Information Percolation and Informed Short Selling: Evidence from Earnings Announcements

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This study examines short selling in stocks of firms that sequentially reveal partial earnings-related information prior to their eventual full earnings reports. By decomposing the shorting activity prior to the earnings announcements (EAs), we show that short sellers exploit both public partial information disclosures and private informational advantages to profit from forthcoming EAs. We estimate that informed short selling based on public and private information accounts for about 80% and 20%, respectively, of the short selling-related decrease in EA returns. In addition, our results highlight time varying short sale constraints preceding EAs and reveal that the return predictability of short selling depends critically on the effectiveness of these constraints.

Keywords: incomplete information; informed trading; short selling; earnings announcements.
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Abstract

This study examines short selling in stocks of firms that sequentially reveal partial earnings-related information prior to their eventual full earnings reports. By decomposing the shorting activity prior to the earnings announcements (EAs), we show that short sellers exploit both public partial information disclosures and private informational advantages to profit from forthcoming EAs. We estimate that informed short selling based on public and private information accounts for about 80% and 20%, respectively, of the short selling-related decrease in EA returns. In addition, our results highlight time varying short sale constraints preceding EAs and reveal that the return predictability of short selling depends critically on the effectiveness of these constraints.

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1. Introduction

To study whether a particular group of investors are informed about upcoming corporate events, existing research typically examines whether that group's trades are associated with subsequent announcement returns. Quite often, however, a company will sequentially reveal portions of information related to an upcoming event (e.g. an earnings announcement) prior to making the eventual full disclosure. Thus, a critical, but seldom explored, question is whether and how the trading decisions of informed investors reflect partial information released by a company that percolates out over time. To study this issue, we concentrate on one group of informed traders, short sellers, and investigate whether their trades following earnings-related, yet incomplete, disclosures are informative in predicting subsequent earnings announcement (EA) returns. EAs provide an ideal setting for our study since they are highly anticipated and closely monitored by the media and investors. Interestingly, although earnings reports are considered private information until they are eventually released to the public, companies often reveal fragments of earnings-related news prior to the eventual full disclosures.

We focus our analysis on the trades of short sellers, motivated by broadening evidence that they are informed traders as higher short selling is associated with lower future returns.[1] Existing research suggests that the return predictability of short sellers' trades stems from their ability to either (i) skillfully analyze negative public information following significant events or (ii) exploit their private information before those events are announced. As an example of (i), Engelberg, Reed, and Ringgenberg (2012) document that short sellers earn abnormal trading profit by analyzing different types of public news. Consistent with (ii), short sellers have been shown to anticipate corporate announcements that significantly affect security prices, such as EAs (e.g., Christophe, Ferri, and Angel, 2004; Boehmer, Jones, Wu, and Zhang, 2018), earnings restatements (Desai, Krishnamurthy, and Venkataraman, 2006; Efendi and Swanson, 2009), analyst downgrades (Christophe, Ferri, and Hsieh, 2010; Boehmer

[1]For equity returns, see, e.g., Desai, Ramesh, Thiagarajan, and Balachandran (2002), Boehmer, Jones, and Zhang (2008), Diether, Lee, and Werner (2009), and Boehmer, Huszar, Wang, and Zhang (2018). For corporate bond yields and returns, see, e.g., Kecskes, Mansi, and Zhang (2013) and Christophe, Ferri, Hsieh, and King (2016).

et al., 2018), analyst forecast downward revisions (Francis, Venkatachalam, and Zhang, 2005; Boehmer et al., 2018), financial misrepresentation (Karpoff and Lou, 2010), and bond rating downgrades (Henry, Kisgen, and Wu, 2015).

Building upon the vast evidence of informed short selling in the literature, this paper investigates short sellers' informational advantage by evaluating the relative informativeness of short selling arising during the period that starts one day after a firm's last revelation of partial earnings-related information and ends one day prior to the full disclosure of its earnings. More specifically, we decompose a firm's shorting activity during this window into two components. The first component is the short selling that occurs in response to a firm's final partial earnings news prior to the EA date, and the second is the change in shorting activity that occurs from beyond the first component until just before earnings are publicly announced. The former estimates short sellers' ability to utilize mostly public, yet incomplete, information to predict the eventual outcome of an EA, while the latter explores the ability of short sellers to process additional, and most likely private, information for their trading advantage. It is important to note that although firms typically enter the quiet period following their last partial disclosure, it remains possible that information providers such as analysts continue to release earnings-relevant news which could affect short selling. We mitigate this potential effect by including proxies for non-company provided public information in our research design.

We then examine the relative informativeness of these decomposed shorting activities. For this analysis, we utilize two important public disclosures that often occur prior to an EA: scheduling pre-announcements (PAs) and management forecasts (MFs). Previous studies have shown that both of these public disclosures can be highly correlated with the eventual EA return.[2] A PA is when a firm announces the exact upcoming date when its earnings will be reported, and a MF is when a firm announces its own predicted earnings, compared to analysts'. For these two types of disclosures, we are especially interested in examining shorting activity in the cases where for PAs, firms strategically and implicitly time their EA date, and

[2]There is substantial evidence in the literature that links PAs or MFs with the eventual EAs. For more recent evidence, see, e.g., Anilowski, Feng, and Skinner, 2007; Kothari, Shu, and Wysocki, 2009; deHaan, Shevlin, and Thornock, 2015; Bozanic, Roulstone, and Van Buskirk, 2018; Johnson and So, 2018.

for MFs, firms announce forecasts that are below the analyst consensus.

Using various measures to estimate shorting activity during the 2006-2014 period, we first show that shorting activity following PAs and MFs is negatively correlated with the eventual EA return, but the negative relationship is largely concentrated in stocks with the most intense shorting. Importantly, we document a consistent pattern whereby the negative return predictability of short selling becomes greater the longer a firm implicitly delays its EA date. These findings show that short sellers are skilled at processing and profiting from information related to the eventual EA even when only partial information is revealed.

Second, the results from our short selling decomposition show that increased shorting activities (i) following partial disclosures and (ii) prior to the EA are both significantly associated with lower subsequent EA returns. This indicates that short sellers exploit both public and private earnings-related information as it percolates out prior to the EA. The estimates from our regression models indicate that, after controlling for other factors that could also be correlated with the EA return, a one standard deviation increase in short selling following a partial disclosure is associated with a 0.25% to 0.42% reduction in the EA return while a one standard deviation increase in short selling in the days just preceding the EA is related to a 0.07% to 0.09% reduction in the EA return. Consequently, these estimates suggest that informed short selling based on public and private information accounts for 75.76% to 82.35% and 17.65% to 24.24%, respectively, of the short selling-related decrease in EA returns.

Third, we incorporate equity lending fees and the number of lendable shares in our analysis to examine how these two additional shorting-related variables, which arguably proxy for lending supply, impact our results. We find that while the negative association between decomposed shorting activity and the EA return is significantly affected by these two variables, the impact is especially pronounced for short selling that occurs just prior to the EA. In particular, we show that short selling is more informative when lending fees increase (i.e., more costly to short) or when the percentage of lendable shares increases (i.e., easier for short sellers to borrow). The former indicates that higher lending fees may crowd out uninformed short sellers and that only informed short sellers are willing to pay higher fees to exploit their

informational advantage. The latter implies that short sellers might not be able to profit from potential investment opportunities when the availability of lendable shares is severely restricted.

Though the evidence from both equity lending fees and the number of lendable shares suggests the effectiveness of short-sale constraints, we provide an additional examination of the constraints by using institutional holdings as our proxy. Interestingly, although high shorting restrictions (i.e., low institutional holdings) significantly affect the informativeness of shorting activity prior to the EA, they are not effectively binding for shorting activity following a disclosure. Thus, the evidence supports the notion that the effectiveness of short sale constraints varies over time, ineffective during normal non-event days but rising markedly before significant corporate events (e.g., the EAs in this study).

Lastly, the impact of short selling on price quality is a topic of ongoing great interest in the literature. We contribute to this discussion by investigating whether and how our decomposed short selling components affect price quality. We find that increased short selling both following a disclosure and prior to the EA significantly improves price quality. However, its effect is less significant following the EA. Collectively, these findings imply that short selling preceding EAs, but not post EAs, is most likely information driven. We also show that the relationship between short selling and price quality becomes less significant when short-sale constraints are effective, especially for short selling just prior to the EA. This again supports the notion that short-sale constraints are time-varying.

This research contributes to multiple streams of the literature in short selling. First, recent studies identify several information sources used by short sellers. Specifically, short sellers could base their trades on firms' fundamentals and private information. Alternatively, they could also react to news with most of their trading advantage coming from their ability to quickly process publicly available information. Further, Boehmer et al. (2018) implement a return decomposition and document that short sellers are skillful at processing both private and public information. We broaden this line of research by directly decomposing shorting activity to show that short sellers effectively exploit partial information disclosures as well as

private information. To the best of our knowledge, this research is the first to explore how short sellers attain their informational advantage by skillfully utilizing partial information. More importantly, by decomposing shorting activities estimated over different time periods prior to the EAs, we are able to estimate the relative informativeness of the shorting activity based on public vs. private information for predicting returns. Second, our work contributes to the literature examining firms' strategic scheduling of their EAs. Although prior studies show that investors under-react to the timing information, our evidence indicates that firms' longer implicit delays are associated with higher sensitivity of short selling to the eventual EAs, implying that short sellers exploit and profit from the timing information. Third, our findings shed light on the effects of shorting supply on shorting demand and more importantly, on the time-varying effectiveness of short sale constraints. Specifically, we extend the existing research by showing that while short sale constraints can effectively impede short sellers from exploiting their informational advantages, the effectiveness of such constraints varies over time, which in turn, significantly affects the informativeness of decomposed shorting activities. Finally, our results show the impacts of short trades in different periods on price quality and how short-sale constraints affect such relationship.

The remainder of the paper is organized as follows. Section 2 discusses related literature and formulates our hypotheses. Section 3 describes the sample construction and provides summary statistics for the sample used in the study. Section 4 analyzes the relations between short selling following a disclosure and EA returns. Section 5 investigates the relations between decomposed shorting activity and EA returns, and further examines the effect of short sale constraints on such relations. Section 6 discusses extended results and additional evidence. Section 7 concludes.

2. Related Research and Hypotheses

This study investigates the evolution of informed trading in a setting where a firm discloses partial information before revealing its full content in a financial market. Consider a timeline

of three stages (t=0, 1, and 2). At t=0, the firm disseminates partial news regarding the event which will be fully revealed at t=2. Note that although by t=0, informed investors may have already acquired some limited information about the upcoming event, a firm's release of partial information could help them update their priors. At t=1, investors acquire (additional) private information and revise their trades depending on whether the newly-acquired private information complements or substitutes their original information set at t=0. Finally, at t=2, the firm fully reveals its information and investors realize trading profits or losses. With this information structure, several important, yet rarely explored, empirical questions emerge: (1) Does incomplete public information (dis-)incentivize informed traders from obtaining private information? (2) What is the relative informativeness between short trades based on public, albeit partial, information and those based on private information? (3) How significant is the relative impact of different short trades on price quality? and (4) What is the role of short-sale constraints on the return predictability of different short trades? In this research, we investigate these questions by focusing on how a group of informed traders, short sellers, attain their informational advantage prior to EAs.

2.1. Relative Informativeness of Decomposed Short Selling

Theories assert that since short selling is costly and could be constrained, only a select number of investors are willing to pay the cost and sell short (see, e.g., Miller, 1977; Diamond and Verrecchia, 1987; Chen, Hong, and Stein, 2002; Duffie, Garleanu, and Pedersen, 2002; Scheinkman and Xiong, 2003). Although some theoretical models posit mispricing while others do not, a common theme is that short sellers on the whole are informed as higher short selling is associated with lower subsequent returns. Existing empirical research provides robust evidence consistent with theoretical predictions and further suggests that short sellers' informational advantage could originate from obtaining private information or from skillfully processing public information. This paper extends this line of research and investigates the relative informativeness of short trades based on these two different information sources: public vs. private. It is important to note that public information in our setting is different from

that in Engelberg et al. (2012) and Boehmer et al. (2018) who examine short selling *after* a firm fully reveals its information. In this study, we consider a situation where a firm discloses a portion of information *before* its full revelation.

To test how short sellers utilize different information sources, we examine their trades prior to quarterly EAs. EAs epitomize the ideal of how a firm, within legal boundaries, deliberately discloses some related information in advance of its full report. Further, EAs arguably are suitable for distinguishing between public and private information. Specifically, we exploit the "quiet period" which typically follows a firm's last public disclosure before its EA.[3] The last disclosure serves as an anchor point, allowing us to decompose short selling into two parts. The first (denoted as $SHORT_{DIS}$) is the short selling that occurs during the days subsequent to the firm's last earnings-related disclosure. The second ($\triangle SHORT_{BF}$) is the change in short selling after that first estimation period until the day before the EA. The first component is likely related to how short sellers process public information whereas the second likely captures short sellers' use of private information during the quiet period. It is important to recognize that other information providers, such as analysts, may routinely distribute new information during the quiet period. Thus, absent controls, the $\triangle SHORT_{BF}$ estimate could reflect short sellers' utilization of that public information. To mitigate this issue, our empirical specifications include variables to isolate the effect of non-company provided public information on $\triangle SHORT_{BF}$ during a firm's quiet period.

The informativeness of decomposed short selling is examined in our first two sets of hypotheses. As discussed previously, existing research shows that short sellers acquire information through different channels, and make profitable trades both before and after news releases. The former is more in line with short sellers exploiting private information for their advantage while the latter indicates that short sellers use superior information processing skills to generate abnormal returns. Here, we first test whether short sellers profitably exploit public, but partial,

[3]The quarterly quiet period prior to EAs is not as formally regulated as the other better known quiet period in IPOs (e.g., Bradley, Jordan, and Ritter, 2003), and each company has its own pre-determined quiet period. However, firms have incentives to adopt more stringent quiet-period policies so as to protect themselves from being accused of "jumping the gun" and inadvertently disclosing material insider information to a select group of investors. This is especially critical in the post Regulation Fair Disclosure era.

information by using the first component of decomposed short selling ($SHORT_{DIS}$). To the extent that public news releases are associated with reduced information asymmetry, responsive trades by informed investors such as short sellers are less profitable (see, e.g., Diamond and Verrecchia, 1987; Korajczyk, Lucas, and McDonald, 1991). However, a unique characteristic of an incomplete information disclosure is that it is more subject to investors' differential interpretations. Therefore, a partial disclosure presents a unique profitable opportunity for short sellers if they can skillfully process the information revealed (see, e.g., Rubinstein, 1993; Kandel and Pearson, 1995). Overall, this discussion can be formalized in the following hypotheses:

H1A*: Following a partial disclosure, trades by short sellers ($SHORT_{DIS}$) are not informative.*

H1B*: Following a partial disclosure, trades by short sellers ($SHORT_{DIS}$) are informative.*

We next turn to the second component of decomposed short selling ($\triangle SHORT_{BF}$). If considered in isolation (and consistent with existing studies), we would expect short sellers to be able to exploit and profit from private information prior to news events such as EAs. For our analysis, however, we also have to consider the situation that short sellers' incentives to acquire private information could depend on whether short positions have been established based on public partial information. Specifically, when the quality of partial information revealed by a firm is lower, short sellers might trade more conservatively subsequent to that information and be more motivated to collect additional private information. In this case, $SHORT_{DIS}$ will be less informative for predicting EA returns, while the informativeness of $\triangle SHORT_{BF}$ will be greater. On the other hand, a more precise partial information disclosure by a firm could disincentivize short sellers from collecting additional private information. In this situation, $\triangle SHORT_{BF}$ will be less informative, and to the extreme, non-informative. The relative informativeness of these two parts of short selling is an empirical issue. Overall, this discussion leads to the following hypotheses:

H2A*: Prior to the EA, trades by short sellers ($\triangle SHORT_{BF}$) are not informative.*

H2B*: Prior to the EA, trades by short sellers ($\triangle SHORT_{BF}$) are informative.*

2.2. Impact of Short-sale Constraints

Theoretically, the informativeness of short selling depends critically on the presence or absence of short-sale constraints.[4] Diamond and Verrecchia (1987) assert that short-sale constraints could prevent pessimistic opinions from being fully reflected in stock price, thereby allowing optimistic investors to initially drive share price above intrinsic value. The share price eventually declines once it incorporates negative information. A less investigated issue is whether the impact of short-sale constraints is persistent or time varying. Extant research indicates that while most stocks are not expensive to borrow (i.e., not "on special") and their lending fees are rather stable, some stocks get placed on special with significant lending costs during eventful periods (see, e.g., D'Avolio, 2002; Jones and Lamont, 2002; Geczy, Musto, and Reed, 2002; Reed, 2007). This evidence implies that short-sale constraints can be time varying; although they are not binding on most days, they could effectively restrain investors from borrowing shares during other times. In our analysis, we investigate whether short-sale constraints affect the relative informativeness of decomposed shorting activity before EAs. Since the effectiveness of constraints arguably depends on the intensity and timing of shorting demand as well as the concurrent availability of shorting supply, it is an empirical issue as to whether constraints are more binding following a partial public disclosure or during the days just prior to the EA when short trades are likely based on private information. By using the above arguments, we test the following hypotheses:

H3A*: If effective short-sale constraints are persistent, shorting activity (both* $SHORT_{DIS}$ *and* $\triangle SHORT_{BF}$*) will become less informative.*

H3B*: If effective short-sale constraints are time varying, some shorting activity (either* $SHORT_{DIS}$ *or* $\triangle SHORT_{BF}$*) will be more informative than other shorting activity.*

[4] See, e.g., Miller (1977), Chen et al. (2002), Duffie et al. (2002), and Scheinkman and Xiong (2003). Short-sale constraints are usually related to difficulties in locating shares, high lending fees, the risk of hitting the maintenance margin, and the risk of short squeeze.

3. Sample Construction and Descriptive Statistics

We assemble our data from six different sources: (1) earnings scheduling dates from Wall Street Horizon (WSH), (2) earnings announcement dates, consensus and actual earnings, earnings surprises, and management forecasts from I/B/E/S, (3) announcements of delayed earnings from Compustat Capital IQ, (4) daily short selling data from Markit, (5) stock price information from CRSP, and (6) accounting information from Compustat. The sample period, restricted by the intersection of data availability on WSH and Markit, covers the time period from July 1, 2006 to June 30, 2014. Stocks are only included if both return and accounting data are available, and where the share code is either 10 or 11; hence, foreign stocks, closed-end funds, and REITs are excluded from the sample. We discuss earnings and short selling related variables in the next two sub-sections.

