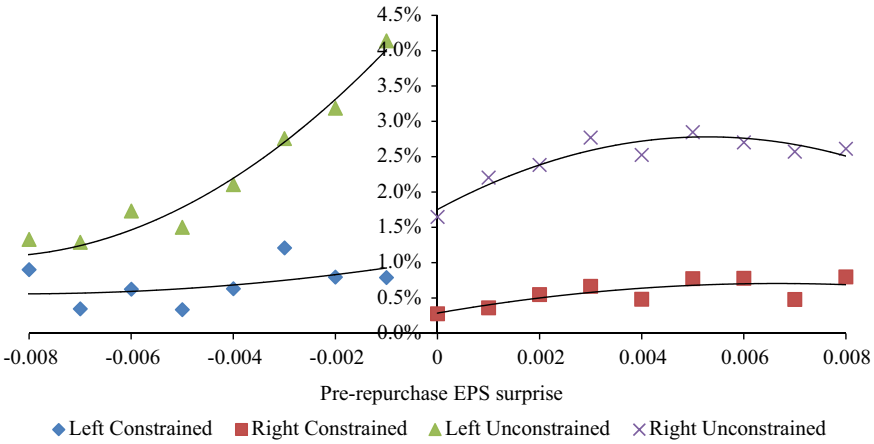

Fig. 4. Probability of accretive share repurchases: financially constrained vs. unconstrained firms. This figure plots the probability of doing an accretive share repurchase as a function of a pre-repurchase earnings surprise. The data and axes are as described in Fig. 1. The figure shows a split in the probability of executing an accretive share repurchase between firms that are financially constrained (above the Hadlock-Pierce, 2010 index median) and firms that are financially unconstrained (below the median).

We first perform a pre-trends analysis (similar to Table 4) to test for whether there are any differential trends in these financial variables among firms that are on either side of the discontinuity. Table 8 reports the results. When we compare firms with small negative and small positive pre-repurchase EPS surprises, firms on either side of the threshold have very similar financial policies. We find no systematic pre-existing differences in either changes in or levels of cash, equity issuances, or debt issuances.

Next, as in the analysis in Section 3.3, we estimate the effect of share repurchases on financial policies. We report the results in Panels A–B of Table 9. The evidence shows that repurchases indeed result in lower cash holdings going forward. However, we find no impact on either equity or debt issuances when we control for the running variable around the threshold (pre-repurchase EPS surprise). Thus, while firms do use cash to finance some of these repurchases, they do not rely on external financing to pay for these repurchases.

Next, as a robustness test, in Panels C–D of Table 9, we repeat the analysis but instead of using net repurchases as the main independent variable, we use raw repurchases (raw repurchases are measured using the variable 'prstkcy' in Compustat). The reason for performing this robustness test is that equity issuances may directly affect the net repurchases measure, which in turn could affect the result in the equity issuance test (column 2). We find no difference in the estimated coefficients between Panels B and D, showing that any confounding effect of equity issuances on net repurchases, if any, is small.[12]

4. Performance and valuation consequences

Our results so far support the conjecture that companies trade off employment and investment for stock repurchases. In this section we examine the valuation and performance consequences that are associated with this trade-off.

4.1. Valuation consequences

In this section we show how the market reacts to EPS-motivated share repurchases. Specifically, we estimate the following regression within the sample that comprises companies in a small window (between -0.003 and 0.003) around the zero-surprise threshold:

$$CAR_{it} = \alpha_0 + \alpha_1 I_{Sue_{adj,it}>0} + \alpha_2 I_{Sue_{adj,it}<0} + \alpha_3 I_{Sue\ sign\ change,it} + \alpha_4 Sue_{adj,it} + \alpha_5 Sue_{adj,it} I_{Sue_{adj,it}>0} + \epsilon_{it}. \quad (6)$$

CAR is the cumulative abnormal return over three trading days around the quarterly earnings announcement date, Sue_{adj} is the pre-repurchase EPS surprise, defined as the difference between the reported EPS adjusted for the effect of repurchases and the median analyst EPS forecast at the end of the quarter, and $I_{Sue_{adj,it}>0}$ and $I_{Sue_{adj,it}<0}$ are indicators of whether the pre-repurchase EPS surprise is positive or negative (zero surprise is the omitted category).[13] The main variable of interest, $I_{Sue\ sign\ change}$, is an indicator of whether an accretive share repurchase changes the sign of the EPS surprise from negative to positive. A positive coefficient on $I_{Sue\ sign\ change}$ would imply that investors reward a change in the EPS surprise sign (from negative to positive) that is induced by repurchases. The third column of Table 10 additionally controls for an indicator of a repurchase, to control for the possibility of an abnormal return from a repurchase itself independently of changing the sign of earnings surprise.

