

# Disclosure Regulation, Myopic Pressures and Managerial Signalling: Evidence from Changes in Mutual Fund Reporting Frequency\*

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## Abstract

A stated cost of frequent disclosures is that it creates pressures from investors to report better short-run performance and forces managers to behave myopically. Can managers resist such pressures by signaling long-term value? Using a 2004 SEC regulation that required more frequent disclosures by mutual funds and has been shown by prior research to induce corporate myopia, we find an increase in both the intensity and profitability of net share purchases by managers. In cross-sectional tests, we find that this effect is stronger for firms that undertook larger investments immediately prior to 2004 and is weaker for firms whose CEOs are more susceptible to myopic pressures. Moreover, this effect is not driven by liquidity changes or changes in the opportunities for insiders to learn from fund disclosures. While greater profitability could reflect insiders' opportunism, our findings are consistent with insider trading by managers to lean against short-term pressures exerted by myopic investors affected by the SEC regulation.

*JEL Classification:* G23, G28, G30, G34, G38

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# Disclosure Regulations, Myopic Pressures and Managerial Signalling: Evidence from Changes in Mutual Fund Reporting Frequency

## 1. INTRODUCTION

Disclosure regulations are aimed at improving capital allocation, investment efficiency and promoting economic growth (see Leuz and Wysocki, 2016, for a review). However, a recently prominent and debated shortcoming of public ownership of firms and frequent disclosures is the short-term bias that such disclosures are said to induce.<sup>1</sup> The “myopia hypothesis” posits that managers of public firms forgo profitable, long-term investment opportunities because of pressure from institutional investors to improve short-term financial results. That is, shareholders undervalue long-term projects (Poterba and Summers, 1995). Alluding to this pressure, CEOs of public firms report that they would avoid initiating a profitable long-term project to meet short-run earnings forecasts (Graham, Harvey and Rajgopal, 2005). Under this narrative, an increase in mandated disclosures of performance of either firms or of asset managers, who hold shares of firms, can lead to increased fixation on near term performance metrics that get reported and can increase myopic behavior. Such arguments have proven highly influential and have led to several policy proposals to alter the frequency of reporting.<sup>2</sup>

Far less attention has been given to the argument that any disclosure-regulation driven myopic pressures from institutional investors does not have to entail short-term behavior by

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<sup>1</sup> An August 15, 2015 article in *The Economist* provides a representative example. See <http://www.economist.com/news/finance-and-economics/21661027-short-termism-may-be-caused-wayinvestors-employ-fund-managers-new>.

<sup>2</sup> For example, SEC Chairman Jay Clayton released a public statement on May 20, 2019 titled “Statement Announcing SEC Staff Roundtable on Short-Term / Long-Term Management of Public Companies, Our Periodic Reporting System and Regulatory Requirements”. See <https://www.sec.gov/news/public-statement/clayton-announcement-short-long-term-management-roundtable>. In the opening remarks, Chairman Clayton urged observers to ponder on the question: “... does the frequency of our disclosure framework allow companies to focus on the long term performance of their businesses or duly result in quarter to quarter management?”

managers. The myopia hypothesis rests on a critical assumption that profit potential from corporate investments may take a long time to reflect in the earnings and stock prices of investee firms and that managers may not be able to communicate the long-term value of the project to investors, perhaps because the information is soft in nature. However, the literature has not evaluated whether managers have the ability to lean against the wind and provide costly signals, such as through insider trades, to communicate future prospects of their investments. If managers can credibly signal long-term prospects of their corporate investments through insider trades, it could help alleviate investors' myopic pressures.

The notion that managers purchase shares of their company to signal value is supported by anecdotal evidence. For example, in May 2019, the CEOs of Macy's, Continental Resources, Bunge, CenturyLink and Cognizant Technology Solutions all bought shares of their firms on the open market after these firms experienced sharp declines in their stock prices. Moreover, the CEO of CenturyLink said the stock purchase highlights his belief in the business and that they are "doing the right things to create long-term shareholder value".<sup>3</sup> Similarly, Deutsche Bank has been under intense pressure from investors and analysts to improve performance, with its share price hitting record lows in 2019. While facing such pressure to quickly improve performance, the new CEO of Deutsche Bank, Christian Sewing, has stated that he is personally buying shares in order to "lead by example and to put money where his mouth is".<sup>4</sup>

In this study, we ask whether and to what extent managers use costly signaling to avert investor-driven myopia following changes in disclosure regulations. To examine this question

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<sup>3</sup> <https://www.barrons.com/articles/ceos-of-macys-centurylink-and-3-others-bough-up-their-companys-stock-51558721615>

<sup>4</sup> <https://www.bloomberg.com/news/articles/2019-07-08/deutsche-bank-ceo-says-he-s-putting-my-money-where-my-mouth-is>

empirically, we require a disclosure regulation setting that resulted in an unambiguous, identifiable increase in myopic behavior by institutional investors. We overcome this challenge by focusing on a disclosure regulation that altered ownership disclosures by mutual funds.<sup>5</sup> Our focus on ownership disclosures by mutual funds is motivated by prior research that suggests that money managers' short-term focus stems from their career concerns (e.g., Shleifer and Vishny 1990) and that greater transparency about their portfolio choices can amplify these concerns. We study a 2004 U.S. Securities Exchange Commission (SEC) ruling (SEC Rule 30b1-5) that altered the frequency with which registered investment management firms (i.e., mutual funds) are required to report their portfolio holdings (hereafter, the SEC regulation).<sup>6</sup> This ruling, effective from May 2004, increased the frequency with which mutual funds have to provide portfolio holdings to their fund investors from semi-annual to quarterly. These reports, which have to be filed within 60 days of the end of a period, provide information about a mutual fund's portfolio holdings and are one of the primary means by which a fund provides periodic information to its investors. A prime motive for this more frequent disclosure requirement is that it will allow fund investors to make more informed asset allocation decisions by revealing portfolio overlaps across funds and exposing deviations in portfolio holdings from the fund's stated investment objectives.

This setting offers several advantages to examine the research question of this study. Among the mandatory disclosure requirements on institutional investors, those on mutual funds

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<sup>5</sup> An increase in the investee firm's reporting frequency is not an ideal setting for our study because the underlying reasons for any observed myopic behaviour are ambiguous. Specifically, it could be either be due to managers' succumbing to pressures from investors or due to opportunistic behaviour by managers, who are worried about their compensation or have career concerns.

<sup>6</sup> The other important disclosure requirement, Section 13(f) of the 1934 Securities Exchange Act, requires mutual fund companies to disclose their aggregate holdings (at the company level) on a quarterly basis in Form 13F, with no more than a 45-day delay. The disclosure requirement we examine typically results in much more detailed information about the investment of mutual funds than that provided by the Form 13F. Moreover, the Form 13F has always been required on a quarterly basis and there has been no regulatory change in the frequency of mandatory disclosure in these filings.

result in perhaps the most detailed information about portfolio holdings and can have broad implications. More important to this study, prior research has documented that mutual funds tend to behave more myopically subsequent to the SEC regulation. Specifically, Agarwal, Vashishtha and Venkatachalam (2018) show that this SEC regulation has resulted in shorter-holding periods for mutual funds and has biased fund managers against taking positions in firms in which profit potential from corporate investments may take a long time to reflect in earnings and stock prices of those firms. Further, Agarwal et al. (2018) show that corporate managers respond by cutting back on innovation consistent with investor myopia resulting in corporate myopia. Thus, this SEC regulation provides a clear setting to test whether managers can at least partly fend off myopic pressures from investors by employing signals.

As a measure of managerial signal, we focus on insider trading. Theoretical studies such as John and Lang (1991) and John and Mishra (1990) put forth signaling models that allow insiders to change their holdings conditional on the arrival of new private information about investment prospects and that the resulting change in level of insider holdings in the firm is one of the signals available to convey this private information to the market.<sup>7</sup> Huddart, Hughes and Levine (2001) shows that information is reflected more rapidly in price with disclosure of insider trades. Consistent with this idea of signaling, there is substantial evidence that insider trading is present around corporate announcements and that this insider trading is motivated by private information (e.g., Damodaran and Liu, 1993). Empirical studies document insider trading prior to investments in R&D (Aboody and Lev, 2000) as well as prior to voluntary disclosures (Gu and Li, 2007) and accounting restatements (Badertscher, Hribar and Jenkins, 2011). Moreover, a large body of

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<sup>7</sup> Our study abstracts away from discussions on the role of insider trading regulations. See Dye (1984), Fishman and Hagerty (1992) and Leland (1992) for discussion on how allowing insiders to trade on material non-public information increases firm value.

literature has shown that insiders trades are profitable (e.g., Seyhun 1986; Lakonishok and Lee 2001; Jagolinzer 2009; Cohen, Malloy and Pomorski, 2012).<sup>8</sup> But whether such insider trading can be a useful tool to fend myopic pressures remains unanswered.

In the setting of the SEC regulation, we examine whether insiders of firms that increase investments will communicate future positive value to investors through insider purchases as an alternative to cutting back on investments when faced with myopic pressures. That is, we test the hypothesis that insider purchases increase subsequent to the SEC Regulation in order to abate the myopic pressures that stem from mutual funds affected by the disclosure regulation. The insider purchases in turn are hypothesized to elicit a positive price response, if the market perceives such signaling to be credible.

We empirically test the effect of SEC's portfolio disclosure mandate on insider trading by employing a difference-in-differences approach. Specifically, we identify actively-managed mutual funds that were required to change their disclosure frequency as a result of the regulation (hereafter referred to as "mandatorily reporting funds") and examine how changes in insider trading around the SEC regulation (first difference) varies with the ownership levels of these mandatorily reporting funds (second difference). Following Lakonishok and Lee (2001), our main measure of the intensity of insider purchases is the net purchase ratio (*NPR*), computed as the number of share purchases minus the number of share sales divided by the total number of insider transactions (i.e., the sum of share purchases and sales) by insiders. We also compute alphas to stock returns over 30, 90 and 360 days following insider purchases to assess the profitability of

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<sup>8</sup> This strand of literature which documents that insiders often trade on private information (e.g., Jaffe 1974; Seyhun 1986, 1988; Rozeff and Zaman 1998; Piotroski and Roulstone 2005; Jagolinzer 2009; Ali et al. 2011) and generally reports that insider purchases, but not insider sales, earn significantly positive alphas. For instance, Jeng et al. (2003) show that insider purchases earn abnormal returns of more than 6% per year, but insider sales earn insignificant abnormal returns.

such trades. We find evidence of a significant increase in both the intensity and profitability of insider purchases in the two years following the SEC regulation (i.e., 2005 and 2006) relative to the prior two years (i.e., 2002 and 2003) for firms with larger ownership by mandatorily reporting funds. This is suggestive of insiders signaling their private information to the market when faced with myopic pressures from mutual funds after the SEC regulation and successfully obtaining a positive stock price response to that signal. We find that the net share purchases by insiders increase significantly subsequent to the regulation. After the SEC regulation, average monthly share purchases by insiders exceed average monthly insider sales by 13% for firms in the top quartile of ownership by mandatorily reporting funds relative to those in the bottom quartile.