3.1. Earnings-Related Variables

Firms regularly make two important types of earnings-related disclosures prior to their actual earnings announcements (EAs). The first is a scheduling disclosure, where a firm announces the exact upcoming date when its earnings will be reported. We denote the date of these scheduling disclosures, obtained from Wall Street Horizon (WSH), as the "pre-announcement" (PA) date.[5] In essence, WSH assembles the dataset through three different channels: (1) contacting firms directly, (2) examining public records such as financial statements, announced news, or a firm's website, and (3) estimating the dates using a company's past reporting pattern. Since WSH continually updates the scheduling records whenever new information becomes available, there can be several expected EA dates for each firm during a quarter, and those dates are flagged as either 'unconfirmed' or 'confirmed'. The unconfirmed dates are those either estimated by WSH or projected (but not yet confirmed) by the firm. Those dates, once available, are distributed by WSH to its subscribers by 4AM EST as a 'heads up' and can therefore be viewed as the expected date that a company will report its EA. Once the dates are eventually verified by WSH or publicly disclosed by the firm, they are flagged as confirmed and recorded

[5]See, e.g., Johnson and So (2018) for a detailed description of the WSH dataset.

in the database. It is important to note that all scheduling disclosure PA dates utilized in this study are obtained via public information, and individual investors could therefore obtain these same data through searching public records without subscribing to WSH's service. WSH data, however, are distinct in two ways. First, they serve as a repertoire of constantly updated expected EA dates which allows researchers to pinpoint the exact dates when information was disseminated to investors.

Second and more importantly, the WSH data allow us to evaluate a firm's strategic scheduling behavior of implicitly advancing or delaying its EA date relative to the date initially expected, and examine whether investors, including short sellers, discern and trade based on such behavior. Advancing (delaying) means the company's confirmed EA date is ahead of (later than) what was anticipated initially. To estimate a firm's implicit advancing or delaying decisions, we follow Johnson and So (2018) and first calculate the difference (denoted as REV, in trading days) between the unconfirmed and confirmed dates ($D_{unconfirmed}$ and $D_{confirmed}$, respectively): $REV = D_{unconfirmed} - D_{confirmed}$. We then use REV to create five $RScore$ indicator variables: $RScore1 = I(REV < -5)$, $RScore2 = I(-5 \leq REV \leq -3)$, $RScore3 = I(-2 \leq REV \leq 2)$, $RScore4 = I(3 \leq REV \leq 5)$, and $RScore5 = I(5 < REV)$. These five indicator variables take into account the possibility that the significance level of REV varies among different groups of delayers and advancers in our subsequent analyses. Accordingly, firms with $RScore1 = 1$ implicitly are delaying their EAs for the most days (more than five days) since their confirmed EA dates occur much later than their predicted dates, while firms with $RScore5 = 1$ are advancing their EA by the greatest number of days. It is assumed that the former ("delayers") are likely associated with forthcoming negative earnings news whereas the latter ("advancers") are likely associated with positive news. An interesting case is when firms purposefully delay or advance their EA dates in one or two days (i.e., those with $RScore3 = 1$). Indeed, prior research finds that delayed EAs tend to convey worse earnings news than advanced EAs (e.g., Chambers and Penman, 1984; Bagnoli, Kross, and Watts, 2002). In addition, recent studies suggest that firms strategically move their EA dates to capitalize on investor (in)attention. For instance, deHaan, Shevlin, and Thornock (2015)

find that firms are likely to announce lower-than-expected earnings on days when investors are less attentive, and Michaely, Rubin, and Vedrashko (2016) find that the worst earnings news tend to be announced on Friday evenings. We extend this stream of literature by examining whether short sellers respond to a firm's scheduling behavior, or if they, like other investors, also suffer from limited attention.

In some instances, rather than just pre-announcing the date when their EAs will occur, some companies instead explicitly announce that their EAs will be delayed. Such announcements may occur, for example, when firms experienced a longer-than-expected audit or when errors in their previous earnings reports have been discovered. Empirical research indicates that this type of public announcements is, on average, associated with significantly negative returns (e.g., Palmon, 1982; Chambers and Penman, 1984). Thus, in addition to the implicit delay measures noted above, we also include these explicit delay cases, obtained from Compustat Capital IQ.[6]

In addition to PAs, the second type of important earnings-related disclosure that some companies provide prior to their EA is a management forecast (MF) for upcoming earnings. We denote the date when management announces such a forecast as the MF date. We focus on forecasts that are related to the forthcoming quarterly or annual earnings announcement, and in most cases, we use quarterly earnings forecasts in conjunction with quarterly earnings announcements. However, in cases where management announces both quarterly and annual forecasts on the same day, we use the annual forecast and match it with the analyst consensus annual forecast for the firm. Further, as shown in other studies, the majority of earnings forecasts are issued concurrently with, or close to, the company's prior quarter EA (e.g., Rogers and Van Buskirk (2013)). For our estimations, we remove any forecasts that occur fewer than five days following the firm's prior quarter EA because it is difficult to effectively disentangle the information content of these two related events.

Moreover, we create an indicator variable, $NegNews$, to estimate the potential effect of

[6]Specifically, we collect the variable 'Delayed Earnings Announcements' (id number 61) in Capital IQ's Key Development database.

negative MFs on EAs and, specifically in our context, whether short selling is higher for those MFs.[7] The value of $NegNews$ equals one if $News < 0$, and zero otherwise, where $News$ is the difference between the MF and the analyst consensus forecast, scaled by the absolute value of the analyst consensus forecast (e.g., Kothari et al., 2009). We only use point and range forecasts of earnings per share (EPS) and exclude open-ended or qualitative forecasts because they are not specific enough to obtain a single numerical EPS estimate.[8] Finally, since we also estimate short selling during the five days preceding the EA, to ensure that we properly estimate the shorting activity in a firm during two separate periods, we require a firm's PA and MF dates to be more than five days before the EA date to minimize any influence of a PA or MF disclosure on the later part of shorting activity.

3.2. Short Selling Variables

We follow existing studies and construct four daily shorting measures. The first measure, $SIRN$, is the aggregate number of a stock's shares out on loan each day, scaled by total number of shares outstanding. The second, $SIRV$, is the aggregate market value of a stock's shares out on loan each day, scaled by the market value of equity. The third is the utilization ratio, UTI, defined as the fraction of the number of shares on loan each day, scaled by the total number of lendable shares. The fourth and last measure, UTV, is the fraction of the market value of shares on loan each day, scaled by the market value of lendable shares.

We estimate these four shorting measures as an average daily value over four different time periods, as illustrated in Figure 1: the five trading days (-5, -1) prior to an EA date ($SHORT(-5,-1)$), the five trading days (1, 5) following a PA date ($SHORT(1,5)$), the five trading days (1, 5) following a MF date (also labeled $SHORT(1,5)$), and the five trading days (2, 6) following the EA date ($SHORT(2,6)$). The second and third time periods are collectively depicted as the 'Disclosure Date' in Figure 1. Note that the last estimation window starts on

[7] For empirical evidence that the market reacts negatively to MFs of bad news, see, e.g., Skinner (1994), Soffer et al. (2000), Hutton et al. (2003) and Anilowski et al. (2007).

[8] For the range forecasts, we use the midpoint, low end, or high end of the reported range depending on whether the I/B/E/S Guidance code indicates the expected EPS would be between the range, at the low end, or at the high end of the range.

day 2 so that it does not overlap with our CAR(0, 1) EA return estimation. We utilize the first three time periods for analyses presented in most of the paper and include the last one in a later part of the paper where we examine the effect of short selling on price quality.

3.3. Sample Characteristics

Table 1 presents summary statistics for our sample firms during the sample period. Panel A reports summary information on earnings-related variables, and it shows that the portion of 63,857 firm-quarter observations in our sample that experience a positive or negative earnings surprise is about equal as the median SUE is almost zero (0.0009).[9] The mean SUE is slightly negative at -0.0038. Interestingly, although the median cumulative abnormal return prior to the earnings announcement, CAR(-5, -1), is positive at 0.08%, the two-day abnormal announcement return, CAR(0, 1), is slightly negative at -0.05%. Consistent with the literature on post-earnings announcement drift, the typical abnormal return continues to be negative at -0.16% during the subsequent five days, CAR(2, 6). In addition, our sample contains 43,828 pre-announcements (PAs) where the company disclosed the date when earnings would be announced. The typical number of days between the PA and EA is 13 while the mean is 14. Our sample also includes 2,005 management forecasts (MFs) where 65.5% are lower than the analyst consensus forecast, resulting in negative mean and median News values of -0.1104 and -0.0125, respectively. Further, note that the number of observations in our MF sample is small since we exclude forecasts announced on, or just after, prior-quarter EA dates.

For EA timing, we find that, as expected, the majority of firms are reluctant to publicly announce delays as we only identify 190 cases (0.3% of the sample) where firms explicitly delayed reporting their earnings. However, by using the *RScore* measure to estimate a firm's implicit EA timing, there is evidence that firms act strategically. For the 43,828 cases where an *RScore* can be calculated, there were 1,437 cases (3.3%) where the company implicitly delayed its EA by more than five days (*RScore*1) and only 578 cases (1.3%) where the company

[9]There are 3,640 firms represented during our sample period. The standardized unexpected earnings, SUE, is defined as the difference between the reported EPS and the median consensus analyst EPS estimate, scaled by the ending share price from the previous fiscal quarter.

implicitly advanced by more than five days ($RScore5$). The majority of firms (79.0%), however, delayed or advanced within two days ($RScore3$).

Panel B provides information on our average daily shorting measures during the five days prior to EAs, and the five days following PAs and MFs. The four shorting measures exhibit considerable cross-sectional variation, as shown in large standard deviations, in each of the three estimation windows, especially for the two utilization ratios (UTI and UTV). In addition, the mean values of the shorting measures are substantially larger than the medians, suggesting that some stocks experience a much higher level of shorting activity than others. Interestingly, the aggregate pattern does not exhibit a general ramp-up in short selling prior to EAs as the overall distributions of the shorting measures are similar during the three estimation windows.

Panel C shows that the four shorting measures are highly correlated in all three estimation windows. Thus, it is plausible that these measures capture similar aspects of shorting demand.[10] Finally, Panel D summarizes some of the salient characteristics of stocks in our sample.[11] The data reveal that the typical stock is followed by four analysts and exhibits negative return momentum. Our sample also contains a wide cross-section of stocks, as displayed by the statistics on market value of equity and institutional holdings.

4. Shorting Activity Prior to Earnings Announcements

To explore how short selling is related to the percolation of information before EAs, we focus our analysis on three key dates in a company's earnings calendar. First, we revisit the association between a company's shorting activity in the five days preceding its EA and its EA return to confirm that the negative relationship, documented in existing studies, also holds in our sample. We then examine whether short selling following a pre-announcement (PA) or management

[10] In a later part of this paper, we investigate the interactions between these shorting measures and others that are more likely to reflect shorting supply.

[11] Momentum is the abnormal returns in the previous twelve months. Turnover is the prior quarter average daily trading volume divided by total shares outstanding. Idiosyncratic volatility is the average daily residuals from a market model estimation using data from the previous quarter. The book-to-market ratio is the prior fiscal year-end book value of equity divided by the market value of equity. Institutional holdings is the prior quarter number of shares held by institutional investors normalized by the total number of shares outstanding.

forecast (MF) date is significantly correlated with the eventual EA return. The objective of this section is to analyze whether and how short sellers react to PAs and MFs, and more importantly, how the trading decisions of short sellers following those two dates are related to the subsequent EA returns. We also extend our analysis to examine the interaction between short selling, a company's decision to either advance or delay its EA date, and the eventual EA return.

4.1. Revisiting the Predictive Power of Short Selling Before EAs

Prior studies document a significantly negative linkage between a company's short selling in the days preceding an EA and the subsequent EA abnormal return, supporting the argument that short sellers are informed traders (see, e.g., Christophe, Ferri, and Angel, 2004; Boehmer, Jones, Wu, and Zhang, 2018). In this section, we conduct a similar exercise by using the following regression:

$$CAR(0,1)_{it} = \alpha + \boldsymbol{\beta SHORT(-5,-1)_{it}} + \delta SUE_{it} + \gamma X_{it-1} + \lambda_j + \tau_t + \epsilon_{it}, \qquad (1a)$$

where, for each firm i in quarter t, $CAR(0,1)$ is the cumulative abnormal return from day 0 to 1 measured relative to the EA date (day 0), and daily abnormal returns are calculated as the raw return minus the return on a size, book-to-market, and momentum-matched portfolio (Daniel, Grinblatt, Titman, and Wermers, 1997). The variable of interest, $SHORT(-5,-1)$, is one of the short selling measures ($SIRN$, $SIRV$, UTI, or UTV) during the five days preceding the EA. We include the firm's SUE in the model to control for the potential effect of public information disclosures from non-company sources such as analysts, and the control variable vector, X_{it-1}, to capture the potential effects of factor-based investment strategies and other variables on EA returns. X_{it-1} includes the seven stock characteristics described in Panel D of Table 1, and they are lagged by at least one quarter in the specifications. Consequently, SHORT estimates the marginal effect of short selling on the EA return beyond what is revealed in analyst and other public information. Finally, λ_j and τ_t are industry and year fixed effects, respectively, to control for potential industry influences and time trends in the sample, and the

standard errors of the coefficient estimates are clustered at the firm level.[12] Table 2 reports estimation results.

The odd-numbered models show that, consistent with prior research, higher short selling in the five days preceding the EA is associated with significantly lower EA returns. The four $SHORT(-5,-1)$ parameter estimates, ranging from -0.012 to -0.041, are statistically significant at the one percent level. They are also economically significant. For instance, the model 1 estimate reveals that a one standard deviation increase in $SIRN$ is associated with a 0.26% decrease in EA return. Similarly, the model 5 estimate suggests that a one standard deviation increase in the utilization ratio (UTI) is associated with 0.34% decrease in EA return. Thus, consistent with existing research, our results show that pre-announcement shorting activity generally contains value-relevant information about the forthcoming EA abnormal return.

An important, yet not explored, issue is whether the predictive power of shorting activity varies depending upon its intensity. To investigate this issue, we sort stocks in each calendar quarter into quintiles based on each of the four shorting measures, and create an indicator variable for each quintile portfolio. The variables '$SHORT\_Q1$' and '$SHORT\_Q5$' equal one for stocks with the lowest and highest shorting, respectively. The remaining three indicator variables, '$SHORT\_Q2$', '$SHORT\_Q3$', and '$SHORT\_Q4$' are for stocks in the second, third, and fourth quintiles, respectively. We then replace the variable $SHORT(-5,-1)$ in Eqn. (1a) with five interaction variables, $SHORT(-5,-1) * SHORT\_Q1$ to $SHORT(-5,-1) * SHORT\_Q5$, and estimate the following regression:

$$CAR(0,1)_{it} = \alpha + \sum_{\boldsymbol{m=1}}^{\boldsymbol{5}} \boldsymbol{\beta_m SHORT(-5,-1) * SHORT\_Q m_{it}} + \delta SUE_{it} + \gamma X_{it-1} + \lambda_j + \tau_t + \epsilon_{it}. \tag{1b}$$

In essence, the parameter estimate of each interaction variable captures the marginal effect of short selling on EA returns for the stocks in that quintile portfolio. The results, presented in the even-numbered models, show that only the parameter estimates for the fourth and fifth quintile portfolios are significant at the 5% or better level. This evidence indicates that the predictive power of shorting activity is mostly concentrated in stocks that experience heavy

[12] The industry fixed effects are based on Fama-French 30 industry groupings.

shorting activity and suggests that only a selective group of short sellers are able to identify and heavily short stocks with forthcoming disappointing earnings.

Moreover, we find that the EA return is significantly associated with several control variables. For example, higher unexpected earnings, greater analyst coverage, and larger institutional holdings are associated with higher announcement returns while larger stocks or those with higher trading volume tend to experience lower announcement returns. Overall, the evidence in this section confirms that short selling in the days preceding an EA significantly predicts the subsequent EA abnormal stock return. The predictive power, however, is primarily concentrated in stocks with heavy shorting.

4.2. Predictive Power of Short Selling After PAs on Subsequent EA Returns

The first type of partial earnings-related information that a firm typically discloses before its EA is a scheduling pre-announcement (PA) where the exact upcoming EA date is revealed. At the PA, companies sometimes explicitly announce that their EAs will be delayed. More frequently, however, companies implicitly delay or advance the EA date. Johnson and So (2018) report that although firms' implicitly changing the expected EA date has important investment implications, average investors do not seem to recognize the economic consequences of a firm's strategic scheduling behavior because stock returns typically exhibit little reaction when a PA occurs.[13]

A related topic that has not yet been examined is whether short sellers are able to exploit the opportunity when a PA reveals that the EA date will be advanced or (more importantly for short sellers trying to profit) delayed. We examine this issue next by modifying Eqn. (1a) as follows:

$$CAR(0,1)_{it} = \alpha + \boldsymbol{\beta SHORT(1,5)_{it}} + \delta SUE_{it} + \gamma X_{it-1} + \lambda_j + \tau_t + \epsilon_{it}, \qquad (2a)$$

where $CAR(0,1)$ is the EA, rather than PA, two-day abnormal return. In this specification, we replace $SHORT(-5,-1)$ with $SHORT(1,5)$, which represents average daily shorting using

[13] As shown in the study, companies that implicitly delay the EA date are likely to ultimately report negative earnings news while those that advance tend to report positive news.

one of the four shorting measures during the five days following a PA. Other variables are as defined previously. Note that this specification is not designed to investigate whether short sellers can predict a forthcoming PA. Rather, we are more interested in evaluating whether short sellers profit from the information about upcoming earnings that is implicitly revealed in the PA.[14] In addition, we require that the firm's PA date is at least six days before the EA to ensure that we can properly estimate a firm's shorting activity.

Table 3 reports the estimation results. Similar to the previous section, we begin by estimating separate models using each of the four shorting measures. The results, shown in models 1, 5, 9, and 13, reveal a significantly negative relation between average short selling during the five days following the PA and the eventual EA return. All $SHORT(1,5)$ parameter estimates in the models are statistically significant at the 1% level, and they are also economically significant. For instance, the model 1 estimate indicates that a one standard deviation increase in short selling in the days following a PA generally predicts a 0.23% reduction in the future EA abnormal return. The economic significance in the other three models is similar.

We next sort stocks into quintiles based on the intensity of shorting activity whereby, during the calendar quarter, the stocks in the first (fifth) quintile experience the lowest (highest) amount of short selling during the five-days following their PA, and estimate the following regression:

$$CAR(0,1)_{it} = \alpha + \sum_{\boldsymbol{m=1}}^{\mathbf{5}} \boldsymbol{\beta_m SHORT(1,5) * SHORT\_Qm_{it}} + \delta SUE_{it} + \gamma X_{it-1} + \lambda_j + \tau_t + \epsilon_{it}. \tag{2b}$$

The results, reported in Models 2 and 6, show that when $SIRN$ and $SIRV$ are used as shorting measures, the significantly negative return predictability of short selling for the future EA return occurs only within the quintile of stocks with the most shorting activity (Q5) while models 10 and 14 indicate that using UTI and UTV as the shorting measures extends the significantly negative effect to the third and fourth shorting quintiles.

