A Model of Stock Buybacks*

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Abstract

This paper studies buybacks in a Kyle-type model with many informed parties: a manager implementing buybacks and speculators trading for themselves. Buybacks introduce two opposing forces. They compete against the speculators' trades, making informed trading less profitable. They also increase (decrease) the firm's per-share value when its shares are undervalued (overvalued), making informed trading more profitable. Less informative buybacks weaken the first force while strengthening the second. The manager's incentive to manipulate the current stock price to increase managerial compensation constrains how much information buybacks contain. The model generates novel predictions linking the structure of managerial compensation, buybacks, and trading outcomes.

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1 Introduction

Repurchase programs represent the dominant payout policy of U.S. firms; between 2010 and 2019, S&P 500 companies returned over $5.3 trillion to shareholders via share repurchases.[1] Open-market repurchase programs represent over 90% of total repurchases (Stephens and Weisbach 1998). The announcement of an open-market repurchase program does not oblige the firm to buy back any shares; the authorization merely grants it the option to do so over a specified period of time. Managers exercise tremendous discretion over the implementation of these programs.[2] Evidence suggests that managers use this discretion and their private information to execute buybacks at favorable prices (see Brockman and Chung 2001, Ikenberry et al. 2000, Cook et al. 2004, Dittmar and Field 2015). Traditionally, the literature asserts that informed buybacks induce an adverse selection trading cost that hurts shareholders. For instance, Barclay and Smith (1988) argue that "the increased trading activity in the secondary market by better-informed managers...reduces the liquidity of the firm's shares, and thereby increases the firm's cost of capital" (see Brockman and Chung 2001, Oded 2005 for similar arguments). The conventional view of buybacks appears at odds with the popularity of such programs.

This paper reassesses the conventional view of open-market repurchase programs, hereafter buyback programs, by analyzing a parsimonious Kyle (1985)-type model with many informed parties: a manager who executes buybacks for the firm and speculators who trade using personal accounts.[3] In this setting, buybacks introduce two opposing economic forces. On the one hand, buybacks intensify the competition for informed

[1] "The Debate Over Share Buybacks, Explained." *The Wall Street Journal*, January 06, 2020.

[2] While factors such as earnings and the availability of free cash may drive the level of share repurchases over a long window, managers decide the timing of actual buys withing that window (Cook et al. 2004, Skinner 2008). Median program completion rates in the U.S. are estimated to be less than 50% (Stephens and Weisbach 1998, Chemmanur et al. 2016). In a quarter of cases, no shares are repurchased at all in the fiscal year of the announcement (Bhattacharya and Jacobsen 2015). The completion rates internationally tend to be even lower. For instance, Rau and Vermaelen (2002) estimate the completion rate for U.K. firms to be 37%. Ikenberry et al. (2000) puts the figure for firms listed on the Toronto Stock Exchange at 28.6%

[3] Evidence suggests that the firm competes against other informed parties over the spoils of private information (see Ben-David and Roulstone 2005, Dittmar and Field 2015, Chemmanur et al. 2016).

trading profits. On the other, buybacks also increase the dispersion of the firm's per-share value across different realizations of firm fundamentals, making informed trading more profitable. A reduction in the information content of buybacks weakens the first force and strengthens the second. This result implies that the conventional view of buybacks, which suggests that uninformed buybacks minimize adverse selection costs, is incomplete. While uninformed buybacks minimize the adverse selection costs due to the manager's private information, they maximize the adverse selection trading costs due to the private information of existing speculators. A more complete view of how buybacks affect adverse selection costs should account for this trade-off.

The framework in this paper features three dates. At $t = 0$, shareholders can authorize a buyback program allowing the manager to buy back shares at the manager's discretion. The fundamental value of the firm is unknown to all in this period. At $t = 1$, the manager and the speculators receive private information about the fundamental value of the firm and submit orders based on their private information. The speculators trade on their own accounts and maximize their expected trading profits. The manager buys back shares for the firm and maximizes the manager's expected compensation, which is assumed to depend on the firm's stock price at $t = 1$ and $t = 2$. These orders, along with noise trades, are settled by Kyle (1985) market-makers. At $t = 2$, information about the firm's fundamentals become public, the firm's stock price adjusts to account for the new information, and the manager is paid.

The main innovation in this framework relative to other Kyle (1985)-type models with many informed traders is a manager who buys back shares on behalf of the firm. The buyback of undervalued shares earns trading profits, which increase the firm's per-share value. The buyback of overvalued shares incurs trading losses, which decrease the firm's per-share value. Hence, unlike the speculators' trades, the manager's trades change the per-share value of the firm, increasing it when the firm's fundamentals are high and decreasing it when the firm's fundamentals are low. This dispersion effect distinguishes buybacks from the trades of other informed parties and is novel to this setting.

One trading outcome of particular interest is the speculators' total expected trading profits. This quantity provides a sufficient statistic for the expected payoff of the firm's existing shareholders when noise trade stem from their liquidity needs. In particular, the existing shareholders' expected payoffs are higher when the speculators' total expected trading profits are lower. Less informative buybacks compete less effectively against the speculators' trades. At the same time, less informative buybacks are more likely to incur trading losses. Hence, the model predicts that the firm's shareholders authorize a buyback program only when they expect the buyback implementation to be sufficiently informed.

Unlike speculators who trade using personal accounts, the manager does not maximize the trading profits. Instead, the manager executes buybacks in a way that maximizes the manager's compensation. When the managerial compensation contract rewards short-run stock price performance, the manager has an incentive to push up the firm's stock price in the short-run by buying back overvalued shares. This agency problem constrains how much the buyback implementation reflects the manager's private information.

The model's predictions are consistent with many stylized facts in the buyback literature. First, a buyback authorization that contains no information about firm fundamentals can improve the expected payoff of the firm's shareholders when the buyback implementation sufficiently reflects the manager's private information. This prediction is consistent with the observation that the market reacts positively to buyback authorizations even though they do not predict higher future operating performances (see Grullon and Michaely 2004, Jagannathan and Stephens 2003).

Second, larger buyback authorizations make it more difficult for the manager to manipulate the firm's stock price upwards by buying back overvalued shares. A larger authorization implies that the manager must buy back more shares in order to move the price. In addition, larger buybacks concentrate a given amount of trading losses among fewer shares, magnifying the decline in the firm's future stock price due to buyback trading losses. Hence, the model predicts that shareholders are more likely to authorize larger buybacks, consistent with the substantial size of the typical buyback authorization (see Jagannathan and Stephens 2003, Chan et al. (2004), Bonaimé (2015), Hillert et al. 2016).

