Information Environment, Sophisticated Investors, and Market Efficiency: Evidence from a Natural Experiment*

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Abstract

This paper examines how changes in information environment affect the trading behavior of sophisticated investors and stock price efficiency. Using closures of brokerage firms as an exogenous shock to information environment, we study how hedge funds trade the affected stocks and how their trades in turn impact price efficiency. We find that, after exogenous reduction of analyst coverage, 1) the magnitudes of post-earnings-announcement-drift (PEAD) become stronger; 2) hedge funds trade more aggressively on the affected stocks in that their abnormal holdings increase (decrease) more prior to positive (negative) earnings announcements; 3) hedge funds obtain higher abnormal returns on the affected stocks; and 4) conditional on high levels of hedge fund holdings prior to earnings announcements, the increase in the magnitudes of PEAD becomes significantly weaker and is indistinguishable from zero, suggesting that the participation of hedge funds can restore the impaired market efficiency. Furthermore, based on a novel dataset of Internet search traffic for EDGAR filings, we identify a channel through which hedge funds increase information acquisition about the affected firms after reduction of analyst coverage. Overall, these results are consistent with a substitution effect between sophisticated investors and providers of public information in facilitating market efficiency.

Keywords: Hedge funds, information environment, information acquisition, analyst coverage, PEAD, price efficiency, EDGAR search volume

JEL Classification: G14, G23, G24

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Information plays a key role for the efficiency of economy and finance (e.g., Hayek, 1945; Fama, 1965). As a prominent phenomenon in US financial markets over the past two decades, institutional investors have replaced retail investors to become dominant figures, among which hedge funds represent a group of most sophisticated investors. Meanwhile, information environment keeps evolving at both the market and firm levels. For example, the passages of Regulation Fair Disclosure and the Dodd-Frank Act have generated market-wide influences on information communication, while substantial variation exists across firms regarding how and what information is disseminated into the market. Motivated by these observations, we attempt to address a largely unexplored question: How do changes in information environment affect the trading behavior of sophisticated investors and hence market efficiency?

A priori, the impact of information environment on sophisticated investors is unclear. On the one hand, sophisticated investors who allocate scarce resources (e.g., labor and technology) to acquire valuable information will have a greater comparative advantage when information channels for other market participants become more constrained. Thus, faced with an opaque information environment, sophisticated investors may have incentives to engage in information acquisition and market participation. On the other hand, if sophisticated investors obtain their advantages mainly through processing public information in advanced manners, they may trade less actively when information environment becomes murky.

Despite unclear a priori, examining how information environment affects sophisticated investors is important for at least three reasons. First, it relates to how sophisticated investors trade and profit from information advantages (e.g., Grossman and Stiglitz, 1980). Second, it deals with the way markets incorporate information that is not accessible to all participants (e.g., Fama, 1970). Third, it helps us better understand the interactions between different types of information processors (e.g., sell-side analysts and hedge funds) in financial markets.

Though important, the question is difficult to tackle. We may suffer from the reverse causality problem as the behavior of sophisticated investors can change firms' information environment. For example, activist hedge funds may demand firms to change their disclosure policies after they accumulate a substantial amount of equities. Moreover, we can also encounter the omitted variable problems. For example, when there are important corporate events, such as mergers and acquisitions, firms' disclosure practice and the trading activities of sophisticated investors can change simultaneously.

To overcome the endogeneity issue, we exploit a natural experiment surrounding the reduction of sell-side analysts due to closures of brokerage firms as an exogenous shock to information environment. As documented in Hong and Kacperczyk (2010) and Kelly and Ljungqvist (2012), closure-related terminations, unlike typical changes in analyst coverage, are usually caused by brokerage firms' adverse business conditions that are unrelated to covered stocks. Hence, such changes affect information environment but are unlikely to be generated by sophisticated investors. In this setting, we study how hedge funds respond to exogenous changes in analyst coverage by trading more aggressively on the affected stocks. We also examine whether hedge funds' profitability increases when they trade on the affected stocks. Furthermore, we are interested in how changes in hedge fund trading activities affect stock price efficiency.

Our sample used in stock-level analyses is formed from merging several datasets covering stocks prices and characteristics, brokerage closures, analyst coverage, and hedge fund holdings. To infer about stock price efficiency, we employ the post-earnings-announcement-drift (PEAD) that prior research (e.g., Bernard and Thomas, 1989) has shown to be related to stock mispricing. Though other stock regularities related to mispricing exist, the benefit of using PEAD is that we can measure the time lapse of the drift and thus evaluate the process of price efficiency. Our data of hedge fund holdings are obtained from quarterly 13F filings in which hedge fund companies are identified by manually matching 13F institutions' names with a list of hedge fund company names compiled from several commercial hedge fund databases and other online sources.

Our analyses generate four sets of main findings. First, after exogenous reduction of analyst coverage, the magnitudes of PEAD become stronger for the affected stocks. The change in magnitude is particularly large for stocks covered by few analysts. This negative association between the information level and the PEAD suggests that reduction in information provision impedes price efficiency.

Second, hedge funds, as a group, trade more aggressively on the affected stocks around earnings announcements after coverage reduction. Relative to unaffected stocks, hedge fund holdings of the affected stocks become significantly more sensitive to standardized unexpected earnings (SUE) after coverage reduction. In other words, hedge fund holdings increase (decrease) more prior to positive (negative) earnings announcements after coverage reduction. These results suggest that, when information environment becomes more opaque due to reduced analyst coverage, hedge funds become more actively participating in the affected stocks.

Third, we are interested in whether hedge funds make higher investment payoffs through active market participation when public information becomes murkier. Indeed, we find that hedge fund trades, especially their purchases (i.e., increase of stock holdings), are associated with abnormal returns on the affected stocks after coverage reduction. Combined with the other findings in the paper, this result provides supportive evidence that hedge funds as a whole make profits by actively participating in the affected stocks.

Finally, conditional on high levels of hedge fund holdings prior to earnings announcements, the increase in the magnitudes of PEAD become significantly weaker for the affected stocks. This mitigating effects of hedge fund participation on PEAD are statistically significant for both positive and negative earnings surprises. More importantly, the decrease in PEAD associated with enhanced hedge fund trading appears to be sufficient to fully offset the unconditional increase in PEAD associated with reduced analyst coverage. Therefore, our evidence is consistent with the notion that, in an opaque information environment, increased participation of hedge funds helps facilitate market efficiency.

In addition, exploiting a novel dataset of Internet search traffic for EDGAR filings, we identify a channel through which hedge funds increase information acquisition about the affected firms after reduction of analyst coverage. The Securities and Exchange

Commission (SEC) assembles information on web search volume for EDGAR filings since February 14, 2003, in which each log entry covers the IP address, date and time, and the CIK of the company submitting the request form, as well as the link to the particular filing. We further use a geolocation technique to associate the Internet search traffic with sophisticated investors. Using a difference-in-differences regression approach, we find that the search volume for the filings of the treated firms increases significantly following the coverage reductions. More importantly, we show that the search volume increase is more pronounced from the IP addresses whose geographic locations are closer to hedge funds. These tests provide evidence that sophisticated investors such as hedge funds scale up their information acquisition when public information providers such as sell-side analysts exit the financial market.

Overall, our results reveal a substitution effect in information provision between sell-side analysts and hedge funds. In practice, information acquisition is costly even for sophisticated investors (Grossman and Stiglitz, 1980). When more analysts provide information on the same stock, sophisticated investors gain a smaller comparative advantage relative to other investors from costly information acquisition and choose to participate less in trading the stock. However, when fewer analysts are at work and information environment becomes opaque, sophisticated investors may have incentives to increase market participation due to higher information advantages. That is, the level of comparative advantage from information acquisition for sophisticated investors depends on information environment. Therefore, the trade-off between comparative advantages and information acquisition cost leads to a substitution effect among information processors.

In our analyses, we use hedge funds to proxy for sophisticated investors. In practice, other types of institutional investors can be active market participants as well. To gain additional insight, we also look at trading patterns of non-hedge-fund institutions (including mutual funds, banks, and insurance companies, among others). We find that non-hedge fund institutions, on average, exhibit little change in their stock holdings after analyst coverage reductions. For example, after analyst coverage drops, there is no significant change in the abnormal holdings of non-hedge fund institutions prior to earnings surprises. In addition, unlike hedge funds, the holdings of non-hedge fund institutions on the affected stocks do not appear to be more informative after analyst coverage reduction.

Our paper makes several contributions to the literature. First, we show evidence that sophisticated investors engage more in investment when information environment turns more opaque, suggesting a substitution effect between different information processors. Kacperczyk and Seru (2007) find evidence that skilled mutual fund managers typically do not use public information produced by sell-side analysts. Our findings are consistent with the notion that sophisticated investors may prefer trading stocks associated with less public information, so as to enjoy better information advantages. Our results are consistent with many theory papers that predict a substitution effect between the acquisition of private information and the supply of public information (Verrecchia, 1982; Diamond, 1985; Bushman, 1991; Lundholm, 1991; Goldstein and Yang, 2017). Lo (2017) provides an extensive presentation that how adaptation to environment changes influences economic behavior and market efficiency. To our best knowledge, our paper is the first to test such a substitution effect empirically in a causal framework.

The substitution effect we document has policy implications. It implies that the increase of public disclosure of firm information could sometimes drive out sophisticated investors from acquiring private information. Thus, if the quality of private information acquired by sophisticated investors is superior to public information, increased public disclosure could delay information being collected and incorporated in stock prices, which in turn slows down the process of market efficiency. On the other hand, when the public information channel is weakened, sophisticated investors with richer resources of information acquisition enjoy a larger edge and make more profits than other investors, while their profit-seeking activity may actually benefit market efficiency.[1]

[1] The Markets in Financial Instruments Directive (MiFID II) regulation, becoming effective in European Union on January 3, 2018, represents a new regulation change for investment intermediaries. Part of this regulation requires institutional investors such as asset managers to pay banks and brokers directly for research, instead of the previous practice of combining it with trading costs. This policy may affect the difference in information acquisition between big asset managers and small institutional investors, giving an edge toward big asset managers. For details of MiFID II, see the website of the European Securities and Markets Authority (ESMA) https://www.esma.europa.eu/policy-rules/mifid-ii-and-mifir.

Indeed, we find that trades of hedge funds improve price efficiency for stocks that experience an exogenous reduction of public information dissemination. In general, price drift after earnings surprises is prolonged for stocks suffering losses of analyst coverage, consistent with the view that sell-side analysts produce useful information (Elton, Gruber, and Grossman, 1986; Wormack, 1996; Jegadeesh, Kim, Krische, and Lee, 2004). In addition, recent research shows that, overall, hedge funds exploit stock mispricing and improve price efficiency (e.g., Akbas, Armstrong, Sorescu, and Subrahmanyam, 2015; Cao, Chen, Goetzmann, and Liang, 2016; Cao, Liang, Lo, and Petrasek, 2016).[2] In this paper, we present fresh evidence that, when exogenous shocks occur to the public information channel, sophisticated investors substitute sell-side analysts to acquire information and facilitate price efficiency. By doing so, they seem to realize net investment profits on average.

Next, our results speak to the nature of PEAD, i.e., the abnormal return associated with earnings surprises over the days after earnings reports (Ball and Brown, 1968). Prior research has debated over different interpretations of PEAD as mispricing or risk premium (e.g., Ball, 1978; Bernard and Thomas, 1989). We find that PEAD becomes stronger when information environment is more opaque, while PEAD becomes weaker following enhanced trading activities of hedge funds. This result suggests that PEAD is likely to relate to stock mispricing, reflecting delayed response to earnings reports.

Finally, our study is related to Wu (2016) who shows that, after closures of brokerage firms, corporate insiders trade actively on the affected stocks. There is an important difference, however, between sophisticated investors and corporate insiders. Unlike sophisticated investors, corporate insiders have access to private information at no cost, and their decision is about whether or not use private information. In the absence of information acquisition cost, corporate insiders do not face the same tradeoff as sophisticated investors do. In addition, the trading volume of insiders is usually much

[2] There has also been evidence based on hedge fund returns that some hedge funds deliver abnormal performance on a risk-adjusted basis, which supports the notion that these successful funds are able to exploit price mispricing (e.g., Kosowski, Naik, and Teo (2007), Jagannathan, Malakhov, and Novikov (2010), and Chen, Cliff, and Zhao (2017)).

smaller than that of outsider investors and thus may have limited impact on price efficiency.

The rest of the paper is organized as follows. Section I describes the data. Section II presents our main results, checks the robustness, and provides additional analysis. Finally, Section III provides some concluding remarks.

I. Data

For our empirical analysis, we collect information by merging several different data sets. Below we describe one of them at a time.

A. Stocks

Our stock level data come from several standard sources. We obtain stock returns data from the Center for Research in Security Prices (CRSP). All accounting data are extracted from Compustat. In addition, analyst data are obtained from I/B/E/S.

B. Closures of Brokerage Firms

The analyst reduction data we use in this paper are the same as the one in Kelly and Ljungqvist (2012). The reduction of analyst coverage is a consequence of 43 brokerage firms closing their research departments between 2000 and 2008, resulting in 4,429 coverage terminations, which affect 2,180 unique stocks. Unlike typical changes in analyst coverage, closure-related reductions of analyst coverage are unrelated to firms' fundamentals (Hong and Kacperczyk, 2010, Kelly and Ljungqvist, 2012).

In this paper, we mainly focus on treated firms that have five or fewer analysts prior to coverage reductions. We match each treated firm with up to five control firms that do not experience coverage reductions one year before and after the termination dates of the treated firm. We require the control firms to be in the same Fama-French 48 industry, in the same Fama-French size and book-to-market quintile as those of the treated firms. If more than five candidate firms exist, we choose firms that are closest to the treated firm in terms of the average bid-ask spreads.