For the remaining models in the table, we consider whether and how the return predictabil-

[14] We investigate the correlation between short selling and abnormal return following a PA in a later section.

ity of short selling is related to a firm's scheduling of either an explicit delay or an implicit change (advance or delay) in its expected EA date. To be more specific, we include in Eqns. (2a) & (2b) either an indictor variable, $Delay$, equal to one for firms that explicitly announce delaying their EAs and zero otherwise, or the five $RScore$ indictor variables as measures of implicit delay or advance, as defined in Table 1. For explicit delays, the results are mixed. While the interaction variable ($SHORT(1,5) * Delay$) results in models 11 and 15 indicate that short selling following delay announcements is significantly related to the subsequent EA return, the relationship is insignificant in models 3 and 7.[15] Nonetheless, the $SHORT(1,5)$ estimate in those four specifications remain significant at the 1% level. A possible explanation for the mixed results in the delay interaction variable is that those firms are likely experiencing ongoing financial difficulty. As skilled traders, short sellers would have already built their positions prior to the release of the explicit delay announcement.

A more interesting and important pattern emerges when the PA indicates an implicit EA delay. As shown in models 4, 8, 12, and 16, short selling significantly predicts the EA return for companies with implicit delays and the negative association between short selling and the subsequent EA return is greater the longer the delay.[16] For instance, in model 4, the parameter estimate of $SHORT(1,5) * RScore3$ is -0.0298, and the estimates decrease to -0.0722 and -0.1098 for $RScore2$ and $RScore1$ interaction variables, respectively. The results shown in the other three models (8, 12, and 16) exhibit a similar pattern. As expected, when firms implicitly advance their EA date (i.e., in $RScore4$ and $RScore5$), short selling is not significantly related to the EA return. If short sellers are informed traders, they would not aggressively short following an implicit disclosure that a company is advancing its EA date because advancing typically has positive EA return implications. Finally, as noted previously, we require a firm's PA date to be at least six days before the EA date such that we can properly estimate short selling. We conduct a robustness test in which we extend the day difference to eleven days. The

[15] Note that our full sample (63,857 firm-quarters) contains only 190 cases where the company explicitly announces a delay. The number decreases to 52 for the PA sample.

[16] We estimate $RScore$ for all firms in the PA sample. For the 52 firms that also explicitly announce delays, the majority (35 cases, 67%) have the longest delays (i.e., more than five days ($RScore1$)), 8 are in $RScore2$, and 9 are in $RScore3$.

results, reported in Appendix Table A.1, are qualitatively similar to those reported here. In sum, the overall evidence in this section shows that short selling following a pre-announcement is negatively correlated with the eventual EA return, and the effect of short selling is more significant for firms with longer implicit delays.

4.3. Predictive Power of Short Selling After MFs on Subsequent EA Returns

A second type of partial information that some companies provide is a management forecast (MF) for upcoming earnings. As noted above, short sellers may be interested in those situations where the MF is lower than expected by the analyst consensus because it signifies a possible earnings miss that could negatively impact the firm's stock performance. Alternatively, short sellers may not react to MFs if their assessment of firm fundamentals differs from the consensus forecast of analysts. Further, a lower MF could be the result of a predictable earnings-guidance game between the firm and its analysts (e.g., Richardson, Teoh, and Wysocki, 2004) that does not interest short sellers.

To examine whether and how shorting activity following a MF is related to the subsequent EA return, we utilize a similar specification as Eqn. (2a), but $SHORT(1,5)$ is estimated during the five days following a MF (instead of a PA). In addition, the specification includes an indicator variable, $NegNews$, defined earlier, and an interaction variable, $SHORT(1,5) * NegNews$, which tests whether the relationship between short selling and the EA return is more pronounced following a lower than expected MF. Table 4 reports the estimation results.

Models 1, 4, 7, and 10 reveal that for the 2,005 cases in our MF sample, average daily short selling during the five days following the MF date significantly predicts the EA return. All four estimates are significantly negative at the 10% level or better and indicate that a one standard deviation increase in short selling is associated with a reduction in the EA return ranging from -0.34% (models 7 and 10) to -0.46% (model 1). This evidence strongly supports the notion that short sellers find the earnings-related information revealed in a MF, albeit only partial, is valuable for making investment decisions. Next, we sort stocks into quintile portfolios during each calendar quarter based on the intensity of short selling following the

MF date. The results presented in models 2, 5, 8, and 11 suggest that not all short selling is informed since the significantly negative effect documented above is more concentrated in companies that experience the most substantial short selling following a MF.

For the remaining models in the table, we utilize the $NegNews$ indicator variable to specifically test whether the short selling of firms that issue a MF that is lower than expected provides additional information about the forthcoming EA. In models 3, 6, 9 and 12, the $SHORT(1,5)$ parameter estimate indicates that short selling following a MF continues to exhibit significant power for predicting the EA return. Further, consistent with the literature, investors seem to under-react to information conveyed in a lower-than-expected MF as the $NegNews$ estimates show a significantly negative association with the eventual EA return. Interestingly, the $SHORT(1,5) * NegNews$ estimates show that when short sellers react more strongly to negative MF news, there is no significantly negative association with the EA return. Rather, it appears that short trades that specifically respond to negative news tend to be the result of overreaction as their associated stock price impacts are eventually reversed when the EA occurs.[17] Finally, we conduct a robustness test in which we extend the day difference between a firm's MF date and its EA date to eleven days. The results, reported in Appendix Table A.2, are qualitative similar to those reported here. Overall, the findings, consistent with the PA evidence in the previous section, affirm that short sellers are able to utilize the partial information revealed prior to the upcoming EA to make profitable investment decisions. However, only the group of short sellers who target and short heavily a selective number of stocks is informed about forthcoming earnings, and the information set of those short sellers is different from and beyond that of financial analysts or public sources.

[17] We examine, in a later section, the stock-price effect of short selling following a MF.

5. Effects of Decomposed Short Selling on EA Returns

5.1. Decomposed Shorting Measures

One of the principal objectives of this research is to analyze the relative informativeness of trades by short sellers based on partial public information versus those based on private information. To examine this issue, we decompose short selling prior to EAs into two separate variables: the first, $SHORT_{DIS}$, is the average short selling during the five days following the company's public disclosure of either a PA or a MF (i.e., $SHORT(1,5)$ in the previous two sections), and the second, $\triangle SHORT_{BF}$, is the change in short selling from the five days after the disclosure date through the five days preceding the eventual EA. Thus, as Figure 1 illustrates, $\triangle SHORT_{BF} = SHORT(-5,-1) - SHORT_{DIS}$, where $SHORT$ is one of the four shorting measures ($SIRN$, $SIRV$, UTI, or UTV). We utilize these two decomposed shorting variables to estimate the relative informativeness of short selling at different intervals of time during the pre-EA period. Intuitively, when a firm's disclosure date is closer to the EA, $SHORT_{DIS}$ could capture more (and presumably more precise) information whereas $\triangle SHORT_{BF}$ would become less informative. We expect the other way around when a firm's disclosure date occurs farther away from its EA. Further, as briefly described earlier, we estimate a third shorting component, $\triangle SHORT_{AR}$, which is the change in short selling post EA relative to the shorting during the five days prior to the EA. More specifically, $\triangle SHORT_{AR} = SHORT(2,6)$–$SHORT(-5,-1)$. We incorporate this additional variable in a later section when studying the consequences of short selling on price quality following full information disclosure (i.e., after a firm's earnings is fully revealed.)

Note that for the first decomposed shorting variable, $SHORT_{DIS}$, we assign a firm's PA or MF date as the disclosure date if it has either date available. Of 63,857 firm-quarter observations, 42,133 have PA dates but no MF dates whereas 310 have MF dates but no PA dates. Complications arise, however, if the firm has both a PA and MF date, or if neither a PA nor a MF date is available. For these situations, we employ the following procedure to minimize potential sample selection bias. Specifically, for the former which includes 1,695 cases,

we assign the date closest to the EA, rather than the date that occurred first, as the disclosure date. This is to ensure that $SHORT_{DIS}$ will best capture the response of short sellers to all of the pre-EA partial information announced by the firm, and also reserve $\triangle SHORT_{BF}$ as a measure that captures the shorting based on private information and is not contaminated by public partial information. For the latter that includes 19,719 cases, we construct a pseudo disclosure date which is 13 days prior to the EA.[18] Firms with missing both PA and MF dates tend to be small firms.

Table 5 presents summary information for the decomposed short selling variables for each of our four short selling measures. As shown in Panel A, the typical firm has a SIRN (SIRV) of 2.77% (2.83%) following a public disclosure. Its respective utilization ratio is 13.58% for UTI and 13.76% for UTV. Moreover, the typical firm experiences no change in short selling prior to and following the EA (e.g., median $\triangle SIRN_{BF} = 0$ and $\triangle SIRN_{AR} = 0$). However, other statistics indicate that short sellers trade actively in a number of stocks during these three different time periods. For example, at the 25th and 75th percentiles, $SIRN_{DIS}$ ranges between 0.89% and 7.08%, $\triangle SIRN_{BF}$ between -0.18% and 0.12%, and $\triangle SIRN_{AR}$ between -0.24% and 0.20%. The large standard deviations of these variables also support the notion of selectively active short selling. In addition, both utilization ratios (UTI and UTV) exhibit higher levels and greater variability than SIRN and SIRV.

Panel B presents the mean shorting estimates within each quintile. For this summary, we first sort stocks into quintile portfolios during each calendar quarter based on the decomposed shorting measures. We then calculate and report the average value of short selling in each quintile. The overall pattern demonstrates great variations in shorting intensity among our sample stocks. For instance, short sellers on average short only 0.25% for stocks in quintile 1 and utilize a mere 1.66% of lendable shares (UTV_{DIS}) whereas they short as high as 16.26% of total shares outstanding ($SIRV_{DIS}$) in quintile 5 and utilize 72.44% of lendable shares (UTV_{DIS}). Moreover, the change in shorting varies following the disclosure date, suggesting that short

[18]For these cases, 13 days is the median number of days between the PA and EA dates (Panel A, Table 1) since we need to select the PA or MF date closest to the EA. For a typical firm, a MF usually occurs 34 days prior to the EA, while it is 13 days for a PA.

sellers continue to assimilate information into their trading decisions. For example, prior to the EA, while short sellers in quintile 1 decrease their positions by 1.15% ($\triangle SIRV_{BF}$) and reduce the utilization ratio by 4.63% ($\triangle UTV_{BF}$), they on average increase their short positions by as much as 1.53% ($\triangle SIRV_{BF}$) and increase the utilization ratio by 6.56% ($\triangle UTV_{BF}$) in quintile 5. Interestingly, shorting activity continues to exhibit considerable variations following the full revelation of (the previously) private information that occurs at the EA. While average short selling declines in the first three quintiles, short sellers in quintiles 4 and 5 increase both their positions and utilization ratios. This shows that short sellers do not just trade on public and private information prior to the EA, they also incorporate the public information in the EA. Overall, the summary statistics in this table indicate that short sellers target and short heavily a limited set of stocks prior to the EA, and they continue to adjust their positions before and after the EA to take advantage of the information they receive.

5.2. Multivariate Evidence

In this section, we use a multivariate approach to investigate whether decomposed short selling predicts the subsequent EA return, and more importantly, how informed short sellers use public partial and private information prior to EAs. For this analysis, we replace $SHORT(-5,-1)$ in Eqn. (1a) with the decomposed short selling variables:

$$CAR(0,1)_{it} = \alpha + \boldsymbol{\beta_1 SHORT_{DIS,it}} + \boldsymbol{\beta_2 \Delta SHORT_{BF,it}} + \delta SUE_{it} + \gamma X_{it-1} + \lambda_j + \tau_t + \epsilon_{it}, \tag{3a}$$

where $SHORT_{DIS}$ is short selling during the five days following a company's disclosure (either a PA or a MF), and $\triangle SHORT_{BF}$ is the change in short selling measured as short selling during the five days preceding the EA minus short selling during the five days following the disclosure. All other variables are as defined previously. Importantly, we include SUE in the specification to control for the potential impact of public information from non-company sources such as analysts and an array of control variables to capture the potential impact of factor-based investment strategies on EA returns. Table 6 reports the regression results.

The odd-numbered models show that after controlling for other factors that could also

affect the EA return, both short selling following a firm's partial public information revelation and the change in short selling prior to the EA are useful for predicting a company's subsequent EA return. This finding lends support for the hypotheses H1B and H2B. Both $SHORT_{DIS}$ and $\triangle SHORT_{BF}$ parameter estimates in the four odd-numbered models are statistically significant. Moreover, we quantify the relative economic significance of decomposed short selling. Model 1 estimates indicate that a one standard deviation increase in $SIRN_{DIS}$ and $\triangle SIRN_{BF}$ are associated with a 0.26% and 0.07% decrease in the EA return, respectively; hence, $SIRN_{DIS}$ and $\triangle SIRN_{BF}$ contribute 78.79% and 21.21%, respectively, to the short-selling predicted reduction in the EA return. The other three models reveal that $SIRN_{DIS}$ accounts for between 75.76% (model 3) and 82.35% (model 5) of the decrease in EA return while $\triangle SIRN_{BF}$ accounts for between 17.65% (model 5) and 24.24% (model 3). All of the estimates strongly suggest that short selling based on both public partial and private information is economically significant in predicting subsequent EA returns.

Next, we sort these two decomposed shorting measures quarterly into quintiles based on the intensity of short selling. $SHORT_{DIS}\_Q1$ and $\triangle SHORT_{BF}\_Q1$ ($SHORT_{DIS}\_Q5$ and $\triangle SHORT_{BF}\_Q5$) are indictor variables for stocks in the lowest (highest) quintile of short selling. The modified specification is as follows:

$$CAR(0,1)_{it} = \alpha + \sum_{\boldsymbol{m=1}}^{\boldsymbol{5}} \boldsymbol{\beta_{1m} SHORT_{DIS} * SHORT_{DIS}\_Qm_{it}} + \sum_{\boldsymbol{n=1}}^{\boldsymbol{5}} \boldsymbol{\beta_{2n} \Delta SHORT_{BF} * \Delta SHORT_{BF}\_Qn_{it}} + \delta SUE_{it} + \gamma X_{it-1} + \lambda_j + \tau_t + \epsilon_{it}. \quad (3b)$$

The results, reported in even-numbered models, show that the informativeness of short selling for predicting EA returns is mostly concentrated in stocks that experience substantial shorting activity. In models 2 and 4, both short selling variables that are statistically significant occur in the highest short selling quintile (Q5). The significance of $SHORT_{DIS}$ also extends to quintile 4 in models 6 and 8. Interestingly, the parameter estimates of $\triangle SHORT_{BF}$*$\triangle SHORT_{BF}\_Q5$ are more significant than those of $\triangle SHORT_{BF}$ (e.g., models 2 vs. 1), implying that short sellers exploit valuable private information to identify and short heavily a preferred set of

stocks with disappointing earnings. Further, we incorporate in the specifications additional variables including $Delay$, $NegNews$, and the implicit delay measures ($RScore1$ to $RScore5$), which are shown important in our previous specifications. The results, reported in Appendix Table A.3, indicate that the two decomposed shorting measures continue to be significantly correlated with EA returns after these additional controls are included. Moreover, the results in the previous section show that the negative relationship between short selling and the EA return becomes more consequential for firms with longer implicit delays. The estimates in the Appendix Table indicate that the association is more pronounced for $SHORT_{DIS}$ than it is for $\triangle SHORT_{BF}$; estimates are significant for the first three delay groups ($RScore1$ to $RScore3$) for the former, while they are significant for only one delay group ($RScore2$) for the latter. Overall, the findings in this section support the argument that the profitability of short selling originates from processing both public (albeit partial) and private information. We further show that only the shorting activity in the most heavily shorted stocks is informative in predicting the subsequent EA return.

5.3. Effects of Shorting Supply

The presented evidence strongly suggests that some short sellers are able to profit from partial information disclosures. In addition, they adjust their short positions in consonance with the updated private information acquired over time. The informativeness of their shorting activity, however, inevitably hinges on the potential impediments they face. In the following two sections, we explore whether and how those impediments could affect our results. The findings shed light on the predominant causes that restrain informed short selling.

The four shorting measures that our analyses thus far have employed are arguably proxies for shorting demand, as the existing studies suggest. It is plausible, however, that the association between shorting demand and subsequent stock return is contingent upon shorting supply. Related, existing papers present evidence that both shorting demand and supply have predictive power for future stock returns although Cohen, Diether, and Malloy (2007) document that shorting demand has more notable return predictability than shorting supply. In this section,

we examine how the interaction between shorting demand and supply could potentially affect the linkage between pre-EA short selling and the EA abnormal return. For this analysis, we employ two measures to proxy for shorting supply. The first is the stock's average lending fee ($BFEE$), estimated during the five days after a partial disclosure or during the five days prior to the EA. $BFEE$ equals the interest rate on cash funds minus the rebate rate where the rebate rate is the interest rate received by a short seller on her collateral account to maintain a margin. Under the assumption that short sellers are informed traders, we posit that an increase in lending fees indicates a tightening supply of lendable shares and is associated with more negative abnormal returns in the future as only more informed short sellers are willing to borrow shares at a higher cost. An exceedingly high borrowing cost, however, could also severely deter informed short sellers from trading. For the second measure, $SUPN$, we use lendable shares directly and estimate it as the firm's average number of shares available for lending, normalized by total shares outstanding, during the five days after the disclosure date or prior to the EA. It is important to acknowledge that although we assign different shorting measures either as a proxy for shorting demand or supply, it is difficult to unambiguously make these categorizations.

As for the shorting demand measures, we further decompose $BFEE$ and $SUPN$ into two separate variables. Specifically, $BFEE_{DIS}$ and $SUPN_{DIS}$ estimate shorting supply during the five days following a disclosure, and $\triangle BFEE_{BF}$ and $\triangle SUPN_{BF}$ captures the change in shorting supply that occurs from the first estimation period until the five days before the EA. Panels A.1 and A.2 of Table 7 report, respectively, summary statistics for the decomposed shorting supply measures and the average value of those measures for quintile groupings. $BFEE$, in general, does not vary greatly as $BFEE_{DIS}$ only increases from 0.375% to 0.475% within the 25th to 75th percentile range, and $\triangle BFEE_{BF}$ remains zero within the same range. The lending fee for a large number of stocks is noticeably fixed at 0.375%. Nevertheless, Panel A.2 reveals considerable variation across quintiles. Particularly, the stocks in Q5 are associated with an average lending fee of 4.85%, more than threefold the sample mean of 1.25% and even much higher than the median of 0.375%. The lending fee also changes markedly prior to some

EAs. The average $\triangle BFEE_{BF}$ is -0.32% for Q1 stocks whereas it is 0.41% for Q5 stocks. $SUPN_{DIS}$ and $\triangle SUPN_{BF}$ also exhibit a similar pattern though it seems that $SUPN$ is not effectively binding under most circumstances as the percentage of lendable shares is much lower than the percentage of institutional holdings (Table 1, Panel D).