The evidence reported in Table 10 suggests that investors reward companies that change the sign of the EPS surprise using share repurchases. Because we control for the magnitude of the surprise, these abnormal returns represent the discontinuous effect on stock prices of just missing or just beating the EPS target. The coefficient on the first row suggests that companies that just meet the forecast are rewarded with a 0.23–0.61% increase in their stock prices, after controlling for the magnitude of the surprise. In contrast, companies that just miss the forecast observe a decline of 0.33–0.43% in their stock prices (second row).[14]

Most importantly, companies that change the sign of their EPS surprise using repurchases observe an earnings announcement CAR that is positive and also indistinguishable from the CAR of companies that just beat the forecast without using repurchases. To see this, notice, for example, in the third column, that the CAR for firms that meet the forecast because of the repurchase is given by the sum of the coefficients on the second and third rows (-0.34% $+0.57\%$, which is equal to 0.23%).[15] Results of an *F*-test, reported at the bottom of Table 10, show that the abnormal returns for companies that changed the sign of the EPS surprise from negative to positive are positive and statistically significant.[16] In fact, the second *F*-test in Table 10 shows that when we control for the polynomials of the pre-repurchase EPS surprise, we cannot reject the hypothesis that the market treats positive EPS surprises produced with share repurchases in the same way as it treats other positive EPS surprises.

This result is distinct from that of Hribar, Jenkins, and Johnson (2006), who also examine the valuation

[12] We also repeat this robustness test for the main results (Table 5). The results are reported in Table A5 in the Appendix, which also show that any confounding effect of equity issuances on the net repurchase measure, if any, is small.

[13] For companies that don't repurchase any shares in the quarter, the pre-repurchase EPS surprise (Sue_{adj}) is, naturally, equal to the actual earnings surprise.

[14] Bartov, Givoly, and Hayn (2002) also show evidence that stock prices are discontinuous at the level of zero EPS surprises, although they do not examine the role of repurchases.

[15] We also examine returns from -1 to $+10$ and $+90$ days following earnings announcements, and find very similar results. For all windows, we cannot reject that firms that repurchase to meet EPS forecasts have returns that are the same as firms that meet EPS forecasts without repurchases (these results are not reported).

[16] The abnormal returns for firms that change the sign from negative to positive can be estimated as $\alpha_2 + \alpha_3$ from Eq. (6); in column 3, this is significantly different from zero only at the 10% level.

Table 8
Pre-existing differences in financial variables among firms with slightly negative/positive pre-repurchase EPS surprises.

This table reports results for pre-existing differences in financial variables around the zero pre-repurchase EPS surprise threshold. Panel A reports results for differences in pre-existing levels and Panels B–E report results for changes ("trends") in these variables. Each column reports results for a different outcome variable, which are defined in Table 1. The test is performed in a sample that consists of observations in a small window around the zero pre-repurchase EPS surprise threshold (between −0.003 and 0.003). We control throughout for the level of the pre-repurchase EPS surprise, interacted with the sign of the surprise, as well as firm- and year-quarter fixed effects. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered at the firm level are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	*Cash* (1)	*Equity issuance* (2)	*Debt issuance* (3)
Panel A: Levels (t−1)			
Negative pre-repurchase EPS surprise	−0.0010	−0.0007	−0.0001
	(−0.63)	(−0.87)	(−0.06)
Panel B: Changes (t−2 to t−1)			
Negative pre-repurchase EPS surprise	0.0003	0.0002	−0.0018
	(0.25)	(0.22)	(−1.27)
Panel C: Changes (t−3 to t−1)			
Negative pre-repurchase EPS surprise	−0.0000	0.0017	−0.0010
	(−0.03)	(1.62)	(−0.62)
Panel D: Changes (t−4 to t−1)			
Negative pre-repurchase EPS surprise	0.0007	0.0012	−0.0005
	(0.50)	(1.18)	(−0.34)
Panel E: Changes (t−5 to t−1)			
Negative pre-repurchase EPS surprise	−0.0009	−0.0001	−0.0010
	(−0.57)	(−0.08)	(−0.75)
Linear control in pre-repurchase EPS surprise	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year-quarter fixed effects	Yes	Yes	Yes

Table 9
The effect of share repurchases on cash holdings, equity issuances, and debt issuances.