We merge I/B/E/S data with the coverage reduction data. We keep the earnings announcement for the treated and control firms within two-year window both before and after the coverage reductions. The merged dataset consists of 372 treated firms and 631 control firms. The merged sample span 1998 to 2009. Table 1 presents the ex-ante summary statistics for both the treated firms and control firms. We can see that the firm characteristics and various outcome variables are comparable between the treated firms and control firms, suggesting that the matching procedure is reasonable.

[Insert Table 1 about here]

C. Hedge Fund Holdings

Our data of hedge fund stock holdings are obtained from Cao, Chen, Goetzmann, and Liang (2015). The data are constructed by manually matching the Thomson Reuters 13F institutional holdings data with a comprehensive list of hedge fund company names and online sources. The list of hedge fund company names is compiled from merging six different hedge fund databases, namely TASS, HFR, CISDM, Bloomberg, Barclay Hedge, and Morningstar. Hedge funds were historically exempt from registering with the SEC. However, hedge fund management companies with more than $100 million in assets under management are required to file quarterly disclosures of their holdings (13F holdings) of registered equity securities. Common stock positions greater than 10,000 shares or $200,000 in market value are subject to such disclosures.

One problem of using 13F holdings data to identify stock hedge fund ownership is that the data do not indicate which institutions are hedge fund companies. Therefore, we identify hedge fund companies through a three-step procedure. As the first step, 13F institutions (excluding banks, insurance companies, and mutual funds) are matched with the list of company names from the six hedge fund databases. Second, among the matched institutions, we assess whether hedge fund management is indeed their primary business. We check whether they are registered with the SEC. Since registration with the SEC is only necessary when conducting non-hedge fund businesses (e.g., mutual fund management), we include those institutions unregistered with the SEC as hedge funds in our sample, following Brunnermeier and Nagel (2004). On the other hand, if a matched institutional investor has registered with the SEC and thus filed Form ADV, we follow Brunnermeier and Nagel (2004) and Griffin and Xu (2009) to include it in our sample only if the following two criteria are both satisfied: over 50% of its investment is listed as "other pooled investment vehicle" (private investment companies, private equity, and hedge funds) or over 50% of its clients are high-net-worth individuals, and the adviser charges performance-based fees. In the third step, to address the concern that some hedge fund companies may not report to any database because of its voluntary nature, we manually check the company website and other online sources for each of the unmatched 13F institutions to decide whether it is a hedge fund company. The final sample covers 1,517 hedge fund management companies over a period of 1980–2012.[3]

For each stock in our sample, we compute its quarterly hedge fund holdings (HF) as the number of shares held by all hedge fund companies at the end of the quarter divided by the total number of shares outstanding. If the stock is not held by any hedge fund company, its HF is set to zero. We define abnormal hedge fund holdings (AHF) as the current quarter HF minus the average HF in the past four quarters. Though AHF is correlated with change in hedge fund ownership from the one quarter to the next, it better captures quarterly variations in arbitrage activity relative to the trend.

[3] Under the Dodd-Frank Act, major hedge fund management companies that were previously exempt from registering with the SEC as investment advisers under the Investment Advisers Act of 1940 are required to do so since 2012. Before the Dodd-Frank Act, the SEC once issued a ruling in December 2004 requiring hedge fund companies that managed more than $25 million with over 14 investors and a lockup period of less than 2 years to register with the commission by February 2006. As a response, many hedge fund companies registered while others avoided the registration by controlling investor size and length of lockup period. The ruling was overturned in June 2006.

D. EDGAR Search Volume

The SEC assembles information on internet search traffic for EDGAR filings covering the period starting from February 14, 2003.[4] Each log entry provides: 1) the IP address of the requesting user, with the final (fourth) octet of the IP address replaced with a unique set of three letters, 2) the data and time of the request, 3) the CIK of the company that filed the request form, and 4) a link to the particular filing. Previous studies (e.g., Drake, Roulstone, and Thornock, 2015) have described this data set in detail.

We merge the EDGAR search traffic data with the coverage reduction data. To test whether investors acquire more information from EDGAR after the exogenous reductions of analyst coverage, we compute the monthly search volume for the treated firms and the matched control firms two years before and after the reductions of analyst coverage.[5] We also compute the search volume for individual types of firm filings, including 10-K, 10-Q, 8-K, insider filings (Form 3, 4, and 5), and other filing types.

To further test whether sophisticated investors such as hedge funds are more likely to increase their information acquisition via EDGAR after the reductions of analyst coverage, we merge the IP addresses in the EDGAR search traffic data with a geolocation IP database from IP2Location, which provides geographic information (e.g., country, state, city, zip code, latitude, and longitude) associated with each IP addresses. Based on the first three octets of the IP addresses in the SEC data, we match 89% IP addresses (78% of the visits) to unique latitude/longitude pairs. The latitude and longitude associated with the matched IP addresses are invariant to the values of the final (fourth) octets of the IP addresses. For each matched IP address that locates in the U.S., we further compute its geographical distance to the nearest hedge funds based on its latitude/longitude and the physical addresses of the hedge funds collected from the 13F SEC filings. We sort the

[4] The EDGAR log file data can be downloaded from: https://www.sec.gov/dera/data/edgar-log-file-data-set.html

[5] Search requests for the EDGAR data can come from automated webcrawlers rather than human beings. Following Drake, Roulstone, and Thornock (2015), we filter out automated webcrawlers using two criteria: 1) no more than five requests per minute per IP address, and 2) no more than 1,000 requests per day per IP address. We exclude the IP addresses that access more than five filings in a minute or more than 1,000 filings during the day.

user requests to the EDGAR server into two groups based on the distance. For each distance group, we compute the monthly search volume two years before and after the reductions of analyst coverage.

II. Empirical Results

A. PEAD After Exogenous Reductions of Analyst Coverage

It is well known that sell-side analysts can provide information to stock markets both before and after earnings announcements of firms. For example, analysts routinely forecast key results of corporate earnings, engage in conference calls, and interpret the information content of earnings releases. Furthermore, analysts' activities immediately after earnings releases can often facilitate price discovery and hence mitigate PEAD. Zhang (2008) shows that the magnitude of PEAD reduces significantly when analysts promptly update their forecasts about future earnings after earnings releases. Therefore, we hypothesize that the magnitude of PEAD will increase after exogenous reductions of analysts. To test this hypothesis, we perform the following difference-in-differences regression:

$$
\begin{aligned}
CAR\_d1\_dn_{it} = {} & \alpha_i + \alpha_t + \beta_1 Treat_{it} * Post_{it} * SUE_{it} + \beta_2 Treat_{it} * SUE_{it} + \beta_3 Post_{it} \\
& * SUE_{it} + \beta_4 SUE_{it} + \beta_5 Treat_{it} * Post_{it} + \beta_6 Treat_{it} + \beta_7 Post_{it} \\
& + \gamma' Controls_{it} + \varepsilon_{it},
\end{aligned}
$$

where $CAR\_d1\_dn_{it}$ denotes the return drift after quarterly earnings announcement. It is measured as the cumulative abnormal returns from the first day to the nth day after earnings announcement, benchmarked by the returns of corresponding Fama-French 5x5 size and book-to-market portfolios.[6] α_i is the firm fixed effects, and α_t is the calendar month fixed effects. SUE is quarterly standardized unexpected earnings, computed as the quarter's actual earnings minus the average of the most recent analyst forecasts, divided

[6] Our stock return data come from CRSP. In CRSP, return at a given date t is computed based on the close price at day t and close price at day t-1. For the earnings release that take place in after-hours, we compute the nth day return after earnings using the (n+1)th day return in CRSP.

by the standard deviation of those forecasts.[7] *Treat* is a dummy variable that equals one for firms that experience exogenous reduction in analyst coverage and zero otherwise. *Post* is a dummy variable that equals one for quarters after the reduction of analyst coverage. In addition, we include a set of control variables including natural log of market capitalization (*LnSize*), natural log of the book-to-market ratio (*LnBEME*), natural log of the debt-to-equity ratio (*LnLev*), and two lagged monthly returns prior to the earnings announcement (*Ret2mPrior*). The regression period covers quarterly earnings announcement within two years both before and after the reductions of analyst coverage. We condition our analysis on treated firms with five or fewer analysts prior to the reductions of analyst coverage, because otherwise the decrease of one out of many analysts would be unlikely to have material impact on a firm's information environment.[8] Standard errors are double clustered at both the firm and earnings announcement date levels.

[Insert Table 2 about here]

Panel A of Table 2 presents the regression results. As the coefficient of interest, β_1 captures the changes of PEAD after the exogenous reductions of analyst coverage. Here, β_1 is significantly positive across different specifications for fixed effects, suggesting that the magnitude of PEAD increase significantly after coverage reductions. According to the regressions with both firm fixed effects and calendar month fixed effects, the sensitivity to SUE increased by 0.24 for the post earnings announcement drift in a two-day window, while the sensitivity to SUE increased by 0.34 for the drift in a four-day window. For one standard deviation change in SUE (4.13 in our sample), the drop of one analyst leads to 1.0 percentage point additional drift in the two-day window, and 1.4 percentage point additional drift in the four-day window. The impact of coverage reductions on PEAD is robust in longer time horizons. As shown by Appendix A, after coverage reductions, we

[7] According to Livnat and Mendenhall (2006), institutional trading reacts more to analyst consensus-based earnings surprises rather than time series-based earnings surprises. Thus, we compute quarterly SUE relative to the analyst forecast consensus.

[8] We examine the impact of analyst reductions on the firms with more than five analysts as a robustness test. Consistent with our prediction, the impact is practically zero.

observe a more pronounced post earnings announcement drift measured in various time horizons ranging from one month to one year.

To test whether the increase in PEAD is robust for both positive and negative earnings announcement, we categorize quarterly earnings announcement into three groups based on the magnitude of SUE. These three groups contain quarterly earnings announcement with top 25% SUE, middle 50% SUE, and bottom 25% SUE, respectively. $D(SUE^{++})$, $D(SUE^{0})$, and $D(SUE^{--})$ are three dummy variables that denote observations in the three groups correspondingly.

$$\begin{aligned} CAR\_d1\_dn_{it} = {} & \alpha_i + \alpha_t + \beta_1 Treat_{it} * Post_{it} * D(SUE^{++})_{it} + \beta_2 Treat_{it} * Post_{it} \\ & * D(SUE^{0})_{it} + \beta_3 Treat_{it} * Post_{it} * D(SUE^{--})_{it} + \beta_4 Treat_{it} * D(SUE^{++})_{it} \\ & + \beta_5 Treat_{it} * D(SUE^{0})_{it} + \beta_6 Treat_{it} * D(SUE^{--})_{it} + \beta_7 Post_{it} * D(SUE^{++})_{it} \\ & + \beta_8 Post_{it} * D(SUE^{0})_{it} + \beta_9 Post_{it} * D(SUE^{--})_{it} + \beta_{10} D(SUE^{++})_{it} \\ & + \beta_{11} D(SUE^{--})_{it} + \gamma' Controls_{it} + \varepsilon_{it}. \end{aligned}$$

Panel B of Table 2 presents the regression results. The coefficients β_1, β_2, and β_3 represent the changes of PEAD after reductions of analyst coverage for positive, neutral, and negative earnings announcement, respectively. For positive earnings, we find that the magnitude of PEAD increases significantly after reductions of analyst coverage. For example, PEAD increases by 0.9 percentage point in the two-day post earnings window, while it increases by 1.5 percentage point in the four-day post earnings window. For negative earnings announcement, the magnitude of the drift also increases significantly (in the negative direction) after reductions of analyst coverage. PEAD increases by 1.4 percentage point in the one-day post earnings window, and this change in magnitude remain roughly the same in next few days. These results confirm that, after exogenous reductions in analyst coverage, the magnitude of PEAD increases for both positive and negative earnings surprises, which provides support to the notion that price efficiency is negatively affected by analyst coverage reductions.

B. *Hedge Fund Holdings Prior to Earnings Announcement*

After exogenous reductions in analyst coverage, firms' information environment becomes more opaque (Kelly and Ljungqvist, 2012). While investors who rely on analysts to obtain information about firms find it harder to access information, sophisticated investors who have the resources and skills to acquire information independently will have a greater comparative advantage over other investors. Therefore, we hypothesize that hedge funds, as a group of most sophisticated investors, will trade more aggressively on the affected stocks to take advantage of the increase of their informational advantage. To test this hypothesis, we merge the data on quarterly hedge fund holdings of stocks with those on quarterly earnings announcement of firms. Then, we examine the pattern of hedge funds' abnormal holdings based on the following regression model:

$$\begin{aligned} Ab\_Holdings_{it} &= \alpha_i + \alpha_t + \beta_1 Treat_{it} * Post_{it} * SUE_{it} + \beta_2 Treat_{it} * SUE_{it} + \beta_3 Post_{it} \\ &* SUE_{it} + \beta_4 SUE_{it} + \beta_5 Treat_{it} * Post_{it} + \beta_6 Treat_{it} + \beta_7 Post_{it} \\ &+ \gamma' Controls_{it} + \varepsilon_{it} \end{aligned}$$

$Ab\_Holdings_{it}$ is the level of abnormal hedge fund holdings at the most recent quarter end prior to the quarterly earnings announcement.[9] Abnormal hedge fund holdings at any given quarter are defined as hedge fund holdings in that quarter minus the average hedge fund holdings of the past four quarters. The other variables are defined in the same way as before.