Third, better firm prospects increase the expected price of the firm's stock. A higher stock price makes it more costly for the manager to buy back overvalued shares. Hence, the model predicts that shareholders are more likely to authorize buybacks in good times, when the expected value of the firm's fundamentals is greater, consistent with the pro-cyclical patterns of aggregate buyback authorizations (see Jagannathan et al. 2000, Dittmar and Dittmar 2008).

The model also provides additional testable implications linking the structure of the managerial compensation contract with the authorization and implementation of buyback programs. A manager who is only rewarded for the firm's short-run stock performance always executes the buyback even when the firm's shares are overvalued in order to increase the short-run stock price. In the other extreme, a manager who is only rewarded for the firm's long-run stock performance never knowingly buys back overvalued shares because doing so reduces the firm's long-run stock price. The manager's implementation of buybacks is insensitive to buyback size, firm prospects, or the precision of the speculators' private information when the manager's compensation contract heavily weighs the stock price performance in either the short-run or the long-run. In contrast, the manager's implementation of buybacks readily responds to these variables when the manager's compensation contract balances the rewards for short-run and long-run stock price performances. Hence, the model's predictions should be more pronounced for firms with such managerial compensation contracts.

Related Literature. This paper relates primarily to two strands in the literature. One deals with open-market repurchase programs as a payout policy. Many explanations have been offered for these programs' popularity such as favorable tax treatment (Grullon and Michaely 2002, Moser 2007, Brockman et al. 2008), financial flexibility (Stephens and Weisbach 1998, Guay and Harford 2000, Jagannathan et al. 2000, Dittmar and Dittmar 2008, Brockman et al. 2008, Bonaime et al. 2013), reduction in agency problems (Babenko 2009, Oded 2011, Caton et al. 2016), and signaling (Constantinides and Grundy 1989, Oded 2005, Bhattacharya and Jacobsen 2015). In almost all instances, works in this area think about buybacks using a Barclay and Smith (1988) framework, in which informed buybacks impose an adverse selection cost, which shareholders begrudgingly accept in order to reap other benefits. This paper contributes to this literature by studying buybacks in a setting with many informed parties. The competition effect in my setting is intuitive but absent in previous papers about buybacks because they assume that only the manager is informed.[4] This paper's analysis suggests that shareholders might allow the manager to buy back shares *because* the manager is informed, not in spite of it.

The other related line of inquiry concerns trading in a Kyle (1985)-type framework with many informed parties. Studies in this literature conclude that an additional informed party decreases the expected trading profits of the existing ones in a variety of rich settings (see for example Admati and Pfleiderer 1988, Holden and Subrahmanyam 1992, Back et al. 2000).[5] The result stems from the increased competition for informed trading profits. In these previous works, the competition effect completely captures the change in the existing speculators' trading profits due to additional informed trading. In contrast, buybacks also induce a dispersion effect, which dominates the competition effect in some instances and results in greater trading profits for the existing speculators. This framework demonstrates that informed buybacks differ from the informed trading

[4] A recent work by Bhattacharya and Jacobsen (2015) also features an informed trader in addition to the firm; however, these informed parties trade in different periods and do not compete against each other.

[5] One notable exception is Subrahmanyam and Titman (1999), which describes a competition for liquidity between two distinct groups of informed parties. The addition of an informed party with one type of information may increase the profits of an existing speculator informed with the other type. The mechanism in their work revolves involves the relative magnitudes of within-group and between-group competition for trading profits and differs from the dispersion effect in this paper.

of other speculators in important ways.

2 The Model

This section describes the features of the model. The model has three dates ($t = 0, t = 1, t = 2$), no inter-temporal discounting, no taxes, no transaction costs, and risk-neutral economic agents (shareholders, manager, speculators). The firm is financed entirely by equity and has one share. At $t = 2$, the firm's assets in place generates a payoff of A_H and A_L with probabilities θ and $1 - \theta$, respectively. For algebraic simplicity, A_H and A_L are normalized to 1 and 0, respectively.

At $t = 0$, the firm's shareholders can announce a buyback program authorizing the manager to buy back $B > 0$ shares on behalf of the firm at the manager's discretion. The size of the buyback program is assumed to be exogenously given due to financial constraints. As noted by Skinner (2008), the level of buybacks over longer horizons is determined by the firm's access to cash. In the model, this is equivalent to the buyback size being limited by the size of A_L prior to normalization. If the firm's shareholders do not authorize a buyback program at $t = 0$, the manager cannot trade. In contrast to signaling models of buybacks, the authorization at $t = 0$ conveys no information about the fundamental value of the firm's assets because it takes place prior to the manager receiving private information. This assumption is consistent with empirical findings. For instance, Grullon and Michaely (2002) find no evidence of future operational improvements, such as profitability, for buyback announcing firms (see Jagannathan and Stephens (2003) for similar findings).

At $t = 1$, trading of the firm's stock occurs in the secondary market. The market is characterized by a Kyle (1985)-type framework similar to the one used in Dow et al. (2017).

Prior to trading, the manager and a unit mass of speculators indexed by $i \in [0, 1]$ learn private information about the fundamental value of the firm. Specifically, the manager receives a signal $\sigma_m \in \{0, 1\}$:

$$Prob(\sigma_m = 1|A = 1) = 1,$$

$$Prob(\sigma_m = 0|A = 0) = 1.$$

The signal structure of σ_m implies that the manager observes the value of A without error. Each speculator receives a signal $\sigma_i \in \{0, 1\}$, which has precision $\frac{1}{2} + \frac{\phi}{4}$ with $\phi \in (0, 1)$[6]:

$$\begin{aligned}
Prob(\sigma_s = 1|A = 1) &= \frac{1}{2} + \frac{\phi}{4}, \\
Prob(\sigma_s = 0|A = 1) &= \frac{1}{2} - \frac{\phi}{4}, \\
Prob(\sigma_s = 0|A = 0) &= \frac{1}{2} + \frac{\phi}{4}, \\
Prob(\sigma_s = 1|A = 0) &= \frac{1}{2} - \frac{\phi}{4}.
\end{aligned}$$

Conditional on the realized value of A, the σ_i's are identically and independently distributed. The law of large numbers implies that a fraction $\frac{1}{2} + \frac{\phi}{4}$ of the speculators receives the correct signal and a fraction $\frac{1}{2} - \frac{\phi}{4}$ receives the incorrect signal.