This table repeats the analysis from Table 5 with new outcome variables: cash holdings, equity issuance, and debt issuance. All variables are defined in Table 1. The regressions are at the firm-quarter level. We report results from IV regressions (Eq. (5)) in a small window around the zero-surprise threshold (between −0.003 and 0.003). In Panel B, we control for the level of the pre-repurchase EPS surprise, interacted with the sign of the surprise. In Panels C–D, we replace Net repurchases with Raw repurchases as measured by prstkcy (Purchase of common and preferred stock) in Compustat. We control for year-quarter fixed effects throughout. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by firm are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	*Cash* (1)	*Equity issuance* (2)	*Debt issuance* (3)
Panel A: IV			
Repurchases / Assets (instrumented)	−10.310***	−0.575***	−0.240
	(−9.02)	(−2.94)	(−0.80)
N	37681	32083	34359
Panel B: IV (linear control)			
Repurchases / Assets (instrumented)	−3.796***	−0.069	−0.190
	(−5.25)	(−0.38)	(−0.58)
N	37681	32083	34359
Panel C: IV			
Raw repurchases / Assets (instrumented)	−10.263***	−0.613***	−0.268
	(−8.33)	(−2.90)	(−0.87)
N	36679	32069	33420
Panel D: IV (linear control)			
Raw repurchases / Assets (instrumented)	−3.379***	−0.069	−0.185
	(−4.90)	(−0.38)	(−0.58)
N	36679	32069	33420
Year-quarter fixed effects	Yes	Yes	Yes

consequences of EPS-driven stock repurchases. They find that investors assign significantly less value to repurchase-induced EPS surprises than to non-repurchase-related surprises. The key difference in approaches is that Hribar et al. do not focus on a small window around zero EPS surprises as we do here, and thus do not fully exploit the discontinuity in stock prices at the zero earnings surprise level. When using the full sample (i.e., not only in a small window around the threshold) to conduct this analysis, we do find evidence consistent with Hribar, Jenkins, and Johnson (2006): firms that meet forecasts using repurchases observe smaller CARs than companies that surprise without resorting to repurchases. However, as discussed above, these results could be driven by companies that have large negative or positive surprises, even after controlling for polynomials of the EPS surprise.

The results in Table 10 suggest that the market doesn't care whether firms surprise positively using repurchases, or not. However, these average results may be hiding interesting cross-sectional variation. Is there a firm characteristic that is correlated with market reaction and performance? Given the evidence that firms cut both cash and real investments following EPS-motivated repurchases, one possibility is that the stock price reaction to earnings announcements may depend on how firms finance repurchases. We examine this possibility next.

Among the firms that do a repurchase and are in the neighborhood immediately left of the zero pre-repurchase EPS surprise threshold, we measure whether they cut cash, Capex, R&D, or employment in that quarter (relative to the previous quarter). As Table 11 shows, in approximately one-half (47%) of firm-quarters, cash decreases in the quarter of the earnings announcement. Capex, R&D, and employment are decreased in 45%, 16%, and 6% of firm-quarters, respectively.[17] Thus, there is significant variation in the type of cut that firms make: while some firms finance repurchases with cash, others cut real investments.[18]

[17] These categories are not mutually exclusive because firms can cut both cash and real investments or neither. For example, about two-thirds of firms that drop cash also drop at least one of the real investment variables (employment, R&D, or Capex), while one-third do not drop any of these variables.

[18] In addition they can fund repurchases with internal cash flow, so for a significant fraction of firm-quarters (18%), there is no cut in either cash or real investments.

Table 10
The changes in earnings surprises induced by repurchases and abnormal returns.