A key identification assumption that underlies our analysis is that the trend in insider trading for high-ownership funds (treatment group) and that for the low-ownership funds (control group) is the same (parallel trends assumption). We next ensure that this assumption is satisfied in our setting. In the period leading up to the SEC regulation, we do not find any difference in net share purchases by insiders at firms with larger ownership by mandatorily reporting funds relative to the control firms. The greater intensity of insider purchases is observed only after the SEC regulation becomes effective in 2004, which rules out the possibility that other confounding events in 2004 drive our findings and supports the parallel trends assumption. We also conduct a series of placebo-type tests by examining the changes in insider trading for firms with large ownerships by other types of institutional investors, i.e., investors not impacted by the SEC regulation. We do not find any effect on the intensity of insider purchases for firms with large ownerships by hedge funds and other types of non-mutual fund institutional investors. There is also no evidence of such an effect for firms with large ownership by mutual funds that were voluntarily disclosing their holdings at a quarterly frequency even prior to the SEC regulation. Overall, these findings support

our main inference that corporate insiders signal their future prospects through greater share purchases in the face of increased myopic pressures.

In terms of the profitability of insider purchases, we find that the 30-day (360-day) excess returns on insiders' trades increases by an economically significant 1.8 (9.7) percentage points in the post-regulation period for firms in the top quartile of mutual fund ownership relative to those in the bottom quartile. When we combine our findings of increased insider profitability following the SEC regulation with the evidence in Agarwal, Mullaly, Tang and Yang (2015) of a decrease in the profitability of mandatorily reporting funds around 2004, it indicates that the SEC regulation had an unintended consequence of transferring wealth from fund investors, whom the mandate was intended to protect, to firms' insiders.

Are the main findings driven by managers' attempts to fend off myopic pressures or by some alternate explanation? We explore this question by using two cross-sectional analyses. First, we follow Agarwal et al (2018) to identify firms where CEOs are less likely to lean against myopic pressures and, so, more willing to forego long-term investment opportunities in response to pressures from myopic investors (viz., firms with less experienced CEOs and industries with stronger CEO-turnover-sensitivity to stock returns). We find that the intensity and profitability of insider purchases is significantly lower for firms with relatively inexperienced CEOs (i.e., bottom tercile of tenure), or those in Fama-French 48 industries with greater sensitivity of CEO turnover to stock price performance (i.e., top tercile of forced turnover sensitivity), relative to other firms. Second, we identify firms that have pre-committed to long-term investments before the SEC regulation in the form of either capital expenditures or investments in fixed assets (Kraft, Vashishtha and Venkatachalam, 2018). We find evidence of significantly greater insider signaling through share purchases at firms with top tercile of capital expenditures or those with top tercile



of additions to net fixed assets immediately prior to 2004. Taken together, these findings suggest that insiders at firms with long-term investments signal future prospects through their share purchases, however they are less likely to do so when faced with myopic incentives.

We also rule out two alternative explanations for our observed findings. First, the increased portfolio disclosures could reveal active mutual funds' views on the prospects of their investee firms, the industry or the overall economy to other market participants. This would allow other investors to free-ride on such information and incorporate them in their own trading strategies (i.e., the *information spillover effect*).<sup>9</sup> If insiders take advantage of the new information revealed in funds' quarterly disclosures, then we would expect their trades immediately after a mandatorily reporting fund's filing date to be correlated with the news released in such filings. However, we find no such evidence of insiders learning from and trading upon the information contained in the mandatorily reporting funds' filings.

Second, the increase in disclosures by informed parties can reduce the information asymmetry in the market and improve liquidity (i.e., the *liquidity effect*). Consistent with this view, Agarwal et al (2015) find that the SEC regulation reduced the price impact in the stocks held by these funds. An increase in liquidity can also facilitate information-based trades by insiders and manifest in the form of greater intensity and profitability of insider purchases. To examine this alternate explanation, we control for contemporaneous liquidity (using the Amihud illiquidity measure) and continue to find a significant increase in net insider purchases around the SEC regulation. Additionally, since greater liquidity should facilitate both insider purchases and sales,

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<sup>9</sup> In mandating quarterly reporting, the SEC did consider the possibility that outside investors could "free ride" on information revealed through a mutual fund's portfolio disclosure. They concluded that such free-riding might actually be desirable for mutual funds, if the free-riding occurs after funds have completed their trading strategy, as the price impact of a free rider's trades would increase the profitability of the fund's strategy.

we separately examine the intensity and profitability of insider sales transactions. We find a significant decrease in the intensity of insider selling and do not find any evidence that insider sales are profitable for firms with larger ownership by mandatorily reporting funds. These results suggest that the greater intensity and profitability of insider purchases is unrelated to liquidity improvements and that the SEC regulation does not merely allow insiders to trade with a lower price impact or better hide their trades.

Finally, in additional tests, we explore the possibility of managers using other forms of signaling, such as through greater share repurchases or by providing more voluntary disclosures. We find that treatment firms, i.e., those with larger ownership by mandatorily reporting funds, are more likely to buyback their shares and tend to increase the frequency of both their annual sales and earnings per share (EPS) forecasts, relative to the control firms. These findings lend further support to our predictions that managers attempt to fend off myopic pressures from investors by using a variety of signaling mechanisms at their disposal.

## **2. CONTRIBUTION, HYPOTHESIS DEVELOPMENT AND INSTITUTIONAL BACKGROUND**

### *2.1. Related Literature and Contribution*

The findings from this study inform the debate in the academic and policy circles on whether and how disclosure regulations affect corporate myopia. Managers often blame the frequent disclosures of performance and the focus of investors on the performance numbers for the myopic behavior. Regulators are grappling in the dark on forming the right policy to abate such behavior while academic studies remain divided on this issue. Ernstberger, Link, Stich, and Vogler (2017), Kraft et al (2018) and Agarwal et al (2018) document a reduction in corporate investments

subsequent to an increase in reporting frequency of firms as well as investors. In contrast, Pozen, Nallareddy and Rajgopal (2017) find no such evidence of myopic behavior. Given the benefits of transparency such as improved liquidity (Balakrishnan, Billings, Ljungqvist and Kelley, 2014) and lower cost of capital (Fu, Kraft, and Zhang 2012), it is important to understand how adverse effects of disclosure enhancing regulation such as investor myopia can be mitigated.

Our study takes a broader signaling perspective and documents an intention on the part of managers to ward off any myopic pressures that may emanate from disclosure regulations. More importantly, our study shows that managerial signaling can be effective and that managers' incentives seem to dictate their tendency to react to any such pressures. The evidence on the role of managerial incentives is consistent with studies such as Edmans, Fang and Lewellen (2017) and Chen, Cheng, Lo and Wang (2015) and suggests that the adverse effects of disclosure regulation could be potentially mitigated by appropriately incentivizing managers. Overall, our study suggests that short-termism in the context of disclosure regulation is a nuanced problem that requires the examination of the disclosure effects as well as managerial incentives to mitigate any adverse effects through signaling. This broader view is consistent with the observations made by the SEC Chairman Clayton in his recent speech.<sup>10</sup>

Our study contributes to the literature that examines the investment consequences of disclosures and disclosure regulations (Roychowdhury, Shroff and Verdi, 2019; Leuz and Wysocki, 2016). The extent of work in this area focuses on corporate disclosure regulations on firms' investment behavior. In contrast, we focus on the real effects of ownership disclosure regulation. Bonetti, Duro and Ormazabal (2019) examine the impact of ownership disclosure

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<sup>10</sup> See Chairman Clayton's Statement at the SEC Staff Roundtable on "Short-Term / Long-Term Management of Public Companies, Our Periodic Reporting System and Regulatory Requirements" (<https://www.sec.gov/news/public-statement/statement-clayton-071819>)

regulations on the market for corporate control. Agarwal et al (2018) document a reduction in corporate innovation subsequent to the SEC regulation examined in this study. We extend this literature by documenting the ability of managers to use costly signaling to avoid myopic pressures induced by disclosure regulations that could discourage long-term investments and innovation.

Our study also adds to the literature on insider trading. Using a signaling framework, prior work has shown that investors use insider trading activities to better understand disclosures and accounting information. Gu and Li (2007) show that voluntary disclosures that are accompanied by insider trades elicit a greater price response suggesting that insider trading increases the credibility of voluntary disclosures. In the context of accounting restatements, Baderstcher et al (2011) finds significantly less negative reactions to accounting restatements when managers are net purchasers of stock before the restatement, and significantly more negative market reactions when managers are net sellers. Extending this line of work, our study examines the effect of mandatory disclosure regulations on insider trading. Our study documents a complementary relation between disclosure regulations and insider trading. Moreover, our study focuses on the role of insider trading in averting myopic pressures – an issue hitherto not examined.

## *2.2. Hypothesis Development*

The starting point for our analysis is the premise that the provision of timelier portfolio disclosures would cause an economically significant change in fund managers' incentives and choice of stocks. Specifically, we posit that fund managers have incentives to be myopic and prefer stocks whose values get immediately impounded in stock price. If the ability of a fund manager is uncertain, promises of returns far in the future cannot justify her authority to manage a large portfolio or demand a high compensation. Therefore, fund managers have incentives to demonstrate their ability early on by reporting superior investment choices in the short run. Thus,

career concerns reduce fund managers' willingness to stay with investee firms that experience short-term declines in price performance. More frequent disclosures of portfolio holdings exacerbate such career concerns. These career concerns lead to a tendency for such managers to sell shares of investee firms that invest for the long-run. It is also important to note that fund managers with shorter horizons will have fewer incentives to collect information about the long term prospects of a firm and might allocate more research effort toward predicting movements in quarterly earnings (Goldman and Slezak 2003). Moreover, even if the fund managers are aware of the long-run prospects, they may not be willing to commit capital to stocks that they expect to appreciate in value only in the long run because of the increased motivation to show winning stocks over quarterly horizons.

The threat of exit from fund managers can force managers of investee firms to cut back on projects that yield results over longer horizons (e.g., Stein 1989; Shleifer and Vishny 1990; Edmans 2009; Kraft et al., 2018; Agarwal et al., 2018). From the perspective of the investee firm, keeping the firms' earnings horizon constant, the pressure to see good news sooner increases subsequent to an increase in the frequency of funds' portfolio disclosures.

Under the threat of a decline in stock price managers face pressures to succumb to the myopic pressures of investors. How can managers avoid a price decline? Consider an investee firm whose manager invests in projects that have poor earnings in the short-run but high earnings in the long-run. For instance, the firm may have upgraded its manufacturing technology that improves the quality of its products. It may take more than a quarter or two for such an investment to increase sales because customers may need some time to experience and appreciate the product quality. Thus, the benefits of such capital investments may not be immediate and hence, not reflected in near term earnings. The basic premise for a decline in stock price under the myopia hypothesis is

that average investors do not appreciate the long-run benefits of investments and are misguided by poor current profits as a sign of poor future prospects. One option for managers is to cut back on such investments and reduce the threat of exit by mutual funds. Alternatively, managers can avoid the decline in stock price by communicating their private information about future prospects of the firm. We consider the latter possibility in this study.

