

Stock Repurchases and Executive Compensation Contract Design: The Role of Earnings per Share Performance Conditions

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ABSTRACT: We examine the link between firms' stock repurchase activity and the presence of earnings per share (EPS) performance conditions in executive compensation contracts. Findings reveal a strong positive association between repurchases and EPS-contingent compensation arrangements. Further analysis suggests net benefits to shareholders from this association. Specifically, repurchasers experience larger increases in total payouts; the positive association between repurchases and cash performance is more pronounced for firms with EPS targets in the presence of surplus cash; undervalued firms with EPS targets are more likely to signal mispricing through a repurchase; and repurchasers with EPS conditions are associated with lower abnormal accruals. We find no evidence that EPS-driven repurchases impose costs on shareholders in the form of investment myopia.

Keywords: *corporate payout policy; performance targets; earnings management; efficient contracting.*

Data Availability: *The data are available from public sources identified in the study.*

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I. INTRODUCTION

This study investigates the link between firms' stock repurchase activity and the presence of earnings per share performance conditions in executive compensation contracts. Our analysis seeks to address the apparent disconnect between theory and practice regarding repurchases. On the one hand, traditional academic theories identify factors such as signaling (Vermaelen 1981), agency costs (Fenn and Liang 2001), and leverage (Dittmar 2000) as important determinants of repurchase activity. On the other hand, survey and anecdotal evidence highlight earnings per share (EPS) as a key factor influencing managers' repurchase decisions (Badrinath and Varaiya 2000; Brav et al. 2005; Caster et al. 2006). Exploring why managers attach such weight to the EPS impact of repurchases represents an important step toward a better understanding of this increasingly significant aspect of payout policy.

Recent research sheds light on the links between repurchase decisions and EPS-related considerations. Kahle (2002), Bens et al. (2002), and Bens et al. (2003) focus on the dilutive impact of employee stock options (ESOs). Their findings suggest repurchases are a managerial response to EPS dilution concerns. Evidence also suggests that managers use repurchases for benchmark-beating purposes, including meeting or exceeding analysts' EPS forecasts (Hribar et al. 2006), preserving a sequence of EPS improvement (Myers et al. 2007), and maintaining historic EPS growth rates (Bens et al. 2003).

Our analysis builds on prior research by examining whether managers' stock repurchase decisions are sensitive to explicit EPS-related incentives provided by executive compensation contracts. Compensation contracts linking rewards to EPS performance provide executives with direct and potentially powerful incentives to manage reported EPS. We therefore test whether repurchase activity is higher for firms with executive compensation tied to EPS performance.

Empirical tests employ data for a comprehensive sample of U.K. nonfinancial firms over the period January 1998 through December 2006. Several features make the U.K. a particularly attractive setting in which to explore the link between repurchases and compensation contract design. First, in addition to executive bonus plans that routinely condition rewards on EPS performance, executives' long-term incentives including options and restricted stock frequently employ EPS vesting conditions (Conyon et al. 2000; Carter et al. 2009). Second, regulatory restrictions governing the treatment of repurchases during the majority of our sample period help simplify empirical tests by tempering the link between repurchase activity and the dilutive effects of ESOs. In particular, U.K. Company Law required repurchased shares to be cancelled immediately rendering repurchases a costly device for offsetting ESO-related EPS dilution (because issuing new shares is administratively more costly than reissuing treasury stock). Instead, U.K. firms with ESO programs typically established a wholly owned trust company to repurchase (and reissue) shares on their behalf. Under U.K. GAAP, shares held by ESO trusts are excluded from the EPS calculation until shares vest unconditionally. Since ESO shares are purchased solely to fund share-based compensation plans and because ESO purchases do not meet the legal definition of a stock repurchase, our tests can distinguish between repurchases driven by dilution concerns (ESO shares) and repurchases driven by other factors.¹

Findings reveal a significant association between repurchase activity and the presence of EPS-based compensation arrangements. The predicted odds of a repurchase for firms for which

¹ U.K. Company Law was amended in December 2003 to allow firms to hold repurchased shares as treasury stock. Consistent with the absence of ESO-related motives for repurchases, none of our sample firms mentioned the dilutive impact of stock-based compensation plans among the list of repurchase reasons disclosed in their annual reports prior to this date. Following the regime switch, most U.K. firms continue to cancel repurchased shares. As described in Section III, we exclude from our subsequent empirical tests firms that explicitly repurchase stock into treasury post-December 2003 to fund option plans.

executive compensation depends on EPS performance are almost twice the level observed for firms for which rewards are independent of EPS. EPS conditions in bonus and option plans are associated with incrementally significant effects. Our findings suggest that EPS performance conditions represent an important determinant of U.K. managers' stock repurchase decisions.

An important ancillary question raised by our findings is how the link between repurchases and executive compensation arrangements impacts shareholder value. We explore this issue by examining the costs and benefits associated with compensation-driven repurchases. On balance, our evidence suggests that EPS-driven repurchases yield net benefits to shareholders. First, repurchasers make higher aggregate payouts to shareholders regardless of the performance conditions employed in executive compensation contracts, and we find no evidence that EPS-driven repurchase payouts occur at the expense of either investment myopia (Bens et al. 2002) or dividend substitution (Grullon and Michaely 2002). Second, tests reveal several contracting benefits from repurchase incentives caused by linking compensation to EPS performance, including a stronger association between cash performance and repurchases in the presence of surplus cash, a higher propensity to signal undervaluation through a repurchase when stock price falls below intrinsic value, and lower accrual manipulation.

Our study contributes to prior research in several ways. First, while extant work links repurchases to the dilutive impact of employee option plans (Kahle 2002; Bens et al. 2002; Bens et al. 2003), and EPS-based bonus plans to the dilutive impact of new equity issues (Huang et al. 2010), the association between repurchase activity and EPS-contingent compensation has attracted little attention. Our study highlights EPS-based executive compensation contracts as an important determinant of repurchase activity that is entirely consistent with the EPS benefits of buybacks frequently highlighted by management (Badrinath and Varaiya 2000; Brav et al. 2005; Caster et al. 2006). Our findings complement and extend Marquardt et al.'s (2009) evidence that EPS-based bonus plans explain managers' preference for accelerated stock repurchases over regular open market buybacks. We add to their findings by demonstrating that EPS-based compensation arrangements also explain the underlying decision to repurchase stock and that shareholders benefit from this relation. Second, our analysis relates to work on performance measure choice in compensation contracts. In particular, prior research emphasizes how EPS targets encourage overinvestment (Brealey et al. 2008, 889). Our results provide a counterbalance to this view by highlighting how the repurchase incentives created by EPS-contingent pay help align managers' interests with those of shareholders. Our conclusion is consistent with Huang et al. (2010) who model the use of EPS conditions in executive bonus plans and find that EPS-contingent compensation helps resolve agency problems by protecting current shareholders from a reduction in proportional ownership. Our analysis also contributes to the small body of research exploring the interaction between alternative earnings management instruments (e.g., Demski et al. 2004; Cohen et al. 2008). We argue that shareholders gain when managers manipulate EPS through repurchases rather than accounting accruals, and we show that the incentive created by EPS targets to manipulate via repurchases correlates with less accrual management.

Section II develops the link between repurchases and executive compensation arrangements, and reviews the structure of executive compensation plans in the U.K. Section III provides details of our sample, data, and research design. Section IV reports results of tests that examine the association between repurchases and EPS-based performance targets in executive compensation plans. Section V explores the implications for shareholders of repurchases motivated by EPS-contingent performance conditions. Section VI concludes.

II. LITERATURE REVIEW AND INSTITUTIONAL OVERVIEW

Stock Repurchases, Earnings Management, and Executive Compensation

Despite being overlooked in much of the corporate payout policy literature, managers and financial commentators have long recognized the EPS implications of stock repurchases. The impact of repurchases on reported EPS represents the net of both numerator and denominator effects. The numerator effect, which works to reduce EPS, represents the decline in earnings caused by an increase in borrowing (for repurchases financed with debt) or a reduction in investment returns (for repurchases financed using cash reserves). The denominator effect serves to increase EPS by reducing the number of shares outstanding. Repurchases have a positive net effect on EPS for firms whose earnings-to-price ratio exceeds the opportunity cost of funds (i.e., either the after-tax return on short-term cash investments or the cost of debt; Guay 2002; Bens et al. 2003; Hribar et al. 2006). Survey evidence reported by Brav et al. (2005) highlights the central role EPS considerations play in shaping managers' repurchase decisions, with three-quarters of senior executives citing EPS growth as an important factor affecting their repurchase decisions.

Research has begun to explore the link between repurchases and EPS in several contexts. One EPS-related factor predicted to motivate repurchases is earnings dilution caused by ESO plans. Accretive stock repurchases can offset the dilutive effects of ESOs on reported EPS in several ways. For example, while ESO exercises reduce basic EPS by increasing the weighted average number of shares outstanding for the period, managers can mitigate this dilution by repurchasing shares to fund option exercises. Bens et al. (2002) and Kahle (2002) present evidence consistent with this option-funding hypothesis. Conversely, Bens et al. (2003) conclude that repurchases are not a response to the dilutive impact of option exercises on basic EPS. Instead, their results suggest the link between repurchases and options is driven by the effect of ESOs on diluted EPS, with buybacks increasing in the level of in-the-money ESOs outstanding.

Repurchases motivated by EPS considerations have also been linked with benchmark-beating earnings management activity. Controlling for dilution effects, Bens et al. (2003) find that repurchases are increasing in the amount by which earnings undershoot the level required to sustain historical diluted EPS growth. Myers et al. (2007) document similar behavior in a sample of firms characterized by long strings of consecutive quarterly EPS increases, with managers strategically timing repurchases to boost reported EPS when the string would otherwise be broken. Meanwhile, Hribar et al. (2006) conclude that managers use repurchases to meet or beat analysts' consensus EPS forecasts. In all these studies, benchmark-beating stock repurchase activity is motivated through implicit managerial incentives in the form of higher stock-related compensation, greater job security, and a lower cost of capital.²

Compensation contracts represent a powerful source of incentives for managers. For example, research demonstrates that executives use their accounting discretion to manipulate earnings in response to compensation-driven considerations (Bushman and Smith 2001). Further, a growing body of evidence suggests that corporate payout decisions are sensitive to executives' compensation arrangements. For instance, firms for which the executives' annual bonus pool is contingent on dividends paid are associated with higher dividend payouts and yields (White 1996), while ESOs that are not dividend-protected create incentives for executives to reduce dividend payments

² Bens et al. (2003, 75–76) argue that explicit compensation contract considerations are not the source of their findings linking repurchases to EPS manipulation. They estimate firm-specific correlations between CEO cash compensation and reported EPS and use the median correlation to divide firms into high and low cash compensation-EPS sensitivity firms. Tests reveal no evidence that their main results differ across the two subsamples. However, this approach is unlikely to provide a powerful means of distinguishing firms with explicit EPS targets from those using alternative earnings-based performance metrics. Further, since the approach focuses exclusively on cash compensation, it ignores the impact of EPS vesting conditions in long-term compensation.

(Lambert et al. 1989; Kahle 2002; Fenn and Liang 2001). In related research, Aboody and Kasznik (2008) demonstrate how compensation plan design can help align managers' cash payout decisions with shareholders' tax-driven payout preferences. Finally, Wallace (1997) and Marquardt et al. (2009) examine the link between bonus plan performance conditions and corporate payout policy. Using a sample of firms adopting residual income-based plans (which penalize managers for accumulating capital that earns less than the opportunity cost of capital), Wallace (1997) documents a post-adoption rise in repurchase activity as managers liquidate unproductive assets. Marquardt et al. (2009), meanwhile, provide direct evidence on the link between EPS performance conditions and stock repurchase activity. Specifically, they find that managers are more likely to favor accelerated stock repurchases (which record the full EPS benefits of the repurchase immediately) over regular open market repurchases when their bonus plans are explicitly tied to EPS performance. However, the extent to which EPS-based compensation arrangements explain the propensity to repurchase more generally remains unexplored.