[Insert Table 3 about here]

Panel A of Table 3 presents the regression results. β_1 is the coefficient of interest, and it captures the changes of the sensitivity of hedge fund holdings to the SUE of the earnings announcement. Note that SUE on the right-hand-side is not public information at the time when $Ab\_Holdings_{it}$ is measured. β_1 hence represents the changes of hedge

[9] Hedge fund holdings data are at the aggregate level as we sum up the holdings of individual hedge funds. The data reports the aggregate hedge fund holdings for individual stocks at the end of each calendar quarter (March 31st, June 30th, September 30th, and December 31st).

fund holdings that are likely driven by private information acquired by hedge funds. Interestingly, as shown in columns (1) through (3), β_1 are significantly positive for abnormal hedge fund holdings. This suggests that the abnormal hedge fund holdings after reductions of analyst coverage become more sensitive to unexpected earnings. According to the specification with both firm fixed effects and calendar month fixed effects, the sensitivity of abnormal hedge fund holdings to SUE increases by 0.091 after coverage reductions. For a one standard deviation change in SUE (4.13 in our sample), the drop of one analyst for firms with five or fewer analysts leads to 0.38 percentage point additional change in abnormal hedge fund holdings, which is roughly 1/8 of the standard deviation of abnormal hedge fund holdings. These results are consistent with the hypothesis that hedge funds trade more aggressively due to their comparative advantage in acquiring the information that used to be produced by the removed analysts.

Next, we perform the following regression model to further examine the change of abnormal hedge fund holdings for positive, neutral, and negative earnings announcement:

$$\begin{aligned} Ab\_Holdings_{it} &= \alpha_i + \alpha_t + \beta_1 Treat_{it} * Post_{it} * D(SUE^{++})_{it} + \beta_2 Treat_{it} * Post_{it} \\ &* D(SUE^{0})_{it} + \beta_3 Treat_{it} * Post_{it} * D(SUE^{--})_{it} + \beta_4 Treat_{it} * D(SUE^{++})_{it} \\ &+ \beta_5 Treat_{it} * D(SUE^{0})_{it} + \beta_6 Treat_{it} * D(SUE^{--})_{it} + \beta_7 Post_{it} * D(SUE^{++})_{it} \\ &+ \beta_8 Post_{it} * D(SUE^{0})_{it} + \beta_9 Post_{it} * D(SUE^{--})_{it} + \beta_{10} D(SUE^{++})_{it} \\ &+ \beta_{11} D(SUE^{--})_{it} + \gamma' Controls_{it} + \varepsilon_{it} \end{aligned}$$

Panel B of Table 3 presents the regression results. The abnormal hedge fund holdings prior to positive earnings (top 25% SUE) increase by an additional 0.62 percentage point after reductions of analyst coverage. The abnormal hedge fund holdings prior to negative earnings (bottom 25% SUE), decrease by an additional 0.45 percentage point after reductions of analyst coverage. The increase of hedge fund holdings prior to positive earnings is statistically significant, while the decrease of hedge fund holdings prior to negative earnings is not. The relative weak results for the negative earnings are not surprising since our hedge fund holdings data cover their long positions only without their short positions. In other words, though we observe hedge funds' divestiture of their existing holdings in reaction to negative earnings, we cannot observe the changes of their short positions.

Besides hedge funds, we also examine the holding changes of other institutional investors (such as banks, insurance companies, and mutual funds) in the 13F data. Table 3 presents the regression results based on the aggregate holdings of all the non-hedge funds, while Appendix B shows the regression results based on the aggregate holdings of individual types of non-hedge fund institutions. We find no evidence that non-hedge fund institutions exhibit an increase in the sensitivity of their holdings to unexpected earnings after coverage reductions. The abnormal holdings of non-hedge funds do not increase more prior to positive earnings, and they also do not decrease more prior to negative earnings after coverage reductions. Unlike hedge funds, the holdings of non-hedge fund investors on the affected stocks do not appear to be more information-driven after reduction of analyst coverage.

C. Profitability of Hedge Funds

So far, we have shown that hedge fund holdings of the affected stocks become more information-driven after coverage reductions. In this section, we test whether their profitability indeed increases on the affected stocks after coverage reductions. Since we do not observe individual transactions of hedge funds, we estimate hedge funds' profitability based on their aggregate holdings. We first infer the trading direction of hedge funds on a given stock in quarter t by comparing the aggregate holdings at the end of quarter t (HF_t) and the aggregate holdings at the end of quarter t-1 (HF_{t-1}). If $HF_t > HF_{t-1}$, we infer hedge funds as a whole increase their positions during quarter t (hedge fund buys). On the other hand, if $HF_t < HF_{t-1}$, we infer hedge funds as a whole decrease their positions during quarter t (hedge fund sells). We then use difference-in-differences regressions to test the changes of hedge fund profitability after coverage reductions. The outcome variable is stocks' abnormal returns from the quarter end t to quarter end t+1, with the abnormal returns benchmarked by the corresponding DGTW portfolios.[10]

[10] Our results are robust to other holding periods, such as one month and six months.

[Insert Table 4 about here]

Panel A of Table 4 presents the regression results. Column (1) shows the 3-month cumulative abnormal returns of the affected stocks following hedge fund buys increase by 2.5 percentage point. The increase in profitability is more pronounced among the stocks with large increases in hedge fund holdings (large hedge fund buys). These results suggest that hedge funds indeed earn high abnormal returns from the affected stocks after coverage reductions when they increase their holdings. Conditional on hedge funds decreasing their holdings, however, we do not observe a significant change in profitability after coverage reductions, which is likely because we do not observe hedge funds' short positions.

We also examine the changes in the profitability for non-hedge funds in Panel B of Table 4. Conditional on non-hedge funds increase their holdings (non-hedge fund buys), we find that the 3-month cumulative abnormal returns of the affected stocks increase by 1.1 percentage point, though this increase is not statistically significant. Moreover, the magnitude of the increase in the profitability drops to 0.7 percentage point (also statistically insignificant) for large non-hedge fund buys. These results suggest non-hedge funds, as a whole, benefit little from the affected stocks after coverage reductions.

D. Information Acquisition via EDGAR

We have previously conjectured that sophisticated investors will scale up their information acquisition after reduction of analyst coverage, which leads to more aggressive trading behavior and higher profitability. In this section, we exploit a novel data set on the web traffic to SEC's EDGAR server and provide more direct evidence on the changes of investors' information acquisition behavior following the reductions of analyst coverage.

Using a difference-in-differences regression approach, we find that the search volume for the filings of the treated firms increases significantly following the coverage reductions. As shown by Panel A of Table 5, the EDGAR search volume of the treated firms increases by 11.4% after the drops of analyst coverage, suggesting that investors as a whole scale up their information acquisition when there is less public information available. This effect is mainly contributed by investors' search to insider filings, which is consistent with Wu (2016), who documents that corporate insiders earn much higher abnormal returns from trading the stocks of their own firms following coverage reductions.

Do sophisticated investors scale up their information acquisition more compared to other investors? To shed light on this question, we identify the geographic information (e.g., country, state, city, zip code, latitude, and longitude) of the requesting users by merging the EDGAR log file data with a commercial geolocation IP address database. Although the last (fourth) octets of the IP addresses are masked in the EDGAR log file, we are able to match more than 78% of user requests to unique pairs of latitude/longitude using the first three octets of the IP addresses provided by the EDGAR log file. The latitude and longitude associated with the matched IP addresses are invariant to the values of the final (fourth) octets of the IP addresses. If sophisticated investors indeed are more likely to scale up their information acquisition with a reduction in the supply of public information, we expect that the web search volume from the IP addresses whose geographic locations are closer to sophisticated investors should increase more. To test this prediction, we perform three sets of analyses, which collectively support our hypothesis.

First, we run the difference-in-differences regressions separately for each state in the U.S. As shown by Appendix C, we find that the states with highest percentage increase in their search volume for insider filings are the states with large presence of sophisticated investors.[11]

[11] The states in the top quintile sorted by the DID coefficients are: New York, California, Texas, Illinois, New Jersey, Massachusetts, Colorado, Pennsylvania, Connecticut, and Arizona.

Next, we compute the distance from the geographic location of each U.S.-based IP address to its nearest hedge funds. The median geographic distance in our web traffic sample is around 10 km. We then construct the monthly web traffic volume two years before and after the coverage reductions separately based on the web searches coming from the IP addresses whose distance to the nearest hedge funds is below and above the median value. Consistent with our hypothesis, we find that the increase in the EDGAR search volume mainly comes from the IP addresses whose distance to the nearest hedge fund is shorter than the median value (see Panel B and C in Table 5).

[Insert Table 5 about here].

Finally, we group the IP addresses based on zip codes and compute the distance from each zip code to its nearest hedge fund. We then run the following regression to quantify the impact of the distance on the changes of the web search volume after coverage reductions:

$$
\begin{aligned}
Ln(ESV_{zit}+1) = {} & \alpha_i + \alpha_t + \beta_1 Treat_{it} * Post_{it} * ln(Distance_z + 1) + \beta_2 Treat_{it} * Post_{it} \\
& + \beta_3 ln(Distance_z + 1) + \beta_4 Post_{it} * ln(Distance_z + 1) + \beta_5 Treat_{it} \\
& * ln(Distance_z + 1) + \beta_6 Treat_{it} + \beta_7 Post_{it} + \gamma' Controls_{it} + \varepsilon_{zit}
\end{aligned}
$$

Here, ESV_{zit} is the EDGAR search volume for insider filings from zip code z to firm i in month t. $Distance_z$ is the distance from zip code z to its nearest hedge fund. As shown by Appendix D, the coefficients β_2 are positive and statistically significant, suggesting that the investors from the zip codes where at least one hedge fund locates increase their search volume for insider filings significantly after coverage reductions. The coefficients β_1 are negative and statistically significant, suggesting that the increase in search volume gets weaker when the zip codes are further away from hedge funds. Based on the magnitudes of the β_1 and β_2 coefficients, we find that the increase in search volume for insider filings is indistinguishable from zero for a zip code that is 20 km away from its nearest hedge fund.

Taken together, the above results provide evidence that sophisticated investors such as hedge funds scale up their information acquisition when public information providers such as sell-side analysts exit the financial market.

E. Impact of Hedge Funds on Stock Price Efficiency

We have shown that, after exogenous coverage reduction, hedge funds tend to trade more aggressively on the affected stocks and earn higher abnormal returns. In this section, we examine whether hedge fund activities can, in turn, shape the information environment. We again use PEAD as an indicator of price efficiency. We use the abnormal hedge fund holdings at the nearest quarter end prior to earnings announcement as a proxy for potential hedge fund participation around the earnings release. The rationale is that hedge funds are more likely to trade around the earnings release if they already hold large positions in a particular stock. In the following regression, $D(HF^{++})_{it}$ is a dummy variable that equals one if the abnormal aggregate hedge fund holding for stock i at the nearest quarter end prior to earnings announcement (t) is in the top quartile of the abnormal hedge fund holdings. Abnormal hedge fund holdings at any given quarter are computed as hedge fund holdings at the current quarters trailing the average hedge fund holdings over the past four quarters. We use the following regression model to examine the change of the hedge funds' impact on PEAD after coverage reductions.

$$
\begin{aligned}
CAR\_d1\_dn_{it} = {} & \alpha_i + \alpha_t + \beta_1 Treat_{it} * Post_{it} * D(HF^{++})_{it} * SUE_{it} + \beta_2 Treat_{it} * Post_{it} \\
& * SUE_{it} + \beta_3 Treat_{it} * D(HF^{++})_{it} * SUE_{it} + \beta_4 Treat_{it} * SUE_{it} + \beta_5 Post_{it} \\
& * D(HF^{++})_{it} * SUE_{it} + \beta_6 Post_{it} * SUE_{it} + \beta_7 D(HF^{++})_{it} * SUE_{it} + \beta_8 SUE_{it} \\
& + \beta_9 Treat_{it} * Post_{it} * D(HF^{++})_{it} + \beta_{10} Treat_{it} * Post_{it} + \beta_{11} Treat_{it} \\
& * D(HF^{++})_{it} + \beta_{12} Treat_{it} + \beta_{13} Post_{it} * D(HF^{++})_{it} + \beta_{14} Post_{it} \\
& + \beta_{15} D(HF^{++})_{it} + \gamma' Controls_{it} + \varepsilon_{it}
\end{aligned}
$$

Panel A of Table 6 presents the regression results. β_1 and β_2 are the coefficients of interest. The sensitivity of PEAD to SUE increases significantly after coverage reductions in the absence of a high level of abnormal hedge fund holdings, as illustrated by the positive and significant coefficient β_2 , and this is consistent with our previous unconditional results. However, conditional on a high level of abnormal hedge fund holdings, the sensitivity of PEAD to SUE decreases significantly after coverage reductions. This result is illustrated by the negative and significant β_1 in the regressions. In fact, for firms with high levels of abnormal hedge fund holdings, the change in the magnitude of PEAD after coverage reductions are not statistically different from zero, which suggests that the participation of hedge fund is able to restore the impaired price efficiency.

[Insert Table 6 about here].