We consider insider trading as the signaling mechanism. We view insider trading as a signal that is not merely a “cheap talk” signal and one that can result in a separating equilibrium. Our view is supported by both theory and empirical evidence. John and Mishra (2001) argue that, in an environment where corporate insiders have superior private information about the future prospects of the firm, the trading activity of corporate insiders would be one of the most direct signals available to them to communicate their information to the market. Huddart, Hughes and Levine (2001) show that when insider trades are disclosed, trading by insider results in quicker price discovery and higher market efficiency. John and Mishra (2001) show that in the “efficient” signaling equilibrium, corporate insiders use their own net trading and announced changes in capital expenditures to convey their private information to the market at least cost. Thus, we expect that managers with positive private information about the long-term results of their investments will choose to purchase shares of their company. We also posit that such trading activity will result in an increase in market price. Formally,

*H1: Insider net purchase increases subsequent to increase in portfolio disclosures.*

*H2: Insider trading profitability increases subsequent to increase in portfolio disclosures.*

In any signaling story, it is important to consider the possibility of pooling. In the setting of insider trading, there are several reasons why managers with no positive news will not trade with an intention to pool. First, insider trading (unlike other signals) is unique due to regulatory constraints. That is, managers who mislead investors through their trades are punishable under the Securities and Exchange Act of 1934. Second, insider purchases meant to mislead investors can lead to large personal losses for insiders in the event they fail to mislead investors or when their true intentions are revealed eventually. For example, the CEO of Doral Financial bought about \$5 million of stocks to allay fraud suspicions in 2005. However, the fraud was later revealed resulting in huge pecuniary penalties. Moreover, future earnings reports act as verification of the manager's signal. This future confirmation can act as a disciplining force on managers.

Although insider trades as a signal is theoretically well motivated as the most efficient signal, it is an empirical question whether managers consider using other signals such as voluntary disclosures or stock repurchases. We believe that the costs of these alternative signals are different and so is their efficacy as a signal. Nevertheless, we examine sales forecasts, earnings forecasts and stock repurchases in our additional analyses.

### *2.3. Institutional Background*

Since May 2004, mutual funds in the U.S. are required to file a quarterly report with the SEC listing their entire portfolio holdings.<sup>11</sup> Previously, these reports were required only semi-annually. The prime motivation for the higher disclosure frequency was to permit investors to better link the composition of a fund's portfolio to its performance, which would provide investors

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<sup>11</sup> A fund could delay disclosing its position for holdings that do not exceed 5% of its portfolio for up to one year to guard against premature release of certain positions. But this protection is available only when a fund has not previously disclosed an investment in that security.

with greater transparency about fund managers' actions and facilitate tighter monitoring of fund managers. Since mutual funds can easily complete round-trip transactions within a six-month period, semi-annual disclosures were not viewed as a sufficient period for fund investors to fully understand the funds' trading behavior or to accurately observe the actual positions taken by a fund. Moreover, semi-annual reporting also provided greater opportunities for fund managers to engage in window-dressing activities by buying or selling stocks shortly before the effective date (i.e., the date as of which a fund's holdings are published).<sup>12</sup>

The SEC's 2004 regulatory amendment was predicated on a variety of anticipated benefits to fund investors from more frequent disclosures of a fund's portfolio holdings. First, quarterly portfolio disclosures allow investors to better understand funds' trading activities, enabling more complete assessment of the extent to which a fund complies with its stated objectives. Secondly, quarterly reporting allows investors to better identify overlap in portfolio holdings across funds, thus helping them to make more informed asset allocation decisions. Thirdly, the more frequent disclosures likely help fund investors to monitor instances of "style drift", which occurs when the portfolio holdings of a fund deviate from its stated investment objectives. Lastly, increased reporting frequency increases the costs for fund managers to engage in manipulative activities, improving returns to fund's shareholders.

In addition, the SEC requires that large mutual funds (with more than \$100 million in holdings) disclose their company-level portfolio holdings in Form 13F on a quarterly basis. Thus

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<sup>12</sup> Fund managers could buy or sell portfolio securities shortly before the reporting date to create an impression that the manager has been investing in companies that have had exceptional performance during the reporting period. Fund managers could also potentially pump up their disclosed holdings by buying shares of stocks, especially illiquid ones, that the fund already owns on the reporting date, so as to drive up the price of these stocks and inflate the fund's performance results (Gallagher et al. 2009). These types of manipulation potentially enhance the disclosed quality of a fund's portfolio holdings and book-value performance, but in reality lower fund returns for investors.



even prior to the 2004 rule change, some mutual funds were disclosing their holdings. But the company-level information provided in Form 13F is less informative than what is disclosed at the fund-level under the 2004 SEC regulation. First, the 13F forms provide only aggregated-holding information at a company level and since investment management firms can operate multiple mutual funds with different investment styles, including passive investments, these disclosures are not always sufficient to identify funds' trading strategies. Secondly, 13F filings disclose only large positions (i.e., positions involving more than 10,000 shares and market value exceeding \$200,000 in equities, convertible bonds, and exchange-listed options). In contrast, filings under the 2004 regulation are filed by *all* mutual funds for *all* types of securities regardless of a fund's size or the size of its positions in individual securities. Consistent with the 2004 SEC regulation having a significant effect, Agarwal et al. (2015) and Agarwal et al. (2018) find that the affected mutual funds' profitability decline and trading strategies changed in the post-regulation period.

### **3. EMPIRICAL SPECIFICATION, SAMPLE DESCRIPTION, and VARIABLE CONSTRUCTION**

#### **3.1. Identifying mandatory disclosers**

We begin by identifying the actively managed domestic equity mutual funds that were affected by the 2004 SEC regulation and had to increase their disclosure frequency. We obtain mutual fund portfolio holdings data from the Thomson Reuters S12 database, the CRSP Mutual Fund database, and the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database. Since CRSP obtained its mutual fund portfolio holdings data from Morningstar prior to the fourth quarter of 2007 (Schwarz and Potter 2016), we essentially examine three different sources of portfolio holdings disclosures to comprehensively identify mutual funds that had to

change their disclosure frequency. Prior to 2004, mutual funds were only required to file their portfolio holdings semi-annually using Form N-30D, while the SEC Regulation in 2004 mandated filing quarterly holdings reports using Forms N-Q and N-CSR. However, several mutual funds in our sample voluntarily released their quarterly portfolio holdings prior to 2004. Hence, in order to identify mutual funds affected by the regulatory change, we first aggregate portfolio holdings data from the abovementioned three sources and then separately examine the disclosure frequency of each mutual fund across these sources.

Specifically, we first obtain the portfolio holdings of all mutual funds from the Thomson Reuters S12 and CRSP databases for the two years 2002 and 2003, i.e., prior to the SEC Regulation enactment in 2004. We then merge the two datasets using the Mutual Funds Links (MFLINKS) data provided by Wharton Research Data Services. Next, we use the mutual fund names from this merged dataset to search the EDGAR database and to collect all form N-30D, N-Q, and N-CSR filings that contain portfolio holdings of the matched mutual funds. Further, since our hypotheses are predicated on the exogenous change in mandatory disclosure behavior by mutual funds, we restrict our sample to actively managed domestic equity mutual funds.<sup>13</sup> We then examine the annual frequency of portfolio holdings data available for each mutual fund across these three databases. To avoid instances of mutual funds changing their disclosure frequency in anticipation of 2004 SEC regulation, which is prevalent in the data, we focus on funds' disclosure frequency

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<sup>13</sup> We follow an approach similar to Kacperczyk et al. (2005) and Wei et al. (2015) to identify actively managed domestic equity mutual funds. First, we drop all mutual funds in the Thomson Reuters S12 database with the Investment Objective Codes of 1, 5 or 6 to remove all international, municipal bonds, and bond & preferred funds. Next, we drop all mutual funds in the CRSP Mutual Fund database with the Index Fund Flag coded as "D," which identifies pure index funds, or with the investment policy coded as "B&P," "Bonds," "C&I," "GS," "MM," "Pfd" or "TFM," which identify bond and preferred, bonds, Canadian and international, government securities, money market, preferred or tax-free money market funds, respectively. Finally, we remove all foreign equity funds as flagged by the CRSP objective codes.

in 2002 and identify 839 mutual funds as those required to change their disclosure frequency (mandatorily reporting funds).

Although our methodology is similar to Agarwal et al. (2015), we identify fewer mandatorily reporting mutual funds. This is because we identify and exclude a larger number of voluntarily disclosing mutual funds (i.e., those disclosing more than twice a year) from our sample than Agarwal et al. (2015). Hence, while our sample includes 839 mandatorily reporting funds, the Agarwal et al. (2015) sample consists of 1,459 mandatorily reporting funds. Given the differences in our identification procedures and the final samples, we first ensure that our sample is not biased in any way. Accordingly, we first replicate the main results of Agarwal et al. (2015) as presented in their Table II, Panels A and B. The results of our replication tests are presented in Appendix B. Following Agarwal et al. (2015), we regress changes in the Amihud illiquidity measure, calculated as the difference between one-year before and one-year after the SEC regulation, on mandatorily reporting fund ownership and firm-level control variables measured in the pre-period, i.e., one-year period prior to the SEC regulation. See Appendix A for more details on variable construction. Consistent with Agarwal et al. (2015), we find that the firms with higher levels of mandatorily reporting fund ownership experience the greatest reductions in the Amihud illiquidity measure (i.e., the most increases in stock liquidity, after the SEC regulation). Although the economic magnitude of the effect is smaller due to sample differences, the direction and overall tenor of these results are comparable to the findings of Agarwal et al. (2015).

### **3.2. Measuring insider trading**

Our primary measure of interest is the extent to which managers increase their net share purchases to signal future value. To calculate this measure, we follow John and Lang (1991), Lakonishok and Lee (2001) and Frankel and Li (2004) to construct a measure of the direction of

insider trading (i.e., whether they are buying or selling) in any given firm-month. We define the net purchase ratio (*NPR*) as the net purchases by insiders, computed as the number of share purchase transactions minus the number of sales transactions divided by the total number of insider trades (i.e., the sum of purchase and sale transactions). We first collect daily insider trading data from the TFN Insider Filing Data Files obtained from WRDS. Next, we identify insider transactions in this dataset as purchases or sales by CEO, CFO, COO and the President. We aggregate all transactions to the firm level and use the total number of purchase and sale transactions by insiders in a month to compute *NPR* for firm (*i*) as of month (*t*) as follows:

$$NPR_{i,t} = [(\# \text{Purchase Transactions}_{i,t} - \# \text{Sale Transactions}_{i,t}) / (\# \text{Purchase Transactions}_{i,t} + \# \text{Sale Transactions}_{i,t})] \quad (1)$$

We then average these firm-month values over the pre-period (2002 and 2003) and the post-period (2005 and 2006) around the SEC regulation in 2004 to arrive at our primary measure of the intensity of insider trading *Ave\_NPR<sub>i,t</sub>*.

For robustness, we also consider a variant of this measure. Specifically, we define *%Purchases* as the number of shares purchased by insiders in a month as a percentage of total shares outstanding at the end of the month. Similar to the *Ave\_NPR* variable, we average these firm-month values over the pre-period (2002 and 2003) and the post-period (2005 and 2006).