EPS is a popular performance metric used in executive compensation contracts (Murphy 1999; Conyon et al. 2000; Pass et al. 2000). Compensation contracts that tie managerial rewards to EPS create explicit incentives for executives to manage the EPS denominator through repurchases (over and above any implicit market-based incentives associated with increasing stock-based wealth and improving job security). These direct incentives are absent in compensation contracts that employ non-per-share-based earnings metrics such as return on assets, and non-accounting measures such as stock price or qualitative targets linked to personal objectives. Accordingly, we predict that stock repurchase activity will be positively associated with the incidence of EPS-based performance conditions in executive compensation contracts. We test this prediction in the U.K. where short- and long-term elements of executive pay are linked to EPS (Conyon et al. 2000; Pass et al. 2000; Carter et al. 2009).

Overview of Executive Compensation Arrangements in the U.K.

The typical compensation package for a U.K. executive director includes both short-term bonus arrangements and longer-term incentives such as options and restricted stock (Conyon and Murphy 2000). Bonus payments are normally linked to short-term performance measures and objectives. In addition, U.K. firms regularly impose performance-vesting conditions in executives' long-term stock- and cash-based plans. Widespread adoption of performance-vesting conditions in executives' long-term compensation plans can be traced to the Greenbury Report (1995), which proposed that all long-term incentives (including option plans) should include challenging performance criteria. After December 31, 1995, revised London Stock Exchange rules required all listed firms to either comply with the Greenbury recommendation or publish a statement explaining noncompliance. Further pressure to adopt performance conditions for long-term incentives was applied by influential shareholder groups including the Association of British Insurers and the National Association of Pension Funds. As a result, performance vesting conditions in long-term plans are now commonplace among U.K. firms (Carter et al. 2009).

While best practice compensation guidelines do not favor any single performance metric, survey evidence reveals widespread adoption of EPS-based targets. For example, Conyon et al. (2000) report that 72 percent of option plans with performance-contingent vesting conditions define targets in terms of EPS growth, while Pass et al. (2000) find that 34 percent of long-term incentive plans (LTIPs) surveyed had an EPS performance condition. Accordingly, the performance conditions applied in long-term compensation arrangements often mirror those used in short-term bonus plans, for which EPS targets have long been used. The widespread use of EPS targets in executive compensation arrangements is expected to create powerful incentives for U.K. executives to manage EPS realizations through repurchases.

III. DATA AND METHODS

Sample and Data

The initial sampling frame comprises all U.K.-resident firms (excluding closed-end investment trusts) listed on the London Stock Exchange (LSE) with fiscal year-ends between January 1, 1998 and December 31, 2006. The sample period starts in 1998 because executive compensation data are collected with a one-year lag and disclosures relating to performance conditions in executive compensation contracts are patchy before 1997.

Firm-level repurchase data relate to aggregate reacquisitions made during a fiscal year. Only repurchases executed in the open market or via self-tender offer are used in subsequent tests. We hand-collect annual repurchase data from firms' published financial statements. This process involves identifying potential repurchasers using a variety of news sources including the London Stock Exchange Regulatory News Service, the Securities Data Corporation, and *The Financial Times*. Financial statements with year-ends between January 1998 and December 2006 are then examined for all firms in the provisional list to identify the number, value, and fraction of shares repurchased. The resulting sample comprises 1,047 repurchase firm-year observations for 460 firms. We remove financial firms due to the unique nature of performance measurement in that sector. Utility firms are also removed due to a lack of nonrepurchasing firms in the same sector for matching purposes (see below). A further 67 observations are lost due to missing data required to construct one or more of our test variables. We also exclude ten treasury stock repurchase observations driven entirely by outstanding option commitments. The final sample consists of 665 repurchase firm-years.

Repurchasing firms are drawn from 31 Datastream level-4 nonfinancial industry groups, with no single industry accounting for more than 12 percent of the final sample. The aggregate value of shares reacquired during the sample window exceeds £83 billion, with an average (median) annual repurchase value of £124.9 million (£3.9 million). Repurchase activity in the U.K. is increasing over time, with the aggregate amount rising from £636 million in 1998 to almost £28 billion in 2006. The average (median) annual repurchase involves approximately 5 (3) percent of common shares outstanding. Repurchased shares are cancelled in the majority of cases: only 66 observations (10 percent) utilize the treasury stock option.

Empirical tests require details of performance conditions used in executive compensation contracts, data for which are also hand-collected from firms' published annual reports and financial statements. Collecting such data for all LSE-listed nonrepurchase firms is infeasible. We therefore employ a case-control matched sample design whereby each of the 665 repurchase firm-year observations is paired with a time-, industry- and size-matched nonrepurchasing firm.³ Matching by industry (Datastream level-4) helps control for factors that are expected to affect payout policy (Smith and Watts 1992) and compensation arrangements (Antle and Smith 1986), while matching by size (lagged total assets) helps to control for established associations between firm size and repurchase activity (Dittmar 2000; Jagannathan et al. 2000), and between firm size and compensation arrangements (Pass et al. 2000). Nonrepurchase control firms are matched with repurchasers at the fiscal year-end immediately preceding the repurchase year. Nonrepurchasers must not have implemented a buyback at any point prior to the matching year or during the subsequent four-year period.

³ Case-control matching unavoidably leads to disproportionate random sampling on the dependent variable. However, subsequent tests linking repurchase activity to EPS-based performance conditions in executive compensation contracts employ logistic regression, a well-known property of which is that slope coefficients remain unbiased in the presence of disproportionate random sampling on the dependent variable (Prentice and Pyke 1979).

Details of the following performance-related elements of executive compensation are collected from repurchase and nonrepurchase firms' annual reports in the matching year: short-term bonus plans, option plans, and long-term incentive plans. Bonus plans comprise all arrangements for which rewards are tied to short-term (\leq one-year) performance targets. Option plans comprise all stock-based arrangements granting executives the right to acquire shares at a nonzero exercise price. (Firm-wide employee option plans and save-as-you-earn schemes are excluded.) LTIPs consist of all remaining long-term compensation arrangements not classified as options (e.g., deferred bonus schemes, share matching schemes, zero strike price options, stock appreciation rights, long-term cash-based bonus plans, etc.). We record the performance conditions for all active plans in each category. The data-collection process has to confront two disclosure problems. First, a handful of firms fail to unambiguously disclose use of one or more of the three plan types. Second, some firms fail to provide details of the performance conditions used in one or more of their plans. We use previous years' Annual General Meeting resolutions and remuneration disclosures up to two years ahead to verify plan existence and determine performance conditions employed.⁴ Cases for which we cannot unambiguously determine plan existence or the use of an EPS performance condition are coded as nondisclosers.

Research Design

We expect EPS performance conditions to be more prevalent among repurchasing firms. We test this prediction using a conditional logistic regression to model the probability of a repurchase and a left-censored tobit regression to model the value of repurchases:

$$\text{Log}\left(\frac{p_{it}}{1-p_{it}}\right) = \gamma_1 \text{NDISC}_{ijt-1} + \gamma_2 \text{EPS}_{ijt-1} + \sum_{k=1}^K \theta_k \text{Controls}_{kit-1}, \quad (1)$$

$$\text{Rep}_{it} = \lambda_0 + \lambda_1 \text{NDISC}_{ijt-1} + \lambda_2 \text{EPS}_{ijt-1} + \sum_{k=1}^K \delta_k \text{Controls}_{kit-1} + v_{it}. \quad (2)$$

For the conditional logistic model presented in Equation (1), p_{it} is the latent probability that firm i repurchases shares in year t ($y_{it} = 1$). The conditional logistic model is the appropriate estimation method for the matched pair structure of our data (Allison 1999, 203).⁵ For the left-censored tobit model presented in Equation (2), Rep is the observed value of the latent propensity to repurchase stock (Rep^*): $\text{Rep}_{it} = 0$ if $\text{Rep}_{it}^* \leq 0$ and $\text{Rep}_{it} =$ value of stock repurchases in fiscal year t scaled by lagged total assets if $\text{Rep}_{it}^* > 0$.

The vector of explanatory variables is the same in Equations (1) and (2): NDISC is an indicator variable taking the value of 1 if the presence of an EPS performance condition is indeterminate for at least one of the j compensation components ($j =$ bonus plans, stock option plans, and LTIPs), and 0 otherwise; EPS is an indicator variable taking the value of 1 if an EPS performance condition is used in at least one of the j compensation components, and 0 otherwise; and Controls is a vector of K additional factors expected to influence the repurchase decision.⁶ The

⁴ Compensation disclosures in the U.K. improved dramatically during the late 1990s and early 2000s. When using one- and two-period-ahead remuneration disclosures, we are careful to distinguish between established plans and new plans introduced subsequently.

⁵ We also estimated Equation (1) using a pooled (unmatched) logistic model with very similar results. Results are available from the authors on request.

⁶ Incomplete disclosure of performance conditions means that EPS realizations may take one of three forms: EPS condition is used and disclosed; EPS condition is unambiguously not used; and EPS condition is indeterminate due to insufficient disclosure. Defining EPS in Equations (1) and (2) as a three-way categorical variable imposes a linearity constraint on the data. The alternative (unconstrained) approach is to recode the three-way variable as three separate

set of control variables includes the market-to-book ratio, net leverage, dividend yield, prior-period abnormal stock price performance, and firm size (Stephens and Weisbach 1998; Dittmar 2000; Grullon and Michaely 2002). Since repurchases have a positive net effect on EPS when a firm's earnings-to-price (E/P) ratio exceeds its opportunity cost of funds, only firms that meet such a condition will repurchase shares to boost EPS. We therefore include an indicator variable for firms reporting negative earnings on the grounds that the E/P condition is least likely to hold in such cases. Prior research documents a link between ESO plans and stock repurchases by U.S. firms (Fenn and Liang 2001; Dittmar 2000). Although U.K. regulatory rules governing stock repurchases militate against such behavior during our sample period, for completeness we include the total number of options outstanding for all employees (scaled by market capitalization) as an additional control variable. To ensure that our analysis is capturing effects unique to EPS, we also control for the presence of earnings-based performance conditions of any description.⁷ Finally, we control for the well-established link between repurchases and surplus cash (Stephens and Weisbach 1998; Dittmar 2000; Guay and Harford 2000; Jagannathan et al. 2000). The presence of surplus cash is captured using both stock (surplus cash holdings) and flow (excess cash flow) measures. Our measure of surplus cash holdings is cash and cash equivalents in excess of the level required for normal operations and investments. Following Opler et al. (1999), we estimate surplus cash holdings as the residual from an OLS regression of cash holdings (scaled by lagged noncash assets) on a vector of explanatory variables comprising the market-to-book ratio, net working capital (scaled by lagged total assets), lagged operating cash flow (scaled by lagged total assets), net leverage, R&D spending (scaled by total revenue), the natural logarithm of market capitalization, an indicator variable for nonzero dividend payments, and industry fixed effects. The regression is estimated annually using all Extel nonfinancial firms with complete data after excluding the top and bottom percentiles of scaled cash holdings. We extract the residuals (ε_{it}) from the annual estimations to construct an indicator variable equal to 1 when $\varepsilon_{it} > 0$, and 0 otherwise.

We use two measures of excess cash flow, one based on operating activities (*Free cash flow*) and one based on nonoperating activities (*Excess investing cash flow*). Following Opler and Titman (1993) and Fenn and Liang (2001), *Free cash flow* is an indicator variable equal to 1 for firms with a market-to-book ratio less than the Extel annual sample median and operating cash flow (scaled by lagged total assets) greater than the Extel annual sample median, and 0 otherwise. *Excess investing cash flow* is an indicator variable taking the value of 1 when net cash inflow from investing activities is positive, and 0 otherwise. (Investing cash inflows result from the sale of fixed and intangible assets, associates and other investments, and subsidiaries.) All explanatory variables in Equations (1) and (2) are measured at the start of the repurchase year.