To further test the impact of hedge fund trading on PEAD for both positive and negative earnings announcements, we perform the following regression:

$$
\begin{aligned}
CAR\_d1\_dn_{it} = {} & \alpha_i + \alpha_t + \beta_1 Treat_{it} * Post_{it} * D(HF^{++})_{it} * D(SUE^{++})_{it} + \beta_2 Treat_{it} \\
& * Post_{it} * D(HF^{++})_{it} * D(SUE^{0})_{it} + \beta_3 Treat_{it} * Post_{it} * D(HF^{++})_{it} \\
& * D(SUE^{--})_{it} + \beta_4 Treat_{it} * Post_{it} * D(SUE^{++})_{it} + \beta_5 Treat_{it} * Post_{it} \\
& * D(SUE^{0})_{it} + \beta_6 Treat_{it} * Post_{it} * D(SUE^{--})_{it} + \beta_7 Treat_{it} * D(HF^{++})_{it} \\
& * D(SUE^{++})_{it} + \beta_8 Treat_{it} * D(HF^{++})_{it} * D(SUE^{0})_{it} + \beta_9 Treat_{it} * D(HF^{++})_{it} \\
& * D(SUE^{--})_{it} + \beta_{10} Treat_{it} * D(SUE^{++})_{it} + \beta_{11} Treat_{it} * D(SUE^{0})_{it} \\
& + \beta_{12} Treat_{it} * D(SUE^{--})_{it} + \beta_{13} Post_{it} * D(HF^{++})_{it} * D(SUE^{++})_{it} \\
& + \beta_{14} Post_{it} * D(HF^{++})_{it} * D(SUE^{0})_{it} + \beta_{15} Post_{it} * D(HF^{++})_{it} * D(SUE^{--})_{it} \\
& + \beta_{16} Post_{it} * D(SUE^{++})_{it} + \beta_{17} Post_{it} * D(SUE^{0})_{it} + \beta_{18} Post_{it} \\
& * D(SUE^{--})_{it} + \beta_{19} D(HF^{++})_{it} * D(SUE^{++})_{it} + \beta_{20} D(HF^{++})_{it} * D(SUE^{0})_{it} \\
& + \beta_{21} D(HF^{++})_{it} * D(SUE^{--})_{it} + \beta_{22} D(SUE^{++})_{it} + \beta_{23} D(SUE^{--})_{it} \\
& + \gamma' Controls_{it} + \varepsilon_{it}
\end{aligned}
$$

Here, we find β_4 to be significantly positive while β_6 significantly negative. These results suggest that PEAD increases significantly following both positive and negative earnings announcement in the absence of high levels of hedge fund holdings. However, conditional on hedge levels of hedge fund holdings, we find that the increase in the magnitude of PEAD are eliminated following both positive and negative earnings announcement. Again, these results are consistent with the view that, as a whole, the participation of sophisticated investors like hedge funds can help restore the impaired price efficiency.

F. Robustness and Additional Analysis

F.1 Number of Analysts Prior to Coverage Reductions

Our previous analysis has focused on firms with five or fewer analysts prior to the coverage reductions. The rationale is that the reduction of one analyst would have a smaller impact on firms with a large number of analysts prior to coverage reductions. In this section, we test this hypothesis explicitly.

We first repeat our analysis regarding the impact of coverage reductions on PEAD for treated firms with six or more analysts. Panel A of Table 7 presents the regression results. Consistent with our hypothesis, we indeed find the impact of coverage reductions on PEAD is no longer significant for treated firms with six or more analysts. Next, we examine the impact of coverage reductions on the investors' information acquisition behavior for treated firms with six or more analysts. As shown by Appendix E, we find that the web traffic to the EDGAR serve shows no sign of increase after coverage reductions. Finally, we test the impact of hedge fund investors on PEAD. Again, we find no change in hedge funds' impact on PEAD after coverage reductions in treated firms with six or more analysts, as shown in Panel B of Table 7.

[Insert Table 7 about here]

F.2 Interaction with the Abnormal Returns on the Earnings Announcement Dates

Following the PEAD literature, we have used SUE to proxy the unexpected information content of earnings release. Hong and Kacperczyk (2010) find analysts exhibit an increase in optimism bias after coverage reductions due to a decrease in competition. Thus, the quality of SUE as a measure of unexpected information contents could suffer from coverage reductions. In particular, the changes in the optimism bias after coverage reduction may introduce biases to the coefficients of interests in our previous regressions (such as the coefficients for Treat*Post*SUE).[12] To mitigate this concern, we use the abnormal returns on the earnings announcement dates (CAR_d0) to proxy for the unexpected information content in the earnings release.[13]

[Insert Table 8 about here]

We replace the SUE with CAR_d0 and repeat the analysis regarding the impact of coverage reductions on PEAD. Panel A, Table 8 shows the sensitivity of PEAD to CAR_d0 increases significantly after coverage reductions. For one standard deviation change in CAR_d0 (8.32% in our sample), the drift in the two-day post earnings window increases by 0.77 percentage point while the drift in the four-day post earnings window increases by 0.84 percentage point. Furthermore, we reexamine the impact of hedge fund holdings on PEAD using CAR_d0 to proxy for the unexpected information contents. We again find that a high level of abnormal hedge fund holdings can mitigate the PEAD significantly after coverage reductions. For firms with top 25% abnormal hedge fund holdings in the nearest quarter prior to the earnings announcement, the increase in PEAD due to coverage reductions can be fully eliminated. Since we find similar results using CAR_d0 as a proxy for unexpected information contents, our results are unlikely to be driven by the changes in analyst optimism bias after coverage reductions.

F.3 Impact of Short Sellers on PEAD

We have shown that hedge funds can mitigate the increase of PEAD after coverage reductions. In this section, we turn our attention to short sellers who are also likely to be informed investors.[14] Prior research shows that high levels of short interests tend to be

---

[12] Note that if the increase in optimism bias after coverage reduction is a constant across all treated firms, the coefficients of interests in our previous regressions (such as the coefficients for Treat*Post*SUE) will not be affected by the changes in optimism bias.

[13] The abnormal return is benchmarked by the portfolio returns of the corresponding Fama-French 5*5 size and book-to-market portfolios. For an after-hours earnings release, CAR_d0 is the return of the next trading day in the CRSP data.

[14] According to industry estimate (e.g., Goldman Sachs), about 80% of short sellers are actually hedge funds. Since our hedge fund data come from 13F filings that only contain long positions of hedge funds, the analysis of this section does not overlap with our previous analysis based on abnormal hedge fund holdings.

associated with negative future stock returns. We proxy short sellers' participation around earnings release using the abnormal short interests at the nearest quarter ends prior to the earnings announcement. The results are reported in Table 9. Similar to hedge funds, we find that short sellers' participation can also help restore the impaired market efficiency.

[Insert Table 9 about here]

III. Conclusion

In this paper, we analyze the impact of changes to information environment on the trading behavior of hedge funds and stock price efficiency. Using closures of brokerage firms as an exogenous shock to information environment, we examine how hedge funds trade the affected stocks and how their trades in turn impact price efficiency. Based on merged data of stock prices, analyst coverage, and hedge fund holdings, we find that, after exogenous reduction of analyst coverage, the magnitudes of post-earnings-announcement-drift (PEAD) become stronger, indicating a decrease of price efficiency. Meanwhile, there is evidence that hedge funds trade more aggressively on the affected stocks, since their holdings increase (decrease) more prior to positive (negative) earnings announcements and hedge funds obtain higher abnormal returns on the affected stocks. More importantly, conditional on high levels of hedge fund holdings prior to earnings announcements, the increase in the magnitudes of PEAD becomes significantly weaker and is indistinguishable from zero. Taken together, these results are consistent with a substitution effect between sophisticated investors and providers of public information. When the channel of public information provision is impeded, sophisticated investors become more active in participating in stock markets and, on average, their trades can help restore price efficiency.

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Table 1. Ex-ante Summary Statistics

Notes: This table presents ex-ante summary statistics for both the treated group and the matched control group. The treated firms are firms that experience closure-related terminations of analyst coverage. Each treated firm is matched with up to five control firms in the same Fama-French 48 industry, Fama-French size and book-to-market quintile. If more than five candidate firms exist, those with the closest bid-ask spreads before the terminations of analyst coverage are chosen. Summary statistics are calculated at the firm-quarter level using observations in the two-year period prior to the terminations of analyst coverage. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. CAR_d0 are the abnormal returns on the dates of earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. CAR_d1_dn are the cumulative abnormal returns from the first day to the nth day after earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. Ab_HF is the abnormal aggregate hedge fund holdings at the nearest quarter end prior to earnings announcement, which is computed as hedge fund holdings at the current quarters minus the average hedge fund holdings of the past four quarters. Ab_NonHF is the abnormal aggregate non-hedge fund holdings at the nearest quarter end prior to earnings announcement, which is computed as non-hedge fund holdings at the current quarters minus the average non-hedge fund holdings of the past four quarters. Ab_Short is the abnormal short interests at the nearest quarter end prior to earnings announcement, which is computed as short interest at the current quarters minus the average short interest of the past four quarters. *LnSize* is the natural log of market capitalization (in millions) in year t-1; *LnBEME* is the natural log of book-to-market ratio in year t-1; *LnLev* is the natural log of debt-to-equity ratio in year t-1; *Ret2mPrior* is the two-month (day -42 to day -1) cumulative raw returns prior to the earnings announcement; The treated firms are limited to firms that have five or fewer analysts covering the firm prior to coverage reductions. The data span 1998 to 2009.

	Treated Group (372 firms, 2114 quarters)					Control Group (631 firms, 3358 quarters)					
	Mean	SD	5%	50%	95%	Mean	SD	5%	50%	95%	p-value
SUE	0.41	4.27	-5.56	0.61	7.50	0.68	4.04	-4.95	0.71	7.50	0.291
CAR_d0 (%)	-0.24	8.50	-13.11	-0.13	12.55	-0.33	8.66	-14.30	-0.20	13.16	0.712
CAR_d1_d1 (%)	0.01	5.06	-6.96	-0.16	7.21	0.00	4.70	-7.11	-0.18	7.51	0.973
CAR_d1_d2 (%)	-0.12	6.46	-9.57	-0.39	9.53	-0.14	6.37	-9.78	-0.28	9.72	0.877
CAR_d1_d3 (%)	-0.43	7.48	-11.72	-0.43	11.31	-0.22	7.38	-11.76	-0.36	11.16	0.313
CAR_d1_d4 (%)	-0.55	8.18	-13.30	-0.55	12.10	-0.21	8.26	-12.68	-0.38	12.97	0.137
Ab_HF (%)	0.42	3.12	-3.51	0.08	5.48	0.51	3.62	-3.91	0.09	6.15	0.377
Ab_NonHF (%)	1.75	9.74	-12.69	1.57	16.14	1.91	16.15	-9.77	1.79	17.68	0.575
Ab_Short (%)	0.22	2.65	-2.91	0.02	4.08	0.30	2.45	-2.69	0.03	3.77	0.269
LnBEME	-0.82	0.92	-2.55	-0.73	0.47	-0.84	0.83	-2.26	-0.76	0.31	0.435
LnSize	5.88	1.15	4.07	5.88	7.81	5.67	1.09	3.89	5.66	7.45	0.002
LnLev	-0.36	1.27	-2.41	-0.27	1.56	-0.41	1.17	-2.33	-0.42	1.36	0.517
Ret2mPrior (%)	1.52	24.72	-39.57	1.83	40.51	2.01	23.92	-35.44	1.87	40.09	0.466

Table 2. Impact of Exogenous Coverage Reductions on PEAD

Notes: This table evaluates changes in the magnitude of PEAD after the reductions of analyst coverage. The dependent variables $CAR\_d1\_dn_{it}$ are the cumulative abnormal returns from the first day to the nth day after earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one for earnings announcement that happens after reductions of analyst coverage. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. D(SUE^{++}), D(SUE^{0}), and D(SUE^{--}) are three dummy variables that equal one for earnings announcement with top 25% SUE, middle 50% SUE, and bottom 25% SUE, respectively. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Panel A. Interaction with SUE

$$CAR\_d1\_dn_{it} = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} * SUE_{it} + \beta_2 Treat_{it} * SUE_{it} + \beta_3 Post_{it} * SUE_{it} + \beta_4 SUE_{it} + \beta_5 Treat_{it} * Post_{it} + \beta_6 Treat_{it} + \beta_7 Post_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

	CAR_d1_d2 (%)			CAR_d1_d4 (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post × SUE	0.198***	0.253***	0.237***	0.289***	0.348***	0.342***
	[0.054]	[0.058]	[0.058]	[0.067]	[0.074]	[0.074]
Treat × SUE	-0.179***	-0.216***	-0.209***	-0.204***	-0.244***	-0.243***
	[0.044]	[0.050]	[0.050]	[0.049]	[0.057]	[0.057]
Post × SUE	-0.128***	-0.151***	-0.150***	-0.189***	-0.208***	-0.214***
	[0.035]	[0.038]	[0.038]	[0.047]	[0.052]	[0.052]
SUE	0.225***	0.241***	0.245***	0.285***	0.302***	0.307***
	[0.027]	[0.030]	[0.031]	[0.035]	[0.041]	[0.041]
Treat × Post	-0.324	-0.250	-0.328	-0.246	-0.111	-0.172
	[0.248]	[0.250]	[0.251]	[0.325]	[0.333]	[0.340]
Treat	0.155	0.605	0.612	-0.195	0.676	0.737
	[0.184]	[0.435]	[0.440]	[0.250]	[0.548]	[0.561]
Post	0.388**	0.437***	0.368*	0.716***	0.768***	0.501**
	[0.151]	[0.162]	[0.193]	[0.211]	[0.225]	[0.249]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Calendar month FE	No	No	Yes	No	No	Yes
Observations	11511	11511	11511	11511	11511	11511
R-squared	0.015	0.131	0.146	0.015	0.135	0.151

Table 2. Impact of Exogenous Coverage Reductions on PEAD (continued)

Panel B. Interaction with positive and negative earnings announcement.

$$CAR\_d1\_dn_{it} = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} * D(SUE^{++})_{it} + \boldsymbol{\beta_2} Treat_{it} * Post_{it} * D(SUE^{0})_{it} + \boldsymbol{\beta_3} Treat_{it} * Post_{it} * D(SUE^{--})_{it} + \beta_4 Treat_{it} * D(SUE^{++})_{it} + \beta_5 Treat_{it} * D(SUE^{0})_{it} + \beta_6 Treat_{it} * D(SUE^{--})_{it} + \beta_7 Post_{it} * D(SUE^{++})_{it} + \beta_8 Post_{it} * D(SUE^{0})_{it} + \beta_9 Post_{it} * D(SUE^{--})_{it} + \beta_{10} D(SUE^{++})_{it} + \beta_{11} D(SUE^{--})_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