The speculators trade using their private information to maximize their expected trading profits. Each speculator is restricted to trading an amount $a_i \in [-1, 1]$ due to limited wealth as in Dow et al. (2017). A feasible trading strategy for a speculator is given by $a_i(\sigma_i)$, which specifies the order that the i^{th} speculator submits given the signal σ_i.

Restrictions on insider trading prevents the manager from trading using a personal account. If a buyback program was authorized at $t = 0$, the manager can buy back shares

[6] The restriction on ϕ ensures that informed trading is profitable. $\phi > 0$ means that the signals are informative. $\phi < 1$ guarantees the equilibrium order flow does not always fully reveal the fundamental value of the firm.

Table 1: Summary of Model Timing	
t=0	Firm authorizes buyback program or not
t=1	The manager receives a signal σ_m. The speculators each receive a signal σ_i. Informed and noise traders simultaneously submit orders Market-makers set a price based on aggregate order flow and clear the market
t=2	The firm's fundamental value becomes public information Accounts are settled The firm is liquidated and proceeds distributed to remaining shareholders The manager is paid

on behalf of the firm at $t = 1$. In practice, the manager has the discretion to buy less than the entire authorized amount. However, for tractability, I assume that the manager either buys back B shares or none at all. The manager's buyback implementation strategy is given by $b(\sigma_m)$, which specifies the probability with which the manager buys back B shares given the signal σ_m.

Noise traders, in total, submit an order z that is uniformly distributed on $[-1, 0]$. The size of the noise trade is uncorrelated with the firm's fundamental value. In a later section, I analyze the effect of buybacks on the payoff to shareholders under the assumption that noise trades at $t = 1$ stem from the liquidity needs of the firm's existing shareholders.

The orders from noise and informed traders are aggregated into an order flow q. Deep-pocketed market-makers competitively set a price conditioned on the observed aggregate order flow q that allows them to serve as the counter-party to any aggregate order imbalance and break even in expectation.

At $t = 2$, the realized values of the firm's fundamentals become public information. The market-makers settle accounts. The firm is liquidated with proceeds going to its remaining shareholders and the manager is paid. The timing of the model is summarized in Table 1.

The equilibrium of trading at $t = 1$ is characterized by a pricing rule $P(q)$, the speculators' trading strategies a_i, and the manager's buyback strategy b such that the following conditions hold.

1. *Market Efficiency*: The market-makers' pricing rule satisfies

$$P(q) = E_1[V|q, a_i, b],$$

where V is the per-share liquidation value of the firm.

2. *Profit Maximization*: For any alternative trading strategy $\hat{a}_i$,

$$E_1[\pi_i(a_i)|\sigma_i, a_{-i}, b, P(q)] \geq E_1[\pi_i(\hat{a}_i)|\sigma_i, a_{-i}, b, P(q)],$$

where π_i is the trading profit of the i^{th} speculator.

3. *Pay Maximization*: For any alternative buyback implementation strategy $\hat{b}$,

$$E_1[U(b)|\sigma_m, a_i, P(q)] \geq E_1[U(\hat{b})|\sigma_m, a_i, P(q)],$$

where $U(b)$ is the expected compensation of the manager.

These conditions imply that the market-makers set the price at the expected per-share value of the firm at liquidation conditional on the observed order flow q, the speculators' trading strategies a_i, and the manager's buyback implementation strategy b. Each speculator's trading strategy a_i maximizes that speculator's expected trading profits given the market-makers' pricing rule $P(q)$, the manger's buyback implementation strategy b, and the private signal σ_i. The manager's buyback implementation strategy b maximizes the manager's expected compensation, given the market-makers' pricing rule $P(q)$, the speculators' trading strategies a_i, and the private signal σ_m.

3 Equilibrium Trading Outcomes at $t = 1$

This section analyzes the effects of buybacks on the outcomes of trading at $t = 1$, focusing in particular on the speculators' total expected trading profits. I begin by describing the benchmark in which there is no buyback authorization and the speculators are the only informed parties trading at $t = 1$.

Lemma 1 *When the speculators are the only informed parties trading at $t = 1$, the equilibrium is characterized by $a_i(0) = -1$ and $a_i(1) = 1$ for all $i \in [0, 1]$ and a pricing rule:*

$$P_0(q) = \begin{cases} 0 & q \leq -1 + \frac{\phi}{2} \\ \theta & -1 + \frac{\phi}{2} < q \leq -\frac{\phi}{2} \\ 1 & q > -\frac{\phi}{2}. \end{cases}$$

As in Dow et al. (2017), the assumption that speculators are risk-neutral and too small to directly impact the price implies that they trade the maximum size possible. A speculator that receives a signal $\sigma_i = 0$ believes that the firm's stock is overvalued and submits an order of -1. A speculator that receives a signal $\sigma_i = 1$ believes that the firm's stock is undervalued and submits an order of 1. The law of large numbers implies that when $A = 0$, the fraction of speculators receiving a bad signal ($\sigma_i = 0$) $\frac{1}{2} + \frac{\phi}{4}$ and the fraction of them receiving a good signal ($\sigma_i = 1$) is $\frac{1}{2} - \frac{\phi}{4}$. In total, the speculators submit a net order of $(\frac{1}{2} + \frac{\phi}{4})(-1) + (\frac{1}{2} - \frac{\phi}{4})(1) = -\frac{\phi}{2}$ when $A = 0$. Following the same logic, the speculators submit a net order of $\frac{\phi}{2}$ when $A = 1$.

Lemma 1 implies that the speculators' total expected trading profit is given by:

$$\begin{aligned} \Pi_0(\theta, \phi) = (1 - \theta)\left(-\frac{\phi}{2}\right)\Big[\phi(0 - 0) + (1 - \phi)(0 - \theta)\Big] + \\ \theta\left(\frac{\phi}{2}\right)\Big[(1 - \phi)(1 - \theta) + \phi(1 - 1)\Big] \\ = \theta(1 - \theta)\phi(1 - \phi). \end{aligned} \tag{1}$$

Note that $\theta(1-\theta)$ captures the variance of the fundamental value of the firm's assets. As in standard Kyle (1985)-type frameworks, (1) implies that the speculators' total expected trading profits increase in the variance of the firm's fundamentals, $\theta(1 - \theta)$.