IV. RESULTS

Descriptive Statistics

Table 1, Panel A reports descriptive statistics for the incidence of bonus plans, option plans, and LTIPs. Frequency counts reported in columns 2–4 reveal most firms operate at least one bonus plan and one option plan, whereas only 40 percent of firms have an active LTIP. Cross-sample comparisons indicate that repurchasers are marginally more likely to operate a bonus plan ($p = 0.09$). Consistent with the absence of powerful ESO-related motives for stock repurchases in

dummy variables and then use two of these in place of the original variable (Allison 1999, 128–130). Tests reveal that imposing the linearity constraint on our data leads to a reduction in model fit (the change in the likelihood ratio statistic is significant at the 0.01 level), suggesting that the unconstrained formulation presented in Equations (1) and (2) is more appropriate in our case.

⁷ For example, residual income also creates incentives to distribute capital earning less than the opportunity cost of funds (Wallace 1997).

TABLE 1
Summary Statistics and Features of Compensation Plan Components for Repurchaser and Nonrepurchaser Matched Pairs

Panel A: Frequency of Plans

Compensation Component	Plan Status by Firm			Number of Plans				
	≥1 Plan	No Plan	Not Disclosed	n	Mean	Std. Dev.	Median	Max
Bonus Plans								
Repurchasers	601	49	15	605	0.931	0.277	1	2
Nonrepurchasers	596	68	1	600	0.904	0.315	1	2
p-value for difference	0.09				0.17		0.17	
Option Plans								
Repurchasers	591	69	5	759	1.150	0.621	1	3
Nonrepurchasers	601	64	0	789	1.186	0.620	1	3
p-value for difference	0.62				0.29		0.31	
Long-Term Incentive Plans								
Repurchasers	282	377	6	377	0.572	0.745	0	3
Nonrepurchasers	287	378	0	373	0.561	0.744	0	3
p-value for difference	0.89				0.77		0.74	

Panel B: Performance Measures by Plan

Performance Measures by Compensation Component	Frequency Counts			
	Repurchasers		Nonrepurchasers	
	n	%	n	%
Bonus Plans				
Earnings per share	168	(27.8)	121	(20.2)
Profit before tax/EBIT/Operating profit	303	(50.1)	329	(54.8)
Residual income	15	(2.5)	7	(1.2)
Return on capital	21	(3.5)	34	(5.7)
Share price/Total shareholder return	16	(2.6)	16	(2.7)
Personal objectives	88	(14.5)	118	(19.7)
Other	198	(32.7)	252	(42.0)
Not disclosed	153	(25.3)	122	(20.3)
Total Number of Plans	605		600	
Option Plans				
Earnings per share	488	(64.3)	398	(50.4)
Profit before tax/EBIT/Operating profit	24	(3.2)	15	(1.9)
Return on capital	4	(0.5)	1	(0.1)
Share price/Total shareholder return	62	(8.2)	125	(15.8)
Personal objectives	0	(0.0)	1	(0.1)
Other	8	(1.1)	12	(1.5)
No performance condition	176	(23.2)	238	(30.2)
Not disclosed	27	(3.6)	9	(1.1)
Total Number of Plans	759		789	
Long-Term Incentive Plans				
Earnings per share	155	(41.1)	151	(40.5)
Profit before tax/EBIT/Operating profit	13	(3.4)	17	(4.6)

(continued on next page)

Panel B: Performance Measures by Plan

Performance Measures by Compensation Component	Frequency Counts			
	Repurchasers		Nonrepurchasers	
	n	%	n	%
Residual income	6	(1.6)	2	(0.5)
Return on capital	10	(2.7)	13	(3.5)
Share price/Total shareholder return	217	(57.6)	196	(52.5)
Other	14	(3.7)	17	(4.6)
No performance condition	52	(13.8)	43	(11.5)
Not disclosed	1	(0.3)	3	(0.8)
Total Number of Plans	377		373	

The sample comprises 665 fiscal years between January 1, 1998 and December 31, 2006 in which firms repurchased shares and 665 nonrepurchase firm-years matched by fiscal year, industry, and lagged total assets.

All compensation data relate to compensation contracts for executive directors. Data are collected on all plans for the following three elements in executives' compensation contracts: bonuses, share options, and long-term incentives. Bonus plans comprise all arrangements where rewards are tied to short-term (\leq one-year) performance targets. Option plans consist of incentive contracts granting executives the right to acquire their firm's shares at a non-zero exercise price. (Firm-wide employee share option plans and save-as-you-earn schemes are not included.) Long-term incentive plans (LTIPs) consist of all remaining long-term compensation arrangements not classified as options. Probability values reported in Panel A are for Chi-square tests (column 2), paired t-tests (column 6), and paired Wilcoxon tests (column 8).

For each compensation component, the sum of performance measure percentages reported in Panel B may exceed 100 because some firms use multiple measures in a single plan.

the U.K., the frequency of firms with at least one option plan is equivalent in the two samples, as is the incidence of LTIPs. The final three columns in Panel A report summary statistics for the number of active plans. No significant differences are apparent between the two samples.

Plan-level details of performance conditions are reported in Table 1, Panel B. For bonus plans, 28 percent of the 605 plans operated by repurchasers have EPS performance conditions, as compared to only 20 percent of 600 comparable plans operated by nonrepurchasers. In contrast, aggregate profit-based metrics such as profit before tax, personal objectives, and other measures (e.g., operations metrics, KPIs) are more common among nonrepurchasers. Note also that repurchase firms are characterized by poorer disclosure of bonus-related performance conditions: 25 percent of plans in the repurchase sample contain no details of performance conditions, as compared to only 20 percent of plans in the nonrepurchase sample. Similar patterns are apparent for option plans. Option exercise is conditional on EPS performance in 64 percent of repurchase firms' plans, as compared to 50 percent of plans in the nonrepurchase sample. Results for bonus and option plans provide preliminary evidence that repurchase activity is increasing in the presence of EPS performance conditions. No difference in the use of EPS conditions exists for LTIPs; roughly 40 percent of plans in both samples are conditional on EPS performance.

Summary statistics for our main test variables are reported in Table 2. Seventy-one percent of repurchasers have at least one plan linking at least one element of executive compensation to EPS. The comparable figure for nonrepurchasers is 60 percent, which is significantly lower based on a paired Wilcoxon test ($p < 0.01$). Analyzing the incidence of EPS targets for each compensation element separately reveals that repurchasers are significantly more likely to have at least one bonus plan and at least one option plan tied to EPS. In contrast, repurchase and nonrepurchase firms are equally likely to have an LTIP conditional on EPS. Significant differences across repur-

TABLE 2
Descriptive Statistics

	Repurchase Sample (n = 665)						
	Mean	Std. Dev.	Max	Q3	Median	Q1	Min
Compensation Variables							
<i>EPS</i>	0.71	0.46	1	1	1	0	0
<i>NDISC</i>	0.14	0.35	1	0	0	0	0
<i>EPS_{Bonus}</i>	0.25	0.43	1	1	0	0	0
<i>NDISC_{Bonus}</i>	0.24	0.43	1	0	0	0	0
<i>EPS_{Option}</i>	0.62	0.49	1	1	1	0	0
<i>NDISC_{Option}</i>	0.05	0.21	1	0	0	0	0
<i>EPS_{LTIP}</i>	0.20	0.40	1	0	0	0	0
<i>NDISC_{LTIP}</i>	0.01	0.09	1	0	0	0	0
Control Variables							
<i>Surplus cash holdings</i>	0.69	0.46	1	1	1	0	0
<i>Free cash flow</i>	0.32	0.47	1	1	0	0	0
<i>Excess investing cash flow</i>	0.19	0.39	1	0	0	0	0
<i>Log(market capitalization)</i>	5.29	2.43	11.71	6.96	5.05	3.30	-0.21
<i>Market-to-book</i>	1.61	0.96	6.29	1.88	1.31	1.00	0.44
<i>Net leverage</i>	-0.15	1.54	0.84	0.19	0.05	-0.15	-24.61
<i>Dividend yield</i>	0.04	0.07	1.42	0.05	0.03	0.02	0.00
<i>Negative returns</i>	0.56	0.50	1	1	1	0	0
<i>Negative earnings</i>	0.10	0.30	1	0	0	0	0
<i>Options outstanding</i>	0.76	18.38	47.91	0.04	0.01	0.00	0.00

	Nonrepurchase Sample (n = 665)							p-value for Difference
	Mean	Std. Dev.	Max	Q3	Median	Q1	Min	
Compensation Variables								
<i>EPS</i>	0.60	0.49	1	1	1	0	0	0.01
<i>NDISC</i>	0.09	0.29	1	0	0	0	0	0.01
<i>EPS_{Bonus}</i>	0.18	0.39	1	0	0	0	0	0.01
<i>NDISC_{Bonus}</i>	0.18	0.38	1	0	0	0	0	0.01
<i>EPS_{Option}</i>	0.50	0.50	1	1	1	0	0	0.01
<i>NDISC_{Option}</i>	0.01	0.10	1	0	0	0	0	0.01
<i>EPS_{LTIP}</i>	0.19	0.40	1	0	0	0	0	0.61
<i>NDISC_{LTIP}</i>	0.01	0.08	1	0	0	0	0	0.75
Control Variables								
<i>Surplus cash holdings</i>	0.65	0.48	1	1	1	0	0	0.09
<i>Free cash flow</i>	0.29	0.45	1	1	0	0	0	0.16
<i>Excess investing cash flow</i>	0.14	0.35	1	0	0	0	0	0.02
<i>Log(market capitalization)</i>	4.72	1.91	10.74	6.06	4.73	3.20	-0.88	0.01
<i>Market-to-book</i>	1.63	1.61	29.69	1.69	1.25	1.00	0.41	0.01
<i>Net leverage</i>	0.03	0.88	1.87	0.29	0.15	-0.02	-10.69	0.01
<i>Dividend yield</i>	0.03	0.09	1.46	0.04	0.02	0.00	0.00	0.01
<i>Negative returns</i>	0.61	0.49	1	1	1	0	0	0.01
<i>Negative earnings</i>	0.28	0.45	1	1	0	0	0	0.01
<i>Options outstanding</i>	0.16	0.77	11.24	0.07	0.02	0.01	0.00	0.01

(continued on next page)

All variables are measured at the beginning of the repurchase year. The “p-value for Difference” column reports probability values for two-tailed paired Wilcoxon Sign Rank tests of the difference between repurchase and nonrepurchase firms.