	CAR_d1_d1 (%)	CAR_d1_d2 (%)	CAR_d1_d3 (%)	CAR_d1_d4 (%)
	(1)	(2)	(3)	(4)
Treat × Post × D(SUE^{++})	0.420	0.912**	1.275**	1.498***
	[0.366]	[0.451]	[0.508]	[0.575]
Treat × Post × D(SUE^{0})	0.180	0.049	0.126	0.084
	[0.276]	[0.363]	[0.392]	[0.432]
Treat × Post × D(SUE^{--})	-1.428***	-1.587***	-1.371**	-1.374*
	[0.415]	[0.544]	[0.660]	[0.743]
Treat × D(SUE^{++})	-0.116	-0.461	-0.539	-0.667
	[0.355]	[0.478]	[0.579]	[0.685]
Treat × D(SUE^{0})	0.200	0.407	0.621	0.963
	[0.329]	[0.479]	[0.552]	[0.593]
Treat × D(SUE^{--})	1.321***	1.434**	1.264*	1.042
	[0.436]	[0.592]	[0.670]	[0.725]
Post × D(SUE^{++})	-0.004	-0.427	-0.449	-0.576
	[0.230]	[0.282]	[0.338]	[0.380]
Post × D(SUE^{0})	0.173	0.163	0.165	0.223
	[0.181]	[0.242]	[0.275]	[0.305]
Post × D(SUE^{--})	0.863***	1.117***	1.405***	1.440***
	[0.264]	[0.325]	[0.393]	[0.448]
D(SUE^{++})	0.856***	1.389***	1.654***	1.914***
	[0.208]	[0.268]	[0.320]	[0.355]
D(SUE^{--})	-0.659***	-1.030***	-1.029***	-0.840**
	[0.236]	[0.297]	[0.328]	[0.358]
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes
Observations	11511	11511	11511	11511
R-squared	0.145	0.145	0.148	0.150

Table 3. Hedge Fund and Non-Hedge Fund Holdings prior to Earnings Announcements

Notes: This table evaluates changes in the abnormal holdings of hedge funds and non-hedge funds after the reductions of analyst coverage. The dependent variables $Ab\_Holdings_{it}$ are the levels of abnormal hedge fund holdings (or non-hedge fund holdings) at the nearest quarter ends prior to the quarterly earnings announcement. Abnormal hedge fund holdings (or non-hedge fund holdings) at any given quarter are computed as hedge fund holdings (or non-hedge fund holdings) at the current quarters minus the average hedge fund holdings (or non-hedge fund holdings) of the past four quarters. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. D(SUE^{++}), D(SUE^{0}), and D(SUE^{--}) are three dummy variables that equal one for earnings announcement with top 25% SUE, middle 50% SUE, and bottom 25% SUE, respectively. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Panel A. Interaction with SUE

$$Ab\_Holdings_{it} = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} * SUE_{it} + \beta_2 Treat_{it} * SUE_{it} + \beta_3 Post_{it} * SUE_{it} + \beta_4 SUE_{it} + \beta_5 Treat_{it} * Post_{it} + \beta_6 Treat_{it} + \beta_7 Post_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

	Abnormal HF Holdings (%)			Abnormal Non-HF Holdings (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post × SUE	0.073**	0.099***	0.091**	-0.096	-0.131	-0.160
	[0.036]	[0.037]	[0.039]	[0.109]	[0.114]	[0.111]
Treat × SUE	-0.016	-0.038	-0.037	0.099	0.161*	0.167*
	[0.025]	[0.026]	[0.027]	[0.082]	[0.086]	[0.088]
Post × SUE	-0.032	-0.059**	-0.061**	-0.138**	-0.056	-0.044
	[0.025]	[0.026]	[0.026]	[0.063]	[0.068]	[0.067]
SUE	-0.002	0.023	0.024	0.230***	0.097*	0.088
	[0.016]	[0.017]	[0.017]	[0.049]	[0.055]	[0.054]
Treat × Post	-0.013	0.072	0.055	1.386**	1.745***	1.241*
	[0.225]	[0.256]	[0.258]	[0.598]	[0.664]	[0.678]
Treat	-0.079	-0.232	-0.128	-1.091***	-1.326	-0.904
	[0.151]	[0.325]	[0.315]	[0.401]	[0.853]	[0.856]
Post	0.026	-0.095	0.124	0.051	-0.858*	-1.256***
	[0.147]	[0.174]	[0.176]	[0.400]	[0.455]	[0.475]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Calendar month FE	No	No	Yes	No	No	Yes
Observations	10146	10146	10146	10146	10146	10146
R-squared	0.002	0.169	0.195	0.014	0.126	0.151

Table 3. Hedge Fund and Non-Hedge Fund Holdings prior to Earnings Announcements (Continued)

Panel B. Interaction with positive and negative earnings announcement.

$$Ab\_Holdings_{it} = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} * D(SUE^{++})_{it} + \boldsymbol{\beta_2} Treat_{it} * Post_{it} * D(SUE^{0})_{it} + \boldsymbol{\beta_3} Treat_{it} * Post_{it} * D(SUE^{--})_{it} + \beta_4 Treat_{it} * D(SUE^{++})_{it} + \beta_5 Treat_{it} * D(SUE^{0})_{it} + \beta_6 Treat_{it} * D(SUE^{--})_{it} + \beta_7 Post_{it} * D(SUE^{++})_{it} + \beta_8 Post_{it} * D(SUE^{0})_{it} + \beta_9 Post_{it} * D(SUE^{--})_{it} + \beta_{10} D(SUE^{++})_{it} + \beta_{11} D(SUE^{--})_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

	Abnormal HF Holdings (%)			Abnormal Non-HF Holdings (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post × D(SUE^{++})	0.511*	0.631**	0.621**	0.745	0.634	-0.106
	[0.278]	[0.312]	[0.310]	[0.925]	[0.940]	[0.932]
Treat × Post × D(SUE^{0})	0.040	0.166	0.131	1.804*	2.252*	1.796
	[0.274]	[0.298]	[0.296]	[1.062]	[1.170]	[1.221]
Treat × Post × D(SUE^{--})	-0.444	-0.423	-0.447	0.991	1.701*	1.299
	[0.397]	[0.415]	[0.420]	[0.829]	[0.900]	[0.894]
Treat × D(SUE^{++})	-0.231	-0.468	-0.377	-0.795	-0.427	0.033
	[0.185]	[0.347]	[0.335]	[0.707]	[1.095]	[1.132]
Treat × D(SUE^{0})	-0.236	-0.406	-0.306	-0.923	-1.145	-0.756
	[0.195]	[0.345]	[0.340]	[0.727]	[1.086]	[1.092]
Treat × D(SUE^{--})	0.302	0.262	0.375	-1.372**	-2.149**	-1.668*
	[0.274]	[0.406]	[0.399]	[0.650]	[1.004]	[1.003]
Post × D(SUE^{++})	-0.227	-0.373*	-0.168	-0.540	-0.894	-1.202*
	[0.188]	[0.209]	[0.219]	[0.636]	[0.637]	[0.692]
Post × D(SUE^{0})	0.050	-0.100	0.114	-0.358	-1.297	-1.712*
	[0.178]	[0.198]	[0.201]	[0.868]	[0.968]	[0.963]
Post × D(SUE^{--})	0.175	0.061	0.323	1.061**	-0.209	-0.663
	[0.272]	[0.287]	[0.280]	[0.479]	[0.497]	[0.527]
D(SUE^{++})	0.248	0.310*	0.326*	0.844	0.247	0.203
	[0.154]	[0.171]	[0.169]	[0.951]	[1.067]	[1.071]
D(SUE^{--})	0.086	-0.071	-0.086	-1.786***	-0.855	-0.830
	[0.192]	[0.200]	[0.203]	[0.650]	[0.678]	[0.679]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Calendar month FE	No	No	Yes	No	No	Yes
Observations	10146	10146	10146	10146	10146	10146
R-squared	0.003	0.170	0.196	0.014	0.126	0.151

Table 4. Profitability of Hedge Funds and Non-Hedge Funds

Notes: This table evaluates changes in the profitability of hedge funds and non-hedge funds. The dependent variables are stocks' abnormal returns from the quarter end t to quarter end t+1, benchmarked by corresponding DGTW portfolios. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Panel A: Hedge funds' profitability

	3-month CAR from quarter end t to quarter end t+1 (%)			
Sample	HF Buys (HF_t - HF_{t-1} > 0) (1)	Large HF Buys (HF_t - HF_{t-1} > 0.5%) (2)	HF Sells (HF_t - HF_{t-1} < 0) (3)	Large HF Sells (HF_t - HF_{t-1} < -0.5%) (4)
Treat × Post	2.530**	3.731**	-0.184	0.023
	[1.288]	[1.819]	[1.527]	[2.191]
Treat	-1.113	-3.337	-1.811	-0.952
	[1.867]	[2.607]	[2.391]	[3.113]
Post	0.106	1.566	0.133	0.209
	[0.904]	[1.342]	[1.019]	[1.384]
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes
Observations	6195	3722	5307	3138
R-squared	0.243	0.308	0.276	0.350

Panel B: Non-hedge funds' profitability

	3-month CAR from quarter end t to quarter end t+1 (%)			
Sample	Non-HF Buys (NF_t - NF_{t-1} > 0) (1)	Large Non-HF Buys (NF_t - NF_{t-1} > 1%) (2)	Non-HF Sells (NF_t - NF_{t-1} < 0) (3)	Large Non-HF Sells (NF_t - NF_{t-1} <1%) (4)
Treat × Post	1.084	0.668	-0.521	-0.046
	[1.211]	[1.393]	[1.563]	[1.930]
Treat	0.985	2.267	-0.478	2.334
	[1.921]	[2.247]	[2.373]	[2.869]
Post	-0.360	-0.258	0.556	0.253
	[0.783]	[0.889]	[0.955]	[1.228]
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Calendar quarter FE	Yes	Yes	Yes	Yes
Observations	7690	5632	5437	3691
R-squared	0.231	0.251	0.252	0.313

Table 5. Impact of Exogenous Coverage Reductions on Information Acquisition via EDGAR

Notes: This table evaluates changes in the EDGAR search volume after the reductions of analyst coverage. The SEC maintains a database that tracks the web visits to its EDGAR system since 2003. In Panel A, the dependent variables are the natural log of the monthly EDGAR search volume (ESV) for the filings of firm i in month t. Column (1) includes user requests for all types of EDGAR filings. Column (2), (3), (4), (5), and (6) include user requests for 10K, 10Q, 8K, insider filings (Form 3, 4, and 5), and other types of filings, respectively. The SEC also records the IP addresses of the requesting users, with the final (fourth) octet of the IP addresses replaced with a unique set of three letters. We use the IP2Location data to map IP addresses to geolocation information including latitude and longitude. Based on the first three octets of the IP addresses in the SEC data, we match 89% of IP addresses (78% of the total visits) to unique latitude/longitude pairs. The latitude and longitude associated with the matched IP addresses are invariant to the values of the final octet of the IP addresses. For each matched IP address, we then compute its geographical distance to the shortest hedge funds based on its latitude/longitude and the physical addresses of the hedge funds collected from the 13F SEC filings. We sort the web visits to two groups based on the distance. In Panel B, we construct a monthly EDGAR search volume dataset based on the user requests from U.S. IP addresses whose distance to the nearest hedge funds is *smaller* than the median value. In Panel C, we construct a monthly EDGAR search volume dataset based on the user requests from U.S. IP addresses whose distance to the nearest hedge funds is *larger* than the median value. The panel data used for the difference-in-differences regressions cover monthly EDGAR search volume for the treated firms and the matched control firms two years before and after the reductions of analyst coverage. The sample period is from 2003 to 2009. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the calendar month level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

$$Ln(ESV_{it}+1) = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} + \beta_2 Treat_{it} + \beta_3 Post_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

Panel A. Sample constructed based on all U.S. IP addresses in the sample.

	Ln(EDGAR Search Volume +1)					
Filing Types	All	10-K	10-Q	8-K	Insider	Others
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post	0.114**	0.004	-0.007	0.074	0.156**	-0.027
	[0.052]	[0.017]	[0.013]	[0.060]	[0.063]	[0.035]
Treat	-0.051	0.098	0.032	0.061	-0.286**	0.032
	[0.072]	[0.147]	[0.102]	[0.203]	[0.138]	[0.122]
Post	-0.115**	-0.036	-0.019	-0.076*	-0.084	-0.033
	[0.044]	[0.045]	[0.043]	[0.044]	[0.057]	[0.020]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25078	25078	25078	25078	25078	25078
R-squared	0.503	0.295	0.459	0.399	0.325	0.169

Table 5. Impact of Exogenous Coverage Reductions on Information Acquisition via EDGAR (Continued)

Panel B. Sample constructed based on user requests from U.S. IP addresses whose distance to the nearest hedge funds is *smaller* than the median value.

	Ln(EDGAR Search Volume +1)					
Filing Types	All	10K	10Q	8K	Insider	Others
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post	0.142***	0.002	-0.012	0.046	0.194***	-0.008
	[0.048]	[0.016]	[0.010]	[0.048]	[0.046]	[0.023]
Treat	-0.032	0.009	0.055	-0.038	-0.221**	-0.042
	[0.066]	[0.049]	[0.115]	[0.154]	[0.100]	[0.076]
Post	-0.075*	-0.033	-0.008	-0.017	-0.042	-0.027*
	[0.042]	[0.031]	[0.030]	[0.032]	[0.042]	[0.014]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25078	25078	25078	25078	25078	25078
R-squared	0.454	0.272	0.388	0.330	0.297	0.148

Panel C. Sample constructed based on user requests from U.S. IP addresses whose distance to the nearest hedge funds is *larger* than the median value.