Panel B of the table shows that the correlations between shorting demand and supply measures are significant in both estimation windows, suggesting that these measures may be capturing similar aspects of shorting activity. However, the large variation in correlations further illustrates that while these measures might not be perfect surrogates for shorting demand or supply, they appear to also capture different aspects of shorting activity. Thus, it is worthwhile to consider different shorting measures and their interactions in this study.

For the specifics of the analysis, since our focus is on whether the informativeness of our shorting demand measures is affected by shorting supply, we first sort stocks into quintile portfolios based on the two shorting supply measures and then examine, within each shorting supply quintile, whether and to what extent that shorting demand predicts the EA return. Next, we create five indictor variables for each of the decomposed supply measures. $BFEE_{DIS}\_Q1$ (to Q5) and $\triangle BFEE_{BF}\_Q1$ (to Q5) are indicator variables for stocks in the lowest (to highest) quintiles of lending fees during the five days following the disclosure date, and change in lending fees during the five days prior to the EA, respectively. The stocks in Q5 have the highest shorting costs (or the largest increase in shorting costs) which could deter speculators from shorting. The indicator variables for $SUPN_{DIS}\_Q1$ (to Q5) and $\triangle SUPN_{BF}\_Q1$ (to Q5) are defined similarly. Note, however, that their interpretations differ from those for $BFEE$. Specifically, stocks in Q5 based on $SUPN$ have the highest percentage of, or the largest increase in, shares available for shorting, which implies the least restrictive shorting situations. Finally, we interact these indicator variables for shorting supply with our four shorting demand

measures and estimate the following specification (e.g., for $BFEE$):

$$CAR(0,1)_{it} = \alpha + \sum_{\boldsymbol{m=1}}^{\boldsymbol{5}} \boldsymbol{\beta_{1m} SHORT_{DIS} * BFEE_{DIS}\text{-}Qm_{it}} + \sum_{\boldsymbol{n=1}}^{\boldsymbol{5}} \boldsymbol{\beta_{2n} \Delta SHORT_{BF} * \Delta BFEE_{BF}\text{-}Qn_{it}} + \delta SUE_{it} + \gamma X_{it-1} + \lambda_j + \tau_t + \epsilon_{it}. \tag{4}$$

In the above equation, we pair the variable of demand level with that of supply level as well as the variable of demand change with that of supply change, accordingly. Using $BFEE$ as a shorting supply measure, Panel A of Table 8 shows that when shorting supply tightens (because the lending fee either is higher or increases), short selling both following a partial disclosure and prior to the EA is negatively correlated with the EA return. In all four models, both the $SHORT_{DIS} * BFEE_{DIS}\text{-}Q5$ and the $\triangle SHORT_{BF} * \triangle BFEE_{BF}\text{-}Q5$ estimates are negative and statistically significant. This evidence shows that equity lending fee plays a critical role in determining the predictive relationship between short selling and the subsequent EA returns. It is consistent with the notion that higher shorting costs drive out uninformed shorting, and consequently, only short sellers who are better informed are willing to pay higher fees to profit from the information they possess. In addition, we find that the statistical significance of short selling following a partial disclosure extends to the third (in all four models) and fourth (in models 3 and 4) quintile portfolios. These findings suggest that the effect of shorting costs is more consequential for short selling based on private information during the five days prior to the EA than it is for short selling based on public partial information following a disclosure.

Utilizing $SUPN$ as the shorting supply measure, the regression results in Panel B show that the shorting activity, coupled with either the highest level of, or the largest increase in, lendable shares is significant in predicting the subsequent EA return. In all four models, the coefficient estimates for the fifth quintile portfolio are significantly negative, suggesting that a large portion of, or increase in, lendable shares facilitates informed shorting activity. Moreover, consistent with the $BFEE$ results, the $SUPN$ evidence indicates that the predictive relationship between short selling and the EA return is more sensitive to the condition of lending supply prior to the EA but is less so following a disclosure. As shown in all four

models, the $\triangle SHORT_{BF}$ estimates are significant only in the fifth quintiles (i.e., the portfolio of stocks with the greatest increase in lendable shares) while the $SHORT_{DIS}$ estimates are significant in all quintiles. Evidently, lending supply is most critical when the EA is drawing closer. Another important related result is that $SHORT_{DIS}$ is most informative when the level of shorting supply is the lowest (i.e., presumably the quintile of stocks with the highest short-sale constraints) whereas $\triangle SHORT_{BF}$ is most informative when shorting supply increases the most (i.e., the quintile of stocks with the lowest short-sale constraints). Thus, it seems that the effect of shorting supply on the relationship between shorting activity and the EA return is distinct depending on when shorting activity occurs. Overall, the findings in this section strongly demonstrate that lending supply plays a crucial, yet differing, role in the predictive power of decomposed short selling for EA returns.

5.4. Effects of Short-Sale Constraints

As discussed earlier, a fundamental argument in the literature postulates that effective short sale constraints lead to security prices that are slow to incorporate private and negative information. Consistent with this conjecture, Reed (2007) finds that stocks with costly short selling experience larger price reactions to EAs and their EA returns are more left skewed. In this section, we extend this literature and test our third hypothesis which is related to two specific questions: (1) whether and how the predictive relationship between the decomposed short selling and the EA return differs in the presence of short sale constraints, and (2) whether short-sale constraints are consistently binding over time? To this end, we follow existing studies and employ institutional holdings as a proxy for short sale constraints.[19] Institutional investors are often willing to supply shares to the equity lending market for a fee. Consequently, ceteris paribus, it is easier (more difficult) for short sellers to borrow stocks with high (low) institutional ownership. Put differently, a stock with higher (lower) institutional holding will typically exhibit lower (higher) short-sale constraints.

To investigate the above two questions, we first sort all of the stocks in the CRSP/Compustat

[19]Note that the two lending supply proxies we utilize in the previous section, equity lending fees ($BFEE$) and lendable shares ($SUPN$), are also used as proxies for short sale constraints in other studies.

universe into quintile portfolios (Q1 to Q5) according to their previous-quarter institutional holdings; portfolio Q1 (Q5) contains stocks with the lowest (highest) level of institutional holdings. Note that we include in the first sort all of the stocks with available institutional holdings, not just those in our sample, to mitigate any potential misclassification of some of our sample stocks.[20] We then assign stocks in our sample into quintile portfolios whereby the low constraint subsample contains stocks in quintiles Q4 and Q5 and the high constraint subsample contains stocks in Q1 and Q2. Finally, we re-estimate Eqns. (3a) and (3b) using these two subsamples and report the results in Table 9.[21]

For the low constraint group, the odd-numbered models in Panel A show that both $SHORT_{DIS}$ and $\triangle SHORT_{BF}$ are negatively correlated with the EA return. Therefore, for low constraint stocks, shorting activity during both periods of after a disclosure and prior to an EA contains valuable information about the impending EAs. Next, we short stocks in this subsample into quintiles in each quarter based on the intensity of their shorting activity. As shown in the even-numbered models, the significantly negative relationship between the decomposed shorting measures and the EA return is mainly concentrated in stocks that experience the most substantial short selling. Thus, the evidence presented in this panel is similar to the results presented earlier and is consistent with the argument that low short sale constraints allow informed short sellers to exploit and profit from their informational advantage.

For stocks experiencing high constraints, Panel B shows that short sale constraints offer only marginal impediments to short selling following a partial disclosure as we again find a significantly negative predictive relationship between short selling ($SHORT_{DIS}$) and the subsequent EA return. Similar to the results in Panel A, the evidence further shows that the significant relation is largely driven by stocks with the most intense shorting. In sharp contrast, however, we find that all of the $\triangle SHORT_{BF}$ and $\triangle SHORT_{BF} * \triangle SHORT_{BF}\_Q5$ estimates become insignificant when short sale constraints are high, strongly suggesting that

[20] This is because small stocks tend to have no short selling data available and thus are excluded from our sample. If we only sort stocks in our sample, some will be mis-categorized into the portfolio of stocks with high short sale constraints.

[21] We include control variables (as in other tables) in the estimation, but to conserve space, their estimates are not reported. A full report of the table is available upon request from the authors.

those constraints are effective in impeding informed shorting activity prior to the EA. Overall, the findings in this section lend strong support for hypothesis H3B and suggest that the impact of short sale constraints varies greatly depending on the timing of the shorting activity. In particular, we show that constraints are not binding for short selling following a partial disclosure whereas they are effective in curbing informed short selling during the five days prior to the EA when short sellers attempt to exploit their private information.

6. Extensions and Additional Tests

6.1. Concurrent Relationship between Short Selling and Stock Returns Following a Partial Disclosure

We have shown in Tables 3 and 4 that short selling following a partial disclosure significantly predicts the subsequent EA abnormal return. In this section, we examine whether short selling during that period is significantly associated with the stock's contemporaneous abnormal return. This issue is partly motivated by the evidence of Johnson and So (2018) who document that the partial information revealed in a PA is not reflected in stock prices until the eventual EA. For our analysis, since we have already shown that short trades following a partial disclosure significantly predict the EA return, our objective here is to explore whether their trades are, to some extent, stealthy, or alternatively, they allow stock prices to more quickly reflect the information embedded in the disclosure. The latter suggests a significantly negative correlation between short selling and contemporaneous return following a disclosure whereas the former suggests an insignificant correlation.

To test these conjectures, we modify and re-estimate Eqns. (2a) and (2b) by replacing CAR(0, 1) for the EA with CAR(1, 5), a stock's abnormal return over the five-days following a disclosure. Consequently, both short selling and abnormal returns are estimated within the same window. Results for our PA and MF samples are presented in Panels A and B, respectively, of Table 10.[22]

For PAs, we find that the results are mixed. For example, as shown in models 9, 11,

[22]Again, for brevity, control variables are included in the specification, but their estimates are not reported.

13, and 15, where UTI and UTV are used as the shorting measures, short selling exhibits a significantly negative association with contemporaneous returns. The relationship in models 1, 3, 5, and 7, however, is insignificant for $SIRN$ and significantly positive for $SIRV$. This ambiguity extends to the columns where we include the five short selling quintile interaction variables (models 2, 6, 10, and 14). These mixed results suggest that though overall short selling following a PA could be informative, it often is somewhat stealthy. A more targeted examination of short selling, however, is more revealing. As shown in the remaining four models (4, 8, 12, and 16), shorting activities in stocks with an $RScore1$ or $RScore2$ are negatively correlated with contemporaneous abnormal returns, and seven of eight parameter estimates are significant. Recall that these stocks have an implicit EA delay of more than three days and delaying firms are likely to report disappointing earnings. Thus, even though investors as a whole fail to consistently discern the information content in a PA, short selling in some particular situations is associated with a contemporaneous negative stock price reaction.

Panel B shows that the results for MFs are also mixed. To be specific, we find an insignificant relationship between short selling following MFs and contemporaneous abnormal returns when one of the four shorting measures or their respective five quintile interaction variables are included. However, the results in models 3, 6, 9, and 12 show that the parameter estimates on both $NegNews$ and $SHORT(1,5) * NegNews$ are significantly negative. Thus, when the MF conveys negative news, the abnormal return over the subsequent five days is negatively impacted, and this impact is greater when it is accompanied by substantial short selling. Overall, the findings in this section indicate that the concurrent relationship between shorting activity and abnormal stock returns following a PA or MF disclosure is largely insignificant. However, the shorting activity associated with disclosures that convey significantly negative news is notably informative.

6.2. Fridays

Several recent studies extend earlier research by showing that firms strategically time their EAs and often report disappointing earnings when investor attention is low, especially on Fridays

(see, e.g., deHaan, Shevlin, and Thornock, 2015; Michaely, Rubin, and Vedrashko, 2016). The underlying premise in these papers is that investors react less negatively to bad news when they are distracted or busy. For this study, a related issue is whether short sellers, who presumably are professional traders, also suffer from inattention to earnings news, or alternatively whether they exploit the behavioral biases of other investors. In this section, we explore this issue by investigating whether our results differ when a firm's EA, PA, or MF occurs on Friday.

Specifically, we conduct three separate analyses by adding four different interaction variables to the three specifications: $Friday{*}SHORT(-5,-1)$ in Eqn. (1a), $Friday{*}SHORT(1,5)$ in (2a), and $Friday * SHORT_{DIS}$ and $Friday * \triangle SHORT_{BF}$, in (3a). In these specifications, $Friday$ is an indicator variable for EAs that occur on Friday. The first two analyses estimate the predictive impact of short selling on Friday EAs and disclosures, respectively, and the last estimates the predictive impact of decomposed shorting on Friday EAs. Furthermore, we expand the specifications by replacing $SHORT(-5,-1)$ or $SHORT(1,5)$ with their respective five quintile variables. The untabulated results show no discernable difference in the predictability of short selling for Friday versus non-Friday EA returns. None of the $Friday$ interaction variables are statistically significant in the estimations.[23] In addition, using a similar procedure, we examine the cases in which PAs or MFs were announced on Friday, and the results are also insignificant. Overall, the insignificant evidence for Friday EAs, PAs, or MFs may be driven by the earlier documented results that the return predictability of short selling is significantly related to a firm's strategic EA timing, which already incorporates information regarding whether its EA is scheduled on Friday or other days.

6.3. Decomposed Short Selling and Price Quality

Existing research documents that active short selling is broadly associated with more efficient equity prices and improved market quality, whereas short sale restrictions serve as an impediment (see, e.g., Bris, Goetzmann, and Zhu, 2007; Reed, 2007; Saffi and Sigurdsson, 2011; Boehmer and Wu, 2012). In this section, we extend the existing literature and explore

[23] A full report of the results is available upon request from the authors.

the impact of decomposed short selling on price quality. First, we use a multivariate setting to examine how two often-used indicators of market quality, the bid-ask spread and Amihud illiquidity, are correlated with the two decomposed shorting measures. The bid-ask spread is estimated as the average daily differences between ask and bid prices during the EA month, normalized by the midpoint, defined as the average of bid and ask prices. Amihud illiquidity is estimated as the natural log of one plus the ratio of the absolute stock return to the dollar volume, scaled by 10^6, during the EA month. A lower bid-ask spread or illiquidity implies lower information asymmetry and hence, better price quality. In addition, we include our previously defined post-EA shorting measure, $\triangle SHORT_{AR}$, to capture any potential post-EA effect of shorting on the bid-ask spread or illiquidity. Finally, we further examine whether and how the findings are affected by short sale constraints. Tables 11 and 12 present results for bid-ask spread and illiquidity, respectively.

Panel A of Table 11 presents regression results using our full sample of firms, and it shows that increased short selling both following a partial disclosure and prior to the EA on average improves price quality by lowering the bid-ask spread. In all four models, the coefficient estimates are statistically significant at the 10% level or better. The change in shorting activity post EA, on the other hand, does not exert a consistent effect on the bid-ask spread; the estimates are only significant for $SIRN$ and $SIRV$. These findings imply that shorting activity prior to the EA is likely motivated by information and is critical in improving price quality. Shorting activity following the EA, on the other hand, is not materially correlated with price quality.[24]

We next investigate whether short sale constraints affect these findings by first splitting the sample into low (Panel B.1) versus high (B.2) constraint stocks and then re-estimating the specification. For this partitioning, institutional holdings are used again as our proxy for constraints. We find that shorting restrictions in general do not materially affect the

[24]Note that the bid-ask spread is measured within the EA month. Consequently, it is likely that part of $\triangle SHORT_{AR}$ in the following month of the EA could be included if an EA occurs near the end of the month. To circumvent this issue, we also estimate the bid-ask spread in the following month of the EA. The results are qualitatively similar to those reported here.

documented negative relationship between short selling following a partial disclosure and the bid-ask spread although increased short selling in high constraint stocks seems to have a greater impact on bid-ask spreads (i.e., more improved price quality) than short selling in low constraint stocks. In contrast, constraints seem to have a more significant effect on short selling during the five days prior to the EA. As shown in the panels, the impact of short selling on the bid-ask spread for high constraint stocks exhibits greater variations than the impact for low constraint stocks; although the $\triangle SHORT_{BF}$ coefficient estimates are greater in several of the high constraint regressions, they are insignificant when UTI or UTV is used as the shorting measure.

Panels A and B of Table 12 shows results for illiquidity using the full sample and subsamples based on short sale constraints, respectively. We find that the results are similar for illiquidity. Short selling following a partial disclosure and prior to the EA is significantly and negatively correlated with illiquidity. Thus, higher short selling leads to more liquidity and, hence, higher price quality. In contrast to the evidence for the bid-ask spread, however, short selling following the EA is also significant in increasing liquidity. In addition, short sale constraints do not materially affect the negative relationship between short selling and illiquidity. Taken together, the findings in this section indicate that short selling following both a partial disclosure and prior to the EA, has price quality consequences. Increased shorting activity is associated with improved price quality (lower bid-ask spreads and higher liquidity). Further, we find that short sale constraints can impede the relationship between shorting activity and price quality prior to the EA.

7. Summary

Companies often release partial earnings-related information prior to the full release of their earnings reports. In this study, we utilize their earnings process to examine how short sellers obtain their informational advantage by exploiting both public and private earnings-related information that percolates out over time. We focus on two important public disclosures that

regularly occur: (i) scheduling pre-announcements (PAs) in which a firm confirms its earnings announcement (EA) date, and, (ii) management forecasts (MFs) in which a firm releases its own predicted earnings. The date of a company's final scheduling PA or MF prior to its EA serves as a starting point for tracking the evolution of short selling based upon public versus private information. Given the fact that a company, following its final PA or MF, enters a "quiet period", during which it refrains from publicly communicating new earnings-related information, we estimate short selling following that last disclosure as public, albeit incomplete, information driven, whereas short selling that occurs from the first estimation period until the five days just prior to the EA is likely driven by private information. Further, since other information providers such as analysts likely continue to distribute new information during the quiet period, we include control variables in the empirical specifications to isolate the effect of non-company provided public information on short selling during a firm's quiet period.