This table reports the relationship between cumulative abnormal returns during three trading days around a quarterly earnings announcement and changes in EPS surprise induced by repurchases. The pre-repurchase EPS surprise is described in Fig. 1. The indicator for a change in sign of EPS surprise due to repurchases is 1 if the sign of pre-repurchase EPS surprise is negative but the sign of actual reported EPS surprise is positive. The test is performed in a small window around the threshold of zero pre-repurchase EPS surprises (between −0.003 and 0.003). All variables are defined in Table 1. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by date are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable: cumulative abnormal return around earnings announcement (−1 to +1 days) (%)	(1)	(2)	(3)
Indicator (positive pre-repurchase EPS surprise)	0.61*** (25.20)	0.24*** (7.82)	0.23*** (7.54)
Indicator (negative pre-repurchase EPS surprise)	−0.43*** (−16.39)	−0.33*** (−9.49)	−0.34*** (−9.72)
Indicator (change in sign of EPS surprise from negative to positive due to repurchases)	0.68*** (5.28)	0.64*** (4.90)	0.57*** (4.37)
Indicator (repurchase)			0.11*** (5.28)
Constant	−0.05** (−2.35)	−0.05** (−2.35)	−0.08*** (−3.73)
Linear control in pre-repurchase EPS surprise	No	Yes	Yes
R^2	3%	4%	4%
N	74,784	74,784	74,784
F-test: indicator (negative pre-repurchase EPS surprise) + Indicator (change in sign of EPS surprise from negative to positive due to repurchases) = 0			
Sum of coefficients	0.25	0.31	0.23
F-stat	3.88	5.47	3.06
p-Value	0.049	0.019	0.080
F-test: indicator (negative pre-repurchase EPS surprise) + Indicator (change in sign of EPS surprise from negative to positive due to repurchases) = Indicator (positive pre-repurchase EPS surprise)			
Difference of coefficients	0.36	−0.07	0.00
F-stat	7.34	0.27	0.00
p-Value	0.007	0.603	0.990

This variation allows us to explore whether the valuation consequences of changing the sign of EPS surprises depend on how these repurchases were financed. Before we discuss the results, it is important to note that the interpretation of these results is subject to some important caveats. First, because firms choose how to finance repurchases, we should not give a causal interpretation to the correlation between financing choices and stock price reactions. Second, it is important to note that we are trying to infer the market reaction to investment cuts from the reaction to earnings announcements. Ideally, what we would like to do is to conduct an event study directly on investments. However, this is not possible because there is no natural date to measure the market reaction to changes in investments. Thus, the results will be confounded by the market's perception about the earnings announcement itself. Despite these caveats, evidence that the market reaction to meeting EPS forecasts is lower when firms cut real investments would provide at least suggestive evidence that some firms are cutting valuable investments to help finance repurchases.

To operationalize this idea, we split the indicator *Sue sign change* into *Sue sign change* $_*$ *Drop* and *Sue sign change* $_*$ *NoDrop*, where *Drop* and *NoDrop* are indicators for whether the firm cut a given variable (cash, Capex, R&D,

Table 11
Value implications of changes in cash and investment during the event quarter.

In this table, we split the effect of the main variable of interest from Table 10, Indicator (change in sign of EPS surprise from negative to positive due to repurchases), into two parts: firms that cut cash or specific investment variables, and firms that don't cut these variables during the quarter in which they perform the EPS-motivated repurchase. Each column represents a split on a different variable: for example, column 1 splits the effect for firms that cut cash and firms that don't cut cash. Columns 2 to 4 perform similar splits for Capex, R&D, and Employment, respectively. All other variables are defined in Table 1. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by date are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: cumulative abnormal return around earnings announcement (−1 to +1 days) (%)				
"Drop" variable	Cash	Capex	R&D	Employment
Fraction of firms with drop	47%	45%	16%	6%
	(1)	(2)	(3)	(4)
Indicator (positive pre-repurchase EPS surprise)	0.22*** (7.18)	0.23*** (7.42)	0.22*** (7.15)	0.22*** (7.18)
Indicator (negative pre-repurchase EPS surprise)	−0.33*** (−9.22)	−0.31*** (−8.72)	−0.33*** (−9.22)	−0.32*** (−9.06)
Indicator (change in sign of EPS surprise from negative to positive due to repurchases) * *Drop*	0.56*** (3.16)	0.46** (2.01)	0.01 (0.02)	−0.48 (−0.54)
Indicator (change in sign of EPS surprise from negative to positive due to repurchases) * *No drop*	0.57*** (2.79)	0.65*** (4.12)	0.66*** (4.63)	0.61*** (4.57)
Indicator (repurchase)	0.12*** (5.79)	0.11*** (5.70)	0.12*** (5.78)	0.12*** (5.85)
Constant	−0.09*** (−3.83)	−0.09*** (−4.01)	−0.09*** (−3.79)	−0.09*** (−3.90)
Linear control in pre-repurchase EPS surprise	Yes	Yes	Yes	Yes
R^2	0.040	0.040	0.040	0.040
N	73,386	71,766	73,448	72,687