Variable Definitions (with Extel codes in square brackets where applicable):

- NDISC* = indicator variable taking the value of 1 when insufficient disclosure renders the presence of an EPS target indeterminate, and 0 otherwise;
- EPS* = indicator variable taking the value of 1 for firms with at least one bonus plan, option plan, or LTIP tied to EPS performance, and 0 otherwise;
- NDISC_{Bonus}* = indicator variable taking the value of 1 for firms that fail to explicitly disclose whether bonus payments are conditional on EPS performance, and 0 otherwise;
- EPS_{Bonus}* = indicator variable taking the value of 1 for firms where bonus payments are fully or partially conditional on EPS performance, and 0 otherwise;
- NDISC_{Option}* = indicator variable taking the value of 1 for firms that fail to explicitly disclose whether option vesting is conditional on EPS performance, and 0 otherwise;
- EPS_{Option}* = indicator variable taking the value of 1 for firms where option vesting is fully or partially conditional on EPS performance, and 0 otherwise;
- NDISC_{LTIP}* = indicator variable taking the value of 1 for firms that fail to explicitly disclose whether LTIP rewards are conditional on EPS performance, and 0 otherwise;
- EPS_{LTIP}* = indicator variable taking the value of 1 for firms where LTIP rewards are fully or partially conditional on EPS performance, and 0 otherwise;
- Surplus cash holdings* = indicator variable based on the residual from yearly OLS regressions of the natural logarithm of cash holdings (cash and cash equivalents [ex.CurrentAssetsCashAndNearCash + ex.CurrentAssetsCurrentInvestments] scaled by lagged total assets [ex.TotalAssets] net of cash and cash equivalents) on the natural logarithm of market capitalization [ex.MarketCapitalization], operating cash flow [ex.CFOperatingInflows] scaled by lagged total assets, net working capital (noncash current assets [ex.CurrentAssets – ex.CurrentAssetsCashAndNearCash – ex.CurrentAssetsCurrentInvestments] – current liabilities [ex.Creditors + ex.DebtSTLoans] divided by total assets net of cash and cash equivalents), net leverage (total liabilities [ex.DebtLTLoans + ex.DebtSTLoans] net of cash and cash equivalents divided by total assets net of cash and cash equivalents), research and development ([ex.TradingExpResearchAndDevelopment] divided by total revenue [ex.Sales]), the market-to-book ratio (book value of debt [ex.TotalAssets – ex.ShareholdersEquityOwnEquShares – ex.ShareholdersEquityOwnSharePrem – ex.ShareholdersEquityPreferShares – ex.ShareholdersEquityParticipShares] plus the market value of equity divided by total assets), and dividend payout (an indicator variable taking the value of 1 for firms with non-zero ordinary dividends per share [ex.DividendsPerShareNetReported], and 0 otherwise); *Surplus cash holdings* indicator variable takes the value of 1 where the regression residual is positive, and 0 otherwise;
- Free cash flow* = indicator variable taking the value of 1 for firms with a market-to-book ratio less than the entire Extel annual sample median and net operating cash flow (scaled by lagged total assets) greater than the entire Extel annual sample median, and 0 otherwise;
- Excess investing cash flow* = indicator variable taking the value of 1 if investing cash flows [ex.CFInvestments] are positive, and 0 otherwise;
- Market capitalization* = fiscal year-end share price multiplied by the number of shares outstanding;
- Market-to-book* = book value of debt plus the market value of equity divided by total assets;
- Net leverage* = total liabilities net of cash and cash equivalents divided by total assets net of cash and cash equivalents;
- Dividend yield* = ordinary dividends per share divided by share price;
- Negative returns* = indicator variable taking the value of 1 if 12-month stock returns are less than the market return over the corresponding period, and 0 otherwise;
- Negative earnings* = indicator variable taking the value of 1 if earnings per share [ex.EPSAsReported] is negative, and 0 otherwise; and
- Options outstanding* = aggregate number of outstanding options for all employees at the balance sheet date scaled by market capitalization.

chase and control samples are apparent for almost all control variables. Consistent with prior research, repurchasers have more surplus cash, lower net leverage, and are larger than their nonrepurchaser counterparts.

Logistic and Tobit Regressions

Coefficient estimates and model summary statistics for conditional logistic regressions relating the probability of a repurchase to the incidence of EPS-based performance conditions are reported in Table 3, Models 1–3. Results for comparable left-censored tobit regressions are reported in Models 4–5. *EPS* in Model 1 equals 1 when at least one plan of any type links executive compensation to EPS, and 0 otherwise. As predicted, the estimated coefficient on *EPS* is positive and significant. EPS performance conditions also represent an economically important driver of repurchase activity; the predicted odds of a repurchase for firms where executive compensation depends on EPS performance are almost twice the odds for firms where payouts are independent of EPS. Note also that the odds ratio for *EPS* in Model 1 is similar to (and in many cases larger than) the odds ratios associated with traditional determinants of repurchase activity such as excess cash flow and low leverage.

Model 1 also reveals that repurchasers are less likely to disclose details of performance conditions used in executive compensation contracts. The estimated coefficient on *NDISC* is positive and highly significant, while the odds ratio is large relative to other variables. We have no predictions concerning the link between repurchase activity and the transparency with which firms disclose details of compensation arrangements. To ensure that nondiscloser cases are not confounding the analysis, we re-estimated Model 1 after removing such cases. Results reported in Model 2 are entirely consistent with those in Model 1. Whatever effect *NDISC* may be capturing, it appears to be distinct from our main prediction.

Of the remaining control variables in Models 1 and 2, coefficient estimates on *Free cash flow*, *Excess investing cash flow*, *Market-to-book*, *Net leverage*, and *Negative earnings* are statistically significant and of the predicted sign. In addition, even after controlling for differences in lagged total assets via our matching procedure, repurchasers are characterized by higher market capitalization at the beginning of the repurchase year.

Model 3 in Table 3 provides evidence on the incremental effects of EPS-based bonus, option, and LTIP arrangements. EPS-based bonus and option plans are associated with incremental positive effects of similar magnitude. In contrast, EPS-based LTIPs have no discernable effect on repurchase activity. The absence of an LTIP effect likely reflects the lower incidence of such plans relative to bonus and option plans (see Table 1, Panel A), coupled with the dominance of total shareholder return (TSR) performance conditions in these plans.⁸

Models 4 and 5 in Table 3 are for left-censored tobit regressions modeling the scaled value of repurchases. Findings replicate those for the conditional logistic models. Even after controlling for traditional determinants of repurchases, annual spending on buybacks is positively associated with *EPS* and the marginal effect for this variable is similar to (and in many cases larger than) the effect for more established drivers of repurchase activity. Consistent with the logistic results, while the coefficient on *NDISC* is positive and highly significant in Model 4, exclusion of nondisclosing matched pairs (Model 5) does not affect the *EPS* coefficient estimate. Collectively, results reported

⁸ Although many firms employ EPS targets in their LTIPs, these are often combined with (and subordinate to) a TSR condition. For example, awards under KBC Advanced Technologies' share-based LTIP require minimum TSR over a three-year period equal to the median for the FTSE Small Cap Index over the same period, with maximum awards for TSR at or above 75th percentile ranking. Irrespective of TSR performance, awards are conditional on real EPS growth over the performance period (KBC Advanced Technologies plc Annual Report 2002, 15–16).

TABLE 3
Coefficient Estimates and Model Summary Statistics for Conditional Logistic
(Left-Censored Tobit) Regressions Relating the Probability (Scaled Value) of a Repurchase
to the Incidence of EPS-Based Performance Conditions in Executive Compensation
Contracts

Variables	Predicted Sign	Logistic Models			Tobit Models	
		Model 1	Model 2	Model 3	Model 4	Model 5
<i>Surplus cash holdings</i>	(+)	0.20	0.24	0.24	0.01	0.02
		<i>1.22</i>	<i>1.27</i>	<i>1.27</i>	<i>0.00</i>	<i>0.00</i>
		(0.18)	(0.17)	(0.12)	(0.01)	(0.02)
<i>Free cash flow</i>	(+)	0.69	0.60	0.66	0.00	0.00
		<i>2.00</i>	<i>1.83</i>	<i>1.93</i>	<i>0.00</i>	<i>0.00</i>
		(0.01)	(0.01)	(0.01)	(0.61)	(0.77)
<i>Excess investing cash flow</i>	(+)	0.71	0.86	0.75	0.02	0.03
		<i>2.03</i>	<i>2.40</i>	<i>2.11</i>	<i>0.01</i>	<i>0.01</i>
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
<i>Log(market capitalization)</i>	(?)	1.27	1.51	1.22	0.00	0.00
		<i>3.56</i>	<i>4.52</i>	<i>3.39</i>	<i>0.00</i>	<i>0.00</i>
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
<i>Market-to-book</i>	(−)	−0.72	−0.81	−0.68	0.01	0.01
		<i>0.49</i>	<i>0.45</i>	<i>0.51</i>	<i>0.00</i>	<i>0.00</i>
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
<i>Net leverage</i>	(−)	−0.43	−0.46	−0.43	−0.01	−0.01
		<i>0.65</i>	<i>0.63</i>	<i>0.65</i>	<i>−0.00</i>	<i>−0.00</i>
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
<i>Dividend yield</i>	(?)	1.18	1.34	1.15	0.01	0.00
		<i>3.25</i>	<i>3.82</i>	<i>3.15</i>	<i>0.00</i>	<i>0.00</i>
		(0.20)	(0.17)	(0.23)	(0.80)	(0.93)
<i>Negative returns</i>	(+)	−0.05	−0.06	−0.03	0.00	0.00
		<i>0.95</i>	<i>0.94</i>	<i>0.97</i>	<i>0.00</i>	<i>0.00</i>
		(0.73)	(0.73)	(0.84)	(0.99)	(0.98)
<i>Negative earnings</i>	(−)	−1.22	−1.38	−1.14	−0.05	−0.06
		<i>0.30</i>	<i>0.25</i>	<i>0.32</i>	<i>−0.01</i>	<i>−0.01</i>
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
<i>Options outstanding</i>	(+)	−0.021	−0.03	−0.02	−0.00	−0.00
		<i>0.98</i>	<i>0.98</i>	<i>0.98</i>	<i>−0.00</i>	<i>−0.00</i>
		(0.10)	(0.13)	(0.13)	(0.04)	(0.07)
<i>Earnings-based target</i>	(?)	−0.15	−0.22	−0.06	−0.01	−0.01
		<i>0.86</i>	<i>0.80</i>	<i>0.94</i>	<i>−0.00</i>	<i>−0.00</i>
		(0.33)	(0.21)	(0.74)	(0.28)	(0.34)
<i>NDISC</i>	(?)	1.29			0.04	
		<i>3.62</i>			<i>0.01</i>	
		(0.01)			(0.01)	
<i>EPS</i>	(+)	0.65	0.71		0.03	0.03
		<i>1.91</i>	<i>2.03</i>		<i>0.01</i>	<i>0.01</i>
		(0.01)	(0.01)		(0.01)	(0.01)
<i>NDISC_{Bonus}</i>	(?)			0.54		
				<i>1.72</i>		
				(0.02)		

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TABLE 3 (continued)

Variables	Predicted Sign	Logistic Models			Tobit Models	
		Model 1	Model 2	Model 3	Model 4	Model 5
<i>EPS_{Bonus}</i>	(+)			0.36 <i>1.43</i> (0.07)		
<i>NDISC_{Option}</i>	(?)			1.95 <i>7.03</i> (0.01)		
<i>EPS_{Option}</i>	(+)			0.38 <i>1.46</i> (0.02)		
<i>NDISC_{LTIP}</i>	(?)			-0.80 <i>0.45</i> (0.38)		
<i>EPS_{LTIP}</i>	(+)			-0.08 <i>0.92</i> (0.67)		
Intercept	(?)				-0.08 (0.01)	-0.08 (0.01)
Likelihood ratio		278.44	233.59	283.14	328.63	276.65
p-value		0.01	0.01	0.01		
Pseudo R ²		0.46	0.48	0.46		
% classified correctly		77.30	77.70	75.60		
n		665	524	665	1330	1173
n censored					665	602

Three values are reported for each covariate: the first value is the coefficient estimate; the second (italicized) value is the odds ratio (marginal effect) for logistic (tobit) models; and the third value (in parentheses) is the two-tailed probability value.

The dependent variable in the columns headed “Logistic Models” is the logarithm of the odds of a repurchase. The dependent variable in the columns headed “Tobit Models” is the aggregate amount (including expenses) spent repurchasing shares during fiscal year *t*, scaled by lagged total assets. All variables are measured at the beginning of the repurchase year. Marginal effects for the tobit models are equal to the probability of a no-limit observation multiplied by the coefficient estimate and are evaluated at the mean of each covariate.