We document several major findings. First, we show that short selling during both periods of following a partial disclosure of public information and prior to the EA based on private information is significantly and negatively associated with the eventual EA return. This evidence suggests that short sellers not only are skillful in processing public, albeit incomplete, information, but also exploit their private informational advantage. More importantly, by decomposing short selling into public and private information-based components, we quantify the relative predictive performance of each on the short selling-related decreases in EA returns. Second, the evidence indicates that short sellers are able to profit from firms' strategic EA scheduling behavior as longer implicit delays are associated with lower EA returns, conditional on higher short selling. Third, our results illustrate time varying short sale constraints. In particular, we show that while the return predictability of shorting activity depends greatly on lending fees, availability of lendable shares, and short sale constraints during the period just prior to EAs, these impediments are not significantly effective in restraining short selling following a disclosure. Finally, we show that short selling based on both public and private information significantly improves price quality; however, again, short sale constraints could render such effects less significant. Overall, our results have important implications for under-

standing how short sellers are informed, and how short sale constraints affect the information content of short selling.

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Figure 1. Quarterly Earnings Announcement Time Line

This plot depicts the time line for a typical quarterly earnings announcement (EA). Day 0 is the EA date. Day "-d" (d≥6) is the closest disclosure date to the EA, and it occurs d days prior to the EA. A disclosure date is either a scheduling pre-announcement (PA) date or a management forecast (MF) date. CAR(0, 1) is the two-day cumulative abnormal return. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SHORT is one of the short selling measures; i.e., SHORT∈{SIRN, SIRV, UTI, UTV}. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. SHORT(1, 5) estimates short selling during the five-day period following the disclosure date. SHORT(-5, -1) estimates short selling during the five-day period prior to the EA date. SHORT(2, 6) estimates short selling during the five-day period starting two days following the EA date.

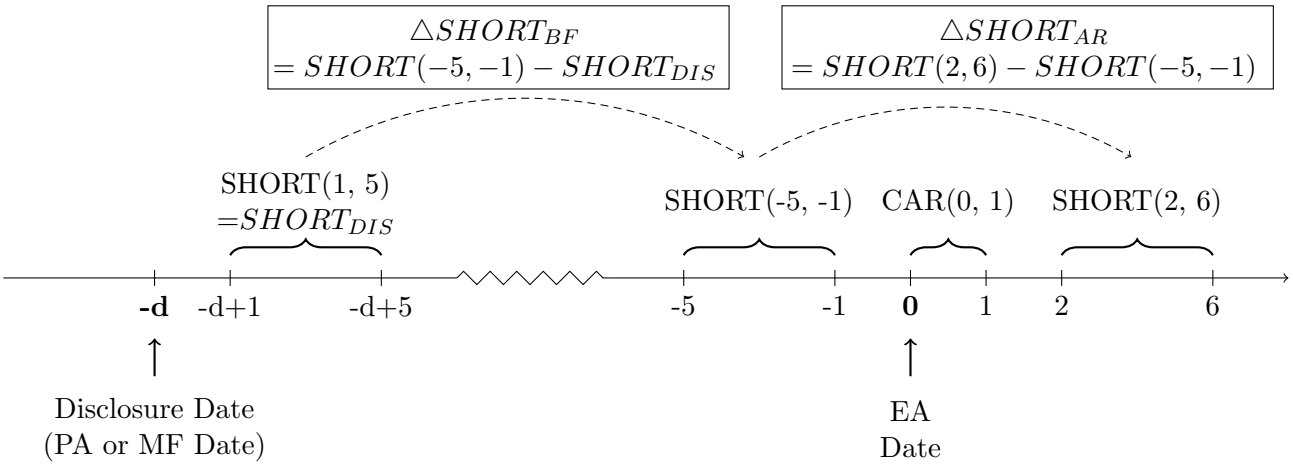

Table 1. Summary Statistics of Earnings Variables, Shorting Measures, and Stock Characteristics, 2006-2014

The sample consists of CRSP firms with share code 10 or 11 with available daily short trades from Markit, earnings variables from I/B/E/S, stock price information from CRSP, and accounting information from Compustat. The earnings scheduling dates are from Wall Street Horizons. The sample period is from Q3.2006 to Q2.2014. Panel A presents summary statistics on earnings-related variables. SUE is standardized unexpected earnings, defined as the difference between the reported EPS and the median of analyst consensus EPS estimates, scaled by the share price in the previous quarter. CAR(-5, -1), CAR(0, 1), and CAR(2, 6) are cumulative daily abnormal returns surrounding the EA dates (day 0). The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. News is estimated as the difference between management forecast and analyst consensus forecast, scaled by the absolute value of analyst consensus forecast. NegNews is an indicator variable whose value equals one if News is less than 1 and zero otherwise. RScore1 to RScore5 are indicator variables whose values equal to one if REV is within a specified range and zero otherwise. REV is the difference in trading days between the unconfirmed and confirmed EA dates. Panel B presents summary statistics on four shorting measures for three different time periods: five days before earnings announcement (EA) dates, five days after scheduling pre-announcement (PA) dates, and five days after management forecast (MF) dates. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending during the five-day period. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending during the five-day period. Panel C presents correlations between shorting measures. All correlations are significant at the 1% level. Panel D presents summary statistics on firm characteristics. Momentum is the abnormal returns in the previous twelve months. Turnover is the average daily trading volume divided by total shares outstanding in the previous quarter. Idiosyncratic volatility is the average daily residuals based on the market model in the previous quarter. The book-to-market ratio is the book value of equity divided by the market value of equity. Institutional holdings is normalized by the total number of shares outstanding. The book-to-market ratio is measured in the fiscal year end prior to EAs, and institutional holdings are measured in the quarter prior to EAs.

Panel A. Earnings-Related Variables

	N	Mean	25%	Median	75%	Std. Dev.
SUE	63,857	-0.0038	-0.0066	0.0009	0.0060	0.0621
CAR(-5, -1)	63,857	0.0016	-0.0243	0.0008	0.0259	0.0613
CAR(0, 1)	63,857	0.0001	-0.0414	-0.0005	0.0426	0.0890
CAR(2, 6)	63,857	-0.0005	-0.0294	-0.0016	0.0275	0.0657
#Days between PA and EA Dates	43,828	14	9	13	18	7
#Days between MF and EA Dates	2,005	35	27	34	45	12
News	2,005	-0.1104	-0.0860	-0.0125	0.0053	0.4638
NegNews	2,005		(65.5%)			
# Firms Announcing Delays	190		(0.3%)			
Implicit Delays or Advances:						
Delayer: RScore1=(REV < -5)	1,437		(3.3%)			
RScore2=(-5 ≤ REV ≤ -3)	5,558		(12.7%)			
RScore3=(-2 ≤ REV ≤ 2)	34,614		(79.0%)			
RScore4=(3 ≤ REV ≤ 5)	1,641		(3.7%)			
Advancer: RScore5=(5 < REV)	578		(1.3%)			

Table 1.*(Cont'd)* Summary Statistics of Earnings Variables, Shorting Measures, and Stock Characteristics, 2006-2014

Panel B. Shorting Measures

	N	Mean	25%	Median	75%	Std. Dev.
Before Earnings Announcement (EA) Date (-5, -1):						
SIRN	63,857	0.0520	0.0096	0.0284	0.0714	0.0627
SIRV	63,857	0.0547	0.0096	0.0289	0.0720	0.0713
UTI	63,857	0.2529	0.0510	0.1389	0.3472	0.2826
UTV	63,857	0.2548	0.0519	0.1407	0.3505	0.2832
After Pre-Announcement (PA) Date (1, 5):						
SIRN	43,828	0.0544	0.0106	0.0302	0.0748	0.0643
SIRV	43,828	0.0570	0.0109	0.0309	0.0755	0.0721
UTI	43,828	0.2277	0.0476	0.1292	0.3118	0.2559
UTV	43,828	0.2295	0.0485	0.1308	0.3147	0.2567
After Management Forecast (MF) Date (1, 5):						
SIRN	2,005	0.0597	0.0135	0.0336	0.0822	0.0693
SIRV	2,005	0.0605	0.0135	0.0345	0.0806	0.0741
UTI	2,005	0.2082	0.0514	0.1256	0.2795	0.2268
UTV	2,005	0.2096	0.0521	0.1269	0.2815	0.2274

Panel C. Correlation Matrix between Shorting Measures

	SIRV	UTI	UTV
Before Earnings Announcement (EA) Date (-5, -1):			
SIRN	0.8701	0.6643	0.6650
SIRV		0.5818	0.5836
UTI			0.9994
After Pre-Announcement (PA) Date (1, 5):			
SIRN	0.8700	0.7769	0.7769
SIRV		0.6796	0.6811
UTI			0.9996
After Management Forecast (MF) Date (1, 5):			
SIRN	0.8672	0.8860	0.8854
SIRV		0.7955	0.7956
UTI			0.9997

Panel D. Firm Characteristics

	N	Mean	25%	Median	75%	Std. Dev.
#Analysts Following	63,857	6.2557	1	4	9	6.3909
Momentum	63,857	0.0105	-0.2265	-0.0390	0.1687	0.4302
Turnover	63,857	0.0084	0.0033	0.0062	0.0107	0.0084
Idiosyncratic Volatility	63,857	0.0289	0.0185	0.0250	0.0345	0.0163
Book-to-Market Ratio	63,857	0.6262	0.2975	0.4980	0.7794	0.6088
Market Value of Equity ($MM)	63,857	5,178	255	766	2,605	20,999
Institutional Holdings	63,857	0.6883	0.5444	0.7572	0.8854	0.2551

Table 2. Short Selling Prior to Earnings Announcements

The table summarizes results from regressing earnings announcement returns, CAR(0, 1), on one of the four short selling measures (SHORT), where SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated during the five-day period, day -5 to -1, before the announcement date (day 0). CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_Q1 (SHORT_Q5) is an indictor variable for firms in the lowest (highest) SHORT quintile. SHORT_Q2, Q3, and Q4 are indicator variables for firms in the second, third, and fourth SHORT quintiles, respectively. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	SHORT = SIRN		**SHORT = SIRV**		**SHORT = UTI**		**SHORT = UTV**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
SHORT(-5, -1)	-0.0411***		-0.0353***		-0.0121***		-0.0120***	
	(0.0001)		(0.0001)		(0.0001)		(0.0001)	
SHORT(-5, -1)*SHORT_Q1		0.0284		0.6939***		0.0124		0.0296
		(0.9093)		(0.0033)		(0.7830)		(0.5006)
SHORT(-5, -1)*SHORT_Q2		0.0064		0.0753		-0.0199		-0.0141
		(0.9333)		(0.3153)		(0.2087)		(0.3701)
SHORT(-5, -1)*SHORT_Q3		-0.0529		-0.0073		-0.0115		-0.0067
		(0.1692)		(0.7423)		(0.1709)		(0.4230)
SHORT(-5, -1)*SHORT_Q4		-0.0515**		-0.0336*		-0.0139***		-0.0129***
		(0.0181)		(0.0803)		(0.0025)		(0.0050)
SHORT(-5, -1)*SHORT_Q5		-0.0396***		-0.0283***		-0.0120***		-0.0114***
		(0.0001)		(0.0001)		(0.0001)		(0.0001)
SUE	0.1343***	0.1343***	0.1359***	0.1361***	0.1346***	0.1347***	0.1346***	0.1347***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln(#Analysts)	0.0015***	0.0015***	0.0014***	0.0015***	0.0015***	0.0015***	0.0015***	0.0015***
	(0.0026)	(0.0023)	(0.0035)	(0.0025)	(0.0018)	(0.0018)	(0.0018)	(0.0017)
Momentum	-0.0012	-0.0011	-0.0005	-0.0004	-0.0014	-0.0014	-0.0014	-0.0013
	(0.3083)	(0.3194)	(0.6657)	(0.7057)	(0.2282)	(0.2356)	(0.2301)	(0.2380)
Turnover	-0.0052***	-0.0051***	-0.0053***	-0.0054***	-0.0044**	-0.0043**	-0.0044**	-0.0044**
	(0.0031)	(0.0044)	(0.0025)	(0.0026)	(0.0117)	(0.0149)	(0.0118)	(0.0127)
Idiosyncratic Volatility	0.0062	0.0071	0.0005	-0.0013	0.0449	0.0451	0.0449	0.0441
	(0.8790)	(0.8607)	(0.9906)	(0.9755)	(0.2693)	(0.2677)	(0.2698)	(0.2784)
Book-to-Market Ratio	0.0002	0.0001	0.0004	0.0003	-0.0001	-0.0002	-0.0001	-0.0001
	(0.8065)	(0.8482)	(0.6183)	(0.7017)	(0.8541)	(0.8316)	(0.8575)	(0.8404)
Ln(ME)	-0.0006*	-0.0006*	-0.0005*	-0.0007**	-0.0006*	-0.0006**	-0.0006*	-0.0006**
	(0.0664)	(0.0531)	(0.0973)	(0.0326)	(0.0500)	(0.0434)	(0.0497)	(0.0420)
Institutional Holdings	0.0141***	0.0144***	0.0135***	0.0141***	0.0089***	0.0092***	0.0090***	0.0092***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	0.0003	0.0003	0.0002	-0.0000	0.0041	0.0041	0.0041	0.0038
	(0.9296)	(0.9349)	(0.9460)	(0.9884)	(0.2055)	(0.2103)	(0.2069)	(0.2540)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	63,857	63,857	63,857	63,857	63,857	63,857	63,857	63,857
R^2	0.0116	0.0117	0.0117	0.0118	0.0122	0.0122	0.0122	0.0122

Table 3. Short Selling Subsequent to the Scheduling Pre-announcements

The table summarizes results from regressing earnings announcement returns, CAR(0, 1), on one of the four short selling measures, SHORT, where SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated during the five-day period, day 1 to 5, following the scheduling pre-announcement (PA) date (day 0). CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_Q1 (SHORT_Q5) is an indictor variable for firms in the lowest (highest) SHORT quintile. SHORT_Q2, Q3, and Q4 are indicator variables for firms in the second, third, and fourth SHORT quintiles, respectively. Delay is an indicator variable for firms announcing that it is expected to delay reporting its earnings. RScore1 to RScore5 are indicator variables whose values equal to one if REV is within a specified range and zero otherwise. REV is the difference in trading days between the unconfirmed and confirmed EA dates. See Table 1 for the definitions of other control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	SHORT = SIRN				**SHORT = SIRV**			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
SHORT(1, 5)	-0.0355***		-0.0353***		-0.0312***		-0.0311***	
	(0.0001)		(0.0001)		(0.0001)		(0.0001)	
SHORT(1, 5)*SHORT_Q1		0.4463				1.1018***		
		(0.1487)				(0.0002)		
SHORT(1, 5)*SHORT_Q2		0.0158				0.1774*		
		(0.8682)				(0.0517)		
SHORT(1, 5)*SHORT_Q3		-0.0151				0.0457		
		(0.7341)				(0.3037)		
SHORT(1, 5)*SHORT_Q4		-0.0269				-0.0069		
		(0.2741)				(0.7682)		
SHORT(1, 5)*SHORT_Q5		-0.0313***				-0.0201**		
		(0.0011)				(0.0181)		
Delay			0.0276				0.0155	
			(0.2454)				(0.5494)	
SHORT(1, 5)*Delay			-0.4740				-0.3077	
			(0.1025)				(0.3547)	
SHORT(1, 5)*RScore1				-0.1098***				-0.1078***
				(0.0048)				(0.0008)
SHORT(1, 5)*RScore2				-0.0722***				-0.0740***
				(0.0001)				(0.0001)
SHORT(1, 5)*RScore3				-0.0298***				-0.0244***
				(0.0007)				(0.0011)
SHORT(1, 5)*RScore4				0.0108				0.0032
				(0.7102)				(0.8955)
SHORT(1, 5)*RScore5				0.0347				0.0125
				(0.5290)				(0.7794)
SUE	0.1109***	0.1109***	0.1105***	0.1098***	0.1122***	0.1124***	0.1120***	0.1113***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln(#Analysts)	0.0010*	0.0010*	0.0010*	0.0009	0.0009*	0.0010*	0.0010*	0.0008
	(0.0767)	(0.0720)	(0.0762)	(0.1251)	(0.0881)	(0.0695)	(0.0880)	(0.1489)
Momentum	-0.0015	-0.0015	-0.0015	-0.0016	-0.0008	-0.0007	-0.0008	-0.0009
	(0.2510)	(0.2621)	(0.2439)	(0.2201)	(0.5345)	(0.5775)	(0.5301)	(0.4850)
Turnover	-0.0056*	-0.0056*	-0.0056*	-0.0056*	-0.0057*	-0.0061**	-0.0057*	-0.0056*
	(0.0564)	(0.0604)	(0.0565)	(0.0585)	(0.0519)	(0.0424)	(0.0519)	(0.0558)
Idiosyncratic Volatility	0.0198	0.0201	0.0209	0.0212	0.0116	0.0083	0.0120	0.0138
	(0.7141)	(0.7109)	(0.6996)	(0.6950)	(0.8306)	(0.8779)	(0.8241)	(0.7989)
Book-to-Market Ratio	-0.0004	-0.0004	-0.0004	-0.0004	-0.0002	-0.0003	-0.0002	-0.0002
	(0.6755)	(0.6479)	(0.6735)	(0.6692)	(0.8381)	(0.7668)	(0.8373)	(0.8196)
Ln(ME)	-0.0006	-0.0007*	-0.0006	-0.0006	-0.0006	-0.0007**	-0.0006	-0.0005
	(0.1023)	(0.0729)	(0.1029)	(0.1249)	(0.1249)	(0.0465)	(0.1253)	(0.1512)
Institutional Holdings	0.0138***	0.0141***	0.0139***	0.01400***	0.0134***	0.0140***	0.0134***	0.0135***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	0.0012	0.0011	0.0012	0.0010	0.0013	0.0012	0.0013	0.0011
	(0.7879)	(0.8047)	(0.7862)	(0.8189)	(0.7717)	(0.7949)	(0.7718)	(0.8123)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828
R^2	0.0084	0.0084	0.0084	0.0089	0.0084	0.0087	0.0084	0.0090