	Ln(EDGAR Search Volume +1)					
Filing Types	All	10K	10Q	8K	Insider	Others
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post	0.067	0.002	-0.002	0.049	0.054	-0.015
	[0.050]	[0.015]	[0.011]	[0.048]	[0.046]	[0.023]
Treat	-0.149	0.072	-0.024	-0.053	-0.226	0.028
	[0.091]	[0.121]	[0.048]	[0.201]	[0.201]	[0.079]
Post	-0.084***	-0.021	-0.001	-0.066**	-0.059	-0.012
	[0.031]	[0.032]	[0.034]	[0.028]	[0.039]	[0.013]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25078	25078	25078	25078	25078	25078
R-squared	0.432	0.280	0.375	0.327	0.281	0.145

Table 6. Impact of Hedge Fund on PEAD

Notes: This table evaluates the impact of hedge funds on the magnitude of PEAD after the reductions of analyst coverage. The dependent variables $CAR\_d1\_dn_{it}$ are the cumulative abnormal returns from the first day to the nth day after earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. D(HF^{++}) is a dummy variable that equals one if the abnormal aggregate hedge fund holdings at the nearest quarter end prior to earnings announcement is in the top quartile of the abnormal hedge fund holdings. Abnormal hedge fund holdings at any given quarter are computed as hedge fund holdings at the current quarters minus the average hedge fund holdings of the past four quarters. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. D(SUE^{++}), D(SUE^{0}), and D(SUE^{--}) are three dummy variables that equal one for earnings announcement with top 25% SUE, middle 50% SUE, and bottom 25% SUE, respectively. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Panel A. Interaction with SUE

	CAR_d1_d2 (%)			CAR_d1_d4 (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post × D(HF^{++}) × SUE	-0.477***	-0.552***	-0.598***	-0.400*	-0.473**	-0.543**
	[0.163]	[0.174]	[0.173]	[0.205]	[0.214]	[0.214]
Treat × Post × SUE	0.330***	0.385***	0.384***	0.368***	0.413***	0.432***
	[0.062]	[0.071]	[0.071]	[0.077]	[0.088]	[0.089]
Treat × D(HF^{++}) × SUE	0.215	0.250	0.303*	0.190	0.215	0.276
	[0.145]	[0.158]	[0.157]	[0.165]	[0.175]	[0.174]
Treat × SUE	-0.248***	-0.286***	-0.288***	-0.267***	-0.295***	-0.309***
	[0.051]	[0.062]	[0.062]	[0.061]	[0.069]	[0.070]
Post × D(HF^{++}) × SUE	0.177*	0.157	0.158*	0.131	0.065	0.080
	[0.094]	[0.096]	[0.096]	[0.123]	[0.125]	[0.123]
Post × SUE	-0.153***	-0.159***	-0.166***	-0.192***	-0.182***	-0.198***
	[0.037]	[0.039]	[0.040]	[0.050]	[0.057]	[0.058]
D(HF^{++}) × SUE	-0.088	-0.057	-0.059	-0.084	-0.038	-0.051
	[0.074]	[0.077]	[0.077]	[0.096]	[0.097]	[0.095]
SUE	0.245***	0.257***	0.263***	0.319***	0.333***	0.343***
	[0.030]	[0.032]	[0.033]	[0.044]	[0.050]	[0.051]
Treat × Post × D(HF^{++})	0.604	0.192	0.284	0.902	0.508	0.640
	[0.589]	[0.614]	[0.615]	[0.817]	[0.848]	[0.845]
Treat × Post	-0.612**	-0.485*	-0.544*	-0.688**	-0.601*	-0.637*
	[0.262]	[0.277]	[0.285]	[0.348]	[0.353]	[0.369]
Treat × D(HF^{++})	0.141	0.602	0.501	-0.051	0.452	0.310
	[0.434]	[0.492]	[0.498]	[0.620]	[0.663]	[0.671]
Treat	0.269	0.409	0.357	0.063	0.334	0.298
	[0.207]	[0.435]	[0.427]	[0.295]	[0.528]	[0.547]
Post × D(HF^{++})	0.141	0.324	0.302	-0.206	0.071	-0.003
	[0.337]	[0.361]	[0.365]	[0.476]	[0.504]	[0.501]
Post	0.413***	0.309*	0.416**	0.740***	0.595**	0.599**
	[0.159]	[0.175]	[0.207]	[0.220]	[0.235]	[0.266]
D(HF^{++})	-0.170	-0.362	-0.297	0.077	-0.254	-0.140
	[0.262]	[0.284]	[0.290]	[0.374]	[0.384]	[0.382]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Calendar month FE	No	No	Yes	No	No	Yes
Observations	9818	9818	9818	9818	9818	9818
R-squared	0.020	0.150	0.167	0.020	0.150	0.167
Test p-value: $\beta_1 + \beta_2 = 0$	0.317	0.261	0.149	0.856	0.742	0.543

Table 6. Impact of Hedge Fund on PEAD (Continued)

Panel B. Interaction with positive and negative earnings announcement.

	CAR_d1_d1 (%)	CAR_d1_d2 (%)	CAR_d1_d3 (%)	CAR_d1_d4 (%)
	(1)	(2)	(3)	(4)
Treat × Post × $D(HF^{++})$ × $D(SUE^{++})$	-2.002**	-2.977**	-2.747*	-2.143
	[0.923]	[1.252]	[1.453]	[1.568]
Treat × Post × $D(HF^{++})$ × $D(SUE^{0})$	-1.013	-0.566	-0.685	-0.901
	[0.644]	[0.869]	[1.048]	[1.194]
Treat × Post × $D(HF^{++})$ × $D(SUE^{--})$	1.605*	2.976**	2.900*	4.388***
	[0.902]	[1.187]	[1.481]	[1.656]
Treat × Post × $D(SUE^{++})$	0.767*	1.390**	1.639***	1.545**
	[0.402]	[0.549]	[0.617]	[0.704]
Treat × Post × $D(SUE^{0})$	0.430	0.171	0.081	-0.085
	[0.334]	[0.424]	[0.470]	[0.523]
Treat × Post × $D(SUE^{--})$	-1.948***	-2.426***	-2.184***	-2.617***
	[0.498]	[0.627]	[0.721]	[0.777]
Treat × $D(HF^{++})$ × $D(SUE^{++})$	1.304*	2.055*	2.325*	1.691
	[0.781]	[1.127]	[1.290]	[1.426]
Treat × $D(HF^{++})$ × $D(SUE^{0})$	1.451***	0.949	1.235	1.017
	[0.478]	[0.667]	[0.854]	[0.934]
Treat × $D(HF^{++})$ × $D(SUE^{--})$	-0.286	-0.991	-0.390	-1.313
	[0.675]	[0.907]	[0.985]	[1.098]
Treat × $D(SUE^{++})$	-0.263	-0.882*	-1.242**	-1.192*
	[0.390]	[0.500]	[0.609]	[0.698]
Treat × $D(SUE^{0})$	1.404***	1.506**	0.932	1.227
	[0.517]	[0.652]	[0.734]	[0.778]
Treat × $D(SUE^{--})$	-0.018	0.116	0.012	0.426
	[0.388]	[0.501]	[0.579]	[0.612]
Post × $D(HF^{++})$ × $D(SUE^{++})$	1.130**	1.076*	0.460	0.262
	[0.492]	[0.622]	[0.772]	[0.931]
Post × $D(HF^{++})$ × $D(SUE^{0})$	0.834**	0.728	1.142**	1.031
	[0.359]	[0.506]	[0.580]	[0.633]
Post × $D(HF^{++})$ × $D(SUE^{--})$	-0.312	-0.535	-0.265	-1.614
	[0.616]	[0.736]	[0.891]	[1.009]
Post × $D(SUE^{++})$	-0.262	-0.463	-0.481	-0.475
	[0.251]	[0.327]	[0.382]	[0.436]
Post × $D(SUE^{0})$	0.855***	1.202***	1.281***	1.627***
	[0.284]	[0.358]	[0.432]	[0.483]
Post × $D(SUE^{--})$	0.124	0.194	0.228	0.321
	[0.198]	[0.281]	[0.319]	[0.346]
$D(HF^{++})$ × $D(SUE^{++})$	-0.534	-0.706	-0.612	-0.477
	[0.394]	[0.521]	[0.668]	[0.806]
$D(HF^{++})$ × $D(SUE^{0})$	-0.835***	-0.605	-0.851*	-0.701
	[0.286]	[0.393]	[0.463]	[0.470]
$D(HF^{++})$ × $D(SUE^{--})$	0.268	0.353	0.195	0.828
	[0.446]	[0.565]	[0.649]	[0.708]
$D(SUE^{++})$	0.826***	1.474***	1.756***	2.040***
	[0.240]	[0.327]	[0.380]	[0.434]
$D(SUE^{--})$	-0.727***	-1.035***	-1.169***	-1.148***
	[0.255]	[0.332]	[0.362]	[0.389]
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes
Observations	9423	9423	9423	9423
R-squared	0.161	0.165	0.164	0.165
Test p-value: $\beta_1 + \beta_4 = 0$	0.113	0.116	0.342	0.639
Test p-value: $\beta_3 + \beta_6 = 0$	0.653	0.588	0.579	0.221

Table 7. Robustness: Number of Analysts prior to Coverage Reductions

Notes: Panel A of this table evaluates changes in the magnitude of PEAD after the reductions of analyst coverage. Panel B evaluates the impact of hedge funds on the magnitude of PEAD after the reductions of analyst coverage. The dependent variables $CAR\_d1\_dn_{it}$ are the cumulative abnormal returns from the first day to the nth day after earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. D(HF^{++}) is a dummy variable that equals one if the abnormal aggregate hedge fund holdings at the nearest quarter end prior to earnings announcement is in the top quartile of the abnormal hedge fund holdings. Abnormal hedge fund holdings at any given quarter are computed as hedge fund holdings at the current quarters minus the average hedge fund holdings of the past four quarters. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Panel A. Impact of coverage reductions on PEAD.

	CAR_d1_d2 (%)		CAR_d1_d4 (%)	
Initial # of Analysts	<=5	>=6	<=5	>=6
	(1)	(2)	(3)	(4)
Treat × Post × SUE	0.237***	-0.017	0.342***	-0.038
	[0.058]	[0.051]	[0.074]	[0.063]
Treat × SUE	-0.209***	0.058	-0.243***	-0.019
	[0.050]	[0.172]	[0.057]	[0.214]
Post × SUE	-0.150***	0.051	-0.214***	0.064
	[0.038]	[0.035]	[0.052]	[0.043]
SUE	0.245***	-0.028	0.307***	-0.025
	[0.031]	[0.032]	[0.041]	[0.042]
Treat × Post	-0.328	-0.149	-0.172	-0.199
	[0.251]	[0.200]	[0.340]	[0.243]
Treat	0.612	0.112***	0.737	0.148***
	[0.440]	[0.023]	[0.561]	[0.029]
Post	0.368*	0.020	0.501**	0.140
	[0.193]	[0.132]	[0.249]	[0.160]
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes
Observations	11511	26372	11511	26372
R-squared	0.146	0.122	0.151	0.130

Table 7. Robustness: Number of Analysts prior to Coverage Reductions (Continued)

Panel B. Impact of hedge funds on PEAD.

	CAR_d1_d2 (%)		CAR_d1_d4 (%)	
Initial # of Analysts	<=5	>=6	<=5	>=6
	(1)	(2)	(3)	(4)
Treat × Post × D(HF^{++}) × SUE	-0.598***	-0.155	-0.543**	0.027
	[0.173]	[0.125]	[0.214]	[0.154]
Treat × Post × SUE	0.384***	-0.005	0.432***	-0.022
	[0.071]	[0.053]	[0.089]	[0.063]
Treat × D(HF^{++}) × SUE	0.303*	0.183*	0.276	0.075
	[0.157]	[0.094]	[0.174]	[0.110]
Treat × SUE	-0.288***	0.001	-0.309***	0.010
	[0.062]	[0.038]	[0.070]	[0.047]
Post × D(HF^{++}) × SUE	0.158*	0.087	0.080	0.032
	[0.096]	[0.073]	[0.123]	[0.088]
Post × SUE	-0.166***	-0.019	-0.198***	-0.038
	[0.040]	[0.036]	[0.058]	[0.044]
SUE × D(HF^{++})	-0.059	-0.007	-0.051	0.028
	[0.077]	[0.056]	[0.095]	[0.065]
SUE	0.263***	0.121***	0.343***	0.175***
	[0.033]	[0.026]	[0.051]	[0.033]
Treat × Post × D(HF^{++})	0.284	0.301	0.640	0.581
	[0.615]	[0.429]	[0.845]	[0.557]
Treat × Post	-0.544*	0.003	-0.637*	-0.233
	[0.285]	[0.186]	[0.369]	[0.224]
Treat × D(HF^{++})	0.501	-0.366	0.310	-0.524
	[0.498]	[0.361]	[0.671]	[0.441]
Treat	0.357	-0.046	0.298	0.036
	[0.427]	[0.212]	[0.547]	[0.253]
Post × D(HF^{++})	0.302	0.086	-0.003	-0.021
	[0.365]	[0.282]	[0.501]	[0.371]
Post	0.416**	0.061	0.599**	0.236
	[0.207]	[0.139]	[0.266]	[0.166]
D(HF^{++})	-0.297	0.049	-0.140	0.100
	[0.290]	[0.221]	[0.382]	[0.270]
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes
Observations	9818	21329	9818	21329
R-squared	0.167	0.127	0.167	0.133

Table 8. Robustness: Interaction with the Abnormal Returns on the Earnings Announcement Dates

Notes: Panel A of this table presents results from difference-in-differences specifications that evaluate changes in the magnitude of PEAD after the reductions of analyst coverage. Panel B presents results from difference-in-differences specifications that evaluate the impact of hedge funds on the magnitude of PEAD after the reductions of analyst coverage. The dependent variables $CAR\_d1\_dn_{it}$ are the cumulative abnormal returns from the first day to the nth day after earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. CAR_d0 are the abnormal returns on the dates of earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. D(HF^{++}) is a dummy variable that equals one if the abnormal aggregate hedge fund holdings at the nearest quarter end prior to earnings announcement is in the top quartile of the abnormal hedge fund holdings. Abnormal hedge fund holdings at any given quarter are computed as hedge fund holdings at the current quarters minus the average hedge fund holdings of the past four quarters. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Panel A: Impact of coverage reductions on PEAD.