Variable Definitions:

NDISC = indicator variable taking the value of 1 when insufficient disclosure renders the presence of an EPS target indeterminate, and 0 otherwise;

EPS = indicator variable taking the value of 1 for firms with at least one of the *j* compensation components (*j* = bonuses, options, or LTIPs) linked to EPS performance, and 0 otherwise;

NDISC_j = indicator variable taking the value of 1 for firms that fail to explicitly disclose whether the *j*th compensation element is conditional on EPS performance, and 0 otherwise;

EPS_j = indicator variable taking the value of 1 for firms where the *j*th compensation element is conditional on EPS performance, and 0 otherwise;

Surplus cash holdings = indicator variable taking the value of 1 where the residual from yearly optimal cash holdings regressions is positive, and 0 otherwise (see Table 2 for details);

Free cash flow = indicator variable taking the value of 1 for firms with a market-to-book ratio less than the sample median for the year and net operating cash flow greater than the sample median for the year, and 0 otherwise;

Excess investing cash flow = indicator variable taking the value of 1 if investing cash flows are positive, and 0 otherwise;

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TABLE 3 (continued)

<i>Market capitalization</i>	= share price multiplied by the number of shares outstanding;
<i>Market-to-book</i>	= book value of debt plus the market value of equity divided by total assets;
<i>Net leverage</i>	= total liabilities net of cash holdings divided by total assets net of cash holdings;
<i>Dividend yield</i>	= ordinary dividends per share divided by share price;
<i>Negative returns</i>	= indicator variable taking the value of 1 if 12-month stock returns are less than the market return over the corresponding period, and 0 otherwise;
<i>Negative earnings</i>	= indicator variable taking the value of 1 if reported EPS is negative, and 0 otherwise;
<i>Options outstanding</i>	= aggregate number of outstanding options for all employees at the balance sheet date scaled by market capitalization; and
<i>Earnings-based target</i>	= indicator variable equal to 1 for firms where at least one of the j compensation components is linked to any earnings-based metric (including EPS), and 0 otherwise.

in Table 3 provide consistent evidence that EPS-based performance conditions in executive compensation contracts are an important determinant of repurchase activity among U.K. firms.⁹

V. FURTHER ANALYSIS

While tests presented in the previous section establish an association between repurchase activity and performance conditions applied in executive compensation contracts, they leave unresolved the more fundamental question of whether such a link is in shareholders' best interests. This section seeks evidence on the costs and benefits associated with compensation-driven repurchase activity. We begin by testing whether repurchasers with EPS targets exhibit weaker performance (lower payouts to shareholders) as a consequence of management diverting funds from profitable investment opportunities (regular dividends) to fund repurchase activity. Next, we test whether compensation-driven repurchases help to alleviate the problems of surplus cash, suboptimally low leverage, market mispricing, and accrual manipulation.

Post-Repurchase Performance and Payouts

Bens et al. (2002) conclude that U.S. managers divert capital from positive NPV investments to fund repurchases aimed at offsetting the dilutive impact of ESOs. If managers adopt the same strategy to achieve EPS performance targets, then EPS-induced repurchases could represent a serious cost for shareholders in the form of underinvestment. Accordingly, we examine whether a higher probability of repurchases in the presence of EPS-based compensation arrangements is associated with material underinvestment problems.

All else equal, failure to exploit profitable investment opportunities by channeling capital from positive NPV projects to fund repurchases should be reflected in inferior future performance. Tests reported in Table 4 compare the performance of repurchasers and nonrepurchasers using a difference-in-differences OLS specification in which the dependent variable is the change in performance from the pre- to the post-repurchase period. We estimate models for two alternative performance metrics: change in return on assets (ΔROA) and change in market-adjusted stock returns ($\Delta Returns$). The vector of explanatory variables includes indicator variables for repurchas-

⁹ In supplementary tests we explored whether the propensity for repurchases is increasing in the number of compensation elements linked explicitly to EPS. The indicator variable EPS_{Single} (EPS_{Multi}) captures firm-years where one (more than one) compensation element is tied to EPS. For conditional logistic regressions, coefficient estimates on EPS_{Single} and EPS_{Multi} are 0.60 and 0.79, respectively, and significant at the $p < 0.01$ level. For tobit regressions, coefficient estimates on both covariates are equal to 0.03 and statistically significant at the $p < 0.01$ level. Results indicate that repurchases are more likely for firms with single and multiple components of pay tied to EPS. However, tests fail to reject equality of coefficient estimates in favor of the alternative hypothesis that the coefficient on $EPS_{Multi} > EPS_{Single}$.

TABLE 4
Coefficient Estimates and Model Summary Statistics for Difference-in-Differences OLS
Regressions of Change in Performance Relative to Repurchase Year t

Variable	Δ Performance: Pre- to Post-Repurchase				Δ Performance	
	Δ ROA		Δ Returns		(t-1 to t+1) for:	
	t-1 to t+1	t-1 to t+2	t-1 to t+1	t-1 to t+2	Δ ROA	Δ Returns
ROA	-0.32 (0.01)	-0.29 (0.01)	-0.17 (0.04)	-0.04 (0.63)	-0.32 (0.01)	-0.17 (0.05)
Negative earnings	-0.02 (0.06)	-0.01 (0.50)	0.05 (0.23)	-0.03 (0.45)	-0.02 (0.05)	0.04 (0.31)
Returns	0.01 (0.15)	0.01 (0.09)	-0.90 (0.01)	-0.94 (0.01)	0.01 (0.14)	-0.90 (0.01)
Log(Total assets)	0.01 (0.01)	0.01 (0.01)	0.01 (0.37)	-0.01 (0.47)	0.01 (0.01)	0.01 (0.17)
Δ Log(Total assets)	0.04 (0.01)	0.04 (0.01)	0.20 (0.01)	0.15 (0.01)	0.04 (0.01)	0.19 (0.01)
Market-to-book	-0.01 (0.02)	-0.01 (0.01)	-0.04 (0.01)	-0.02 (0.13)	-0.01 (0.01)	-0.04 (0.01)
Leverage	-0.01 (0.78)	-0.04 (0.14)	-0.11 (0.19)	-0.04 (0.71)	-0.01 (0.78)	-0.13 (0.14)
Working capital	0.00 (0.79)	0.01 (0.86)	-0.01 (0.01)	-0.01 (0.01)	0.00 (0.75)	-0.01 (0.01)
Investing cash flow	0.02 (0.43)	0.00 (0.92)	-0.02 (0.90)	-0.02 (0.88)	0.03 (0.38)	0.09 (0.48)
Operating cash flow	0.11 (0.01)	0.03 (0.48)	-0.02 (0.87)	-0.01 (0.94)	0.11 (0.01)	0.05 (0.75)
Cash holdings	-0.03 (0.35)	-0.06 (0.07)	0.02 (0.88)	-0.24 (0.06)	-0.03 (0.39)	0.04 (0.73)
Options outstanding	-0.00 (0.39)	-0.00 (0.42)	-0.01 (0.01)	0.01 (0.94)	0.01 (0.61)	-0.01 (0.01)
Repurchase	-0.01 (0.37)	-0.01 (0.66)	0.11 (0.04)	0.09 (0.10)		
EPS	0.01 (0.23)	0.00 (0.86)	0.08 (0.06)	0.00 (0.97)		
Repurchase \times EPS	0.02 (0.29)	0.01 (0.43)	-0.09 (0.14)	-0.04 (0.56)		
Repurchase _{Cash rich}					-0.04 (0.16)	-0.12 (0.29)
Repurchase _{Cash constrained}					-0.02 (0.14)	0.13 (0.03)
Nonrepurchase _{Cash rich}					-0.01 (0.49)	-0.01 (0.86)
Repurchase _{Cash rich} \times EPS					0.05 (0.09)	0.07 (0.54)
Repurchase _{Cash constrained} \times EPS					0.03 (0.03)	-0.10 (0.12)
Nonrepurchase _{Cash rich} \times EPS					0.00 (0.83)	0.02 (0.71)

(continued on next page)

TABLE 4 (continued)

Variable	Δ Performance: Pre- to Post-Repurchase				Δ Performance	
	Δ ROA		Δ Returns		(t-1 to t+1) for:	
	t-1 to t+1	t-1 to t+2	t-1 to t+1	t-1 to t+2	Δ ROA	Δ Returns
Intercept	-0.04 (0.06)	-0.02 (0.50)	0.03 (0.73)	0.10 (0.24)	-0.03 (0.17)	0.09 (0.32)
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.21	0.20	0.51	0.55	0.20	0.51
p-value	0.01	0.01	0.01	0.01	0.01	0.01
n	1178	930	1176	930	1178	1176

Performance is measured using return on assets (ROA) and 12-month market-adjusted stock returns (Returns). Two-tailed probability values are reported in parentheses. All explanatory variables are measured at the beginning of the repurchase year unless otherwise indicated.

Variable Definitions:

- Δ ROA = change in operating earnings scaled by total assets;
- Δ Returns = change in 12-month stock returns ending on the fiscal year-end less the equally weighted return on the FTSE All Share index over the corresponding period;
- Repurchase = indicator variable equal to 1 for repurchasing firms, and 0 otherwise;
- EPS = indicator variable taking the value of 1 for firms with at least one of the j compensation components (j = bonus plans, option plans, or LTIPs) tied to EPS performance, and 0 otherwise;
- Repurchase_{cash rich} = indicator variable taking the value of 1 for repurchasing firms where either *Surplus cash holdings*, *Free cash flow*, or *Excess investing cash flow* from Table 3 is equal to 1 at time $t-1$, and 0 otherwise;
- Repurchase_{Cash constrained} = indicator variable taking the value of 1 for repurchasing firms where *Surplus cash holdings*, *Free cash flow*, and *Excess investing cash flow* from Table 3 are equal to 0 at time $t-1$, and 0 otherwise;
- Nonrepurchase_{Cash rich} = indicator variable taking the value of 1 for nonrepurchasing firms where either *Surplus cash holdings*, *Free cash flow*, or *Excess investing cash flow* from Table 3 is equal to 1 at time $t-1$, and 0 otherwise;
- ROA = return on assets;
- Negative earnings = indicator variable taking the value of 1 for firms reporting a loss, and 0 otherwise;
- Returns = 12-month market-adjusted stock returns;
- Log(total assets) = natural logarithm of total assets;
- Δ Log(total assets) = change in the natural logarithm of total assets over the same period as the dependent variable is measured;
- Market-to-book = book value of debt plus the market value of equity divided by total assets;
- Leverage = total liabilities divided by total assets;
- Working capital = change in noncash current assets minus liabilities scaled by total assets;
- Investing cash flow = cash flow from investing activities scaled by total assets;
- Operating cash flow = cash flow from operating activities scaled by total assets;
- Cash holdings = cash and cash equivalents scaled by total assets;
- Options outstanding = aggregate number of outstanding options for all employees scaled by market capitalization;
- Industry effects = vector of industry indicator variables based on Datastream level-3 classification; and
- Year effects = vector of calendar year indicator variables.

ers and firms with EPS-based performance conditions, respectively, the associated two-way interaction effect, and a set of controls. Columns 2 and 3 (4 and 5) in Table 4 report results for Δ ROA (Δ Returns). Findings provide no evidence that repurchasers in general, or repurchases with EPS conditions in particular, exhibit inferior post-repurchase performance. Estimated coefficients on the *Repurchase* indicator variable are either insignificant in the Δ ROA models or positive in the

Δ Returns models, while coefficient estimates on *Repurchase* \times *EPS* are consistently insignificant. Our findings do not support the view that EPS-based performance targets encourage management to divert cash from positive NPV projects to fund buybacks.