Table 3.*(Cont'd)* Short Selling Subsequent to the Scheduling Pre-announcements

	SHORT = UTI				SHORT = UTV			
	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
SHORT(1, 5)	-0.0102***		-0.0099***		-0.0101***		-0.0100***	
	(0.0001)		(0.0001)		(0.0001)		(0.0001)	
SHORT(1, 5)*SHORT_Q1		0.0294				0.0139		
		(0.5917)				(0.7952)		
SHORT(1, 5)*SHORT_Q2		-0.0039				-0.0037		
		(0.8361)				(0.8433)		
SHORT(1, 5)*SHORT_Q3		-0.0191**				-0.0173*		
		(0.0398)				(0.0557)		
SHORT(1, 5)*SHORT_Q4		-0.0101**				-0.0109**		
		(0.0390)				(0.0240)		
SHORT(1, 5)*SHORT_Q5		-0.0100***				-0.0099***		
		(0.0001)				(0.0001)		
Delay			0.0352				0.0353	
			(0.1329)				(0.1326)	
SHORT(1, 5)*Delay			-0.1137**				-0.1136**	
			(0.0479)				(0.0477)	
SHORT(1, 5)*RScore1				-0.0287***				-0.0290***
				(0.0009)				(0.0008)
SHORT(1, 5)*RScore2				-0.0198***				-0.0198***
				(0.0001)				(0.0001)
SHORT(1, 5)*RScore3				-0.0084***				-0.0083***
				(0.0002)				(0.0002)
SHORT(1, 5)*RScore4				-0.0008				-0.0007
				(0.9101)				(0.9203)
SHORT(1, 5)*RScore5				0.0079				0.0080
				(0.4861)				(0.4756)
SUE	0.1112***	0.1112***	0.1107***	0.1100***	0.1112***	0.1112***	0.1107***	0.1099***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln(#Analysts)	0.0010*	0.0010*	0.0010*	0.0009	0.0010	0.0010*	0.0010*	0.0009
	(0.0652)	(0.0606)	(0.0659)	(0.1140)	(0.0651)	(0.0606)	(0.0658)	(0.1153)
Momentum	-0.0017	-0.0016	-0.0017	-0.0018	-0.0017	-0.0016	-0.0017	-0.0018
	(0.2031)	(0.2168)	(0.1956)	(0.1627)	(0.2063)	(0.2181)	(0.1987)	(0.1648)
Turnover	-0.0052*	-0.0050*	-0.0052*	-0.0051*	-0.0052*	-0.0050*	-0.0052*	-0.0050*
	(0.0760)	(0.0908)	(0.0771)	(0.0833)	(0.0764)	(0.0881)	(0.0775)	(0.0838)
Idiosyncratic Volatility	0.0455	0.0455	0.0472	0.0490	0.0456	0.0455	0.0473	0.0491
	(0.3998)	(0.4000)	(0.3815)	(0.3652)	(0.3991)	(0.4003)	(0.3807)	(0.3642)
Book-to-Market Ratio	-0.0006	-0.0007	-0.0006	-0.0006	-0.0006	-0.0007	-0.0006	-0.0006
	(0.5103)	(0.4726)	(0.5069)	(0.5057)	(0.5105)	(0.4796)	(0.5071)	(0.5054)
Ln(ME)	-0.0006*	-0.0007*	-0.0006*	-0.0006	-0.0006*	-0.0007*	-0.0006*	-0.0006
	(0.0907)	(0.0624)	(0.0922)	(0.1152)	(0.0897)	(0.0685)	(0.0912)	(0.1142)
Institutional Holdings	0.0102***	0.0105***	0.0102***	0.0103***	0.0102***	0.0105***	0.0102***	0.0103***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	0.0040	0.0043	0.0039	0.0036	0.0040	0.0042	0.0039	0.0036
	(0.3824)	(0.3515)	(0.3839)	(0.4251)	0.3815	(0.3540)	(0.3829)	(0.4244)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828
R^2	0.0086	0.0087	0.0088	0.0092	0.0086	0.0086	0.0088	0.0092

Table 4. Short Selling Subsequent to Management Forecasts

The table summarizes results from regressing earnings announcement returns, CAR(0, 1), on one of the four short selling measures, SHORT, where SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated during the five-day period, day 1 to 5, following the management forecast (MF) date (day 0). CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_Q1 (SHORT_Q5) is an indictor variable for firms in the lowest (highest) SHORT quintile. SHORT_Q2, Q3, and Q4 are indicator variables for firms in the second, third, and fourth SHORT quintiles, respectively. NegNews is an indicator variable whose value equals one if "News" is less than 1 and zero otherwise. News is estimated as the difference between management forecast and analyst consensus forecast, scaled by the absolute value of analyst consensus forecast. See Table 1 for the definitions of additional control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	SHORT = SIRN			**SHORT = SIRV**			**SHORT = UTI**			**SHORT = UTV**		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
SHORT(1, 5)	-0.0663**		-0.1385**	-0.0537**		-0.0949**	-0.0149*		-0.0363***	-0.0150*		-0.0366***
	(0.0187)		(0.0149)	(0.0341)		(0.0324)	(0.0779)		(0.0063)	(0.0753)		(0.0057)
SHORT(1, 5)*SHORT_Q1		-0.2161			-1.3577			-0.2061			-0.0382	
		(0.8424)			(0.3193)			(0.2055)			(0.8076)	
SHORT(1, 5)*SHORT_Q2		-0.1021			-0.2281			-0.0837			-0.0432	
		(0.7779)			(0.5422)			(0.2286)			(0.5278)	
SHORT(1, 5)*SHORT_Q3		0.0119			-0.1276			-0.0675*			-0.0489	
		(0.9450)			(0.4920)			(0.0736)			(0.1844)	
SHORT(1, 5)*SHORT_Q4		-0.0523			-0.0878			-0.0168			-0.0017	
		(0.5971)			(0.3607)			(0.4277)			(0.9366)	
SHORT(1, 5)*SHORT_Q5		-0.0637*			-0.0654**			-0.0228**			-0.0197*	
		(0.0725)			(0.0459)			(0.0249)			(0.0518)	
NegNews			-0.0143***			-0.0126***			-0.0152***			-0.0153***
			(0.0008)			(0.0033)			(0.0004)			(0.0003)
SHORT(1, 5)*NegNews			0.1055*			0.0687			0.0339**			0.0342**
			(0.0860)			(0.1783)			(0.0360)			(0.0340)
SUE	0.0818	0.0826	0.0764	0.0850	0.0822	0.0776	0.0837	0.0824	0.0801	0.0836	0.0825	0.0801
	(0.1785)	(0.1756)	(0.2054)	(0.1622)	(0.1776)	(0.2002)	(0.1684)	(0.1726)	(0.1839)	(0.1694)	(0.1725)	(0.1839)
Ln(#Analysts)	-0.0051**	-0.0052**	-0.0053**	-0.0052**	-0.0052**	-0.0052**	-0.0053**	-0.0052**	-0.0055**	-0.0053**	-0.0052**	-0.0055**
	(0.0365)	(0.0342)	(0.0285)	(0.0320)	(0.0311)	(0.0311)	(0.0318)	(0.0319)	(0.0253)	(0.0320)	(0.0329)	(0.0255)
Momentum	-0.0060	-0.0061	-0.0070	-0.0035	-0.0034	-0.0042	-0.0062	-0.0065	-0.0070	-0.0062	-0.0065	-0.0069
	(0.4357)	(0.4310)	(0.3645)	(0.6490)	(0.6609)	(0.5882)	(0.4221)	(0.3991)	(0.3636)	(0.4231)	(0.4004)	(0.3657)

(Continued)

Table 4.*(Cont'd)* Short Selling Subsequent to Management Forecasts

	SHORT = SIRN			SHORT = SIRV			SHORT = UTI			SHORT = UTV		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Turnover	0.0110	0.0100	0.0123	0.0109	0.0110	0.0123	0.0106	0.0104	0.0095	0.0106	0.0104	0.0095
	(0.5325)	(0.5779)	(0.4871)	(0.5366)	(0.5406)	(0.4893)	(0.5657)	(0.5856)	(0.6251)	(0.5650)	(0.5788)	(0.6248)
Idiosyncratic Volatility	0.3234	0.3208	0.3235	0.2987	0.3040	0.3106	0.3283	0.3442	0.3300	0.3282	0.3439	0.3303
	(0.2222)	(0.2290)	(0.2179)	(0.2608)	(0.2551)	(0.2403)	(0.2129)	(0.1870)	(0.2049)	(0.2114)	(0.1876)	(0.2042)
Book-to-Market Ratio	-0.0081**	-0.0079**	-0.0085**	-0.0066*	-0.0064	-0.0063	-0.0076**	-0.0075*	-0.0072*	-0.0077**	-0.0075*	-0.0071*
	(0.0365)	(0.0450)	(0.0302)	(0.0952)	(0.1089)	(0.1333)	(0.0461)	(0.0514)	(0.0724)	(0.0460)	(0.0542)	(0.0726)
Ln(ME)	0.0003	0.0005	0.0003	0.0005	0.0007	0.0006	0.0005	0.0006	0.0007	0.0005	0.0006	0.0007
	(0.8274)	(0.7221)	(0.8025)	(0.6754)	(0.5652)	(0.6214)	(0.6709)	(0.6565)	(0.5793)	(0.6750)	(0.6520)	(0.5821)
Institutional Holdings	0.0295**	0.0286**	0.0303***	0.0274**	0.0265**	0.0271**	0.0223**	0.0219*	0.0222**	0.0224**	0.0212*	0.0222**
	(0.0116)	(0.0135)	(0.0088)	(0.0188)	(0.0229)	(0.0176)	(0.0494)	(0.0518)	(0.0471)	(0.0491)	(0.0590)	(0.0468)
Intercept	-0.0179	-0.0182	-0.0123	-0.0189	-0.0192	-0.0151	-0.0141	-0.0114	-0.0064	-0.0141	-0.0133	-0.0064
	(0.4063)	(0.4007)	(0.5743)	(0.3828)	(0.3822)	(0.4917)	(0.5303)	(0.6178)	(0.7852)	(0.5307)	(0.5564)	(0.7875)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005
R^2	0.0270	0.0273	0.0320	0.0264	0.0270	0.0306	0.0259	0.0278	0.0314	0.0259	0.0281	0.0315

Table 5. Summary Statistics of Decomposed Shorting Measures

Panel A presents summary statistics on decomposed shorting (SHORT) measures, estimated from one day after a disclosure date (scheduling pre-announcement date or management forecast date) to six days after earnings announcement (EA) date. SHORT$\in${SIRN, SIRV, UTI, UTV}. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period before EA date, i.e., day -5 to -1. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending during the five-day period. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending during the five-day period. SIRN_{DIS}, SIRV_{DIS}, UTI_{DIS}, and UTV_{DIS} are average daily shorting measures during the five-day period following a disclosure date, i.e., SHORT(1, 5) in the previous tables. $\triangle\text{SIRN}_{BF}$ is the change in SIRN from the five-day period after the disclosure date to the five-day period before the EA date; thus, $\triangle\text{SIRN}_{BF}$=SIRN-$\text{SIRN}_{DIS}$. Similarly, $\triangle\text{SIRV}_{BF}$=SIRV-$\text{SIRV}_{DIS}$, $\triangle\text{UTI}_{BF}$=UTI-UTI_{DIS}, and $\triangle\text{UTV}_{BF}$=UTV-UTV_{DIS}. $\triangle\text{SIRN}_{AR}$ is the change in SIRN around the earnings announcement date; thus, $\triangle\text{SIRN}_{AR}$=SIRN(2,6)-SIRN, where SIRN(2,6) is the average daily number of shares shorted scaled by total shares outstanding during the five-day period starting two days after the EA date. Similarly, $\triangle\text{SIRV}_{AR}$=SIRV(2,6)-SIRV, $\triangle\text{UTI}_{AR}$=UTI(2,6)-UTI, and $\triangle\text{UTV}_{AR}$=UTV(2,6)-UTV. In each quarter, we further sort firms into quintiles on the basis of one of the decomposed shorting measures. Panel B reports mean shorting measures in each quintile. The sample size is 63,857 firm quarters.

	Panel A. Summary Statistics on the Full Sample					**Panel B. Mean Shorting Measures in Each Quintile**				
	Mean	25%	Median	75%	Std. Dev.	Quintile 1	Q2	Q3	Q4	Quintile 5
SIRN:										
SIRN_{DIS}	0.0515	0.0089	0.0277	0.0708	0.0629	0.0025	0.0136	0.0309	0.0606	0.1500
$\triangle\text{SIRN}_{BF}$	0.0005	-0.0018	0	0.0012	0.0134	-0.0087	-0.0013	-0.0001	0.0009	0.0119
$\triangle\text{SIRN}_{AR}$	-0.0001	-0.0024	0	0.0020	0.0085	-0.0097	-0.0018	-0.0001	0.0015	0.0096
SIRV:										
SIRV_{DIS}	0.0540	0.0091	0.0283	0.0714	0.0710	0.0025	0.0135	0.0306	0.0609	0.1626
$\triangle\text{SIRV}_{BF}$	0.0007	-0.0020	0	0.0016	0.0165	-0.0115	-0.0015	-0.0001	0.0012	0.0153
$\triangle\text{SIRV}_{AR}$	-0.0001	-0.0031	0	0.0027	0.0142	-0.0148	-0.0023	-0.0001	0.0019	0.0146
UTI:										
UTI_{DIS}	0.2496	0.0481	0.1358	0.3439	0.2824	0.0166	0.0705	0.1482	0.2916	0.7213
$\triangle\text{UTI}_{BF}$	0.0034	-0.0073	0	0.0051	0.0771	-0.0458	-0.0055	-0.0004	0.0037	0.0650
$\triangle\text{UTI}_{AR}$	0.0008	-0.0095	0	0.0090	0.0700	-0.0544	-0.0072	-0.0001	0.0067	0.0587
UTV:										
UTV_{DIS}	0.2514	0.0490	0.1376	0.3467	0.2830	0.0169	0.0715	0.1499	0.2943	0.7244
$\triangle\text{UTV}_{BF}$	0.0034	-0.0074	0	0.0052	0.0773	-0.0463	-0.0056	-0.0004	0.0038	0.0656
$\triangle\text{UTV}_{AR}$	0.0008	-0.0096	0	0.0093	0.0701	-0.0548	-0.0072	-0.0001	0.0069	0.0593

Table 6. Decomposed Short Selling Prior to Earnings Announcements

The table summarizes results from regressing earnings announcement returns, CAR(0, 1), on one of the four decomposed short selling measures (SHORT), estimated from five days following a disclosure day (PA date or MF date) to five days before earnings announcement (EA) date. SHORT∈{SIRN, SIRV, UTI, UTV}. CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. SIRN_{DIS}, SIRV_{DIS}, UTI_{DIS}, and UTV_{DIS} are average daily shorting measures during the five-day period following a disclosure date. $\triangle\text{SIRN}_{BF}$=SIRN-$\text{SIRN}_{DIS}$, $\triangle\text{SIRV}_{BF}$=SIRV-$\text{SIRV}_{DIS}$, $\triangle\text{UTI}_{BF}$=UTI-UTI_{DIS}, and $\triangle\text{UTV}_{BF}$=UTV-UTV_{DIS}. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_{DIS}-Q1 and $\triangle\text{SHORT}_{BF}$-Q1 ($\text{SHORT}_{DIS}$-Q5 and $\triangle\text{SHORT}_{BF}$-Q5) are indictor variables for firms with the lowest (highest) SHORT_{DIS} and $\triangle\text{SHORT}_{BF}$, respectively. The remaining three quintiles are defined similarly. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	SHORT = SIRN		**SHORT = SIRV**		**SHORT = UTI**		**SHORT = UTV**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
SHORT_{DIS}	-0.0409***		-0.0349***		-0.0121***		-0.0120***	
	(0.0001)		(0.0001)		(0.0001)		(0.0001)	
$\triangle\text{SHORT}_{BF}$	-0.0533*		-0.0460**		-0.0122**		-0.0117**	
	(0.0678)		(0.0456)		(0.0321)		(0.0393)	
SHORT_{DIS}*SHORT_{DIS}-Q1		0.3832		0.8742***		0.0199		0.0269
		(0.1544)		(0.0008)		(0.6871)		(0.5797)
SHORT_{DIS}*SHORT_{DIS}-Q2		0.0556		0.1365*		-0.0125		-0.0073
		(0.4894)		(0.0835)		(0.4418)		(0.6515)
SHORT_{DIS}*SHORT_{DIS}-Q3		0.0092		0.0325		-0.0112		-0.0074
		(0.8121)		(0.3869)		(0.1795)		(0.3721)
SHORT_{DIS}*SHORT_{DIS}-Q4		-0.0341		-0.0243		-0.0112**		-0.0108**
		(0.1107)		(0.2184)		(0.0104)		(0.0139)
SHORT_{DIS}*SHORT_{DIS}-Q5		-0.0318***		-0.0233***		-0.0116***		-0.0113***
		(0.0003)		(0.0016)		(0.0001)		(0.0001)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{SHORT}_{BF}$-Q1		0.0674		0.0305		-0.0025		-0.0027
		(0.4285)		(0.6115)		(0.8094)		(0.7948)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{SHORT}_{BF}$-Q2		-0.2608		0.1825		0.0539		-0.0246
		(0.6617)		(0.7382)		(0.7026)		(0.8651)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{SHORT}_{BF}$-Q3		1.1170		2.0468		0.6299		0.4554
		(0.7515)		(0.5939)		(0.5553)		(0.6369)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{SHORT}_{BF}$-Q4		-0.7199		-0.8752		-0.1236		-0.0739
		(0.3468)		(0.1213)		(0.4798)		(0.6654)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{SHORT}_{BF}$-Q5		-0.0751**		-0.0645**		-0.0158**		-0.0143**
		(0.0226)		(0.0142)		(0.0257)		(0.0430)
SUE	0.1343***	0.1342***	0.1359***	0.1360***	0.1346***	0.1343***	0.1346***	0.1346***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln(#Analysts)	0.0015***	0.0015***	0.0014***	0.0015***	0.0015***	0.0018***	0.0015***	0.0015***
	(0.0026)	(0.0016)	(0.0035)	(0.0020)	(0.0018)	(0.0002)	(0.0018)	(0.0016)
Momentum	-0.0012	-0.0011	-0.0005	-0.0004	-0.0014	-0.0011	-0.0014	-0.0014
	(0.3074)	(0.3238)	(0.6585)	(0.7295)	(0.2281)	(0.3336)	(0.2301)	(0.2344)
Turnover	-0.0052***	-0.0055***	-0.0054***	-0.0055***	-0.0044**	-0.0045**	-0.0044**	-0.0046**
	(0.0031)	(0.0024)	(0.0025)	(0.0022)	(0.0119)	(0.0111)	(0.0121)	(0.0101)
Idiosyncratic Volatility	0.0060	0.0063	0.0005	-0.0007	0.0449	0.0714*	0.0450	0.0443
	(0.8832)	(0.8771)	(0.9904)	(0.9869)	(0.2711)	(0.0932)	(0.2705)	(0.2783)
Book-to-Market Ratio	0.0002	0.0002	0.0004	0.0003	-0.0001	0.0714	-0.0001	-0.0001
	(0.8041)	(0.8252)	(0.6149)	(0.6774)	(0.8544)	(0.9366)	(0.8568)	(0.8560)
Ln(ME)	-0.0006*	-0.0006**	-0.0005*	-0.0007**	-0.0006*	-0.0001*	-0.0006**	-0.0006**
	(0.0665)	(0.0435)	(0.0984)	(0.0359)	(0.0500)	(0.0619)	(0.0497)	(0.0436)
Institutional Holdings	0.0141***	0.0144***	0.0135***	0.0141***	0.0090***	0.0092***	0.0090***	0.0089***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	0.0003	0.0004	0.0002	0.0003	0.0041	0.0002	0.0040	0.0041
	(0.9169)	(0.9046)	(0.9365)	(0.9258)	(0.2062)	(0.9461)	(0.2086)	(0.2111)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	63,857	63,857	63,857	63,857	63,857	63,857	63,857	63,857
R^2	0.0117	0.0118	0.0117	0.0120	0.0122	0.0123	0.0122	0.0122

Table 7. Summary Statistics of Lending Fee and Supply Measures

Panel A presents summary statistics and means for each quintile on decomposed shorting fee and supply measures, estimated from one day after a disclosure date (scheduling pre-announcement date or management forecast date) to one day before earnings announcement (EA) date. Panel B presents correlations between these two measures (lending fees and supply) and lending demand measures (SHORT). BFEE is the average annualized loan fee which equals the interest rate on cash funds minus the rebate rate. SUPN is the average fraction of the number of shares available for lending scaled by total shares outstanding. $BFEE_{DIS}$ and $SUPN_{DIS}$ are measured during the five-day period following a disclosure date. In each quarter, we sort firms into quintiles on the basis of decomposed BFEE or SUPN where $\triangle BFEE_{BF}$=BFEE-$BFEE_{DIS}$ and $\triangle SUPN_{BF}$=SUPN-$SUPN_{DIS}$. $BFEE_{DIS}$_Q1 and $\triangle BFEE_{BF}$_Q1 ($BFEE_{DIS}$_Q5 and $\triangle BFEE_{BF}$_Q5) are indictor variables for firms with the lowest (highest) $BFEE_{DIS}$ and $\triangle BFEE_{BF}$, respectively. The quintile portfolios for SUPN are defined similarly. SHORT$\in$\{SIRN, SIRV, UTI, UTV\}. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period before EA date, i.e., day -5 to -1. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending during the five-day period. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending during the five-day period. $SIRN_{DIS}$, $SIRV_{DIS}$, UTI_{DIS}, and UTV_{DIS} are average daily shorting measures during the five-day period following a disclosure date, i.e., SHORT(1, 5) in the previous tables. $\triangle SIRN_{BF}$ is the change in SIRN from the five-day period after the disclosure date to the five-day period before the EA date; thus, $\triangle SIRN_{BF}$=SIRN-$SIRN_{DIS}$. Similarly, $\triangle SIRV_{BF}$=SIRV-$SIRV_{DIS}$, $\triangle UTI_{BF}$=UTI-UTI_{DIS}, and $\triangle UTV_{BF}$=UTV-UTV_{DIS}. The sample size is 63,857 firm quarters.