We are also interested in the price reactions elicited by the insider transactions to examine the credibility of such signaling through insider purchases. In order to compute the profitability of insider trades, we first define the event day (day 0) of interest for each firm as the day on which an insider transaction occurs. We then use the Carhart (1997) four-factor model to calculate the abnormal stock returns following each event. We obtain daily returns from CRSP and merge this

dataset with the Fama and French (1993) and Carhart (1997) factors at the daily level. To account for potential changes in market parameters, we follow the methodology in Seyhun (1986) and compute out-of-sample alphas over the 30, 90 or 360 days following the event-day. For each event  $j$ , we obtain model parameters by estimating the following time series regression using data for the day -365 to day -1 and day +360 to day +720:

$$R_{jt} = \alpha_{jt} + \sum_{f=1}^4 \beta_{jf} F_t + \varepsilon_{jt}, \quad (2)$$

where  $R_{jt}$  is the return on day  $t$  and  $F_t$  denotes one of the four Fama-French and Carhart factors. We restrict our analyses to stocks with a share price that is more than \$5 and ensure the availability of at least 200 daily return observations for the regression analyses. To account for the effect of outliers, we also truncate the parameter estimates at the 1.5% and 98.5% levels.<sup>14</sup> The estimated parameters ( $\hat{\beta}_{j,f}$ ) and the risk-free rate ( $RF_t$ ) are then used to calculate the 30-, 90- or 360-day abnormal returns for event  $j$  (*Insider\_Profitability<sub>j</sub>*), as follows:

$$Insider\_Profitability_j = \frac{1}{n} * \sum_{t=1}^n R_{j,t} - RF_t - \sum_{f=1}^4 \hat{\beta}_{j,f} * F_s, \text{ where } n=30, 90 \text{ or } 360. \quad (3)$$

Thus, *Insider\_Profitability* represents the average daily abnormal stock returns.<sup>15</sup> Analogous to the *NPR* measure, we average the abnormal stock returns for insider trades at each firm  $i$  over the pre-period (2002 and 2003) and the post period (2005 and 2006) to compute our profitability measure (*Ave\_insider\_profit*).

### 3.3. Measuring mutual fund ownership and control variables

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<sup>14</sup> We use 1.5% and 98.5% to be consistent with Seyhun (1986), but our results are robust to truncating parameters at the 1% and 99% levels.

<sup>15</sup> In robustness checks, we consider alternative methods to calculate the abnormal returns, such as in-sample alphas and DGTW benchmark portfolio adjusted returns, and obtain qualitatively similar results.

We use portfolio holdings data from the Thomson Reuters S-12 database to calculate firm-level ownership by mandatorily reporting mutual funds. Following an approach similar to Agarwal et al. (2015), we first aggregate the shareholding of the 839 mandatorily reporting funds at the end of each month. If shareholding data for a fund is not available for the month-end, we use the latest shareholding reported in the previous six months. We then define our primary treatment variable *Mandatory Fund Ownership (MFO)* as the average monthly ownership of the mandatorily reporting funds over 2002 and 2003.

We control for the following firm characteristics that affect abnormal stock returns and that could also influence managers' incentives to trade on long-term private information: firm size, book-to-market ratio, leverage, and prior stock returns, as these may have additional predictive power over insiders' returns due to the noise in the estimation of abnormal returns. Previous studies have shown that leverage ratio has some predictive power for expected stock returns (Fama and French 1992). Accordingly, we include leverage (*Lev*), measured as the ratio of the total short- and long-term debt of a firm to its total assets. Book-to-market ratio (*BTM*) is measured as the ratio of the book value of the equity of a firm to its market value of equity. We use market capitalization (*Mcap*) as the proxy for size, measured using the natural logarithm of monthly market capitalization in millions of U.S. dollars. Prior stock return (*Ret*) is measured as the cumulative stock return over the past 11 months, prior to the immediately preceding month. We construct these firm-level control variables using data from the Compustat and CRSP databases for firm fundamentals and stock trading data, respectively.

Our final sample consists of 7,133 observations with firm-level insider trading and mutual fund ownership data. After merging the control variables, created using data from Compustat and CRSP databases, our sample is marginally smaller with 6,884 non-missing observations. Table 1

provides the descriptive statistics for our final sample. *Ave\_NPR* has a mean of negative 0.29, implying that our sample of insider trades consists of more share sales than purchase transactions and is in accordance with the prior literature (e.g., Frankel and Li, 2004). The average insider purchase transaction in our sample earns a daily abnormal return of 9 basis points, while the average stock ownership by mutual funds that were affected by the SEC regulation is 4%. In terms of firm fundamentals, the average firm in our sample has a market capitalization of US\$317 million, with a book-to-market ratio of 0.81 and a leverage ratio of 0.21.

### 3.4. Empirical specification

To estimate the effect of the increased reporting frequency of mutual fund portfolio disclosures on insider trading, we follow the approach of Agarwal et al. (2015) and use a difference-in-differences (DiD) specification with a continuous treatment variable. Specifically, following the SEC Regulation in May 2004, we compare changes in the intensity of insider purchases of firms that have high mutual fund ownership (treatment firms) to changes in the intensity of insider purchases of firms that have low mutual fund ownership (control firms).

Formally, we implement the following regression specification:

$$Ave\_NPR_{i,t} = \alpha + \beta_1 Post_t \times MFO_i + \beta_2 Post_t + \beta_3 MFO_i + \Gamma \mathbf{CONTROLS} + \varepsilon_{i,t}, \quad (4)$$

where *Ave\_NPR* for firm *i* and period *t* is the net purchase ratio in either the pre-SEC Regulation period (2002 and 2003) or the post-SEC regulation period (2005 and 2006). Since insider trades do not necessarily occur every month for our sample firms, we compute the intensity of insider trades as the average of *NPR* in the pre- or post-periods. *MFO* is the percentage of stock ownership by mandatorily reporting funds and *Post* is a dummy variable that takes the value 1 for the post SEC regulation period. *CONTROLS* is a vector of control variables that have been shown

in prior work to be determinants of the profitability of insider trading and could also motivate managers to trade on their private information. As in Agarwal et al. (2015), all explanatory variables are measured prior to the SEC regulation as monthly averages over 2002 and 2003. Our main results remain unaffected if we measure the control variables as monthly averages in the two years before (2002 and 2003) and the two years after (2005 and 2006) the SEC regulation (i.e., contemporaneously with *Ave\_NPR*). Thus, for each firm in our sample, we have two observations: one prior to the SEC regulation and one post SEC Regulation.<sup>16</sup> Throughout, standard errors are clustered by firm.

### 3.5. Identification strategy

Identification in Equation (4) relies on a cross-sectional comparison of stocks with higher mutual fund ownership (the treatment group) to those with lower mutual fund ownership (the control group). The primary coefficient of interest in the above specification is the coefficient  $\beta_1$  on the interaction term, *Post*\**MFO*, which measures the average change in net insider purchases of firms with high mutual fund ownership (first difference) relative to the average change in net insider purchases of firms with low mutual fund ownership (second difference). Accordingly, coefficient  $\beta_1$  captures the DiD estimate of the impact of the SEC regulation on the intensity of insider purchases.

The DiD design offers the advantage that we can establish a causal relation between the increased levels of disclosure and insider trading. Specifically, the DiD design rules out the possibility that unobservable differences between treatment and control firms or time trends drive

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<sup>16</sup> The model does not include separate firm or time fixed effects as these are subsumed by *MFO* (which is constant for each firm) and *Post*, respectively. Also, our results are robust to requiring firms to have data available in both the pre- and post-regulation periods. This change reduces the sample size, but otherwise does not affect our results.



the results. For example, a potential concern in an association study between mutual fund ownership and insider trading is that unobserved firm characteristics could drive both the higher fund ownership and the decision of the insider to trade. However, in our design, the first difference compares firms with high mutual fund ownership pre- and post-regulation and rules out this possibility. Further, removing the second difference, (i.e., the changes for the firms with low fund ownership pre- and post-regulation) removes any unobserved common shock that may coincide with the disclosure regulation.

Still, there are some challenges to identification in our context that need to be addressed. First, for our research design to provide causal inference, the treatment and control groups should exhibit parallel trends absent the regulatory shock. Accordingly, we conduct tests of this assumption in both univariate and multivariate settings. Secondly, it is possible that the results are driven by mutual fund ownership being correlated with institutional investor ownership in general. To test this possibility, we conduct a series of placebo-type tests where we consider ownership by alternate groups of institutional investors unaffected by the SEC regulation, such as hedge funds. These tests are discussed in Subsection 4.2. Finally, to provide additional evidence of the causal relationship and the hypothesized underlying mechanism, we discuss our cross-sectional tests in Subsections 4.4 and 4.5, which demonstrate the role played by managers' myopic incentives and help rule out alternate mechanisms through which the SEC regulation could affect insider trading, respectively.

## **4. RESULTS**

### **4.1 Causal effect of SEC regulation on insider signaling**

Table 2 presents our main findings on the SEC regulation's causal effect on the intensity of insider purchases by providing ordinary least squares estimates from Equation (4). We find an increase in *Ave\_NPR* following the SEC regulation, which suggests that managers significantly increase their net share purchases in the post-period. That is, insider signaling increases significantly post SEC regulation and the magnitude as well as the statistical significance of this effect is largely unchanged by the inclusion of control variables in Column (2). The coefficient on *Post\*MFO* in Column (2) is 1.548 implying that, after the SEC regulation, average monthly share purchases by insiders exceed average monthly insider sales by 13% for firms in the highest quartile of *MFO* as compared to the insiders of firms in the lowest quartile of *MFO*. This is an economically large and meaningful increase in the net purchase ratio, especially since the mean of *Ave\_NPR* is -0.29 (see Table 1) and implies that average insider share purchases are 45% lower than share sales in our sample.<sup>17</sup>

As an alternative approach, we re-estimate Equation (4) using *%Purchases* as the dependent variable. The results presented in Column (3) of Table 2 show that the coefficient on *Post\*MFO* is positive and significant, which is consistent with the findings based on *Ave\_NPR* and supports the view that insiders increase their net share purchases after the SEC regulation.

#### 4.2 Tests of Identification Assumption

To provide better identification, we explore the timing of the changes in insider trading around the SEC regulation. This analysis helps us to examine the parallel trends assumption, as well as the persistence of the effect. Observing a sharp change in the post-period (2005 and 2006)

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<sup>17</sup> The coefficient of 1.548 in Column (2) implies that, after the SEC regulation and relative to insiders of the firms in the bottom quartile of *MFO*, *Ave\_NPR* of the insiders at firms in the top quartile of *MFO* is 0.06 (=1.548\*(0.05-0.01)). Since *Ave\_NPR* is computed as  $[(\#purchase\ transactions - \#sale\ transactions) / (\#purchase\ transactions + \#sale\ transactions)]$ , a value of 0.06 leads to  $(\#purchase\ transactions / \#sale\ transactions) = 1.13$  by a simple rearrangement of terms. Likewise, for the mean *Ave\_NPR* of -0.29, we can compute the ratio of insider purchases to sales as 0.55.

but not in the pre-period (2002 and 2003) likely rules out the possibility that other events that occur around the 2004 SEC regulation drive our findings.