	CAR_d1_d2 (%)			CAR_d1_d4 (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post × CAR_d0	0.101***	0.097**	0.092**	0.102*	0.102*	0.101*
	[0.039]	[0.039]	[0.038]	[0.053]	[0.054]	[0.054]
Treat × CAR_d0	-0.042	-0.044	-0.044	-0.062*	-0.074**	-0.079**
	[0.027]	[0.028]	[0.027]	[0.035]	[0.036]	[0.037]
Post × CAR_d0	-0.029	-0.025	-0.026	-0.036	-0.036	-0.040
	[0.020]	[0.021]	[0.021]	[0.026]	[0.027]	[0.027]
CAR_d0	0.036***	0.034**	0.034**	0.057***	0.059***	0.062***
	[0.014]	[0.014]	[0.014]	[0.018]	[0.018]	[0.019]
Treat × Post	-0.041	0.044	-0.010	0.033	0.151	0.113
	[0.211]	[0.206]	[0.209]	[0.287]	[0.285]	[0.302]
Treat	-0.056	0.418	0.415	-0.346*	0.445	0.460
	[0.149]	[0.339]	[0.341]	[0.205]	[0.422]	[0.431]
Post	0.056	0.072	0.026	0.308*	0.374**	0.179
	[0.113]	[0.119]	[0.142]	[0.179]	[0.183]	[0.202]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Calendar month FE	No	No	Yes	No	No	Yes
Observations	11511	11511	11511	11511	11511	11511
R-squared	0.006	0.103	0.112	0.005	0.114	0.126

Table 8. Robustness: Interaction with the Abnormal Returns on the Earnings Announcement Dates (Continued)

Panel B: Impact of hedge funds on PEAD

	CAR_d1_d2 (%)			CAR_d1_d4 (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post × D(HF^{++}) × CAR_d0	-0.191**	-0.231***	-0.241***	-0.177	-0.211*	-0.230**
	[0.086]	[0.084]	[0.086]	[0.109]	[0.113]	[0.114]
Treat × Post × CAR_d0	0.172***	0.166***	0.164***	0.160***	0.154**	0.160**
	[0.048]	[0.048]	[0.048]	[0.062]	[0.063]	[0.062]
Treat × D(HF^{++}) × CAR_d0	0.046	0.060	0.069	0.043	0.068	0.079
	[0.061]	[0.063]	[0.064]	[0.083]	[0.089]	[0.089]
Treat × CAR_d0	-0.044	-0.038	-0.040	-0.052	-0.062	-0.070
	[0.034]	[0.034]	[0.034]	[0.044]	[0.044]	[0.044]
Post × D(HF^{++}) × CAR_d0	0.075	0.074	0.075	0.094	0.119*	0.122*
	[0.052]	[0.053]	[0.054]	[0.066]	[0.070]	[0.070]
Post × CAR_d0	-0.041*	-0.025	-0.027	-0.052*	-0.039	-0.043
	[0.023]	[0.024]	[0.024]	[0.030]	[0.031]	[0.031]
D(HF^{++}) × CAR_d0	-0.013	-0.014	-0.014	-0.024	-0.047	-0.049
	[0.038]	[0.039]	[0.039]	[0.054]	[0.057]	[0.057]
CAR_d0	0.054***	0.044**	0.045**	0.080***	0.074***	0.077***
	[0.017]	[0.018]	[0.018]	[0.024]	[0.024]	[0.024]
Treat × Post × D(HF^{++})	-0.185	-0.483	-0.444	0.137	-0.083	0.004
	[0.512]	[0.538]	[0.525]	[0.705]	[0.744]	[0.736]
Treat × Post	-0.239	-0.114	-0.208	-0.288	-0.175	-0.287
	[0.207]	[0.217]	[0.214]	[0.285]	[0.298]	[0.298]
Treat × D(HF^{++})	0.397	0.820*	0.784*	0.127	0.539	0.448
	[0.394]	[0.444]	[0.442]	[0.556]	[0.620]	[0.625]
Treat	-0.012	0.235	0.224	-0.143	0.220	0.296
	[0.153]	[0.347]	[0.350]	[0.223]	[0.428]	[0.448]
Post × D(HF^{++})	0.277	0.344	0.356	-0.121	0.045	0.045
	[0.267]	[0.290]	[0.293]	[0.389]	[0.413]	[0.415]
Post	0.183	0.014	0.039	0.437***	0.234	0.088
	[0.119]	[0.132]	[0.156]	[0.163]	[0.171]	[0.198]
D(HF^{++})	-0.207	-0.359	-0.318	0.017	-0.300	-0.251
	[0.216]	[0.231]	[0.234]	[0.303]	[0.327]	[0.326]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Calendar month FE	No	No	Yes	No	No	Yes
Observations	9818	9818	9818	9818	9818	9818
R-squared	0.012	0.117	0.126	0.012	0.117	0.128
Test p-value: $\beta_1 + \beta_2 = 0$	0.789	0.378	0.301	0.850	0.549	0.462

Table 9. Impact of Short Sellers on PEAD

Notes: This table presents results from difference-in-differences specifications that evaluate the impact of short sellers on the magnitude of PEAD after the reductions of analyst coverage. The dependent variables $CAR\_d1\_dn_{it}$ are the cumulative abnormal returns from the first day to the nth day after earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. *Treat* is a dummy variable that equals for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. D(SI^{++}) is a dummy variable that equals one if the abnormal short interest at the nearest quarter end prior to earnings announcement is in the top quartile of the abnormal short interest. Abnormal short interest at any given quarter are computed as short interest at the current quarters minus the average short interest of the past four quarters. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. D(SUE^{++}), D(SUE^{0}), and D(SUE^{--}) are three dummy variables that equal one for earnings announcement with top 25% SUE, middle 50% SUE, and bottom 25% SUE, respectively. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

Panel A: Interaction with SUE

	CAR_d1_d2 (%)			CAR_d1_d4 (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post × D(SI^{++}) × SUE	-0.230*	-0.299**	-0.305**	-0.302*	-0.389**	-0.378**
	[0.127]	[0.137]	[0.135]	[0.172]	[0.189]	[0.188]
Treat × Post × SUE	0.258***	0.318***	0.303***	0.383***	0.457***	0.446***
	[0.067]	[0.070]	[0.069]	[0.081]	[0.088]	[0.087]
Treat × D(SI^{++}) × SUE	0.053	0.089	0.092	0.058	0.072	0.058
	[0.104]	[0.115]	[0.116]	[0.126]	[0.141]	[0.141]
Treat × SUE	-0.200***	-0.239***	-0.236***	-0.238***	-0.280***	-0.279***
	[0.054]	[0.059]	[0.059]	[0.060]	[0.068]	[0.068]
Post × D(SI^{++}) × SUE	0.034	0.017	0.010	0.072	0.091	0.084
	[0.078]	[0.083]	[0.081]	[0.107]	[0.112]	[0.112]
Post × SUE	-0.140***	-0.158***	-0.155***	-0.219***	-0.244***	-0.248***
	[0.042]	[0.046]	[0.044]	[0.058]	[0.066]	[0.065]
D(SI^{++}) × SUE	0.033	0.064	0.062	0.012	0.019	0.021
	[0.061]	[0.066]	[0.065]	[0.078]	[0.083]	[0.083]
SUE	0.223***	0.231***	0.237***	0.292***	0.308***	0.315***
	[0.033]	[0.037]	[0.037]	[0.044]	[0.052]	[0.052]
Treat × Post × D(SI^{++})	0.363	-0.218	-0.238	-0.645	-0.884	-0.921
	[0.609]	[0.630]	[0.646]	[0.838]	[0.850]	[0.862]
Treat × Post	-0.310	-0.142	-0.230	0.007	0.154	0.084
	[0.302]	[0.305]	[0.304]	[0.384]	[0.397]	[0.401]
Treat × D(SI^{++})	-0.091	0.434	0.460	0.635	0.907	0.923
	[0.439]	[0.497]	[0.512]	[0.620]	[0.670]	[0.685]
Treat	0.110	0.447	0.477	-0.385	0.397	0.511
	[0.217]	[0.457]	[0.460]	[0.291]	[0.580]	[0.585]
Post × D(SI^{++})	0.078	0.280	0.398	0.326	0.245	0.368
	[0.379]	[0.389]	[0.398]	[0.488]	[0.487]	[0.494]
Post	0.384**	0.394**	0.283	0.666***	0.751***	0.417
	[0.179]	[0.189]	[0.216]	[0.255]	[0.268]	[0.286]
D(SI^{++})	-0.166	-0.477	-0.536	-0.343	-0.506	-0.562
	[0.306]	[0.327]	[0.335]	[0.388]	[0.405]	[0.414]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Calendar month FE	No	No	Yes	No	No	Yes
Observations	11250	11250	11250	11250	11250	11250
R-squared	0.016	0.131	0.145	0.017	0.135	0.150
Test p-value: $\beta_1 + \beta_2 = 0$	0.779	0.867	0.984	0.569	0.677	0.676

Table 9. Impact of Short Sellers on PEAD (Continued)

Panel B: Interaction with positive and negative earnings announcement.

	CAR_d1_d1 (%)	CAR_d1_d2 (%)	CAR_d1_d3 (%)	CAR_d1_d4 (%)
	(1)	(2)	(3)	(4)
Treat × Post × D(SI^{++}) × D(SUE^{++})	-1.204	-2.057**	-2.404**	-2.531*
	[0.818]	[1.027]	[1.157]	[1.324]
Treat × Post × D(SI^{++}) × D(SUE^{0})	0.246	-0.591	-1.352	-2.106*
	[0.683]	[0.906]	[1.026]	[1.147]
Treat × Post × D(SI^{++}) × D(SUE^{--})	0.858	1.271	1.203	1.808
	[0.997]	[1.178]	[1.381]	[1.630]
Treat × Post × D(SUE^{++})	0.456	1.274**	1.827***	2.141***
	[0.436]	[0.581]	[0.664]	[0.719]
Treat × Post × D(SUE^{0})	0.368	0.462	0.748*	0.919*
	[0.307]	[0.407]	[0.432]	[0.479]
Treat × Post × D(SUE^{--})	-1.599***	-1.829***	-1.663**	-1.816**
	[0.498]	[0.655]	[0.756]	[0.847]
Treat × D(SI^{++}) × D(SUE^{++})	0.582	1.516*	1.510	1.791
	[0.673]	[0.888]	[0.992]	[1.112]
Treat × D(SI^{++}) × D(SUE^{0})	1.112	0.766	1.128	1.231
	[0.803]	[0.934]	[1.018]	[1.243]
Treat × D(SI^{++}) × D(SUE^{--})	-0.551	-0.074	0.559	0.415
	[0.524]	[0.668]	[0.792]	[0.879]
Treat × D(SUE^{++})	-0.065	-0.656	-0.881	-1.076
	[0.371]	[0.563]	[0.682]	[0.779]
Treat × D(SUE^{0})	1.054**	1.272**	1.149	0.916
	[0.474]	[0.640]	[0.714]	[0.777]
Treat × D(SUE^{--})	0.146	0.150	0.245	0.487
	[0.337]	[0.483]	[0.560]	[0.611]
Post × D(SI^{++}) × D(SUE^{++})	0.123	0.477	1.097	0.935
	[0.463]	[0.613]	[0.726]	[0.820]
Post × D(SI^{++}) × D(SUE^{0})	0.558	0.586	0.807	0.793
	[0.387]	[0.517]	[0.581]	[0.658]
Post × D(SI^{++}) × D(SUE^{--})	-0.179	-0.036	-0.406	-0.627
	[0.596]	[0.710]	[0.831]	[0.938]
Post × D(SUE^{++})	-0.074	-0.641*	-0.869**	-1.001**
	[0.281]	[0.359]	[0.438]	[0.488]
Post × D(SUE^{0})	0.944***	1.149***	1.534***	1.643***
	[0.322]	[0.383]	[0.459]	[0.531]
Post × D(SUE^{--})	-0.010	-0.058	-0.136	-0.087
	[0.199]	[0.271]	[0.308]	[0.329]
D(SI^{++}) × D(SUE^{++})	-0.231	-0.434	-0.768	-0.617
	[0.387]	[0.538]	[0.618]	[0.703]
D(SI^{++}) × D(SUE^{0})	-0.338	-0.424	-0.644	-0.572
	[0.301]	[0.434]	[0.484]	[0.540]
D(SI^{++}) × D(SUE^{--})	-0.471	-0.581	-0.391	-0.423
	[0.483]	[0.573]	[0.632]	[0.743]
D(SUE^{++})	0.827***	1.380***	1.821***	2.025***
	[0.259]	[0.349]	[0.413]	[0.456]
D(SUE^{--})	-0.771***	-1.197***	-1.318***	-1.151***
	[0.286]	[0.349]	[0.384]	[0.414]
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes
Observations	9423	9423	9423	9423
R-squared	0.145	0.145	0.148	0.150
Test p-value: $\beta_1 + \beta_4 = 0$	0.295	0.367	0.551	0.731
Test p-value: $\beta_3 + \beta_6 = 0$	0.374	0.570	0.708	0.996

Appendix A

PEAD with Various Time Horizons

Notes: This table presents results from difference-in-differences specifications that evaluate changes in the magnitude of PEAD after the reductions of analyst coverage. The dependent variables $CAR\_d1\_mN_{it}$ are the cumulative abnormal returns from the first day to the end of Nth month after earnings announcement, benchmarked by the returns of corresponding Fama-French 5*5 size and book-to-market portfolios. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one for earnings announcement that happens after reductions of analyst coverage. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

$$CAR\_d1\_mN_{it} = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} * SUE_{it} + \beta_2 Treat_{it} * SUE_{it} + \beta_3 Post_{it} * SUE_{it} + \beta_4 SUE_{it} + \beta_5 Treat_{it} * Post_{it} + \beta_6 Treat_{it} + \beta_7 Post_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