Table 12
The effect of share repurchases on ROA.

Column 1 of this table repeats the analysis from Panel D of Table 5 with a new outcome variable: return on Assets. ROA is measured as quarterly operating income before depreciation (OIBDOQ) divided by contemporaneous assets (ATQ). In columns 2 to 5, we split the effect of the negative pre-repurchase EPS surprise indicator into two parts: firms that cut cash or specific investment variables, and firms that don't cut these variables. All other variables are defined in Table 1. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by firm are reported in parentheses below the coefficient estimates. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable: change in ROA (year 1 vs. year −1)					
		"Drop" variable:			
	(1)	Cash (2)	Capex (3)	R&D (4)	Employment (5)
Negative pre-repurchase EPS surprise	−0.0004 (−1.39)				
Negative pre-repurchase EPS surprise * *Drop*		−0.0006* (−1.78)	−0.0007** (−1.97)	−0.0021*** (−3.87)	−0.0019*** (−2.62)
Negative pre-repurchase EPS surprise * *No drop*		−0.0003 (−0.76)	−0.0003 (−0.98)	−0.0002 (−0.51)	−0.0004 (−1.09)
Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes
R^2	0.052	0.052	0.052	0.052	0.052
N	36,495	36,458	36,038	36,495	36,217

employment). For example, the variable drop R&D assumes a value of one if R&D falls, and is zero otherwise. Table 11 present results for each of these variables.

Our results do show that financing is correlated with the market reaction to earnings announcements. Firms that cut cash to help finance EPS-driven repurchases continue to have the same market reaction as that of firms that surprise positively without repurchases (column 1). However, firms that cut some type of real variable (either employment, Capex, or R&D) to meet an EPS forecast show a lower reaction to beating the forecast. For example, column 2 of Table 11 shows that firms that cut Capex and change the EPS surprise sign have a stock price reaction that is on average 0.21% (difference between 0.65% and 0.46%) lower than that of firms that can change the sign of the surprise without Capex (these firms are using cash or cash flow to do so). Columns 3 and 4 show that this difference is particularly large for firms that decrease R&D and employment—these firms get no significant reward for changing the sign of EPS surprise using share repurchases when they cut R&D or employment. These results are consistent with firms sacrificing valuable investments to finance share repurchases, particularly, when they cut R&D and employment to do so.

4.2. Performance consequences

We complete the analysis by examining the effect of EPS-driven repurchases on future profitability as measured by accounting performance. To do so, we employ the same fuzzy regression discontinuity framework as in Section 3.3, and use return on assets (ROA) as the outcome variable. ROA is measured as quarterly operating income before depreciation (oibdpq) divided by contemporaneous assets (atq). Column 1 of Table 12 shows the baseline result.

The result suggests that EPS-driven repurchases on average do not cause significant subsequent changes in accounting performance, after controlling for the level of the EPS surprise. Following the analysis in Table 11, we next examine whether the performance consequences depend on whether companies cut cash, Capex, R&D, or employment to finance the repurchase. Consistent with the valuation analysis in Table 11, columns 2–5 in Table 12 show that firms that cut investments (particularly R&D and employment) to finance the EPS-motivated repurchases have more adverse subsequent performance consequences.[19]

4.3. How permanent are the investment effects?

To better understand the performance and valuation results above, we consider the longer-term dynamics of changes in employment and investments. If firms are able to shift investment and employment growth to future periods, then the performance consequences of EPS-driven repurchases should be mitigated. In contrast, if these cuts are permanent, then we would expect the performance consequences to be stronger.