Buybacks introduce two economic forces to trading at $t = 1$. The first involves competition, which is a robust feature of Kyle (1985)-type frameworks. The second deals with the dispersion of the firm's per-share value across different payoff states and is novel to this setting.

3.1 Competition Effect

To explore the competition effect, it is convenient to first describe the equilibrium outcomes of trading at $t = 1$ when buy orders from an additional informed party are introduced. Suppose that this additional informed party trades on a personal account, submitting a buy order of B shares with probability 1 when $A = 1$ and a buy order of B shares with probability $1 - \gamma$ when $A = 0$. The parameter γ captures the precision of the information about the value of A contained in this additional informed party's buy orders. For instance, when $\gamma = 0$, the additional informed party always buys B shares; hence, those buy orders are uninformative. At the other extreme, when $\gamma = 1$, this additional informed party submits a buy order only when $A = 1$, making those buy orders fully informative about the realized value of A. It can be shown that the equilibrium pricing rule in this scenario is:

$$P_a(q) = \begin{cases} 0 & q \leq -1 + B + \frac{\phi}{2} \\ \theta & -1 + B + \frac{\phi}{2} < q \leq -\frac{\phi}{2} \\ \frac{\theta}{1-\gamma(1-\theta)} & -\frac{\phi}{2} < q \leq B - \frac{\phi}{2} \\ 1 & q > B - \frac{\phi}{2}. \end{cases} \tag{2}$$

The pricing rule in (2) implies that the speculators' total expected trading profits in this scenario can be expressed as

$$\begin{aligned}\Pi_a(\theta,B,\gamma) = (1-\theta)\gamma\left(-\frac{\phi}{2}\right)&\Big[(B+\phi)(0-0)+(1-B-\phi)(0-\theta)\Big]+\\ (1-\theta)(1-\gamma)\left(-\frac{\phi}{2}\right)&\left[(1-B-\phi)(0-\theta)+B\left(0-\frac{\theta}{1-\gamma(1-\theta)}\right)\right]+\\ \theta\left(\frac{\phi}{2}\right)&\left[(1-B-\phi)(1-\theta)+B\left(1-\frac{\theta}{1-\gamma(1-\theta)}\right)+\phi(1-1)\right]\\ =\theta\phi&\left[(1-B-\phi)(1-\theta)+B\left(1-\frac{\theta}{1-\gamma(1-\theta)}\right)\right].\end{aligned} \tag{3}$$

Let C be the change in the speculators' total expected trading profits due to competition from the additional informed buys of size B and precision γ:

$$C(\theta,B,\gamma) = \Pi_a(\theta,B,\gamma) - \Pi_0(\theta,B,\gamma). \tag{4}$$

Lemma 2 *$C(\theta,B,\gamma)$, the change in the speculators' total expected trading profits due to the additional informed buys of size $B>0$ and precision γ is negative if and only if $\gamma>0$. The magnitude of this change increases in γ.*

When the additional buy orders are uninformative ($\gamma = 0$), they do not change the expected price at which the speculators execute their trades. Consequently, additional uninformative buy orders do not affect the speculators' total expected trading profits. However, when the additional buy orders are informative ($\gamma > 0$), they intensify the competition for trading profits. When $A = 1$, the additional informed buy order increases the expected price paid by speculators for their buy orders. When $A = 0$, the absence of additional buy orders lowers the expected price received by the speculators' for their short-sell orders. On average, the additional informed buy orders make the aggregate order flow more informative about A, which reduces the information asymmetry in trading and lowers the speculators' total expected trading profits. This effect is stronger when the additional buy orders contain more information. The results of Lemma 2 are broadly consistent with previous papers studying competition between informed traders in a Kyle (1985)-type framework (see for example Admati and Pfleiderer (1988), Holden and Subrahmanyam (1992), Foster and Viswanathan (1993), Back et al. (2000)).

3.2 Dispersion Effect

Speculators transact using private accounts and personally bear the gains and losses of their trades. Their trading activities alter the composition of the firm's shareholders, but do not directly affect the per-share value of the firm.[7]

In contrast, the manager executes buybacks on behalf of the firm. The trading gains and losses stemming from buybacks accrue to the firm's remaining shareholders. When the firm's fundamentals are high relative to the market's expectations, its shares are undervalued. The buyback of undervalued shares earns a trading profit, which increases the per-share liquidation value of the firm. When the firm's fundamentals are low relative to the market's expectations, its shares are overvalued. The buyback of overvalued shares incurs a trading loss, which decreases the per-share liquidation value of the firm. As a result, buybacks, unlike the trades of speculators, tend to increase the dispersion of the per-share value of the firm across different payoff states, increasing the per-share value of the firm when its fundamentals are high and decreasing the per share-value of the firm when its fundamentals are low.

The manager's buyback implementation strategy is summarized by $b(\sigma_m)$, which specifies the probability with which the manager executes the buyback conditional on receiving the signal σ_m. The following describes the trading equilibrium at $t = 1$ given that the manager's buyback implementation strategy is $b(0) = 1 - \gamma$ and $b(1) = 1$.

[7] Financial feedback models are exceptions. For instance, in Goldstein and Guembel (2008), the manager extracts information from prices and uses that information to make real decisions. When misinformation becomes incorporated in prices, the manager makes suboptimal decisions, which lowers payouts. See Bond et al. (2012) for a survey of feedback models. The mechanism in feedback models differs from that in this analysis because the manager in this setting does not make any real investment decisions following the trading game. The change in the distribution of payouts to shareholders in this analysis stems entirely from realized trading profits.