	CAR_d0_m1 (1)	CAR_d0_m3 (2)	CAR_d0_m6 (3)	CAR_d0_m9 (4)	CAR_d0_m12 (5)
Treat × Post × SUE	0.338**	0.484***	0.626**	0.946***	0.970**
	[0.166]	[0.187]	[0.278]	[0.342]	[0.393]
Treat × SUE	-0.253**	-0.400***	-0.527**	-0.550**	-0.597**
	[0.120]	[0.141]	[0.206]	[0.252]	[0.290]
Post × SUE	-0.117	-0.146	-0.225	-0.569***	-0.436*
	[0.099]	[0.110]	[0.175]	[0.219]	[0.256]
SUE	0.669***	0.554***	0.302**	0.216	-0.019
	[0.071]	[0.082]	[0.132]	[0.166]	[0.182]
Treat × Post	-0.114	0.789	0.029	-2.930	-3.473
	[0.654]	[0.785]	[1.470]	[2.089]	[2.631]
Treat	1.256	-0.110	1.561	5.804*	8.709**
	[1.047]	[1.131]	[1.850]	[3.289]	[3.865]
Post	0.483	0.738	1.493*	1.487	0.301
	[0.454]	[0.510]	[0.891]	[1.383]	[1.740]
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes	Yes
Observations	10817	10815	10805	10796	10784
R-squared	0.164	0.182	0.270	0.336	0.385

Appendix B

Non-Hedge Fund Holdings prior to Earnings Announcements: Breakdown Analyses by Institution Types

Notes: This table evaluates changes in the abnormal holdings of different types of non-hedge funds after the reductions of analyst coverage. The dependent variables are the levels of abnormal holdings of different types of non-hedge funds at the nearest quarter ends prior to the quarterly earnings announcement. Abnormal holdings of a given type of non-hedge fund institutions at any given quarter are computed as the holdings of this type of non-hedge fund institutions at the current quarters minus the average holdings of this type of non-hedge fund institutions in the past four quarters. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. *SUE* is quarterly standardized unexpected earnings, which is computed as the quarter's actual earnings minus the average of the most recent analyst forecast, divided by the standard deviation of that forecast. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the earnings announcement date level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The data cover earnings announcement two years before and after the reductions of analyst coverage and span 1997 to 2009. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

$$Ab\_Holdings_{it} = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} * SUE_{it} + \beta_2 Treat_{it} * SUE_{it} + \beta_3 Post_{it} * SUE_{it} + \beta_4 SUE_{it} + \beta_5 Treat_{it} * Post_{it} + \beta_6 Treat_{it} + \beta_7 Post_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

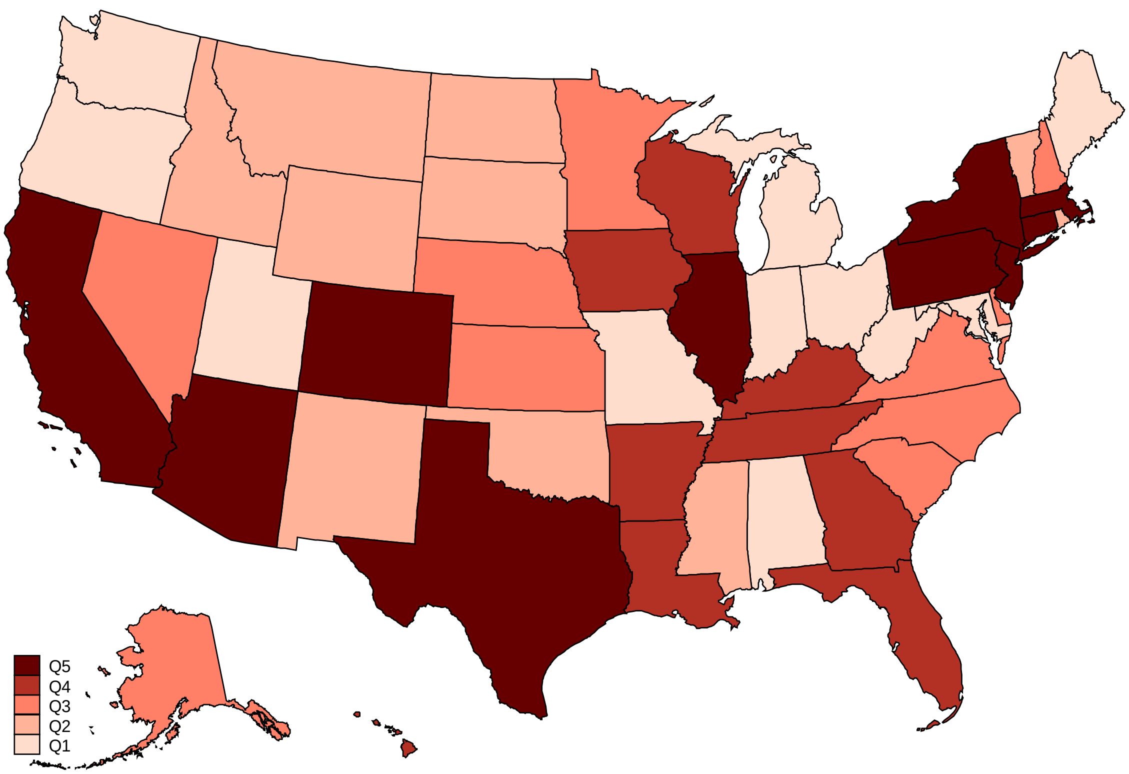
	Abnormal Non-HF Holdings (%)				
Non-HF Types	Banks	Insurance Companies	Investment companies (mostly mutual funds)	Investment advisors	Others (e.g., university endowment)
	(1)	(2)	(3)	(4)	(5)
Treat × Post × SUE	-0.001	-0.033	-0.112	-0.007	-0.008
	[0.031]	[0.041]	[0.083]	[0.032]	[0.020]
Treat × SUE	-0.000	0.014	0.145**	0.004	0.004
	[0.023]	[0.040]	[0.064]	[0.024]	[0.012]
Post × SUE	-0.011	0.010	-0.028	-0.005	-0.009
	[0.020]	[0.037]	[0.049]	[0.022]	[0.013]
SUE	0.047***	0.000	0.014	0.018	0.009
	[0.016]	[0.036]	[0.035]	[0.015]	[0.009]
Treat × Post	-0.168	0.281	1.150***	0.006	-0.003
	[0.220]	[0.357]	[0.440]	[0.175]	[0.114]
Treat	-0.135	-0.085	-1.168*	0.475*	0.070
	[0.269]	[0.235]	[0.657]	[0.261]	[0.153]
Post	-0.296**	-0.165	-0.435	-0.242	-0.126
	[0.144]	[0.267]	[0.292]	[0.152]	[0.102]
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes	Yes
Observations	10146	10146	10146	10146	10146
R-squared	0.233	0.016	0.235	0.212	0.165

Appendix C

Information Acquisition via EDGAR: State-Level Difference-in-Differences Coefficients

Quintiles for the state-level DID coefficients (β_1), web traffic to insider filings

$Ln(ESV_{it}+1) = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} + \beta_2 Treat_{it} + \beta_3 Post_{it} + \gamma' Controls_{it} + \varepsilon_{it}$, for each state



Notes: We use difference-in-differences (DID) regressions to evaluate changes in the EDGAR search volume for insider filings after the reductions of analyst coverage. The regression is performed separately for each state. This figure plots the quintiles of the state-level DID coefficients. The dependent variables in the DID regressions are the natural log of the monthly EDGAR search volume (ESV) for insider filing (Form 3, 4, and 5) of firm i in month t. The panel data used for the difference-in-differences regressions cover monthly EDGAR search volume for the treated firms and the matched control firms two years before and after the reductions of analyst coverage. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. The sample period is from 2003 to 2009. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1.

Appendix D

Information Acquisition via EDGAR: Role of the Distance to Hedge Funds Measured at the Zip Code Level

Notes: This table evaluates changes in the EDGAR search volume for insider filings after the reductions of analyst coverage. The SEC maintains a database that tracks the web visits to its EDGAR system since 2003. It also records the IP addresses of the requesting users, with the final (fourth) octet of the IP addresses replaced with a unique set of three letters. We use the IP2Location data to map IP addresses to zip codes. Based on the first three octets of the IP addresses in the SEC data, we match 90% of IP addresses (80% of the total visits) to unique zip codes. The zip codes associated with the matched IP addresses are invariant to the values of the final octet of the IP addresses. For each matched IP address, we compute its geographical distance to the shortest hedge funds based on the latitude/longitude of the zip codes and the physical addresses of the hedge funds collected from the 13F SEC filings. The dependent variables are the natural log of the monthly EDGAR search volume (ESV) for the insider filings of firm *i* in month *t* from zip code *z*. The data used for the difference-in-differences regressions cover monthly EDGAR search volume for the treated firms and the matched control firms two years before and after the reductions of analyst coverage. The sample period is from 2003 to 2009. We rank all zip codes in the U.S. based on the web traffic volume of each zip code to the SEC EDGAR system. Column (1), (2), (3), (4), (5), and (6) include ESV from top 10, 20, 30, 50, 100, and 500 zip codes. The observations are weighted based on the web traffic volume of the corresponding zip codes. If a zip code *z* has zero visit to a firm *i* throughout the sample period, we exclude the observations from zip code *z* to firm *i* from the sample. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. *Distance* is the distance (measured in km) between a given zip code and the nearest hedge fund. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the calendar month level. The treated firms are limited to firms that have five or fewer analysts covering the firm before coverage reductions. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

$$Ln(ESV_{zit}+1) = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} * ln(Distance_z + 1) + \boldsymbol{\beta_2} Treat_{it} * Post_{it} + \beta_3 ln(Distance_z + 1) + \beta_4 Post_{it} * ln(Distance_z + 1) + \beta_5 Treat_{it} * ln(Distance_z + 1) + \beta_6 Treat_{it} + \beta_7 Post_{it} + \gamma' Controls_{it} + \varepsilon_{zit}$$

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(EDGAR Search Volume +1)					
Filing Types	Insider	Insider	Insider	Insider	Insider	Insider
Treat × Post × ln(Distance+1)	-0.059**	-0.064**	-0.096**	-0.051**	-0.030**	-0.023**
	[0.029]	[0.028]	[0.038]	[0.020]	[0.012]	[0.010]
Treat × Post	0.185***	0.200***	0.192***	0.141***	0.107**	0.085***
	[0.060]	[0.056]	[0.055]	[0.050]	[0.046]	[0.030]
ln(Distance+1)	-0.067***	-0.049**	-0.053***	-0.030**	-0.024**	-0.012
	[0.023]	[0.020]	[0.018]	[0.013]	[0.012]	[0.010]
Post × ln(Distance+1)	0.028	0.023	0.026	0.011	0.003	-0.002
	[0.027]	[0.022]	[0.019]	[0.016]	[0.014]	[0.011]
Treat × ln(Distance+1)	0.025	-0.002	0.009	-0.016	-0.021	-0.023
	[0.025]	[0.035]	[0.047]	[0.040]	[0.035]	[0.045]
Treat	-0.297**	-0.239**	-0.173*	-0.087	-0.039	-0.021
	[0.118]	[0.091]	[0.091]	[0.074]	[0.072]	[0.097]
Post	-0.011	-0.018	-0.017	-0.037	-0.027	-0.017
	[0.045]	[0.036]	[0.035]	[0.030]	[0.027]	[0.021]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Zip codes included	Top 10	Top 20	Top 30	Top 50	Top 100	Top 500
% of traffic volume	18.6%	26.1%	31.7%	38.7%	49.0%	74.1%
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	105275	188260	252076	380788	550332	925820
R-squared	0.232	0.531	0.480	0.381	0.329	0.274

Appendix E

Information Acquisition via EDGAR: Treated Firms with More than Five Analysts prior to Coverage Reductions

Notes: This table evaluates changes in the EDGAR search volume after the reductions of analyst coverage, when treated firms have six or more analysts covering the firm before coverage reductions. The dependent variables are the natural log of the monthly EDGAR search volume (ESV) for the filings of firm *i* in month *t*. Column (1) includes user requests for all types of EDGAR filings. Column (2), (3), (4), (5), and (6) include user requests for 10K, 10Q, 8K, insider filings (Form 3, 4, and 5), and other types of filings, respectively. The panel data used for the difference-in-differences regressions cover monthly EDGAR search volume for the treated firms and the matched control firms two years before and after the reductions of analyst coverage. The sample period is from 2003 to 2009. *Treat* is a dummy variable that equals one for earnings announcement from treated firms. *Post* is a dummy variable that equals one if the earnings announcement happens after reductions of analyst coverage. Control variables include *LnSize*, *LnBEME*, *LnLev*, and *Ret2mPrior*, which are defined in Table 1. Standard errors are included in parentheses and they are double clustered at both the firm and the calendar month level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels.

$$Ln(ESV_{it}+1) = \alpha_i + \alpha_t + \boldsymbol{\beta_1} Treat_{it} * Post_{it} + \beta_2 Treat_{it} + \beta_3 Post_{it} + \gamma' Controls_{it} + \varepsilon_{it}$$

	Ln(EDGAR Search Volume +1)					
Initial # of Analysts	>=6	>=6	>=6	>=6	>=6	>=6
Filing Types	All	10-K	10-Q	8-K	Insider	Others
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post	0.068	0.025	0.000	0.023	0.011	-0.019
	[0.053]	[0.033]	[0.016]	[0.046]	[0.042]	[0.031]
Treat	-0.118	-0.048	-0.071***	-0.067	-0.046	0.173
	[0.158]	[0.066]	[0.022]	[0.134]	[0.109]	[0.124]
Post	-0.002	0.007	-0.021	0.083**	-0.003	0.028
	[0.040]	[0.022]	[0.024]	[0.037]	[0.037]	[0.029]
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	31615	31615	31615	31615	31615	31615
R-squared	0.601	0.324	0.429	0.465	0.436	0.218