Panel A. Lending Supply Measures

	Panel A.1. Summary Statistics on the Full Sample					**Panel A.2. Mean Shorting Measures in Each Quintile**				
	Mean	25%	Median	75%	Std. Dev.	Quintile 1	Q2	Q3	Q4	Quintile 5
BFEE:										
$BFEE_{DIS}$	0.0125	0.00375	0.00375	0.00475	0.0521	0.0029	0.0037	0.0039	0.0046	0.0485
$\triangle BFEE_{BF}$	0.0002	0	0	0	0.0076	-0.0032	-0.0002	0	0.0003	0.0041
SUPN:										
$SUPN_{DIS}$	0.2273	0.1481	0.2410	0.3073	0.1143	0.0575	0.1716	0.2398	0.2936	0.3739
$\triangle SUPN_{BF}$	0.0045	-0.0017	0	0.0020	0.0362	-0.0101	-0.0012	0	0.0016	0.0319

Panel B. Correlations between Lending Demand and Supply Measures

	SIRN:		SIRV:		UTI:		UTV:	
	$SIRN_{DIS}$	$\triangle SIRN_{BF}$	$SIRV_{DIS}$	$\triangle SIRV_{BF}$	UTI_{DIS}	$\triangle UTI_{BF}$	UTV_{DIS}	$\triangle UTV_{BF}$
BFEE:								
$BFEE_{DIS}$	0.1234		0.1149		0.4245		0.4229	
$\triangle BFEE_{BF}$		0.1679		0.1478		0.3569		0.3552
SUPN:								
$SUPN_{DIS}$	0.3522		0.3187		-0.2015		-0.2009	
$\triangle SUPN_{BF}$		0.5937		0.5018		0.2804		0.2824

Table 8. Interactions between Decomposed Lending Demand and Supply on EA Returns

The table summarizes results from regressing earnings announcement (EA) returns, CAR(0, 1), on one of the four decomposed short selling measures (SHORT) while controlling for the lending supply, proxied by the lending fee (BFEE, Panel A) or the percentage of lendable shares (SUPN, Panel B). CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SHORT$\in$\{SIRN, SIRV, UTI, UTV\}. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. BFEE is the average annualized loan fee which equals the interest rate on cash funds minus the rebate rate. SUPN is the average fraction of the number of shares available for lending scaled by total shares outstanding. SIRN_{DIS}, SIRV_{DIS}, UTI_{DIS}, UTV_{DIS}, BFEE_{DIS}, and SUPN_{DIS} are measured during the five-day period following a disclosure date. $\triangle\text{SIRN}_{BF}$=SIRN-$\text{SIRN}_{DIS}$, $\triangle\text{SIRV}_{BF}$=SIRV-$\text{SIRV}_{DIS}$, $\triangle\text{UTI}_{BF}$=UTI-UTI_{DIS}, and $\triangle\text{UTV}_{BF}$=UTV-UTV_{DIS}. In each quarter, we sort firms into quintiles on the basis of decomposed BFEE or SUPN where $\triangle\text{BFEE}_{BF}$=BFEE-$\text{BFEE}_{DIS}$ and $\triangle\text{SUPN}_{BF}$=SUPN-$\text{SUPN}_{DIS}$. BFEE_{DIS}-Q1 and $\triangle\text{BFEE}_{BF}$-Q1 ($\text{BFEE}_{DIS}$-Q5 and $\triangle\text{BFEE}_{BF}$-Q5) are indictor variables for firms with the lowest (highest) BFEE_{DIS} and $\triangle\text{BFEE}_{BF}$, respectively. The quintile portfolios for SUPN are defined similarly. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Lending Supply is Proxied by the Lending Fee (BFEE)

	SHORT = SIRN	SHORT = SIRV	SHORT = UTI	SHORT = UTV
	[1]	[3]	[3]	[4]
SHORT_{DIS}*BFEE_{DIS}-Q1	-0.0222	-0.0197	-0.0046	-0.0045
	(0.1341)	(0.1103)	(0.3085)	(0.3194)
SHORT_{DIS}*BFEE_{DIS}-Q2	-0.0110	-0.0050	-0.0007	-0.0006
	(0.4704)	(0.6889)	(0.8771)	(0.8957)
SHORT_{DIS}*BFEE_{DIS}-Q3	-0.0357***	-0.0303***	-0.0076**	-0.0074**
	(0.0090)	(0.0070)	(0.0396)	(0.0431)
SHORT_{DIS}*BFEE_{DIS}-Q4	-0.0147	-0.0224	-0.0072*	-0.0076*
	(0.3453)	(0.1042)	(0.0722)	(0.0568)
SHORT_{DIS}*BFEE_{DIS}-Q5	-0.0517***	-0.0440***	-0.0132***	-0.0132***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{BFEE}_{BF}$-Q1	0.135	0.0554	-0.0033	-0.0044
	(0.1433)	(0.4430)	(0.7551)	(0.6834)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{BFEE}_{BF}$-Q2	-0.0538	-0.1445	-0.0293	-0.0293
	(0.7889)	(0.3276)	(0.6396)	(0.6255)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{BFEE}_{BF}$-Q3	-0.1466	-0.0243	-0.0369	-0.0304
	(0.1006)	(0.6826)	(0.3186)	(0.3922)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{BFEE}_{BF}$-Q4	0.0320	-0.0013	0.0094	0.0147
	(0.8408)	(0.9923)	(0.8244)	(0.7219)
$\triangle\text{SHORT}_{BF}$*$\triangle\text{BFEE}_{BF}$-Q5	-0.0676**	-0.0695**	-0.0128*	-0.0122*
	(0.0445)	(0.0108)	(0.0535)	(0.0658)
SUE	0.1340***	0.1356***	0.1346***	0.1346***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln(#Analysts)	0.0015***	0.0014***	0.0015***	0.0015***
	(0.0023)	(0.0033)	(0.0022)	(0.0022)
Momentum	-0.0012	-0.0006	-0.0014	-0.0014
	(0.2880)	(0.6136)	(0.2138)	(0.2148)
Turnover	-0.0052***	-0.0053***	-0.0046***	-0.0046***
	(0.0032)	(0.0027)	(0.0086)	(0.0089)
Idiosyncratic Volatility	0.0142	0.0080	0.0507	0.0509
	(0.7270)	(0.8437)	(0.2164)	(0.2147)
Book-to-Market Ratio	0.0002	0.0004	-0.0001	-0.0001
	(0.7863)	(0.6389)	(0.9291)	(0.9305)
Ln(ME)	-0.0006*	-0.0005	-0.0006*	-0.0006*
	(0.0790)	(0.1055)	(0.0548)	(0.0551)
Institutional Holdings	0.0128***	0.0124***	0.0073***	0.0073***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	0.0004	0.0003	0.0041	0.0041
	(0.9040)	(0.9138)	(0.1994)	(0.2043)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
N	63,857	63,857	63,857	63,857
R^2	0.0120	0.0120	0.0125	0.0125

Table 8.*(Cont'd)* Interactions between Decomposed Lending Demand and Supply on EA Returns

Panel B. Lending Supply is Proxied by the Percentage of Lendable Shares (SUPN)

	SHORT = SIRN	SHORT = SIRV	SHORT = UTI	SHORT = UTV
	[1]	[2]	[3]	[4]
$SHORT_{DIS}$*$SUPN_{DIS}$_Q1	-0.1623***	-0.0983***	-0.0153***	-0.0153***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$SHORT_{DIS}$*$SUPN_{DIS}$_Q2	-0.0305*	-0.0349***	-0.0068**	-0.0067**
	(0.0569)	(0.0063)	(0.0196)	(0.0206)
$SHORT_{DIS}$*$SUPN_{DIS}$_Q3	-0.0362***	-0.0252**	-0.0097***	-0.0096***
	(0.0060)	(0.0219)	(0.0034)	(0.0036)
$SHORT_{DIS}$*$SUPN_{DIS}$_Q4	-0.0324**	-0.0263**	-0.0100**	-0.0102***
	(0.0118)	(0.0168)	(0.0106)	(0.0078)
$SHORT_{DIS}$*$SUPN_{DIS}$_Q5	-0.0349***	-0.0282***	-0.0136***	-0.0134***
	(0.0003)	(0.0007)	(0.0002)	(0.0002)
$\triangle SHORT_{BF}$*$\triangle SUPN_{BF}$_Q1	0.0155	-0.0076	-0.0057	-0.0026
	(0.8733)	(0.9012)	(0.6763)	(0.8511)
$\triangle SHORT_{BF}$*$\triangle SUPN_{BF}$_Q2	-0.1545	-0.0121	-0.0268	-0.0358
	(0.3675)	(0.9117)	(0.4108)	(0.2791)
$\triangle SHORT_{BF}$*$\triangle SUPN_{BF}$_Q3	-0.2526	0.1216	-0.0019	0.0006
	(0.2655)	(0.5223)	(0.8948)	(0.9679)
$\triangle SHORT_{BF}$*$\triangle SUPN_{BF}$_Q4	0.0356	-0.0585	-0.0266	-0.0279
	(0.8039)	(0.5441)	(0.2350)	(0.2101)
$\triangle SHORT_{BF}$*$\triangle SUPN_{BF}$_Q5	-0.0610*	-0.0603**	-0.0140**	-0.0140**
	(0.0520)	(0.0280)	(0.0440)	(0.0428)
SUE	0.1345***	0.1362***	0.1350***	0.1350***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln(#Analysts)	0.0014***	0.0014***	0.0014***	0.0014***
	(0.0036)	(0.0049)	(0.0026)	(0.0029)
Momentum	-0.0013	-0.0004	-0.0014	-0.0014
	(0.2627)	(0.7158)	(0.2328)	(0.2343)
Turnover	-0.0042**	-0.0047***	-0.0046**	-0.0046**
	(0.0185)	(0.0083)	(0.0101)	(0.0104)
Idiosyncratic Volatility	0.0294	0.0159	-0.0466	0.0467
	(0.4767)	(0.6986)	(0.2567)	(0.2555)
Book-to-Market Ratio	0.0001	0.0004	-0.0001	-0.0001
	(0.9428)	(0.6140)	(0.8923)	(0.8920)
Ln(ME)	-0.0005	-0.0004	-0.0006*	-0.0006*
	(0.1083)	(0.1573)	(0.0575)	(0.0578)
Institutional Holdings	0.0110***	0.0112***	0.0079***	0.0079***
	(0.0001)	(0.0001)	(0.0003)	(0.0002)
Intercept	0.0004	0.0002	0.0045	0.0044
	(0.9079)	(0.9572)	(0.1683)	(0.1721)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
N	63,857	63,857	63,857	63,857
R^2	0.0122	0.0120	0.0124	0.0124

Table 9. Effects of Short-Sale Constraints on the Relationship between Decomposed Short Selling and EA Returns

The table summarizes results from regressing earnings announcement (EA) returns, CAR(0, 1), on one of the four decomposed short selling measures (SHORT) for stocks with low (Panel A) or high (Panel B) short-sale constraints. CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SHORT∈{SIRN, SIRV, UTI, UTV}. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. We sort stocks in each quarter into quintiles on the basis of previous-quarter institutional holdings. Stocks with high short-sale constraints are those in the lowest and second lowest quintile portfolios, and the remaining stocks are classified as those with low short-sale constraints. $SIRN_{DIS}$, $SIRV_{DIS}$, UTI_{DIS}, and UTV_{DIS} are measured during the five-day period following a disclosure date. $\triangle SIRN_{BF}$=SIRN-$SIRN_{DIS}$, $\triangle SIRV_{BF}$=SIRV-$SIRV_{DIS}$, $\triangle UTI_{BF}$=UTI-UTI_{DIS}, and $\triangle UTV_{BF}$=UTV-UTV_{DIS}. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. $SHORT_{DIS}$-Q1 and $\triangle SHORT_{BF}$-Q1 ($SHORT_{DIS}$-Q5 and $\triangle SHORT_{BF}$-Q5) are indictor variables for firms with the lowest (highest) $SHORT_{DIS}$ and $\triangle SHORT_{BF}$, respectively. The remaining three quintiles are defined similarly. The control variables are included in the specifications, but their estimates are not tabulated to conserve space. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. LOW Short-Sale Constraints

	SHORT = SIRN		**SHORT = SIRV**		**SHORT = UTI**		**SHORT = UTV**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
$SHORT_{DIS}$	-0.0369***		-0.0297***		-0.0122***		-0.0121***	
	(0.0001)		(0.0001)		(0.0001)		(0.0001)	
$\triangle SHORT_{BF}$	-0.0541*		-0.0492**		-0.0239***		-0.0230***	
	(0.0675)		(0.0422)		(0.0018)		(0.0026)	
$SHORT_{DIS}$*$SHORT_{DIS}$-Q1		0.3648		1.0921***		-0.0137		-0.0048
		(0.2190)		(0.0001)		(0.8018)		(0.9294)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q2		0.0384		0.1896**		-0.0059		0.0000
		(0.6612)		(0.0150)		(0.7467)		(0.9998)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q3		-0.0102		0.0456		-0.0171*		-0.0118
		(0.8080)		(0.1987)		(0.0715)		(0.2098)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q4		-0.0307		0.0068		-0.0152***		-0.0137***
		(0.1882)		(0.6724)		(0.0021)		(0.0054)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q5		-0.0255***		-0.0148**		-0.0108***		-0.0101***
		(0.0085)		(0.0481)		(0.0001)		(0.0001)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q1		0.0524		0.0082		-0.0054		-0.0064
		(0.5482)		(0.8939)		(0.7440)		(0.7021)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q2		-0.0449		0.2069		0.0449		-0.0075
		(0.9434)		(0.7206)		(0.7699)		(0.9645)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q3		-0.1844		5.0506		0.5548		-0.2083
		(0.9614)		(0.2555)		(0.6050)		(0.8434)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q4		-0.7900		-0.5447		-0.1031		-0.0626
		(0.3282)		(0.3672)		(0.5861)		(0.7341)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q5		-0.0722**		-0.0547**		-0.0291***		-0.0266***
		(0.0324)		(0.0465)		(0.0026)		(0.0060)
Intercept	-0.0016	-0.0028	-0.0013	-0.0035	0.0024	0.0020	0.0023	0.0014
	(0.7292)	(0.4979)	(0.7813)	(0.3825)	(0.6201)	(0.6320)	(0.6245)	(0.7477)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	52,208	52,208	52,208	52,208	52,208	52,208	52,208	52,208
R^2	0.0092	0.0096	0.0092	0.0098	0.0097	0.0100	0.0097	0.0100

Table 9.*(Cont'd)* Effects of Short-Sale Constraints on the Relationship between Decomposed Short Selling and EA Returns

Panel B. HIGH Short-Sale Constraints

	SHORT = SIRN		**SHORT = SIRV**		**SHORT = UTI**		**SHORT = UTV**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
$SHORT_{DIS}$	-0.0992***		-0.0777***		-0.0100***		-0.0100***	
	(0.0029)		(0.0001)		(0.0008)		(0.0008)	
$\triangle SHORT_{BF}$	0.0029		0.0271		0.0009		0.0013	
	(0.9895)		(0.7758)		(0.9118)		(0.8781)	
$SHORT_{DIS}$*$SHORT_{DIS}$-Q1		0.0198		0.2103		0.1831		0.1704
		(0.9749)		(0.7325)		(0.1733)		(0.1985)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q2		-0.0753		-0.0416		-0.1010**		-0.1146***
		(0.6947)		(0.8219)		(0.0155)		(0.0067)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q3		0.0158		0.0473		0.0128		0.0032
		(0.8748)		(0.5988)		(0.5696)		(0.8786)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q4		-0.0943		-0.0659		0.0058		0.0039
		(0.1471)		(0.1593)		(0.6466)		(0.7681)
$SHORT_{DIS}$*$SHORT_{DIS}$-Q5		-0.0854**		-0.0592**		-0.0098***		-0.0106***
		(0.0401)		(0.0282)		(0.0035)		(0.0018)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q1		0.1702		0.2676		0.0010		0.0004
		(0.6644)		(0.2660)		(0.9436)		(0.9789)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q2		-1.2578		0.8210		0.1900		0.0717
		(0.5231)		(0.6028)		(0.6192)		(0.8611)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q3		7.1854		-5.5417		4.3547		4.4108*
		(0.4081)		(0.4756)		(0.7140)		(0.0649)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q4		-1.2221		-3.9677**		-0.5306		-0.5004
		(0.6186)		(0.0137)		(0.2544)		(0.2786)
$\triangle SHORT_{BF}$*$\triangle SHORT_{BF}$-Q5		0.0159		-0.0004		0.0018		0.0022
		(0.9550)		(0.9973)		(0.8687)		(0.8427)
Intercept	-0.0010	-0.0030	-0.0007	-0.0028	0.0042	0.0012	0.0042	0.0013
	(0.8818)	(0.6859)	(0.9171)	(0.7028)	(0.5342)	(0.8715)	(0.5350)	(0.8604)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,649	11,649	11,649	11,649	11,649	11,649	11,649	11,649
R^2	0.0225	0.0230	0.0227	0.0235	0.0227	0.0246	0.0227	0.0249