Lemma 3 *Given that the manager's buyback implementation strategy is* $b(0) = 1 - \gamma$ *and* $b(1) = 1$*, the trading equilibrium is given by the trading strategies* $a_i(0) = 0$ *and* $a_i(1) = 1$ *for all* $i \in [0, 1]$ *and a pricing rule:*

$$P(q) = \begin{cases} 0 & q \leq -1 + B + \frac{\phi}{2} \\ \frac{\theta}{1 - B\gamma(1-\theta)} & -1 + B + \frac{\phi}{2} < q \leq -\frac{\phi}{2} \\ \frac{\theta}{1-\gamma(1-\theta)} & -\frac{\phi}{2} < q \leq B - \frac{\phi}{2} \\ 1 & q > B - \frac{\phi}{2}. \end{cases} \tag{5}$$

Buybacks affect the per-share value of the firm at $t = 2$, which reflects the firm's fundamentals as well as the profits and losses from the buyback program. Suppose that $A = 1$ and that the manager executes the buyback at a price P. In this case, the per-share value of the firm at $t = 2$ is given by

$$V_1(P) = \frac{\overbrace{1}^{\text{fundamental value}} - \overbrace{BP}^{\text{cost of buybacks}}}{\underbrace{1 - B}_{\text{remaining shares}}} \geq 1,$$

with strict inequality if $P < 1$. In contrast, when $A = 0$ and the manager executes the buyback at a price P, the per-share value of the firm at $t = 2$ is given by

$$V_0(P) = \frac{\overbrace{0}^{\text{fundamental value}} - \overbrace{BP}^{\text{cost of buybacks}}}{\underbrace{1 - B}_{\text{remaining shares}}} \leq 0,$$

with strict inequality if $P > 0$. Note that $V_0(P)$ may be negative due to the normalization of A_L and A_H to 0 and 1, respectively.

For algebraic convenience, let $p_0 = \frac{\theta}{1-B\gamma(1-\theta)}$ and $p_1 = \frac{\theta}{1-\gamma(1-\theta)}$. Lemma 3 implies that the speculators' total expected trading profits in an equilibrium featuring a buyback program can be expressed as

$$\begin{aligned}\Pi_B(\theta,B,\gamma) = \; & (1-\theta)\gamma\left(-\frac{\phi}{2}\right)\Big[(1-B-\phi)(0-\theta)\Big]+ \\ & (1-\theta)(1-\gamma)\left(-\frac{\phi}{2}\right)\Big[(1-B-\phi)\left(V_0(p_0)-p_0\right)+B\left(V_0(p_1)-p_1\right)\Big]+ \\ & \theta\left(\frac{\phi}{2}\right)\Big[(1-B-\phi)(V_1(p_0)-p_0)+B(V_1(p_1)-p_1)\Big] \\ = \; & \theta\phi\left[(1-B-\phi)\frac{1-p_0}{1-B}+B\frac{1-p_1}{1-B}\right].\end{aligned} \tag{6}$$

The manager in the equilibrium identified by Lemma 3 trades in the same way as the additional informed party in Section 3.1. Moreover, their trades have the same information content. Consequently, the difference between the equilibrium featuring a buyback program and one featuring additional buy orders from another informed party isolates the effect stemming from the increased dispersion in the firm's per-share value. Let D be the change in the speculators' total expected trading profits due to the dispersion effect:

$$D(\theta,B,\gamma)=\Pi_B(\theta,B,\gamma)-\Pi_a(\theta,B,\gamma). \tag{7}$$

Lemma 4 *$D(\theta,B,\gamma)$, the change in the speculators' total expected trading profits due to the increased dispersion of the firm's per-share value, is strictly positive. The magnitude of this change decreases in γ.*

Buybacks make the per-share value of the firm at $t=2$ higher when shares are undervalued at $t=1$; they make the per-share value of the firm at $t=2$ lower when shares are overvalued at $t=1$. The increased dispersion of the firm's per-share value across different realizations of firm fundamentals makes the speculators' private information about the firm's fundamentals more valuable for trading. The smaller γ is, the more often the manager buys back overvalued shares at $t=1$, which magnifies the dispersion effect. One implication of Lemma 4 is that the dispersion effect operates even when buybacks are uninformed ($\gamma = 0$).

It is worth noting that the existence of a dispersion effect does not hinge on restrictions against informed selling by the firm. If firms were allowed to sell over-valued shares, via shelf registration for example, the model would still feature a dispersion effect as long as the firm realizes more trading profits per share when firm fundamentals are high than when they are low. This condition is likely satisfied because informed selling by the firm dilutes trading profits while informed buying by the firm concentrates them. Thus, the firm's informed trading does not need to be entirely one sided for the model to generate a dispersion effect.

3.3 Total Effect

The net effect of a buyback program on the speculators' total expected trading profits depends on relative magnitudes of the economic forces highlighted in the two previous subsections. Let $\Delta\Pi$ be the change in the speculators' total expected trading profits due to a buyback program:

$$\Delta\Pi(\theta, B, \gamma) = \Pi_B(\theta, B, \gamma) - \Pi_0(\theta, B, \gamma).$$

It is convenient to decompose $\Delta\Pi$ into the two effects described in Sections 3.1 and 3.2:

$$\begin{aligned} \Delta\Pi(\theta, B, \gamma) &= \Pi_B(\theta, B, \gamma) - \Pi_0(\theta, B, \gamma) \\ &= \underbrace{\Pi_B(\theta, B, \gamma) - \Pi_a(\theta, B, \gamma)}_{\text{Dispersion } (D(\theta,B,\gamma))} + \underbrace{\Pi_a(\theta, B, \gamma) - \Pi_0(\theta, B, \gamma)}_{\text{Competition } (C(\theta,B,\gamma))}. \end{aligned} \tag{8}$$

Proposition 1 *Buybacks reduce the speculators' total expected trading profits if and only if buybacks are sufficiently informative:*

$$\Delta\Pi(\theta, B, \gamma) < 0 \Leftrightarrow \gamma > \underline{\gamma} \text{ for some } \underline{\gamma} \in (0, 1).$$

Proposition 1 implies that uninformed buybacks ($\gamma = 0$) always increase the speculators' total expected trading profits because $\underline{\gamma}$ is strictly bounded below by 0. As noted in the discussion in Section 3.1, the speculators face increased competition for trading profits from the additional buy orders only if the buy orders are informed ($\gamma > 0$). In contrast, Section 3.2 notes that the dispersion effect is maximized when buybacks are uninformed. Hence, when $\gamma = 0$, speculators benefit from the increased dispersion in the per-share value of the firm without facing additional competition for trading profits.

The magnitude of the competition effect strictly increases in γ (Lemma 2), while that of the dispersion effect strictly decreases in γ (Lemma 4). Consequently, the competition effect dominates and buybacks decrease the speculator's expected trading profits only when buybacks are sufficiently informative.

The literature on buybacks often emphasizes how informed managerial trading via buybacks increase adverse selection costs in the secondary market for the firm's shares (e.g., Barclay and Smith 1988, Brockman and Chung 2001). That conventional view suggests that the firm could minimize the adverse costs due to buybacks by committing to not use the manager's private information in the implementation of buybacks. However, this view is incomplete. Uninformed buybacks certainly minimize the adverse costs due to informed managerial trading. However, as Proposition 1 highlights, uninformed buybacks magnify the adverse selection costs due to the informed trading of existing speculators. A more complete view how buybacks affect adverse selection costs should account for this trade-off.