The incentive to channel funds away from profitable investments to support repurchases may be especially strong among the subset of firms with limited cash resources. Columns 6 and 7 in Table 4 extend the previous analysis by replacing *Repurchase* with the following three indicator variables to capture firms' pre-repurchase cash characteristics: *Repurchase*_{Cash rich} takes the value of 1 for repurchasing firms where either *Surplus cash holdings*, *Free cash flow*, or *Excess investing cash flow* from Table 3 equals 1 at time $t-1$, and 0 otherwise; *Repurchase*_{Cash constrained} takes the value of 1 for repurchasing firms where *Surplus cash holdings*, *Free cash flow*, and *Excess investing cash flow* equal 0 at time $t-1$, and 0 otherwise; and *Nonrepurchase*_{Cash rich} takes the value of 1 for nonrepurchasing firms where either *Surplus cash holdings*, *Free cash flow*, or *Excess investing cash flow* equals 1 at time $t-1$, and 0 otherwise. All three indicators are also interacted with *EPS* to capture incremental effects associated with EPS-based compensation. Absent EPS targets, cash-constrained repurchasers are associated with similar accounting performance (column 6) and superior market performance (column 7) in the post-repurchase period relative to other groups. Coefficient estimates on the *Repurchase*_{Cash constrained} \times *EPS* interaction are either positive (Δ ROA model) or indistinguishable from 0 (Δ Return model). Collectively, these findings provide no evidence that cash-constrained repurchasers, as a group, are characterized by abnormally weak future performance, or that the subset of cash-constrained repurchasers with EPS conditions exhibit incrementally worse performance.

Profitable investment opportunities are not the only source of funds for repurchases that could impose costs on shareholders. A second potentially costly source is regular dividend payments. Because dividends are sticky and dividend cuts are associated with significant stock price declines, regular dividend payments represent a permanent commitment to distribute cash flows and, as such, serve as a disciplinary force on managers' actions (Easterbrook 1984). Repurchases, by comparison, do not imply the same ongoing commitment and are therefore more suited to distributing transitory cash flow shocks (Guay and Harford 2000; Jagannathan et al. 2000). Using cash flows underpinning dividends to fund repurchases could therefore weaken monitoring through a lower commitment to ongoing payouts. Alternatively, repurchases may be associated with increased payouts to shareholders if they enable managers to disgorge lumpy cash surpluses in a timely fashion alongside regular dividend payments.

We examine the impact of EPS-motivated repurchases on payouts to shareholders in two ways. First, we model the annual change in total payouts (dividends plus repurchases scaled by lagged total assets) in the repurchase year using a difference-in-differences tobit regression. Explanatory variables include indicator variables for repurchasers and firms with EPS-based performance conditions, the associated two-way interaction effect, and a vector of controls. Column 2 in Table 5 presents results estimated using the full sample. The *Repurchase* coefficient estimate is positive and significant, indicating that repurchasers experience higher payout increases in the repurchase year. The estimated coefficient on *Repurchase* \times *EPS* is not significant at conventional levels; payout increases for repurchases with EPS-contingent compensation are indistinguishable from those exhibited by non-EPS repurchasers. These results do not support dividend substitution claims for repurchasers in general and EPS-contingent repurchasers in particular. Instead, findings suggest that dividends and repurchases represent complementary payout options that in conjunction yield higher payouts to shareholders regardless of whether repurchases are driven by EPS-contingent compensation arrangements.

Columns 3 and 4 in Table 5 examine change in total payouts for firms with and without surplus cash at time $t-1$, respectively. Results and conclusions are similar to those reported for the full sample in column 2. While results in column 3 provide little evidence that EPS targets are

TABLE 5
Coefficient Estimates and Model Summary Statistics for Pooled Regressions Relating Payout Policy to Repurchase Activity and the Incidence of EPS-Based Performance Conditions in Executive Compensation Contracts

Variable	Tobit Models: Δ Total Payout			OLS Model
	Full Sample	Surplus Cash: Yes	Surplus Cash: No	Dividend Forecast Error
<i>Surplus cash holdings</i>	0.01 (0.06)			0.03 (0.24)
<i>Free cash flow</i>	-0.01 (0.10)			0.06 (0.02)
<i>Excess investing cash flow</i>	-0.01 (0.05)			-0.06 (0.04)
<i>Log(Market capitalization)</i>	0.00 (0.09)	0.00 (0.19)	0.00 (0.37)	-0.01 (0.23)
<i>Market-to-book</i>	0.00 (0.20)	0.01 (0.01)	-0.00 (0.57)	0.00 (0.92)
<i>Net leverage</i>	-0.01 (0.01)	-0.00 (0.10)	-0.01 (0.01)	-0.01 (0.49)
<i>Negative returns</i>	-0.00 (0.92)	-0.00 (0.49)	0.01 (0.07)	-0.03 (0.16)
<i>Negative earnings</i>	-0.01 (0.05)	-0.01 (0.07)	-0.03 (0.03)	-0.00 (0.91)
<i>Options outstanding</i>	0.00 (0.99)	-0.00 (0.88)	0.00 (0.54)	-0.01 (0.01)
<i>Dividend yield</i>	0.02 (0.51)	-0.00 (0.96)	0.02 (0.49)	0.02 (0.89)
<i>ROA</i>	0.06 (0.01)	0.06 (0.01)	0.06 (0.08)	-0.03 (0.66)
Δ ROA	-0.03 (0.05)	-0.02 (0.07)	-0.06 (0.17)	-0.08 (0.22)
<i>Repurchase</i>	0.05 (0.01)	0.05 (0.01)	0.04 (0.01)	-0.04 (0.18)
<i>Repurchase \times EPS</i>	-0.01 (0.30)	-0.01 (0.36)	-0.01 (0.72)	0.06 (0.10)
Intercept	-0.01 (0.91)	-0.01 (0.74)	-0.02 (0.32)	0.17 (0.44)
<i>Industry effects</i>	Yes	Yes	Yes	Yes
<i>Year effects</i>	Yes	Yes	Yes	Yes
Likelihood ratio	1370.16	1088.99	301.37	
p-value	0.01	0.01	0.01	0.01
Adjusted R ²				0.04
n	1313	1053	260	1312
n left-censored	214	161	53	

Two-tailed probability values are reported in parentheses.

All explanatory variables are measured at the beginning of the repurchase year unless otherwise indicated.

(continued on next page)

TABLE 5 (continued)

Variable Definitions:

$\Delta Total Payout$ = change in the aggregate value of dividends plus stock repurchases (scaled by lagged total assets) over the period $t-1$ to t ; tobit regression models for $\Delta Total Payout$ are estimated using three samples: all firms with available data (Full sample), observations where either *Surplus cash holdings*, *Free cash flow*, or *Excess investing cash flow* from Table 3 are equal to 1 at time $t-1$ (Surplus Cash: Yes), and observations where *Surplus cash holdings*, *Free cash flow*, and *Excess investing cash flow* from Table 3 are equal to 0 at time $t-1$ (Surplus Cash: No); and

Dividend Forecast Error = unexpected dividend changes (scaled by lagged market capitalization) over the period $t-1$ to t , computed using a portfolio-based application of Lintner's (1956) model;

Explanatory Variable Definitions:

Repurchase = indicator variable equal to 1 for repurchasing firms, and 0 otherwise;

EPS = indicator variable taking the value of 1 for firms with at least one of the j compensation components (j = bonus plans, option plans, or LTIPs) tied to EPS performance, and 0 otherwise;

ΔROA = change in operating earnings scaled by total assets;

Industry effects = vector of industry indicator variables based on Datastream level-3 classification; and

Year effects = vector of calendar year indicator variables.

See Tables 2 and 3 for definitions of remaining variables.

associated with significantly larger payout increases for surplus cash flow repurchasers, there is no suggestion of dividend substitution among low cash flow repurchasers with EPS-contingent compensation (column 4).

Our second test of whether EPS targets encourage managers to divert funds from regular dividend increases to pay for repurchases focuses on dividend forecast errors, defined as the observed dividend change minus the expected dividend change. If repurchasers redirect funds from dividend payments to support repurchase activity, then we should observe lower-than-expected dividend increases in the repurchase year. We draw on Lintner's (1956) model linking current dividends to contemporaneous earnings and lagged dividend payments to estimate expected dividend changes for firm i in year t . Because we are unable to estimate firm-specific regression parameters from Lintner's (1956) model due to insufficient time-series data for earnings and dividends, we instead use a portfolio approach based on the following sequential sort procedure. Each year all nonfinancial firms from Extel with available data are sorted into quintiles based on contemporaneous earnings before exceptional items. Each annual earnings portfolio is then further sorted into quintile portfolios according to lagged ordinary dividends. Median annual dividend changes for the resulting 25 earnings-lagged dividend portfolio combinations (computed after excluding repurchasers) serve as estimates of expected dividend changes. Dividend forecast errors are equal to the observed annual dividend change less the median dividend change for firms' corresponding earnings-lagged dividend portfolio in year t . Column 5 in Table 5 reports coefficient estimates from an OLS regression of dividend forecast errors on the *Repurchase* indicator variable, its corresponding interaction with *EPS*, and a vector of control variables. Although the estimated coefficient on *Repurchase* is negative, as predicted by the dividend-substitution hypothesis, it is not significant at conventional levels ($p = 0.18$). Further, the incremental effect for repurchasers with EPS targets (*Repurchase* \times *EPS*) is positive and marginally significant

($p = 0.10$). Overall, results do not support the view that EPS-contingent compensation arrangements motivate firms to divert funds from ordinary dividend payments to support repurchases.¹⁰

Efficient Contracting

Linking executive compensation to EPS growth provides management with a means of manipulating reported performance (through repurchases) that can easily be avoided by using alternative accounting metrics such as ROA or growth in operating profit. Why EPS conditions remain popular in executive compensation contracts despite the additional earnings management opportunities such arrangements provide is, therefore, an intriguing question. One possibility is that EPS conditions represent an efficient contracting device that helps align interests of managers and shareholders by incentivizing managers to make decisions that promote shareholder value. Prior research highlights several shareholder benefits associated with repurchases including limiting overinvestment of surplus cash, increasing leverage in firms with inefficient capital structure, and signaling stock price undervaluation (Dittmar 2000). Insofar as EPS targets create incentives to manipulate reported performance by repurchasing stock, EPS-based compensation may provide shareholders with a simple means of motivating executives to distribute surplus cash, increase leverage, and correct underpricing in a timely manner.

Table 6 presents models testing whether the positive association between repurchases and cash is more pronounced for firms with EPS performance conditions in the presence of surplus cash. We create an indicator variable, *Surplus cash*, taking the value of 1 where *Surplus cash holdings*, *Free cash flow*, or *Excess investing cash flow* from Table 3 is equal to 1, and 0 otherwise. We use *Surplus cash* to partition the sample before estimating separately for each partition a logistic (left-censored tobit) regression relating the probability (scaled value) of a repurchase to stock and flow measures of cash and their associated interactions with EPS. Estimated coefficients on the *Cash holdings* \times *EPS*, *CFO* \times *EPS*, and *CFI* \times *EPS* interactions are positive and significant in columns 3 and 4, where *Surplus cash* is equal to 1 (except for *Cash holdings* \times *EPS* in the logistic model). In contrast, only the *CFO* \times *EPS* coefficient (tobit model) is positive and significant in columns 5 and 6, where *Surplus cash* is equal to 0. On balance, these findings suggest that EPS targets benefit shareholders by creating a stronger link between repurchases and cash performance in the presence of surplus cash.