To this end, we estimate a version of Equation (4), in which we replace the single *Post* indicator with a series of eight separate indicator variables, each marking a six-month window over the four-year sample period (2002, 2003, 2005 and 2006). We omit the half-year indicator variables for the year 2002 so that this period serves as a benchmark (by definition, the coefficients for 2002 are set to zero). This generates six coefficients for each of the half-years in 2003, 2005 and 2006. We limit the sample to firms that have at least one insider trade in the pre- or post-event periods, so that the sample composition is balanced over time and the coefficients are comparable. The results are presented in Table 3. We find that the coefficients on the interaction terms ( $HY_t \times MFO$ ) are all statistically insignificant prior to the SEC regulation and become significant immediately after the SEC regulation. These findings support the parallel trends assumption and hold after the inclusion of all control variables interacted with *Post* (i.e.,  $Post \times \mathbf{CONTROLS}$ ). Furthermore, we find that the coefficients on the interaction terms continue to be statistically significant two years after the SEC regulation suggesting that this effect is persistent.

Although the level of ownership helps identify a treatment and a control group that are affected by the SEC regulation to varying levels, there is still a possibility that an unobservable confound that is correlated with the ownership levels is driving our findings. We next run a series of tests to rule out this possibility. Towards this, we examine how ownership by three alternate groups of institutional investors impact insider trading. This alternative set of institutional investors are: (i) non-mutual fund institutions, (ii) hedge funds, and (iii) mutual funds that voluntarily disclosed quarterly portfolio holdings prior to the SEC regulation. A DiD test incorporating the ownership of these alternate investor groups should help identify whether the

documented effects are unique to mutual funds affected by the mandatory reporting requirement or are a wider phenomenon observed even for institutional investors unaffected by the regulation.

The intuition for including non-mutual fund institutions and hedge funds in the alternative group of investors is that they are required to file Form 13F and this disclosure pattern was not affected by the SEC regulation. The rationale for inclusion of voluntarily disclosing mutual funds is that they had already moved to a quarterly reporting frequency before the 2004 SEC regulation and, hence, should not be affected by it. Using these alternative investor groups can also help capture any potential trends in insider trading as there is no reason to believe that trends in the intensity of insider trades are different for different types of institutional investors.

However, a potential disadvantage with these tests is that the more frequent SEC mandated portfolio disclosures could also have affected the trading incentives of these other institutional investors, even though their reporting was unaffected by the SEC regulation. In such a case, the inclusion of the other institutional ownership in the model would partly subsume the effect of the disclosure regulation on mandatorily reporting fund ownership, leading to attenuation of the coefficient on  $Post \times MFO$  and a boost to the coefficient on the alternate investors' ownership. Since the effect on the alternate investor ownership is still expected to be weaker than that on mandatorily reporting fund ownership, we draw inferences by primarily focusing on the differences in coefficients across the investor types. The estimates from these tests are also best viewed as lower bounds on the observed effects of the SEC regulation. We implement this test by augmenting Equation (4) with ownership by the alternative set of institutional investors ( $AltOwn$ ) using the following specification:

$$\begin{aligned}
 Ave\_NPR_{i,t} &= \alpha + \beta_1 Post_t \times MFO_i + \beta_2 Post_t + \beta_3 MFO_i \\
 &+ \beta_4 Post_t \times AltOwn_i + \beta_5 AltOwn_i + \Gamma \mathbf{CONTROLS} + \varepsilon_{i,t}
 \end{aligned} \tag{5}$$

Table 4 presents the findings. Columns (1) to (3) report the results when the alternative investor groups are hedge funds, non-mutual fund institutional investors and voluntarily disclosing mutual funds, respectively. We find that the inclusion of these alternate investor groups' ownership does not substantially affect the magnitude or the statistical significance of the coefficient on *Post\*MFO*. The coefficient on *Post\*MFO* varies from 1.77 to 1.37. More importantly, we find that across Columns (1) – (3) the interaction between *Post* and *AltOwn* is insignificant and that the coefficient on *Post\*MFO* is significantly larger than that on *Post\*AltOwn*, as noted at the bottom of Table 4. Together, these findings confirm that our main results are not driven by wider trends or firm-level factors that affect all types of institutional investors.

#### **4.3 Does the insider trading elicit a favorable price response?**

We thus far document an increase to insider purchases subsequent to the SEC regulation. This is consistent with the notion that managers may be using purchases to indicate the future favorable prospects of the firm in the wake of myopic pressures. However, it is not clear whether this signal is perceived by the market to be credible and whether the market reacts favorably to the signal. Evidence on this issue is important because if the market does not react to the purchases then the signaling hypothesis put forth in this study falls apart.

To provide evidence on the price response to insider trading, we compare changes in the profitability of insider purchases of firms that have high mandatorily reporting mutual fund ownership (treatment firms) to changes in the profitability of insider purchases of firms that have low mutual fund ownership (control firms).<sup>18</sup> We estimate the average profitability of insider

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<sup>18</sup> Our focus on insider share purchases is primarily motivated by the signalling problem in this context. When faced with myopic pressures, managers that undertake longer term investments will have to communicate the favourable news about the long-term potential of such investments in a credible manner. Thus, managers will have to buy shares on their own account and their sales transactions are of little relevance.

purchases (*Insider\_Profitability*) using Equation (3) and compute the out-of-sample alphas for share purchases over 30, 90 or 360 days after the transaction. Next, similar to *Ave\_NPR*, we compute firm-level averages of *Insider\_Profitability* over the pre-period (2002 and 2003) and the post period (2005 and 2006) and re-estimate Equation (4) using *Ave\_insider\_profit* as the dependent variable.

As shown in Table 5, we find that the profitability of insider purchases increases after the SEC regulation. Irrespective of whether we focus on alphas estimated over 30 days, 90 days or 360 days, we find the coefficient on *Post\*MFO* to be significantly positive, suggesting that the SEC regulation increased the profitability of insider trades. The coefficient of 1.468 on *Post\*MFO* in Column (1) of Table 5 implies that firms in the top quartile of mandatory reporting fund ownership (*MFO*) saw their insider profitability measured over a 30-day period increase by 1.8 percentage points ( $=1.468*(0.05-0.01)*30$ ), over that seen for firms in the bottom quartile of *MFO*. This suggests that the SEC regulation caused an economically meaningful increase in insider profits from their purchases.

#### **4.4 Is the increase in purchases driven by incentives to address myopia pressures?**

We next attempt to disentangle the channels underlying the change in insider trading and insider profitability following the SEC regulation. Specifically, we aim to provide evidence on the role for myopic pressures exerted on managers by affected mutual fund investors, as shown in Agarwal et al. (2018). We posit that managers who are likely to increase their share purchases are those who would face greater myopic pressures and those who have incentives to fend off these pressures. To this end, we perform two cross-sectional analyses.

First, we expect that the intensity and profitability of insider share purchases will be greater

in firms where CEOs have fewer incentives to be myopic. To examine this prediction, we adopt an approach similar to Agarwal et al. (2018) and categorize CEOs as more likely to be myopic when they are relatively inexperienced or when they operate in industries with greater sensitivity of CEO turnover to stock price performance. We identify relatively inexperienced CEOs across all sample firms as those in the bottom tercile of CEO tenure in the year prior to the SEC regulation.<sup>19</sup> We classify industries (using the Fama-French 48 industry classification) in the top tercile of forced turnover-sensitivity as industries with myopic CEOs, where forced turnover sensitivity is measured based on incidences of forced CEO turnover following poor stock price performance in the five years prior to the SEC regulation. Finally, we define firms with CEOs in the bottom tercile of tenure or those in Fama-French 48 industries in the top tercile of turnover-sensitivity as having myopic CEOs. These firms are denoted by an indicator variable, *CEO Myopia*. We then re-estimate Equation (4) using the dummy variable *CEO Myopia* after interacting it with *Post* and/or *MFO*. The results presented Table 6, Panel A, show that the coefficient on *Post\*MFO\*CEO Myopia* is significantly negative, suggesting that the intensity and profitability of insider purchases is lower in firms where CEOs are more likely to succumb to myopic pressures rather than leaning against such pressures. This is consistent with the notion that insiders are likely to signal through insider purchases and profit from such trading primarily when their firm's CEO is better placed to resist myopic pressures from affected mutual funds.

Next, we examine firms that invest heavily prior to the 2004 SEC regulation. Such firms are the ones that are likely to be most affected by increased pressures from mutual funds and are likely to either commit value-destroying activities such as cut back on investments or lean back against investors' myopic pressures by signaling through insider trading. Following Kraft et al

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<sup>19</sup> We obtain data on CEO tenure from the Equilar database.

(2018), we measure pre-commitment to investments using capital expenditures or additions to net fixed assets in the pre-period (2002 and 2003). The idea is that such capital investments may take more than a quarter or two to increase sales. Thus, the benefits of such capital investments may not be immediate and hence, not reflected in near term earnings. We identify firms in the top tercile of capital expenditures (scaled by beginning total assets) with an indicator variable, *HI\_CAPEX*. Likewise, we identify firms in the top tercile of additions to net fixed assets (i.e., changes in net property, plant and equipment scaled by beginning assets) with an indicator variable, *HI\_CHPPE*. We re-estimate Equation (4) by separately including these indicator variables and by interacting them with *Post* and/or *MFO*. The results presented Table 6, Panel B, show that the coefficients on *Post\*HI\_CAPEX\*MFO* in Column (1) and *Post\*HI\_CHPPE\*MFO* in Column (2) are both positive and significant. These findings suggest that managers are likely to resist myopic pressures and their trading could better signal long-term value when firms are pre-committed to significant investments.

#### **4.5. Alternative explanations for increase in purchases?**

The results from the cross-sectional analysis in Section 4.4 provides unambiguous evidence that managers use insider trading to signal value when there is an increase in pressures to be myopic. However, there are alternative explanations as to why we would observe an increase in insider trading post the SEC regulation. While we do not view any of the alternative explanations to be mutually exclusive, we still endeavor to provide evidence on the significance of two possible alternative explanations. Under the first alternative explanation, insiders trade more and make more profitable trades not due to private information about long term value but because they obtain additional information from the more frequent mutual fund disclosures (information spillover effect). A second alternative is that the increased trading is largely due to the improvement in



liquidity from mandatorily reporting funds reducing information-based trading (liquidity effect), as documented by Agarwal et al (2015).

We examine whether insiders benefit from information revealed in more frequent portfolio disclosures by mutual funds following the SEC regulation by evaluating the timing and incidence of insiders' trades relative to mutual funds' disclosure dates. If insiders use the more frequent reporting of funds' portfolio holdings to update their private information post SEC regulation, we should observe insiders' trades around the portfolio disclosure to be positively correlated with the news revealed by the fund disclosures.