Buybacks also influence the expected return of the firm's stock from $t = 1$ to $t = 2$ because they affect the stock's expected price in both periods. Let R_0 be the expected return of the firm's stock from $t = 1$ to $t = 2$ in the absence of a buyback program. The equilibrium conditions of trading at $t = 1$ implies that $R_0 = 0$. Suppose a buyback program is authorized by the firm's shareholders at $t = 0$. Let P_1 and P_2 represent the price of the firm's stock at $t = 1$ and $t = 2$, respectively. Let R_B be the expected return of the firm's stock from $t = 1$ to $t = 2$ if the buyback program is executed:

$$R_B = \frac{E[P_2|\text{buyback executed}]}{E[P_1|\text{buyback executed}]}. \tag{9}$$

Let R_{NB} be the expected return of the firm's stock from $t = 1$ to $t = 2$ if the buyback program is not executed:

$$R_{NB} = \frac{E[P_2|\text{buyback not executed}]}{E[P_1|\text{buyback not executed}]}. \tag{10}$$

The given buyback strategy $\{b(0) = 1 - \gamma, b(1) = 1\}$, along with the assumption that σ_m is perfectly correlated with the firm's fundamentals, implies that the manager refrains from buying back the firm's stock only when the realized value of the firm's fundamentals is low. Without buybacks, the firm's stock price at $t = 2$ depends only on the realized value of its fundamentals, i.e., $E[P_2|\text{buyback not executed}] = 0$. Because the order flow is not fully revealing in equilibrium, $E[P_1|\text{no buyback}] > 0$. Hence, the expected return of the firm's stock following no buybacks is always negative.[8]

Proposition 2 *The expected return of the firm's stock from $t = 1$ to $t = 2$ following completed buybacks is positive for $\gamma > 0$ and increases in γ.*

First, more informative buybacks are associated with higher fundamentals, which imply higher prices at $t = 2$ once the fundamental value of firm becomes public. Second, more informative buybacks are more likely to earn trading profits, which raise the per-share value of the firm at $t = 2$. In expectation, more informative buybacks also increase the price at $t = 1$. Intuitively, however, the effect of increased precision on the expected price at $t = 1$ following completed buybacks is smaller than the effect on prices at $t = 2$ because

[8] The normalization of A_L to 0 results in a gross return of 0 independent of γ. However, in general $E[P_2|\text{buyback not executed}] = A_L > 0$ and $E[P_1|\text{buyback not executed}]$ increases in γ due to expected trading profits from buybacks. Hence, the expected return of the firm's stock from $t = 1$ to $t = 2$ following no buybacks declines in γ.

prices at $t = 1$ do not always fully incorporate the information contained in buybacks. The prediction of a positive association between the informativeness of buybacks and subsequent returns is consistent with Bonaime and Ryngaert (2013), which documents higher stock returns following actual buybacks when the firm's insiders and the buyback program trade in the same direction.

4 Buyback Implementation

This section analyzes the manager's buyback implementation strategy given that the shareholders authorized a buyback program of size B at $t = 0$. Recall that P_1 and P_2 represent the prices of the firm's stock at the end of $t = 1$ and $t = 2$, respectively. Because the manager's compensation is assumed to be increasing and linear in P_1 and P_2, the manager's utility can be written as

$$U = \lambda P_1 + P_2.\text{[9]} \tag{11}$$

After the manager learns that $\sigma_m = 1$, executing the buyback is a dominant strategy. Buying back B shares strictly increases the firm's stock price at $t = 1$ because the equilibrium order flow is always informative due to the presence of speculators. In addition, executing buybacks when $\sigma_m = 1$ results in positive expected trading profits, which increase the expected price of the firm's stock at $t = 2$. Hence, upon learning that $\sigma_m = 1$, the manager always executes the buyback because it unambiguously increases the manager's expected utility.

After learning that $\sigma_m = 0$, the manager can choose to execute the buyback with some probability. Taking the pricing rule from Lemma 3 with an arbitrary $\gamma \in [0, 1]$ as given, let U_0 and U_1 be the manager's expected utility from strategies $b(0) = 0$ and

[9] This expression of U assumes that the contract's loading on P_2 is strictly positive. If the loading on P_2 were 0, then the manager always executes the buybacks regardless of the realized value of σ_m.

$b(0) = 1$, respectively:

$$U_0 = (1 - B - \phi)(\lambda p_0 + 0),$$
$$U_1 = (1 - B - \phi)(\lambda p_0 + V_0(p_0)) + B(\lambda p_1 + V_0(p_1)).$$

where

$$p_0 = \tfrac{\theta}{1-B\gamma(1-\theta)},$$

and

$$p_1 = \tfrac{\theta}{1-\gamma(1-\theta)}.$$

Upon learning that $\sigma_m = 0$, the manager faces a trade-off. On the one hand, executing the buyback increases the expected price of the firm's stock at $t = 1$, which increases the first component of managerial compensation. On the other, the buyback of overvalued shares results in trading losses that lower the expected price of the firm's stock at $t = 2$, which decreases the second component of managerial compensation. The manager's incentive to buy back overvalued shares is captured by the difference between U_1 and U_0:

$$\begin{aligned}
\Delta U &= U_1 - U_0 \\
&= (1 - B - \phi)V_0(p_0) + B(\lambda p_1 + V_0(p_1)) \\
&= \underbrace{\left(\frac{B}{1+B}\right)}_{>0} \Big[(\lambda(1 - B) - B)p_1 - (1 - B - \phi)p_0\Big], \qquad (12) \\
&= \underbrace{\left(\frac{B}{1+B}\right)}_{>0} \Big[(\lambda(1 - B) - B)p_1 - (1 - B - \phi)p_0\Big].
\end{aligned}$$

When ΔU is positive, the manager strictly prefers to execute the buyback. When ΔU is negative, the manager strictly prefers to not execute the buyback. When ΔU is zero, the manager is indifferent and plays a mixed strategy, which involves executing the buyback with probability $b(0) \in (0, 1)$.

It is convenient to express the manager's buyback strategy as $b(0) = 1 - \gamma$, where γ captures the precision of information contained in buybacks. The following proposition summarizes the manager's equilibrium buyback implementation strategy.