Table 7 examines the intervening effect of low leverage and undervaluation on the link between repurchases and EPS targets. In Models 1 and 2, we estimate a version of Equation (1) relating the probability of a repurchase to the presence of EPS targets and an underleverage indicator variable. *Underleverage* takes the value of 1 when net leverage is less than the annual median value for the corresponding Datastream level-4 industry group (computed using the Extel population), and 0 otherwise. Model 1 includes *Underleverage* as a main effect, while Model 2 includes the *Underleverage* \times *EPS* interaction. As predicted, estimated coefficients for the *Underleverage* main effect are positive and significant in both models, as are the coefficients on *EPS*. The *Underleverage* \times *EPS* variable in Model 2, however, does not load ($p = 0.93$). Accordingly,

¹⁰ In supplementary tests we examined off-diagonal cases based on the predicted probabilities from a pooled version of Model 1 in Table 3. We classified repurchasers with an implied probability ≤ 0.5 as “unexpected repurchasers” and nonrepurchasers with an implied probability > 0.5 as “unexpected nonrepurchasers.” We compared these cases with observations where the model correctly predicts a repurchase (firm is a repurchaser and the implied probability > 0.5) and a nonrepurchase (firm is a nonrepurchaser and the implied probability ≤ 0.5). We find no evidence that unexpected repurchasers perform worse or make lower payouts than expected repurchasers. These results provide further evidence that EPS-based compensation arrangements do not encourage firms to engage in inconsistently suboptimal repurchase activity. On the other hand, there is some suggestion that unexpected nonrepurchasers perform worse than expected nonrepurchasers, consistent with the view that failure to buy back shares in particular situations imposes agency costs on shareholders (e.g., through overinvestment).

TABLE 6
Coefficient Estimates and Model Summary Statistics for Pooled Logistic (Left-Censored Tobit) Regressions Relating the Probability (Scaled Value) of a Repurchase to the Incidence of EPS-Based Performance Conditions in Executive Compensation Contracts, Conditional on Surplus Cash

Variable	Predicted Sign	Surplus Cash: Yes		Surplus Cash: No	
		Logistic	Tobit	Logistic	Tobit
<i>Cash holdings</i>	(+)	-3.63 (0.01)	-0.11 (0.01)	0.30 (0.68)	-0.02 (0.54)
<i>CFO</i>	(+)	3.63 (0.01)	0.14 (0.01)	6.88 (0.03)	0.18 (0.01)
<i>CFI</i>	(+)	1.34 (0.01)	0.03 (0.04)	6.20 (0.09)	0.14 (0.08)
<i>Log(Market capitalization)</i>	(?)	0.07 (0.12)	0.00 (0.10)	0.52 (0.01)	0.01 (0.01)
<i>Market-to-book</i>	(-)	-0.18 (0.10)	0.01 (0.01)	-0.68 (0.03)	-0.01 (0.48)
<i>Net leverage</i>	(-)	-1.57 (0.01)	-0.02 (0.01)	-0.38 (0.01)	-0.02 (0.01)
<i>Dividend yield</i>	(?)	-0.67 (0.53)	-0.04 (0.44)	29.80 (0.01)	-0.03 (0.52)
<i>Negative returns</i>	(+)	-0.05 (0.75)	-0.00 (0.89)	0.40 (0.31)	0.02 (0.18)
<i>Negative earnings</i>	(-)	-1.14 (0.01)	-0.04 (0.01)	-1.13 (0.12)	-0.02 (0.32)
<i>Options outstanding</i>	(+)	-0.02 (0.06)	-0.00 (0.35)	0.02 (0.77)	0.01 (0.47)
<i>NDISC</i>	(?)	1.23 (0.01)	0.03 (0.01)	2.27 (0.02)	0.07 (0.01)
<i>EPS</i>	(+)	0.45 (0.09)	0.01 (0.91)	-0.35 (0.65)	0.00 (0.99)
<i>EPS × Cash holdings</i>	(+)	0.50 (0.60)	0.07 (0.05)	-1.39 (0.63)	-0.19 (0.01)
<i>EPS × CFO</i>	(+)	2.55 (0.06)	0.10 (0.05)	6.00 (0.13)	0.19 (0.05)
<i>EPS × CFI</i>	(+)	3.42 (0.01)	0.15 (0.01)	1.33 (0.76)	0.04 (0.71)
Intercept	(?)	-0.02 (0.96)	-0.04 (0.01)	-4.09 (0.01)	-0.09 (0.01)
<i>Industry</i>		Yes	Yes	Yes	Yes
<i>Year</i>		Yes	Yes	Yes	Yes
Likelihood ratio		233.10	335.66	145.47	90.49
n repurchasers/left-censored		553	516	112	149
Pseudo R ²		0.26		0.57	
% classified correctly		64.50		69.70	
n		1069	1069	261	261

Two tailed probability values are reported in parentheses.

(continued on next page)

TABLE 6 (continued)

The sample is partitioned according to the presence or absence of surplus cash. Columns headed “Surplus Cash: Yes” contain observations where either the *Surplus cash holdings*, *Free cash flow*, or *Excess investing cash flow* indicator variables from Table 3 equals 1. Columns headed “Surplus Cash: No” contain observations where the *Surplus cash holdings*, *Free cash flow*, and *Excess investing cash flow* indicator variables from Table 3 are equal to 0. In columns headed “Logistic” the dependent variable is the logarithm of the odds of a repurchase. In the columns headed “Tobit” the dependent variable is the aggregate amount (including expenses) spent repurchasing shares during fiscal year t , scaled by lagged total assets.

All variables are measured at the beginning of the repurchase year.

Explanatory Variable Definitions:

- NDISC* = indicator variable taking the value of 1 when insufficient disclosure renders the presence of an EPS target indeterminate, and 0 otherwise;
- EPS* = indicator variable taking the value of 1 for firms with at least one of the j compensation components (j = bonuses, options, or LTIPs) linked to EPS performance, and 0 otherwise;
- Cash holdings* = cash and cash equivalents scaled by lagged total assets;
- CFO* = cash flow from operations scaled by lagged total assets;
- CFI* = cash flow from investing activities scaled by lagged total assets;
- Market capitalization* = share price multiplied by the number of shares outstanding;
- Market-to-book* = book value of debt plus the market value of equity divided by total assets;
- Net leverage* = total liabilities net of cash holdings divided by total assets net of cash holdings;
- Dividend yield* = ordinary dividends per share divided by share price;
- Negative returns* = indicator variable taking the value of 1 if 12-month stock returns are less than the market return over the corresponding period, and 0 otherwise;
- Negative earnings* = indicator variable taking the value of 1 if reported EPS is negative, and 0 otherwise; and
- Options outstanding* = aggregate number of outstanding options for all employees at the balance sheet date scaled by market capitalization.

while findings support claims that repurchases are a response to abnormally low leverage, there is no evidence that EPS-based compensation arrangements amplify this effect.

Models 3 and 4 in Table 7 explore the link between equity undervaluation and EPS-motivated repurchases. Our proxy for undervaluation compares observed price with intrinsic value estimated using the harmonic mean of price-to-forward earnings (Liu et al. 2002):

$$IV_{it-1} = E_{it-1}^{F1} \times \frac{1}{\frac{1}{n} \sum_{j=1}^J \frac{E_{jt-1}^{F1}}{P_{jt-1}}}, \quad (3)$$

where IV is intrinsic value for firm i four months after the beginning of repurchase year t , E^{F1} is the last available I/B/E/S mean consensus forecast for one-year-ahead EPS during the window $-300 \text{ days} < t < 120 \text{ days}$, P is observed stock price four months after the end of fiscal year $t-1$, J is the set of firms with consensus forecast data on I/B/E/S in the same Datastream level-3 industry as firm i ($i \in J$), and n is the number of firms in J . The indicator variable *Undervaluation* takes the value of 1 where $IV_{it-1} > P_{it-1}$, and 0 otherwise. Model 3 in Table 7 includes the *Undervaluation* main effect, while Model 4 is expanded to include the *Undervaluation* \times *EPS* term. As with all previous models, *EPS* loads with a statistically significant positive coefficient in both regressions. The *Undervaluation* main effect also loads positively in Model 3, suggesting that repurchases are at least a partial response to market mispricing. However, Model 4 suggests this effect is driven by firms with EPS-based compensation conditions: the coefficient on *Undervaluation* is indistinguishable from 0, whereas *Undervaluation* \times *EPS* is positive and significant at the 10 percent level. (The probability value for a likelihood ratio test comparing Models 3 and 4 is 0.09.) An indication of the economic significance of the interaction effect is provided by compar-

TABLE 7
Coefficient Estimates and Model Summary Statistics for Conditional Logistic Regressions
Examining the Intervening Effect of Underleverage and Undervaluation on the Association
between the Probability of a Repurchase and the Incidence of EPS-Based Performance
Conditions in Executive Compensation Contracts

Variables	Predicted Sign	Underleverage		Undervaluation	
		Model 1	Model 2	Model 3	Model 4
<i>Log(Market capitalization)</i>	(?)	1.21	1.21	1.56	1.56
		<i>3.34</i>	<i>3.35</i>	<i>4.74</i>	<i>4.76</i>
		(0.01)	(0.01)	(0.01)	(0.01)
<i>Market-to-book</i>	(-)	-0.67	-0.68	-0.67	-0.67
		<i>0.51</i>	<i>0.51</i>	<i>0.51</i>	<i>0.51</i>
		(0.01)	(0.01)	(0.01)	(0.01)
<i>Net leverage</i>	(-)			-0.37	-0.41
				<i>0.69</i>	<i>0.66</i>
				(0.10)	(0.07)
<i>Dividend yield</i>	(?)	0.90	0.90	0.65	0.65
		<i>2.45</i>	<i>2.45</i>	<i>1.92</i>	<i>1.91</i>
		(0.33)	(0.33)	(0.57)	(0.57)
<i>Negative returns</i>	(+)	-0.04	-0.04		
		<i>0.96</i>	<i>0.96</i>		
		(0.78)	(0.78)		
<i>Negative earnings</i>	(-)	-1.08	-1.08	-1.26	-1.23
		<i>0.34</i>	<i>0.34</i>	<i>0.28</i>	<i>0.29</i>
		(0.01)	(0.01)	(0.01)	(0.01)
<i>Options outstanding</i>	(+)	-0.02	-0.02	0.01	0.01
		<i>(0.98)</i>	<i>(0.98)</i>	<i>(1.01)</i>	<i>(1.01)</i>
		(0.12)	(0.12)	(0.75)	(0.71)
<i>Surplus cash holdings</i>	(+)	0.15	0.15	-0.24	-0.25
		<i>1.16</i>	<i>1.16</i>	<i>0.78</i>	<i>0.78</i>
		(0.33)	(0.33)	(0.22)	(0.22)
<i>Free cash flow</i>	(+)	0.63	0.63	0.52	0.53
		<i>1.87</i>	<i>1.87</i>	<i>1.67</i>	<i>1.69</i>
		(0.01)	(0.01)	(0.03)	(0.03)
<i>Excess investing cash flow</i>	(+)	0.72	0.72	0.83	0.83
		<i>2.06</i>	<i>2.06</i>	<i>2.30</i>	<i>2.29</i>
		(0.01)	(0.01)	(0.01)	(0.01)
<i>Underleverage</i>	(+)	0.42	0.40		
		<i>1.52</i>	<i>1.49</i>		
		(0.01)	(0.12)		
<i>Undervaluation</i>	(+)			0.76	0.10
				<i>2.13</i>	<i>1.11</i>
				(0.01)	(0.83)
<i>NDISC</i>	(?)	1.46	1.46	1.70	1.85
		<i>4.33</i>	<i>4.33</i>	<i>5.46</i>	<i>6.36</i>
		(0.01)	(0.01)	(0.01)	(0.01)
<i>EPS</i>	(+)	0.67	0.65	0.95	0.68
		<i>1.95</i>	<i>1.92</i>	<i>2.57</i>	<i>1.98</i>
		(0.01)	(0.01)	(0.01)	(0.03)

(continued on next page)

TABLE 7 (continued)

Variables	Predicted Sign	Underleverage		Undervaluation	
		Model 1	Model 2	Model 3	Model 4
$EPS \times Underleverage$	(+)		0.03 <i>1.03</i> (0.93)		
$EPS \times Undervaluation$	(+)				0.79 2.20 (0.10)
Likelihood ratio		267.44	268.17	207.81	210.56
p-value		0.01	0.01	0.01	0.01
Pseudo R ²		0.44	0.44	0.50	0.51
% correctly classified		73.50	73.70	78.10	78.80
n		665	665	439	439

Three values are reported for each covariate: the first value is the coefficient estimate; the second (italicized) value is the odds ratio; and the third value (in parentheses) is the two-tailed probability value.