We start this analysis by examining the persistence of changes in employment and investments in our overall sample. To do so, we regress future changes in the employment/investment variables (the average over quarters $t+5$ to $t+8$ minus the average over quarters $t+1$ to $t+4$) on the immediate change in employment/investment variables (the average over quarters $t+1$ to $t+4$ minus the average over quarters $t-4$ to $t-1$). The results are reported in Panel A of Table A6 in the Appendix. We find that, overall, changes in employment and R&D are positively correlated in the time series: cuts in employment and R&D tend to be followed by further cuts. In

[19] These results are consistent with those in the literature that examine managerial short-termism as a motivation for earnings management. Huang (2011) finds that CEOs with shorter pay duration measured as in Gopalan, Milbourn, Song, and Thakor (2010) are more likely to repurchase shares following good stock performance. Bhojraj, Hribar, Picconi, and McInnis (2009) find that firms that reduce discretionary expenses such as R&D to meet earnings forecasts have short-term valuation gains but underperform relative to other firms in the long run.

contrast, changes in capital expenditures are negatively correlated in the time series, so negative changes tend to be followed by positive ones.

We then examine the persistence in the changes in investment/employment that are driven by EPS management, relative to this benchmark. To do so, we repeat the analysis of Panel A, while interacting the change in investment variables with an indicator for negative pre-repurchase EPS surprise. The results are reported in Panel B of Table A6 in the Appendix. We find that future changes in investment and employment variables are less persistent than those observed in the overall sample. For example, take the results on R&D. The coefficient on the interaction term is −0.26, which means that cuts in R&D that are caused by EPS-driven repurchases are less persistent than in the overall sample. In fact, since the magnitude of the coefficient is equivalent to that in the first row (0.27), the implied future change in R&D is zero for firms that just miss the EPS forecast. For capital expenditures, we find that the negative serial correlation is stronger if the original cut in capital expenditures is caused by a negative pre-repurchase EPS surprise (the coefficient on the interaction term is −0.12). Thus, the reversal in capital expenditures (which is also observed in the overall sample) is stronger in this case. Finally, we also find a negative coefficient on the interaction term for the employment regression, though the coefficient is not statistically significant (*t*-statistic 1.3).

Given that the cuts in investment and employment are more short-lived when they are driven by EPS management, we should in fact expect the consequences of these policy changes to be less dramatic. Thus, these results help us understand why policy changes that are associated with EPS management tend to have small performance and valuation effects.

5. Conclusion

This paper studies the consequences of share repurchases that are motivated by earnings management considerations. Firms' incentives to "just meet" analyst forecasts create a discontinuity in the probability of a share repurchase around the zero earnings surprise level. We use this discontinuity to identify the causal effect of such repurchases on other corporate policies in a fuzzy regression discontinuity framework. The evidence suggests that firms that repurchase shares subsequently reduce employment and investment in capital, and hold less financial slack. Firms that change the sign of an earnings surprise using repurchases experience positive stock market reactions to their earnings announcements, which are on average indistinguishable from those of firms that just meet earnings targets. However, the stock price reactions to earnings announcements are lower when firms cut real variables to help finance repurchases, in particular, R&D and employment. Overall, our results support the conjecture that companies are willing to trade off employment and investment for stock repurchases. While on average this trade-off does not appear to be detrimental to shareholder value, EPS-motivated repurchases can have more negative consequences for value and performance if they are associated with contemporaneous cuts in real investments.

Our paper contributes to the literature on repurchases by providing evidence that EPS-driven repurchases cause firms to decrease investment, employment, and R&D. As we discuss in the paper, the interpretation of our valuation and performance results is a bit more complicated, because firms endogenously choose how to finance repurchases. It would be interesting to explore additional sources of identification to confirm our preliminary evidence that some firms are willing to sacrifice valuable investments to finance EPS-motivated share repurchases. In addition, we cannot speak to other motives for why firms conduct repurchases such as undervaluation and signaling. While EPS-motivated repurchases are interesting in their own right, future literature could look for ways to shed light on a broader set of trade-offs between stock repurchases and other important firm policies.

Appendix A. Supplementary data

Supplementary data associated with this paper can be found in the online version at http://dx.doi.org/10.1016/j.jfineco.2015.08.008.

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