Proposition 3 *When the manager learns that* $\sigma_m = 1$*, the manager executes the buyback with certainty:* $b(1) = 1$*. When the manager learns that* $\sigma_m = 0$*, the manager executes the buyback with probability* $b(0) = 1 - \gamma^*$*, where*

$$\gamma^* = \begin{cases} 1 & \lambda \leq \underline{\lambda} \\ \frac{1-\eta}{1-B\eta}\frac{1}{1-\theta} & \lambda \in (\underline{\lambda}, \bar{\lambda}) \\ 0 & \lambda \geq \bar{\lambda}, \end{cases}$$

$$\eta = \frac{\lambda(1-B)-B}{1-B-\phi},$$

and

$$0 < \frac{\theta(1-B-\phi)+B(1-B(1-\theta))}{(1-B)(1-B(1-\theta))} = \underline{\lambda} < \bar{\lambda} = \frac{1-\phi}{1-B}.$$

Equation (12) implies that ΔU is signed by $(\lambda(1-B)-B)p_1 - (1-B-\phi)p_0$. The parameter λ captures the relative weight of the manager's compensation based on the firm's stock price at $t = 1$. Larger values of λ corresponds to a compensation contract that more heavily weighs the stock price at $t = 1$, which increases the incentive of the manager to buy back overvalued shares. For values of λ that are sufficiently small ($\lambda \leq \underline{\lambda}$), the manager has little incentives to buy back overvalued shares because most of the manager's compensation is based on the firm's stock price at $t = 2$. However, as λ becomes larger, the manager is increasingly motivated to push up the stock price at $t = 1$ in order to maximize expected managerial compensation. The precision of the information contained in the manager's buyback orders, γ^*, continuously declines in λ in this intermediate range. Finally, for values of λ that are sufficiently large ($\lambda \geq \bar{\lambda}$), most of the manager's compensation is based on the firm's stock price at $t = 1$. The myopia induced by the managerial compensation contract leads the manager to push up the firm's stock price at $t = 1$ by always executing buybacks even when the firm's shares are overvalued. The predictions of Proposition 3 are consistent with the empirical evidence. For example, Chen and Wang (2012) documents a correlation between the amount of vested in-the-money options held by the manager and value-destroying buybacks.[10]

The comparative statics for the manager's equilibrium buyback implementation strategy provides some insights into the relationship between the structure of managerial compensation, the profitability of informed trading for speculators, and the returns for the firm's stock following completed buybacks.

4.1 Buyback Size

The size of the buyback program changes the relative costs and benefits to the manager of buying back overvalued shares. A larger buyback program distributes a given quantity of trading losses among a smaller number of shares outstanding. The increased concentration of trading losses amplifies the reduction in the firm's stock price at $t = 2$ and the component of managerial compensation based on that price. The increased cost to the manager of buying back overvalued shares make such buybacks less likely.

Proposition 4 *Larger values of B decrease the likelihood that the manager buys back over-valued shares and increase the precision of information contained in buybacks in equilibrium.*

Proposition 4 states that larger buybacks are more likely to reflect the manager's private information. Proposition 2 notes that more informative buybacks are associated with higher stock returns after completed buybacks. Together, these propositions predict that larger buyback programs are associated with higher stock returns following completed

[10] The authors of that work attribute the correlation to managerial hubris rather than to an agency conflict.

buybacks, consistent with the empirical evidence (e.g., Chan et al. 2004).

4.2 Firm Fundamentals

Better firm prospects, captured by higher values of θ, increase the expected price of the firm's stock at $t = 1$. A higher expected price for the firm's stock at $t = 1$ increases the cost of buying back overvalued shares. As a result, the manager is less likely to buy back overvalued shares when firm prospects are better.

Proposition 5 *Better firm prospects decrease the likelihood that the manager knowingly buys back overvalued shares and increase the precision of information contained in buybacks:*

- $\underline{\lambda}$ *increases in* θ,
- $\bar{\lambda}$ *is independent of* θ,
- γ^* *increases in* θ *for* $\lambda \in (\underline{\lambda}, \bar{\lambda})$.

4.3 Speculator's Private Information

One determinant of liquidity, defined here as the average price sensitivity to order flow, is the precision of the speculators' private information. As in conventional Kyle (1985)-type models, this measure of liquidity increases in the amount of private information the speculator is expected to have, which is captured by the parameter ϕ.

Proposition 6 *An increase in the precision of the speculators' private information increases the likelihood that the manager knowingly buys back overvalued shares and decrease the precision of information contained in buybacks:*

- $\underline{\lambda}$ *decreases in* ϕ,
- $\bar{\lambda}$ *decreases in* ϕ,

- γ^* *decreases in* ϕ *for* $\lambda \in (\underline{\lambda}, \bar{\lambda})$.

Larger values of ϕ correspond to an equilibrium pricing rule that is more responsive to the aggregate order flow. The increased price-order flow sensitivity makes it easier for the manager to push up stock prices at $t = 1$, which drives the manager to buy back overvalued shares with a greater probability.

5 Shareholder Welfare

This section analyzes the effect of a buyback authorization on shareholder welfare. To simplify the analysis, I make two simplifying assumptions. First, noise trade at $t = 1$ stem entirely from the liquidity needs of existing shareholders at $t = 0$. Prior to the trading game at $t = 1$, a fraction z of the firm's homogeneous shareholders learn that they will die at the end of the period and so must liquidate their holdings for immediate consumption. Second, the expected payoff of shareholders at $t = 0$ is well approximated by the payoff they receive from owning the firm's shares.

Let W_B and W_0 be the expected payoff of the firm's shareholders at $t = 0$ with and without a buyback authorization, respectively. In the absence of a buyback authorization, the trading equilibrium at $t = 1$ is characterized by the benchmark case given in Lemma 1. Once a buyback program is authorized, the trading equilibrium is characterized by Lemma 3 and Proposition 3. Consequently, W_0 and W_B can be expressed as

$$W_0 = E_0[A] - E_0[\Pi_0] \tag{13}$$

and

$$W_B = E_0[A] - E[\Pi_m]. \tag{14}$$

The change in the speculators' total expected trading profits due to buybacks serves as a sufficient statistic for the change in the expected payoff of the firm's shareholders at

$t = 0$ due to the authorization of a buyback program:

$$\Delta W = W_B - W_0 = E[\Pi_0] - E[\Pi]_m = -\Delta\Pi. \tag{15}$$

Equation (15) implies that the authorization of a buyback program at $t = 0$ increases the expected payoff of shareholders if and only if the change in the speculators' total expected trading profits due to a buyback program is negative ($\Delta\Pi < 0$).