The dependent variable is the logarithm of the odds of a repurchase. See Tables 2 and 3 for definitions of all remaining variables. All variables are measured at the beginning of the repurchase year.

Variable Definitions:

NDISC = indicator variable taking the value of 1 when insufficient disclosure renders the presence of an EPS target indeterminate, and 0 otherwise;

EPS = indicator variable taking the value of 1 for firms with at least one of the *j* compensation components (*j* = bonus plans, option plans, or LTIPs) tied to EPS performance, and 0 otherwise;

Underleverage = indicator variable taking the value of 1 where net leverage is less than the annual median value for the corresponding Datastream level-4 industry group, and 0 otherwise; and

Undervaluation = indicator variable taking the value of 1 where intrinsic value computed using a price-to-forward-earnings multiple is greater than observed price on the valuation date (four months after the beginning of the repurchase year), and 0 otherwise.

ing the odds ratios for *Undervaluation* in the presence and absence of EPS-contingent contracts.¹¹ The odds of repurchasing are no different than the odds of not repurchasing for undervalued firms in the absence of EPS-contingent compensation ($e^{0.1} = 1.11$). In contrast, the odds of a repurchase are $e^{0.1+0.79} = 2.44$ times higher than the odds of not repurchasing for undervalued firms with EPS-contingent compensation. Results provide further (albeit statistically weak) evidence that shareholders benefit from EPS-motivated repurchases in the form of higher buyback probability when stock price falls below intrinsic value.

Our final set of tests examines the interaction between stock repurchases and accrual management. Executives need not resort to repurchases to meet binding EPS targets. Prior research indicates that managers often use accounting accruals to maximize compensation payouts (Healy 1985). Although the choice between alternative earnings management instruments has not been widely explored in the literature, several factors suggest that U.K. shareholders favor EPS management through repurchases over accruals. First, because shareholders benefit from repurchases

¹¹ Direct interpretation of coefficient estimates and odds ratios reported for interaction terms is problematic in nonlinear models since the effect depends on the contribution of the covariates (Ai and Norton 2003). Comparing odds ratios for the *j*th covariate in the presence and absence of the *i*th covariate provides a simple means of interpreting the economic significance of the *j* × *i* interaction.

(see above), the net impact on shareholder wealth from managing EPS through this method is likely to be less detrimental than accruals, where the gains to shareholders are less obvious. Second, the effect of repurchases on reported EPS is more transparent than accrual choices because U.K. firms must disclose details of all repurchase trades to the stock market without delay and report aggregate repurchase activity in their published financial statements. Investors are therefore better placed to reverse the effect of repurchases on reported EPS, should they wish to do so. Third, unlike accruals that reverse over time, buybacks raise the baseline EPS target permanently and do not contribute to future earnings variability.¹²

If managing EPS through repurchases imposes lower net costs on shareholders relative to accrual manipulation, owners would benefit from compensation-driven buybacks via lower accrual manipulation as executives substitute repurchases for discretionary accruals. We test this prediction by regressing measures of absolute abnormal working capital accruals for the repurchase year on an indicator variable for repurchasers with EPS targets (*Repurchase_EPS*), the two-way interaction capturing the incremental effect for repurchasers without EPS conditions (*Repurchase_EPS* × *NOEPS*), and a vector of controls. We use the absolute value of abnormal accruals because our prediction relates to the overall level of accrual management activity.¹³

Abnormal working capital accruals are estimated using two methods: the modified-Jones model (Dechow et al. 1995) and the performance-matched model (Kothari et al. 2005). We estimate both models cross-sectionally using industry-year portfolios comprising all observations from Extel with available data. Results in Table 8 are consistent with lower abnormal accrual activity for repurchasers with EPS-contingent compensation arrangements, relative to nonrepurchasers and repurchasers without EPS targets. The estimated coefficient on *Repurchase_EPS* is negative and significant in all models, while the *Repurchase_EPS* × *NOEPS* coefficient is reliably positive and significant. These findings are consistent with the view that firms with EPS targets are more likely to manipulate reported EPS through repurchases as opposed to working capital accruals. To the extent that manipulation via accruals imposes higher costs on shareholders, these results suggest an additional channel through which the positive association between repurchases and EPS-contingent compensation can benefit shareholders.

Summary

Results presented in this section suggest net benefits to shareholders from stock repurchases motivated by EPS targets in executive compensation contracts. Repurchasers are associated with larger increases in total payouts, and this effect is no less pronounced for repurchasers with EPS targets, suggesting that dividend substitution is not a first-order concern. Further, the positive link between repurchases and cash performance is more prominent for firms with EPS targets in the presence of surplus cash; undervalued firms with EPS conditions are more likely to signal their

¹² Managers may also favor repurchases over accruals as a means of inflating EPS for several reasons. First, because stock market investors typically view repurchases favorably, they are less likely to question executives' underlying repurchases motives. Second, executives can provide convincing, non-manipulation-based explanations to support their actions if challenged by shareholders.

¹³ Using a levels approach to model absolute abnormal accruals introduces the risk of spurious correlation. Our results and conclusions should be interpreted with this caveat in mind. Several factors militate against using a changes specification however. First, accrual reversals confound a changes specification: absolute abnormal accrual levels may remain similar over short intervals even when the level of accrual management declines (because high absolute accruals capture both contemporaneous accrual management and unwinding of accrual management from previous periods). Second, if firms use repurchases instead of accruals in response to a new stimulus for EPS manipulation, then absolute accruals will remain constant over time and a changes specification will yield null results. Consistent with these arguments, when we model the change in absolute accruals we find no difference between repurchasers with EPS conditions, repurchasers without EPS conditions, and nonrepurchasers.

TABLE 8
Coefficient Estimates and Model Summary Statistics from Pooled OLS Regressions
Relating Absolute Abnormal Accrual Activity to Repurchase Activity and a Vector of
Control Variables

Variable	Predicted Sign	Absolute Abnormal Accruals Computed Using:			
		DSS Model		KLW Model	
		Model 1	Model 2	Model 1	Model 2
<i>Log(Total assets)</i>	(?)		0.00 (0.19)		0.00 (0.04)
<i>Market-to-book</i>	(?)		0.00 (0.29)		0.00 (0.14)
<i>Net leverage</i>	(+)		0.01 (0.01)		0.01 (0.01)
<i>Negative earnings</i>	(+)		0.01 (0.14)		0.01 (0.52)
<i>Options outstanding</i>	(+)		0.00 (0.24)		0.00 (0.11)
σ <i>Operating cash flow</i>	(+)		0.18 (0.01)		0.20 (0.01)
<i>Lagged absolute accruals</i>	(+)		0.05 (0.01)		0.05 (0.01)
<i>Repurchase_EPS</i>	(-)	-0.02 (0.01)	-0.02 (0.02)	-0.02 (0.01)	-0.01 (0.04)
<i>Repurchase_EPS</i> × <i>NOEPS</i>	(+)	0.02 (0.05)	0.02 (0.05)	0.02 (0.02)	0.02 (0.05)
Intercept	(?)	0.10 (0.01)	0.09 (0.01)	0.10 (0.01)	0.09 (0.01)
<i>Industry</i>		No	Yes	No	Yes
<i>Year</i>		No	Yes	No	Yes
Adjusted-R ²		0.01	0.09	0.01	0.07
p-value		0.01	0.01	0.01	0.01
n		1314	1312	1314	1312
n repurchasers		656	654	656	654

Two-tailed probability values are reported in parentheses. The dependent variable is the absolute value of abnormal working capital accruals, where abnormal accruals are the residual from either the Dechow et al. (1995) working capital accrual model (DDS) or the Kothari et al. (2005) working capital accrual model (KLW). Both accrual models are estimated cross-sectionally for all industry-year combinations.

All variables relate to repurchase year t .

Variable Definitions:

Repurchase_EPS = indicator variable equal to 1 for repurchasing firms with at least one of the j compensation components (j = bonus plans, option plans, or LTIPs) tied to EPS performance, and 0 otherwise;

NOEPS = indicator variable taking the value of 1 for firms that do not have at least one of the j compensation components tied to EPS performance, and 0 otherwise;

Total assets = balance sheet value of aggregate assets;

Market-to-book = book value of debt plus the market value of equity divided by total assets;

Net leverage = total liabilities net of cash holdings divided by total assets net of cash holdings;

(continued on next page)

TABLE 8 (continued)

<i>Negative earnings</i>	= indicator variable taking the value of 1 if reported earnings per share are negative, and 0 otherwise;
<i>Options outstanding</i>	= aggregate number of outstanding options for all employees at the balance sheet date scaled by market capitalization;
σ <i>Operating Cash flow</i>	= standard deviation of operating cash flow scaled by lagged total assets computed over the three-year period centered on year <i>t</i> ;
<i>Lagged accruals</i>	= one-year lagged value of the dependent variable;
<i>Industry</i>	= vector of industry indicator variables based on Datastream level-3 classification; and
<i>Year</i>	= vector of calendar year indicator variables.

undervaluation through a repurchase; and repurchasers with EPS conditions are associated with lower abnormal accruals. We find no evidence that EPS-driven repurchases impose costs on shareholders in the form of investment myopia.

VI. CONCLUSIONS

This study examines the impact on firms' stock repurchase activity of EPS performance conditions in executive compensation contracts. Our analysis connects three distinct literatures. One body of research demonstrates how aspects of corporate payout policy are sensitive to executives' compensation arrangements. Another body of work based on surveys and anecdotal evidence indicates that managers are sensitive to the EPS impact of repurchases. A third group of studies concludes that managers use repurchases to achieve key EPS performance thresholds. Our analysis integrates these three literatures by examining how repurchase policy is shaped by contractual arrangements that create an explicit link between executive compensation and reported EPS.

We find that EPS targets explain firm-level repurchase policy after controlling for traditional determinants of buybacks. Further analysis reveals that EPS-motivated repurchases yield net benefits to shareholders. Contrary to [Bens et al. \(2002\)](#), we find no evidence that EPS-driven repurchases lead to investment myopia. Instead, repurchasers are associated with larger payout increases to shareholders that partly reflect a more pronounced link between repurchases and cash performance for firms with EPS targets in the presence of surplus cash flow. In addition, undervalued firms with EPS targets are more likely to signal mispricing through a repurchase, and repurchasers with EPS conditions are associated with lower abnormal accrual activity.

With repurchases emerging as a key payout mechanism in many jurisdictions and in view of concerns about the motives underlying this trend ([Bens et al. 2002](#); [Bens et al. 2003](#); [Hribar et al. 2006](#); [Marquardt et al. 2009](#)), a better understanding of the contractual incentives driving repurchase activity and their associated economic consequences is appropriate. Our findings reveal significant contracting benefits from the repurchase incentives that result from linking executive compensation to EPS. In particular, we identify stock repurchases as a potentially important benefit of EPS-based targets in executive compensation contracts that improves alignment of managers' and shareholders' interests. This insight is consistent with [Huang et al. \(2010\)](#) who find that EPS-based bonus plans help to address agency conflicts between managers and shareholders in the form of ownership dilution. We therefore provide a modest further step toward a more complete understanding of the costs and benefits associated with per-share-based performance measures in general, and in particular why EPS-based targets remain a popular choice in executive compensation contracts despite their obvious limitations.

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