We first obtain mandatorily reporting funds' SEC filing dates from the EDGAR database and compute the percentage change in mandatorily reporting funds' holdings (*% ΔMF Holdings*) revealed in the disclosures. *% ΔMF Holdings* reflects the new information available to insiders from more frequent fund filings. We then investigate whether this disclosure news is related to insider trades that occur during a five-day disclosure window (i.e., the day of and the four days following the SEC disclosure date) and whether this relation is affected by the SEC regulation. We test this using the following OLS regression:

$$\begin{aligned} \% \Delta Insider Holdings_{i,t} = & \alpha + \beta_1 Post_t \times \% \Delta MF Holdings_{i,t} + \beta_2 Post_t \\ & + \beta_3 \% \Delta MF Holdings_{i,t} + \Gamma \mathbf{CONTROLS} + \Lambda_i + \Pi_t + \varepsilon_{i,t}, \end{aligned} \quad (6)$$

where *%ΔInsider Holdings* is the percentage change in insiders' holdings from trades undertaken in the five-day disclosure period. The *CONTROLS* vector includes market capitalization, book-to-market ratio, leverage, and the quarterly stock return ending with the SEC filing date.<sup>20</sup> We also include fixed effects for the firm and for funds' shareholding dates to account for any unobservable

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<sup>20</sup> Quarterly stock returns are measured as the buy-and-hold returns of a stock calculated over a 63-day trading period ending on the SEC filing date of the mandatorily reporting mutual fund.

underlying firm characteristics and time trends, respectively.

The regression in Equation (6) is conditional on the direction of insider trades being related to the direction of mutual funds' trades revealed in their disclosures. As an alternative test, we ignore trade direction and investigate whether unsigned fund disclosure news incentivizes insiders to trade within the five-day disclosure window. Specifically, we estimate the linear probability model of the incidence of insider trades in the five-day disclosure window (*Trade Indicator<sub>i</sub>*) as follows:

$$\begin{aligned} Trade\ Indicator_{i,t} = & \alpha + \beta_1 Post_t \times Abs(\% \Delta MF\ Holdings_{i,t}) + \beta_2 Post_t \\ & + \beta_3 Abs(\% \Delta MF\ Holdings_{i,t}) + \Gamma \mathbf{CONTROLS} + \Lambda_i + \Pi_t + \varepsilon_{i,t}, \end{aligned} \quad (7)$$

where  $Abs(\% \Delta MF Holdings_{i,t})$  is the absolute value of percentage change in funds' holdings as revealed on the disclosure date.

The results from estimating Equations (6) and (7) are presented in columns (1) and (2), respectively, of Table 7. The results from both regressions suggest that mandatorily reporting funds' portfolio holdings disclosures have no bearing on insider trades during the five-day disclosure window. The coefficients for  $\% \Delta MF Holdings$  and  $Abs(\% \Delta MF Holdings)$ , as well as the coefficients on these variables interacted with *Post* are insignificant. These results suggest that, both in the pre- and post-regulation periods, insiders do not trade based on information disclosed by funds. These findings are consistent with the prior literature that generally shows that information spillovers occur from insiders to mutual funds and not the other way around (e.g., Cohen et al. 2012; Sias and Whidbee 2010). These findings are also consistent with insiders having little competitive advantage in copycat trading strategies as compared to other traders who typically face substantially less trading restrictions and with insiders being unlikely to trade on

short-lived information revealed in funds' disclosures due to the SEC's "short swing" profit rule.<sup>21</sup>

Next, we examine the role of changes in liquidity that may drive our results. To examine the role of liquidity effects in explaining the increased intensity of insider trading after the SEC regulation, we include contemporaneous liquidity as an additional control in the regression specification presented in Equation (4). We use the Amihud's illiquidity measure, computed in line with Agarwal et al (2015), to control for contemporaneous liquidity. If liquidity drives changes in the intensity of insider trading around the SEC regulation, we expect Amihud's illiquidity measure to be negative and statistically significant and to subsume the coefficient on  $Post * MFO$ . The results presented in Column (1) of Table 8 do not support the prediction that liquidity drives all of the changes in the intensity of insider trading around the SEC regulation. Contemporaneous Amihud's illiquidity measure is positive and significant with a coefficient of 0.272, suggesting that liquidity has a negative relationship with the level of net insider share purchases. However, the coefficient on  $Post * MFO$  continues to be positive and significant with a magnitude of 0.941, suggesting that average monthly share purchases by insiders exceed their share sales by 8% for firms in the top quartile of  $MFO$  relative to the insiders of firms in the bottom quartile of  $MFO$ .

To further understand the role of liquidity, we examine changes in the profitability of insider sales transactions. While insider purchases are likely to reflect their private information about future prospects (Lakonishok and Lee, 2001), insider sale transactions often reflect liquidity-driven trading. If changes in liquidity explain the increased profitability for insider purchases, we should observe a similar increase for insider sales as well. Accordingly, we first estimate Equation

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<sup>21</sup> The "short swing" rule of the 1934 Security Exchange Act (Rule 16b) requires insiders to forfeit trading profits earned from round-trip transactions that occur within a six-month period. In contrast to other insider trading rules, the scope of the short-swing profit rule is extremely broad as it does not require proof that an insider possessed private information or actually traded on the basis of such information. The only requirement for recovery under this rule is that an insider realized a profit from a round-trip transaction within a six-month period.

(4) with the dependent variable as *%Sales*, which is defined as the average number of shares sold by insiders in a month as a percentage of the number of total shares outstanding at the month end. In Column (2) of Table 8, we do not find any evidence to support the liquidity effect and instead find a significant decrease in insider sales. Next, we examine the profitability of insider share sales over 90 days after the transactions and do not find any evidence of greater profitability after the SEC regulation.<sup>22</sup> The coefficient on *Post\*MFO* in Column (3) is negative and statistically insignificant. Overall, we find no support for the argument that changes in liquidity drive changes in insider profitability.

#### **4.6. Use of alternative signals**

Our analysis thus far has exclusively focused on insider trading. This focus largely stems from prior theoretical work that argues that signaling through insider purchases is the most efficient signal in the context of investments (John and Mishra, 2001). However, managers have a wide variety of signals at their disposals. Broadly we can categorize signals into either those that involve managers providing additional information (voluntary disclosures) or those that involve some real actions by firms. We pick one natural candidate from each of these two categories.

For real actions, we focus on stock repurchases. Like insider trading, stock repurchases also involve managers attempting to signal undervaluation of the firm's shares. Unlike insider trades, stock repurchases can be made in large amounts effectively reducing the shares outstanding by economically significant magnitude. However, the signaling strength of stock repurchases could be weaker than insider trading because management is using firm's cash instead of their

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<sup>22</sup> Consistent with the literature, we find a significantly larger number of firms in our sample have insider share sales compared to insider purchases. This is reflected in the larger number of observations in our analyses on the profitability of insider sales.

personal funds. Moreover, a stock repurchase could also be interpreted as managers returning capital back to shareholders in the face of declining investment opportunities. Thus, it is not obvious whether managers will use stock repurchases as a signal and whether any such repurchases has signaling value. Nevertheless, we examine managers' propensity to undertake stock repurchases. Specifically, we re-estimate the difference-in-differences specification presented in Equation (4), with the dependent variable as *Buyback*, which is an indicator variable set equal to 1 when the number of adjusted shares outstanding at the end of a calendar year is less than that at the beginning of the same year and is set equal to 0 otherwise. This measure captures the likelihood of net repurchases in a given year. Findings presented in Column (1) of Table 9 suggest that managers of treatment firms, i.e., those with larger ownership by mandatorily reporting funds, are more likely to repurchase stock in the period post-SEC Regulation relative to the control firms.

For voluntary disclosures, we focus on management guidance. If market is unable to incorporate news about future earnings, it is easy for managers to bring that news forward through sales and earnings forecasts. Accordingly, we re-estimate the difference-in-differences specification presented in Equation (4), with the dependent variable as a measure of management guidance. Table 9 presents the findings. In Columns (2) and (3), we present the results with the dependent variable as *Sales\_Guidance* and *EPS\_Guidance*, respectively. The measures are computed as the number of annual sales or EPS (earnings per share) forecasts provided by the management in a year, respectively. We find that managers of treatment firms increase the number of both annual sales and EPS forecasts subsequent to the SEC regulation.

## 5. CONCLUSION

Regulators work to ensure that information flow in the capital markets is timely, comprehensive, and accurate. This focus on timeliness of information dissemination has led to disclosure regulations mandating greater reporting frequency in the past. Several recent studies have shown that greater reporting frequency has in turn led to corporate managers becoming more myopic in their investment decisions (Kraft et al. 2018; Asker et al. 2015; Agarwal et al 2018). Since the myopia argument crucially relies on the assumption that longer term investments may not reflect in the earnings and stock prices in the near term, it overlooks the possibility that managers have alternate mechanisms available for them to credibly signal the value of such longer term investments and to communicate better future prospects. In this paper, we use the setting of an increase in the SEC mandated disclosure frequency for mutual funds in 2004 that led to myopic pressures from investors to examine whether managers use insider trading to push back against such pressures and to credibly signal longer term value.

Our results show that, when subjected to myopic pressures, managers increase their net share purchases to communicate their private information about longer term prospects and that markets respond to such insider signals as evidenced by the greater profitability of these insider purchases. Moreover, our cross-sectional tests suggest that managers rely on insider signaling more when the CEOs of their firms are less susceptible to myopic pressures and when the firm has pre-committed to significant long-term investments through capital expenditures or additions to net fixed assets. We also rule out two alternative mechanisms that could drive our findings, viz., insiders learning from more frequent disclosures from mutual funds or greater stock liquidity allowing insiders to better hide their trades. We find that insiders do not increase their trading in a five-day window following the funds' disclosure dates and their trading activities are uncorrelated with information divulged in fund disclosures. Further, our findings do not support liquidity

improvements around the SEC regulation as a potential explanation for the greater intensity and profitability of insider trades. Taken together, these findings make it unlikely that insiders benefit by free riding on mutual funds' information-gathering activities or from greater stock liquidity post SEC regulation.

Insiders are a unique class of traders as, by definition, they have favored access to private information about the firm. Because of this preferential access, markets pay close attention to their trades and attempt to infer signals about firms' future prospects. Prior literature finds that insider purchases are particularly useful to infer managers' private information (Lakonishok and Lee, 2001). Our findings indicate that insider trading is indeed a potent tool at the disposal of corporate managers to lean back against short-term capital market pressures and signal longer term prospects instead of simply capitulating to myopic investor pressures.