5.1 Patterns of Buyback Authorizations

Proposition 1 implies that shareholders who maximize their expected payoffs follow a cut-off rule in making the buyback authorization decision. They authorize a buyback program at $t = 0$ if and only if the precision of information contained in buybacks in equilibrium exceeds the threshold in Proposition 1.

Proposition 4 predicts that, all else equal, the precision of information contained in buybacks increase in the size of buybacks. This result implies that the parameter region over which buybacks decrease the speculators' total expected trading profits grows as B increases.

Corollary 1 *Buyback authorizations are likely to be large.*

The prediction that buyback authorizations are likely to be large is consistent with the substantial size of most buyback programs, with the typical authorization allowing for the buyback of 6 to 8 percent of shares outstanding (Jagannathan and Stephens 2003, Chan et al. 2004, Bonaimé 2015, Hillert et al. 2016).

Proposition 5 predicts that buybacks are more informative when firm prospects are better. Hence, the parameter region over which buybacks decrease the speculators' total expected trading profits grows as θ increases.

Corollary 2 *Buyback authorizations are more likely when firm prospects are high.*

The prediction that a buyback authorization is more likely in good times when the firm's prospects are better is consistent with the pro-cyclical patterns of aggregate buyback authorizations documented by Jagannathan et al. (2000) (see Dittmar and Dittmar (2008) for similar evidence).

Proposition 6 predicts that buybacks are more informative when the precision of the speculators' private information is low. Hence, the parameter region over which buybacks decrease the speculator's expected trading profits grows as ϕ decreases.

Corollary 3 *Buyback authorizations are more likely when the precision of the speculators' private information is low.*

The crux of the result in Corollary 3 is that increased liquidity in the secondary market for the firm's stock makes it harder for the manager to push up the stock price by buying back overvalued shares. Consistent with this prediction, Brockman et al. (2008) document that firms with more liquid stocks are more likely to authorize a buyback program.

Proposition 3 implies that the manager's buyback implementation strategy does not respond to changes in the size of the buyback authorization, the firm's prospects, or the precision of the speculators' private information when the manager's compensation is heavily tilted towards either the short-run or long-run performance of the firm's stock price. For instance, in the extreme when $\lambda = 0$, the manager is only paid based on the firm's stock price at $t = 2$. In this case, it is optimal for the manager to never buy back overvalued shares ($\gamma^* = 1$) regardless of the size of the buyback program, the firm's prospects, and the precision of the speculators' private information. Hence, the patterns of buyback authorization identified by Corollary 1, 2, and 3 should be more pronounced for firms with managerial compensation contracts that balance the rewards for the firm's stock price performances in the short-run and in the long-run. To my knowledge, no work has empirically explored this linkage between the structure of managerial compensation and the patterns of buyback authorizations.

5.2 Disclosure of Information

In this setting, the authorization of a buyback program can increase the expected payoff of shareholders because it mitigates the information asymmetry problem in the secondary market for the firm's shares. Naturally, one wonders whether the firm can also mitigate the information asymmetry problem via disclosures.

To begin, suppose the firm can commit to the truthful disclosure of the manager's private information at $t = 1$. Because the manager's signal perfectly reveals the fundamental value of the firm, its disclosure fully eliminates any information asymmetry during trading at $t = 1$ and reduces the total expected trading profits of speculators to 0. In contrast, buybacks, even when they are fully informative ($\gamma^* = 1$), do not fully reveal the manager's private information about the value of A. Some degree of information asymmetry about the firm's fundamentals remains in expectation, allowing the speculators to profit from their private information. Moreover, buybacks have a dispersion effect that increases the value of private information. Thus, compared to a buyback authorization, a commitment to truthfully reveal private information serves as a superior tool for mitigating information asymmetry.

However, the truthful disclosure of private information by the manager is not incentive compatible if the manager cares at all about the firm's stock price in the short run. Consider the case of $\lambda > 0$, which corresponds to a contract that pays the manager any positive amount based on the short-term performance of the firm's stock. Recall from the discussion in Section 4, the manager refrains from buying back overvalued shares because the trading losses from these buybacks would decrease the per-share value of the firm in the future, which decreases the component of the manager's compensation based on long-term stock performance. The manager does not face an equivalent trade-off in making the disclosure decision. Announcing $\sigma_m = 1$ is a strictly dominant strategy. In this scenario, a signal jamming equilibrium prevails. The manager always announces $\sigma_m = 1$ but the announcement does not change the priors of any market participant.

The speculators' total expected trading profits remain as they were in the benchmark case.

6 Conclusion

This paper analyzes buybacks in a parsimonious market micro-structure model with many informed parties. It shows that when informed trading is already present, a buyback program can increase the expected payoff of shareholders by allowing the privately informed manager to compete against other informed traders.

However, this framework differs from conventional Kyle (1985)-type models with many informed traders because it features the manager trading on behalf of the firm. Because the trading gains and losses of buybacks accrue to the firm's remaining shareholders, buyback endogenously alter the per-share value of the firm. In particular, buybacks tend to increase the firm's per-share value when its fundamentals are high and decrease its per-share value when its fundamentals are low. This increased dispersion of the firm's per-share value across different realizations of the firm's fundamentals makes informed trading more profitable.

The effect of buybacks on trading outcomes depends on the interaction between the opposing forces of competition and dispersion. This paper characterizes the conditions under which one force dominates the other. In particular, the effects of competition dominate those of dispersion only when buybacks are sufficiently informed. However, the manager's buyback implementation strategy does not necessarily maximize the information content of buybacks. Instead, the manager executes buybacks in a way that maximizes managerial compensation. This agency problem constrains how much buybacks reflect the manager's private information and limits the effects of competition.

This paper highlights a connection between the structure of managerial compensation and the effects of buybacks on trading outcomes. The model provides novel testable implications which link the structure of the manager's compensation contract, the buyback authorization decision, and the effect of buybacks on trading outcomes. In addition, the economic forces highlighted by the paper's main results suggest that the firm can use its payout policy to provide incentives or disincentives for speculators to collect additional information about the firm, which may be useful in guiding investments. These economic forces suggests that additional linkages between the firm's payout policy and its investment decisions exist and remain under-explored.

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