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## Appendix A: Variable Definitions

Variable	Short Name	Definition and Calculation of Variable
Net Purchase Ratio	Ave_NPR	Ratio of the excess of insider purchase transactions over insider sales transactions to the total number of insider trades (i.e., sum of purchases and sales) calculated each month and averaged over the 24 months in either 2002-2003 (pre-event) or 2005-2006 (post-event) period.
Insider Profitability	Ave_insider_profit	Average profitability of insiders' purchase transactions in either the pre- or post-event period, calculated as the 30-, 90- or 360-day abnormal stock return earned by each insider purchase transaction and averaged over either 2002-2003 (pre) or 2005-2006 (post).
Mandatory Fund Ownership	MFO	Average aggregate share ownership in the pre-event period (2002-2003) by actively managed domestic equity mutual funds that were forced to change their disclosure frequency in 2004 from semi-annual to quarterly.
Voluntary Fund Ownership	VFO	Average aggregate share ownership in the pre-event period (2002-2003) by actively managed domestic equity mutual funds that voluntarily disclosed their portfolio holdings at a quarterly frequency prior to the SEC regulation.
Non-Mutual Fund Ownership	Non-MFO	Average aggregate share ownership in the pre-event period (2002-2003) by all institutional investors that were not mutual funds and were required to disclose their shareholdings quarterly through Form 13F.
Hedge Fund Ownership	HFO	Average aggregate share ownership in the pre-event period (2002-2003) by all hedge funds, as identified by the FactSet Lionshares database and as obtained from their quarterly Form 13F filings.
Market Capitalization	Mcap	Natural logarithm of monthly market capitalization in millions of U.S. dollars, averaged over the 24 months in the pre-period (2002-2003).
Book-to-Market Ratio	BTM	Ratio of the book value of equity of a firm to its market value of equity, calculated monthly and averaged over the 24 months in the pre-period (2002-2003).
Leverage	Lev	Ratio of the total short- and long-term debt of a firm to its total assets, averaged over the 24 months in the pre-period (2002-2003).

<b>Variable</b>	<b>Short Name</b>	<b>Definition and Calculation of Variable</b>
Past Returns	Ret	Buy-and-hold returns for a firm over the past 11 months prior to the immediately preceding month, calculated monthly and averaged over the 24 months in the pre-period (2002-2003).
Stock Illiquidity - Amihud measure	Amihud	Natural logarithm of the square root of the ratio of absolute value of daily stock returns to the product of stock price and daily trading volume (as defined in Agarwal et al. 2015).
CEO Myopia		Dummy variable set equal to 1 for firms that are (a) in the bottom tercile of CEO tenure in the year prior to the SEC Regulation, or (b) in the top tercile of forced CEO turnover sensitivity to stock price performance, across Fama-French 48 industries, in the five years prior to the SEC regulation. Set to 0 otherwise.
Percentage of Purchases	%Purchases	Ratio of the number of shares purchased by the insiders of a firm in a given month to its total shares outstanding at the end of the month, expressed as a percentage.
Percentage of Sales	%Sales	Ratio of the number of shares sold by the insiders of a firm in a given month to its total shares outstanding at the end of the month, expressed as a percentage.
Percentage Change in MF Holdings	% $\Delta$ MF Holdings	Percentage change in mandatorily reporting funds' shareholding of a firm, as disclosed to the SEC.
Percentage Change in Insider Holdings	% $\Delta$ Insider Holdings	Percentage change in insiders' shareholding due to trades undertaken within a five-day window following the mandatory reporting funds' SEC filing date.
Insider Trade Indicator	Trade Indicator	Indicator variable that takes the value of 1 if insiders' trade in the five-day window immediately following mandatorily reporting funds' SEC filing date and is set to 0 if insiders trade in that month but outside of the five-day window.
Capital Expenditure	HI_CAPEX	Indicator variable set equal to 1 for firms with top tercile capital expenditures (scaled by beginning total assets) averaged over the two years in the pre-period (2002 and 2003) and set to 0 otherwise.
Net Additions to PP&E	HI_CHPPE	Indicator variable set equal to 1 for firms with top tercile changes in net property, plant and equipment (scaled by beginning total assets) averaged over the two years in the pre-period (2002 and 2003) and set to 0 otherwise.

<b>Variable</b>	<b>Short Name</b>	<b>Definition and Calculation of Variable</b>
Buyback Indicator	Buyback	Indicator variable set equal to 1 if the number of adjusted shares outstanding at the end of a calendar year (i.e., in December) is less than that outstanding at the beginning of the calendar year (i.e., in January) and is set equal to 0 otherwise. It is then averaged over the two years in the pre-period (2002-03) or the post-period (2005-06).
Sales Guidance	Sales_Guidance	Number of annual sales forecasts provided by the management in a calendar year, averaged over the two years in the pre-period (2002-03) or the post-period (2005-06).
EPS Guidance	EPS_Guidance	Number of annual earnings per share (EPS) forecasts provided by the management in a calendar year, averaged over the two years in the pre-period (2002-03) or the post-period (2005-06).

## Appendix B: Replication of Table II (Panels A and B) of Agarwal et al. (2015)

This appendix presents replication of the main results of Agarwal et al. (2015) as presented in their Table II, Panels A and B. Panel A presents descriptive statistics of a comparable sample of stocks owned by the 839 mandatorily reporting funds. Column (1) of Panel B presents results of the difference-in-differences estimation using 12 months of firm-level data pre- and post-SEC Regulation in May 2004. Column (2) in Panel B reproduces the reported results in column (1) of Table II Panel B in Agarwal et al. (2015). See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at the 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

### Panel A: Descriptive Statistics

Variable	<i>N</i>	Mean	Median	Std. Dev.	P25	P75
$\Delta$ Amihud	4,980	-0.14	-0.11	0.40	-0.32	0.08
Pre-Period Amihud	4,980	-9.05	-9.11	1.40	-10.12	-8.03
Pre-Period Mcap	4,980	5.86	5.77	1.87	4.54	7.10
Pre-Period BTM	4,980	0.73	0.74	0.38	0.47	0.94
Pre-Period Mom	4,980	0.65	0.36	1.03	0.18	0.76
MFO	4,980	0.04	0.03	0.04	0.01	0.05

### Panel B: Results from estimation of the difference-in-differences specification

VARIABLES	(1)	(2)
	$\Delta$ Amihud	Agarwal et al. (2015) reported results: $\Delta$ Amihud
MFO	-0.580*** (-3.56)	-0.815*** (-7.17)
Pre-Period Amihud	-0.159*** (-11.26)	-0.223*** (-13.22)
Pre-Period Mcap	-0.114*** (-11.45)	-0.155*** (-13.75)
Pre-Period BTM	-0.083*** (-4.68)	-0.129*** (-8.90)
Pre-Period Mom	-0.051*** (-5.62)	-0.082*** (-8.23)
Constant	-0.795*** (-10.32)	-1.064*** (-11.95)
Observations	4,980	4,635
Adjusted R-squared	0.044	0.083

**Table 1: Descriptive Statistics**

This table presents the descriptive statistics of all firm-level variables. See Appendix A for descriptions of the variables. *%Purchases* and *%Sales* are in percentage points (i.e., x 100) below for meaningful values. All variables, except returns, are winsorized at the 1% and 99% levels to account for outliers.

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>Std Dev</b>	<b>P25</b>	<b>P75</b>
Ave_NPR	6,884	-0.29	-0.60	0.79	-1.00	0.00
%Purchases	6,884	0.03	0.00	0.18	0.00	0.00
%Sales	6,884	0.14	0.02	0.35	0.00	0.13
MFO	6,884	0.04	0.03	0.03	0.01	0.05
VFO	6,468	0.05	0.04	0.04	0.01	0.08
HFO	6,212	0.04	0.02	0.05	0.01	0.05
Non-MFO	6,764	0.31	0.32	0.18	0.14	0.46
Mcap	6,884	5.76	5.70	1.89	4.42	7.02
BTM	6,884	0.81	0.55	0.88	0.34	0.93
Ret	6,884	0.17	0.11	0.40	-0.05	0.28
Lev	6,884	0.21	0.17	0.20	0.04	0.34
CAPEX	6,708	0.05	0.03	0.06	0.01	0.06
CHPPE	6,708	0.02	0.00	0.07	-0.01	0.02
Ave_insider_profit_30days	1,508	0.14	0.11	0.43	-0.07	0.33
Ave_insider_profit_90days	1,508	0.08	0.06	0.26	-0.04	0.20
Ave_insider_profit_360days	1,496	0.04	0.03	0.14	-0.03	0.11
Sales Alpha_90day	3,633	0.03	0.02	0.22	-0.08	0.12

**Table 2: Changes in Insider Trading Activity**

This table presents the results of estimating the difference-in-differences specification presented in Equation (4), with the dependent variable as *Net Purchase Ratio (Ave\_NPR)* in Columns (1) and (2) and *%Purchases* in Column (3). See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Ave NPR	(2) Ave NPR	(3) %Purchases
Post x MFO	1.700*** (3.86)	1.548*** (3.50)	0.005*** (4.37)
Post	-0.292*** (-12.44)	-0.271*** (-11.39)	-0.001*** (-7.23)
MFO	-5.190*** (-13.47)	-3.103*** (-8.41)	-0.004*** (-3.76)
Mcap		-0.110*** (-18.98)	-0.000*** (-8.30)
BTM		0.062*** (5.34)	0.000*** (3.25)
Ret		-0.209*** (-7.27)	-0.000 (-1.21)
Lev		0.100** (2.01)	0.000 (1.49)
Constant	0.017 (0.88)	0.525*** (12.42)	0.001*** (8.51)
Observations	7,133	6,884	6,884
Adjusted R-squared	0.058	0.147	0.052



**Table 3: Testing the Parallel-Trends Assumption**

This table presents the coefficients on the interaction term ( $HY_t \times MFO$ ) in the difference-in-differences specification presented in Equation (4) around the 2004 SEC regulation.  $HY_t$  is an indicator variable marking each of the six half-year periods in the years 2003, 2005 and 2006, with the year 2002 serving as the benchmark period. To balance the panel through time, we ensure that insiders trade at least once in each of the pre-event (2002 and 2003) and the post-event (2005 and 2006) windows. See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the t-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Ave NPR	(2) Ave NPR	(3) Ave NPR	(4) Ave NPR
HY1_2003	-0.103*** (-6.32)	-0.105*** (-6.08)	-0.037** (-2.42)	-0.034** (-2.09)
HY1_2003 x MFO	0.516 (1.57)	0.474 (1.39)	0.516 (1.57)	0.474 (1.39)
HY2_2003	-0.263*** (-14.59)	-0.273*** (-14.41)	-0.197*** (-11.60)	-0.202*** (-11.32)
HY2_2003 x MFO	0.162 (0.46)	0.175 (0.48)	0.162 (0.46)	0.175 (0.49)
Post	-0.253*** (-13.78)	-0.308*** (-2.70)		
Post x MFO	0.780*** (2.63)	0.843*** (2.58)		
HY1_2005			-0.194*** (-10.53)	-0.242** (-2.14)
HY1_2005 x MFO			0.672* (1.82)	0.742* (1.86)
HY2_2005			-0.225*** (-12.09)	-0.273** (-2.40)
HY2_2005 x MFO			0.804** (2.12)	0.876** (2.13)
HY1_2006			-0.222*** (-11.43)	-0.270** (-2.37)
HY1_2006 x MFO			0.861** (2.29)	0.916** (2.29)
HY2_2006			-0.188*** (-9.43)	-0.237** (-2.07)
HY2_2006 x MFO			0.790** (2.00)	0.847** (2.02)
Constant	0.001 (0.14)	0.042 (0.36)	-0.065*** (-9.71)	-0.070*** (-10.13)
Observations	26,650	25,289	26,650	25,289
Adjusted R-squared	0.279	0.279	0.275	0.275
Firm FE	Yes	Yes	Yes	Yes
Half-Year FE	Yes	Yes	No	No
Post x Controls	No	Yes	No	Yes

**Table 4: Ownership of Alternate Investor Groups**

This table presents the results of estimating the modified difference-in-differences specification presented in Equation (5), with additional interaction coefficients for ownership by three alternate groups of institutional investors: hedge funds (*HFO*), non-mutual fund institutional investors (*Non-MFO*), and mutual funds that voluntarily disclosed quarterly holdings prior to the SEC regulation (*VFO*). The *t*-statistics for the difference between the coefficients on the interaction terms for *MFO* and each alternate investor group are presented at the bottom of the table. See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Ave NPR	(2) Ave NPR	(3) Ave NPR
Post	-0.305*** (-10.73)	-0.294*** (-8.96)	-0.273*** (-9.59)
MFO	-3.194*** (-8.19)	-2.533*** (-6.25)	-2.459*** (-6.19)
Post x MFO	1.768*** (3.80)	1.374*** (2.71)	1.550*** (3.14)
HFO	-0.240 (-0.87)		
Post x HFO	0.444 (1.31)		
Non-MFO		-0.414*** (-4.65)	
Post x Non-MFO		0.080 (0.81)	
VFO			-1.606*** (-4.96)
Post x VFO			0.089 (0.22)
Mcap	-0.112*** (-17.48)	-0.091*** (-13.14)	-0.093*** (-14.17)
BTM	0.074*** (6.11)	0.065*** (5.49)	0.074*** (5.85)
Ret	-0.246*** (-10.21)	-0.225*** (-7.51)	-0.219*** (-7.24)
Lev	0.128** (2.49)	0.129*** (2.59)	0.086* (1.68)
Constant	0.536*** (10.89)	0.517*** (11.74)	0.465*** (9.85)
Observations	6,212	6,764	6,468
Adjusted R-squared	0.145	0.155	0.138
Difference: Post x MFO - Post x Alternate Investor Group	1.324	1.294	1.462
<i>t</i> -stat	2.277	2.309	1.946

**Table 5: Insider Trading Profitability around SEC Regulation**

This table presents the results of estimating the difference-in-differences specification presented in Equation (4), with the average profitability of insider purchases as the dependent variable (*Ave\_insider\_profit*). *Ave\_insider\_profit* is computed as the out of sample alpha estimated over 30 days (Column 1), 90 days (Column 2) or 360 days (Column 3) after the insider trade. See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
Ave insider profit:	30-day Alpha	90-day Alpha	360-day Alpha
Post x MFO	1.468** (2.20)	1.027*** (2.61)	0.669*** (3.18)
Post	-0.147*** (-4.70)	-0.101*** (-5.27)	-0.063*** (-6.03)
MFO	0.062 (0.13)	-0.082 (-0.25)	-0.120 (-0.89)
Mcap	-0.005 (-0.74)	-0.008* (-1.82)	-0.004 (-1.64)
BTM	-0.022 (-0.97)	-0.034** (-2.45)	0.007 (0.66)
Ret	0.100*** (2.68)	0.078*** (3.00)	0.095*** (4.55)
Lev	0.004 (0.08)	0.002 (0.05)	-0.011 (-0.60)
Constant	0.206*** (3.50)	0.167*** (4.43)	0.070*** (3.09)
Observations	1,508	1,508	1,496
Adjusted R-squared	0.019	0.035	0.073

**Table 6: Cross-sectional Differences in CEO Incentives**

Panel A presents results of estimating the difference-in-differences specification presented in Equation (4), with an additional interaction term for the dummy variable *CEO Myopia*. *CEO Myopia* is set equal to 1 for firms in either (a) bottom tercile of CEO tenure in the year prior to SEC Regulation, or (b) top tercile of forced CEO turnover sensitivity to stock price performance across Fama-French 48 industries in the five years prior to SEC Regulation. Panel B presents the results for estimating Equation (4), with the interaction term as either an indicator for the top tercile of capital expenditures (*HI\_CAPEX*) in Column (1) or an indicator for the top tercile of changes in net property, plant and equipment (*HI\_CHPPE*) in Column (2). *HI\_CAPEX* and *HI\_CHPPE* are both measured immediately prior to the 2004 SEC Regulation. See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Panel A: CEO Incentives to be Myopic in Response to Investors' Myopic Pressures**

VARIABLES	(1) Ave_NPR	(2) Ave_insider_profit 90-day Alpha
Post x MFO x CEO Myopia	-3.243* (-1.73)	-2.262*** (-2.72)
Post x MFO	3.699*** (3.04)	1.772*** (3.84)
Post x CEO Myopia	0.068 (0.76)	0.066 (1.53)
MFO x CEO Myopia	2.304* (1.93)	1.282* (1.94)
Post	-0.225*** (-4.36)	-0.119*** (-5.47)
MFO	-4.340*** (-5.47)	-0.549 (-1.43)
CEO Myopia	-0.004 (-0.06)	-0.029 (-0.91)
Mcap	-0.085*** (-7.27)	-0.008* (-1.78)
BTM	0.079*** (2.60)	-0.035** (-2.54)
Ret	-0.261*** (-3.26)	0.076*** (2.93)
Lev	0.134 (1.60)	0.009 (0.26)
Constant	1.101*** (13.30)	0.174*** (4.59)
Observations	1,496	1,496
Adjusted R-squared	0.103	0.037

*Panel B: CEO Incentives to Lean Against Investors' Myopic Pressures when Pre-committed to Investments*

VARIABLES	(1) Ave_NPR	(2) Ave_NPR
Post x HI_CAPEX x MFO	1.788* (1.91)	
Post x HI_CAPEX	-0.081 (-1.55)	
HI_CAPEX x MFO	-0.593 (-0.81)	
HI_CAPEX	-0.030 (-0.75)	
Post x HI_CHPPE x MFO		1.872* (1.95)
Post x HI_CHPPE		-0.027 (-0.51)
HI_CHPPE x MFO		-0.997 (-1.36)
HI_CHPPE		-0.037 (-0.90)
Post x MFO	1.002* (1.80)	0.890 (1.63)
Post	-0.248*** (-8.69)	-0.264*** (-9.32)
MFO	-2.779*** (-5.94)	-2.614*** (-5.63)
Mcap	-0.110*** (-18.60)	-0.110*** (-18.53)
BTM	0.060*** (5.21)	0.059*** (5.10)
Ret	-0.220*** (-7.20)	-0.219*** (-7.17)
Lev	0.111** (2.19)	0.103** (2.03)
Constant	0.528*** (11.86)	0.531*** (11.95)
Observations	6,708	6,708
Adjusted R-squared	0.150	0.150

**Table 7: Information Spillover Effects**

This table presents the results of estimating the regression specifications presented in Equations (6) and (7) to examine whether insiders learn from and react to mandatorily reporting funds' SEC filings within a five-day window. Column (1) presents the results with the dependent variable as  $\% \Delta Insider Holdings$  to assess the direction and magnitude of any learning effects. Column (2) presents the results from a linear probability model with the dependent variable as *Trade Indicator* dummy to assess the incidence of insider trades within the five-day window. Firm and Shareholding Date fixed effects are included to account for any unobservable underlying firm characteristics and time trends, respectively. See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) % $\Delta$ Insider Holdings	(2) Trade Indicator
Post	-0.015 (-0.53)	-0.147* (-1.74)
% $\Delta$ MF Holdings	0.006 (0.32)	
Post x % $\Delta$ MF Holdings	0.001 (0.02)	
Abs (% $\Delta$ MF Holdings)		-0.019 (-1.13)
Post x Abs (% $\Delta$ MF Holdings)		-0.005 (-0.21)
Qtrly Return to SEC Filing Date	-0.139*** (-4.57)	0.076*** (2.61)
Mcap	0.051* (1.89)	0.029 (1.32)
BTM	0.158*** (3.16)	0.000 (0.01)
Lev	0.044 (0.79)	-0.223** (-2.43)
Observations	14,275	47,175
Adjusted R-squared	0.498	0.172
Firm FE	Yes	Yes
Shareholding Date FE	Yes	Yes

**Table 8: Role of Liquidity**

This table presents the results of estimating the difference-in-differences specification presented in Equation (4), with additional analyses to examine the role of liquidity. Column (1) presents the results after controlling for contemporaneous liquidity. Column (2) presents the results of estimating Equation (4) with %Sales as the dependent variable, computed as the number of shares sold by insiders as a percentage of the total shares outstanding. Column (3) presents the results when the dependent variable is the profitability of insider sale transactions over 90 days. See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Ave NPR	(2) %Sales	(3) Sales Alpha 90day
Post x MFO	0.941** (2.15)	-0.010*** (-4.17)	-0.231 (-1.01)
Contemporaneous Amihud	0.272*** (16.58)		
Post	-0.079*** (-3.03)	0.000*** (3.37)	0.011 (0.81)
MFO	-1.977*** (-5.25)	0.011*** (5.11)	0.127 (0.70)
Mcap	0.079*** (6.28)	-0.000*** (-9.92)	-0.006** (-2.30)
BTM	0.073*** (6.52)	-0.000** (-2.00)	-0.001 (-0.07)
Ret	-0.141*** (-5.03)	0.001*** (6.08)	-0.071*** (-4.61)
Lev	0.128*** (2.62)	0.000 (0.28)	-0.029 (-1.54)
Constant	1.775*** (20.39)	0.002*** (12.83)	0.080*** (3.20)
Observations	6,860	6,884	3,633
Adjusted R-squared	0.183	0.037	0.015

**Table 9: Other Managerial Signals – Buybacks and Management Guidance**

This table presents the results of estimating the difference-in-differences specification presented in Equation (4), with other means of managerial signaling as dependent variables. Column (1) presents the results with the dependent variable as *Buyback*, which is an indicator variable set equal to 1 when the number of adjusted shares outstanding at the end of a calendar year is less than that at the beginning of the same year and is set equal to 0 otherwise. Columns (2) and (3) present the results with the dependent variables as *Sales\_Guidance* or *EPS\_Guidance*, computed as the number of annual sales or EPS (earnings per share) forecasts provided by the management in a year, respectively. See Appendix A for descriptions of the variables. Standard errors are clustered by firm and the *t*-statistics are reported in parentheses. All variables, except returns, are winsorized at 1% and 99% levels to account for outliers. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) Buyback	(2) Sales Guidance	(3) EPS Guidance
Post x MFO	0.799*** (3.74)	6.628* (1.85)	5.432** (2.20)
Post	-0.007 (-0.67)	1.518*** (7.62)	0.292** (2.19)
MFO	-0.618*** (-3.37)	-0.536 (-0.32)	3.317** (2.10)
Mcap	0.048*** (15.69)	0.233*** (4.60)	0.559*** (13.61)
BTM	0.007 (1.50)	-0.079 (-0.94)	-0.173** (-2.37)
Ret	-0.010 (-0.99)	0.631*** (4.25)	0.746*** (5.64)
Lev	-0.161*** (-7.13)	-0.926** (-2.31)	0.550* (1.89)
Constant	0.003 (0.14)	0.787** (2.45)	-0.843*** (-3.05)
Observations	6,884	1,496	2,809
Adjusted R-squared	0.062	0.144	0.146