Table 10. Effects of Short Selling on Returns Following Disclosure Dates

The table summarizes results from regressing abnormal returns, CAR(1, 5), following scheduling pre-announcement (PA) dates (Panel A) or management forecast (MF) dates (Panel B) on one of the four short selling measures (SHORT). SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated during the five-day period, day 1 to 5, following the PA or MF date (day 0). CAR(1, 5) is cumulative abnormal return from day 1 to 5. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_Q1 (SHORT_Q5) is an indictor variable for firms in the lowest (highest) SHORT quintile. The remaining three quintiles are defined similarly. The control variables are included in the specifications, but their estimates are not tabulated to conserve space. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Dept. Var. = CAR(1, 5) Following the PA Date

	SHORT=SIRN				SHORT=SIRV				SHORT=UTI				SHORT=UTV			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
SHORT(1, 5)	-0.0071		-0.0072		0.0126***		0.0126***		-0.0023*		-0.0024*		-0.0030**		-0.0031**	
	(0.1768)		(0.1724)		(0.0057)		(0.0057)		(0.0947)		(0.0846)		(0.0294)		(0.0256)	
SHORT(1, 5)*SHORT_Q1		-0.1160				0.4105**				0.0122				0.0103		
		(0.5692)				(0.0309)				(0.7322)				(0.7671)		
SHORT(1, 5)*SHORT_Q2		-0.0062				0.0673				-0.0084				-0.0075		
		(0.9180)				(0.2509)				(0.4708)				(0.4992)		
SHORT(1, 5)*SHORT_Q3		0.0202				0.0101				-0.0070				-0.0083		
		(0.4919)				(0.7095)				(0.2422)				(0.1508)		
SHORT(1, 5)*SHORT_Q4		-0.0076				0.0198				-0.0018				-0.0021		
		(0.6155)				(0.1554)				(0.5785)				(0.5072)		
SHORT(1, 5)*SHORT_Q5		-0.0064				0.0151***				-0.0026*				-0.0033**		
		(0.2811)				(0.0032)				(0.0848)				(0.0286)		
Delay			-0.0068				-0.0012				-0.0150**				-0.0152**	
			(0.2731)				(0.8988)				(0.0451)				(0.0432)	
SHORT(1, 5)*Delay			0.0564				-0.0442				0.0379				0.0383	
			(0.6090)				(0.6931)				(0.2439)				(0.2378)	
SHORT(1, 5)*RScore1				-0.0777***				-0.0439**				-0.0146**				-0.0152**
				(0.0010)				(0.0282)				(0.0472)				(0.0371)
SHORT(1, 5)*RScore2				-0.0289***				-0.0073				-0.0099***				-0.0107***
				(0.0077)				(0.4143)				(0.0004)				(0.0001)
SHORT(1, 5)*RScore3				-0.0007				0.0165***				-0.0008				-0.0014
				(0.8983)				(0.0005)				(0.6104)				(0.3515)
SHORT(1, 5)*RScore4				0.0040				0.0387*				0.0052				0.0043
				(0.8660)				(0.0643)				(0.3591)				(0.4381)
SHORT(1, 5)*RScore5				-0.0190				0.0027				-0.0006				-0.0013
				(0.5353)				(0.9194)				(0.9395)				(0.8611)
Intercept	-0.0031	-0.0031	-0.0031	-0.0033	-0.0030	-0.0030	-0.0030	-0.0031	-0.0025	-0.0022	-0.0024	-0.0028	-0.0023	-0.0021	-0.0022	-0.0026
	(0.3613)	(0.3550)	(0.3634)	(0.3247)	(0.3749)	(0.3804)	(0.3753)	(0.3505)	(0.4701)	(0.5092)	(0.4777)	(0.4181)	(0.5022)	(0.5430)	(0.5101)	(0.4471)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828	43,828
R^2	0.0025	0.0026	0.0025	0.0032	0.0027	0.0028	0.0027	0.0032	0.0026	0.0026	0.0026	0.0033	0.0026	0.0027	0.0027	0.0034

Table 10.*(Cont'd)* Effects of Short Selling on Returns Following Disclosure Dates

Panel B. Dept. Var. = CAR(1, 5) Following the MF Date

	SHORT = SIRN			SHORT = SIRV			SHORT = UTI			SHORT = UTV		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
SHORT(1, 5)	-0.0630		-0.0274	-0.0034		0.0146	-0.0084		-0.0002	-0.0105		-0.0019
	(0.1138)		(0.4434)	(0.9025)		(0.5750)	(0.3965)		(0.9789)	(0.2873)		(0.8353)
SHORT(1, 5)*SHORT_Q1		0.3342			-1.2382			0.0487			0.0066	
		(0.7478)			(0.3955)			(0.7913)			(0.9692)	
SHORT(1, 5)*SHORT_Q2		0.3713			0.4906			0.0084			-0.0093	
		(0.3000)			(0.1225)			(0.9141)			(0.9024)	
SHORT(1, 5)*SHORT_Q3		0.0722			-0.0950			0.0112			-0.0114	
		(0.6880)			(0.5751)			(0.7728)			(0.7614)	
SHORT(1, 5)*SHORT_Q4		-0.0572			-0.0221			-0.0149			-0.0203	
		(0.5685)			(0.7982)			(0.5058)			(0.3412)	
SHORT(1, 5)*SHORT_Q5		-0.0430			0.0007			-0.0054			-0.0092	
		(0.3174)			(0.9815)			(0.5812)			(0.3292)	
NegNews			-0.0202***			-0.0201***			-0.0204***			-0.0203***
			(0.0001)			(0.0001)			(0.0001)			(0.0001)
SHORT(1, 5)*NegNews			-0.1542**			-0.1920**			-0.0390***			-0.0408***
			(0.0164)			(0.0206)			(0.0092)			(0.0076)
Intercept	-0.0407	-0.0398	-0.0315	-0.0402	-0.0390	-0.0305	-0.0383	-0.0391	-0.0284	-0.0379	-0.0373	-0.0284
	(0.1057)	(0.1108)	(0.1769)	(0.1074)	(0.1132)	(0.1883)	(0.1393)	(0.1286)	(0.2281)	(0.1457)	(0.1490)	(0.2340)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005
R^2	0.0442	0.0458	0.0774	0.0416	0.0459	0.0742	0.0421	0.0428	0.0735	0.0424	0.0428	0.0748

Table 11. Effects of Decomposed Short Selling on Bid-Ask Spread

The table summarizes results from regressing bid-ask spread on decomposed short selling measures (SHORT) with the full sample (Panel A) or the subsamples split by short-sale constraints. The bid-ask spread is estimated as the average daily (ask price-bid price)/midpoint within a month and the midpoint is the average of the ask and bid prices. SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated in three time periods: the five-day period, day 1 to 5, following the PA or MF date, the five-day period, day -5 to -1, prior to the EA date, and the five-day period, day 2 to 6, following the EA date. We sort stocks in each quarter into quintiles on the basis of previous-quarter institutional holdings. Stocks with high short-sale constraints are those in the lowest and second lowest quintile portfolios, and the remaining stocks are classified as those with low short-sale constraints. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. SIRN_{DIS}, SIRV_{DIS}, UTI_{DIS}, and UTV_{DIS} are average daily shorting measures during the five-day period following a disclosure date. $\triangle\text{SIRN}_{BF}$=SIRN-$\text{SIRN}_{DIS}$, $\triangle\text{SIRV}_{BF}$=SIRV-$\text{SIRV}_{DIS}$, $\triangle\text{UTI}_{BF}$=UTI-UTI_{DIS}, and $\triangle\text{UTV}_{BF}$=UTV-UTV_{DIS}. $\triangle\text{SIRN}_{AR}$ is the change in SIRN around the earnings announcement date; i.e., $\triangle\text{SIRN}_{AR}$=SIRN(2,6)-SIRN where SIRN(2,6) is the average daily number of shares shorted scaled by total shares outstanding during the five-day period starting two days after the EA date. Similarly, $\triangle\text{SIRV}_{AR}$=SIRV(2,6)-SIRV, $\triangle\text{UTI}_{AR}$=UTI(2,6)-UTI, and $\triangle\text{UTV}_{AR}$=UTV(2,6)-UTV. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A. Full Sample				**Panel B. Sample Split by Short-Sale Constraints**							
					Panel B.1. LOW SS Constraints				**Panel B.2. HIGH SS Constraints**			
	SHORT =				SHORT =				SHORT =			
	SIRN	SIRV	UTI	UTV	SIRN	SIRV	UTI	UTV	SIRN	SIRV	UTI	UTV
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
SHORT_{DIS}	-0.0115***	-0.0080***	-0.0016***	-0.0016***	-0.0064***	-0.0049***	-0.0013***	-0.0012***	-0.0450***	-0.0253***	-0.0026***	-0.0027***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$\triangle\text{SHORT}_{BF}$	-0.0089***	-0.0085***	-0.0012*	-0.0012*	-0.0067***	-0.0070***	-0.0021***	-0.0021***	-0.0290***	-0.0122*	-0.0014	-0.0014
	(0.0001)	(0.0001)	(0.0694)	(0.0555)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0022)	(0.0701)	(0.2078)	(0.1953)
$\triangle\text{SHORT}_{AR}$	-0.0055***	-0.0060***	-0.0004	-0.0004	-0.0037***	-0.0043***	-0.0012*	-0.0011	-0.0226*	-0.0273***	-0.0005	-0.0005
	(0.0001)	(0.0001)	(0.5986)	(0.6022)	(0.0001)	(0.0001)	(0.0976)	(0.1239)	(0.0718)	(0.0001)	(0.5749)	(0.5682)
SUE	-0.0043***	-0.0038***	-0.0041***	-0.0041***	-0.0044***	-0.0040***	-0.0043***	-0.0043***	-0.0054***	-0.0047***	-0.0054***	-0.0053***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0013)	(0.0003)	(0.0003)
Ln(#Analysts)	0.0002***	0.0002***	0.0002***	0.0002***	-0.0000	-0.0000*	-0.0000**	-0.0000**	0.0006***	0.0005**	0.0004*	0.0004*
	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.1803)	(0.0554)	(0.0399)	(0.0382)	(0.0088)	(0.0236)	(0.0752)	(0.0740)
Momentum	-0.0005***	-0.0004***	-0.0005***	-0.0006***	-0.0005***	-0.0004***	-0.0005***	-0.0005***	-0.0004*	-0.0001	-0.0004	-0.0004
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0539)	(0.5801)	(0.1039)	(0.1037)
Turnover	-0.0130***	-0.0131***	-0.0130***	-0.0130***	-0.0131***	-0.0131***	-0.0132***	-0.0132***	-0.0099***	-0.0102***	-0.0102***	-0.0102***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Idiosyncratic Volatility	0.0307***	0.0281***	0.0322***	0.0322***	0.0282***	0.0268***	0.0292***	0.0292***	0.0344***	0.0265***	0.0315***	0.0316***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0055)	(0.0008)	(0.0008)
Book-to-Market Ratio	0.0002**	0.0004***	0.0002**	0.0003**	0.0002**	0.0003***	0.0002**	0.0002**	0.0006**	0.0007**	0.0006**	0.0006**
	(0.0147)	(0.0034)	(0.0147)	(0.0146)	(0.0202)	(0.0070)	(0.0247)	(0.0242)	(0.0305)	(0.0127)	(0.0240)	(0.0240)
Ln(ME)	-0.0013***	-0.0013***	-0.0013***	-0.0013***	-0.0007***	-0.0007***	-0.0007***	-0.0007***	-0.0037***	-0.0037***	-0.0038***	-0.0038***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Institutional Holdings	-0.0054***	-0.0057***	-0.0067***	-0.0067***	-0.0028***	-0.0030***	-0.0035***	-0.0035***	-0.0094***	-0.0098***	-0.0119***	-0.0119***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	0.0267***	0.0266***	0.0271***	0.0271***	0.0215***	0.0216***	0.0220***	0.0220***	0.0344***	0.0349***	0.0364***	0.0365***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	63,817	63,817	63,817	63,817	52,176	52,176	52,176	52,176	11,641	11,641	11,641	11,641
R^2	0.5505	0.5485	0.5468	0.5468	0.4436	0.4427	0.4407	0.4406	0.5473	0.5430	0.5406	0.5407

Table 12. Effects of Decomposed Short Selling on Liquidity

The table summarizes results from regressing Amihud illiquidity measure on decomposed short selling measures (SHORT) with the full sample (Panel A) or the subsamples split by short-sale constraints. Amihud illiquidity measure is estimated as the natural log of one plus the ratio of the absolute stock return to the dollar volume, scaled by 10^6. SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated in three time periods: the five-day period, day 1 to 5, following the PA or MF date, the five-day period, day -5 to -1, prior to the EA date, and the five-day period, day 2 to 6, following the EA date. We sort stocks in each quarter into quintiles on the basis of previous-quarter institutional holdings. Stocks with high short-sale constraints are those in the lowest and second lowest quintile portfolios, and the remaining stocks are classified as those with low short-sale constraints. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. SIRN_{DIS}, SIRV_{DIS}, UTI_{DIS}, and UTV_{DIS} are average daily shorting measures during the five-day period following a disclosure date. $\triangle\text{SIRN}_{BF}$=SIRN-$\text{SIRN}_{DIS}$, $\triangle\text{SIRV}_{BF}$=SIRV-$\text{SIRV}_{DIS}$, $\triangle\text{UTI}_{BF}$=UTI-UTI_{DIS}, and $\triangle\text{UTV}_{BF}$=UTV-UTV_{DIS}. $\triangle\text{SIRN}_{AR}$ is the change in SIRN around the earnings announcement date; i.e., $\triangle\text{SIRN}_{AR}$=SIRN(2,6)-SIRN where SIRN(2,6) is the average daily number of shares shorted scaled by total shares outstanding during the five-day period starting two days after the EA date. Similarly, $\triangle\text{SIRV}_{AR}$=SIRV(2,6)-SIRV, $\triangle\text{UTI}_{AR}$=UTI(2,6)-UTI, and $\triangle\text{UTV}_{AR}$=UTV(2,6)-UTV. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	Panel A. Full Sample				**Panel B. Sample Split by Short-Sale Constraints**							
					Panel B.1. LOW SS Constraints				**Panel B.2. HIGH SS Constraints**			
	SHORT =				SHORT =				SHORT =			
	SIRN	SIRV	UTI	UTV	SIRN	SIRV	UTI	UTV	SIRN	SIRV	UTI	UTV
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
SHORT_{DIS}	-0.2729***	-0.1872***	-0.0462***	-0.0461***	-0.1567***	-0.1090***	-0.0343***	-0.0339***	-1.0448***	-0.6202***	-0.0685***	-0.0688***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$\triangle\text{SHORT}_{BF}$	-0.2202***	-0.1381***	-0.0288***	-0.0292***	-0.1331***	-0.1060***	-0.0384***	-0.0392***	-0.8702***	-0.3055**	-0.0382***	-0.0381***
	(0.0001)	(0.0001)	(0.0017)	(0.0013)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0422)	(0.0069)	(0.0071)
$\triangle\text{SHORT}_{AR}$	-0.1961***	-0.0998***	-0.0254**	-0.0257**	-0.0909***	-0.0622***	-0.0168	-0.0163	-1.0354***	-0.5609***	-0.0388***	-0.0393***
	(0.0001)	(0.0001)	(0.0279)	(0.0254)	(0.0001)	(0.0001)	(0.2293)	(0.2356)	(0.0001)	(0.0002)	(0.0024)	(0.0022)
SUE	-0.0688***	-0.0581***	-0.0651***	-0.0651***	-0.0651***	-0.0578***	-0.0634***	-0.0635***	-0.0872***	-0.0700***	-0.0872***	-0.0870***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0013)	(0.0001)	(0.0001)
Ln(#Analysts)	0.0060***	0.0053***	0.0052***	0.0052***	0.0001	-0.0003	-0.0002	-0.0002	0.0174***	0.0155***	0.0128***	0.0129***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.8313)	(0.5242)	(0.7320)	(0.7205)	(0.0001)	(0.0001)	(0.0011)	(0.0011)
Momentum	-0.0146***	-0.0110***	-0.0152***	-0.0152***	-0.0113***	-0.0088***	-0.0116***	-0.0116***	-0.0213***	-0.0140***	-0.0204***	-0.0204***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0001)	(0.0001)
Turnover	-0.2434***	-0.2452***	-0.2425***	-0.242***	-0.2754***	-0.2776***	-0.2777***	-0.2777***	-0.1699***	-0.1763***	-0.1747***	-0.1746***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Idiosyncratic Volatility	0.0630	-0.0012	0.1380*	0.139*	0.3555***	0.319***	0.3940***	0.3934***	-0.2817**	-0.4524***	-0.3035**	-0.3010**
	(0.4066)	(0.9874)	(0.0690)	(0.0673)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0488)	(0.0027)	(0.0343)	(0.0356)
Book-to-Market Ratio	0.0083***	0.0097***	0.0080***	0.0080***	0.0041**	0.0050**	0.0037**	0.0037**	0.0216***	0.0237***	0.0221***	0.0221***
	(0.0030)	(0.0005)	(0.0042)	(0.0042)	(0.0349)	(0.0104)	(0.0492)	(0.0484)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Ln(ME)	-0.0268***	-0.0261***	-0.0260***	-0.0260***	-0.0130***	-0.0125***	-0.0127***	-0.0127***	-0.0738***	-0.0754***	-0.0778***	-0.0778***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Institutional Holdings	-0.1020***	-0.1104***	-0.1328***	-0.1328***	-0.0518***	-0.0584***	-0.0683***	-0.0684***	-0.1702***	-0.1787***	-0.2329***	-0.2332***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Intercept	0.5101***	0.5099***	0.5242***	0.5242***	0.4192***	0.4217***	0.4327***	0.4327***	0.6987***	0.7101***	0.7486***	0.7487***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	63,817	63,817	63,817	63,817	52,176	52,176	52,176	52,176	11,641	11,641	11,641	11,641
R^2	0.5798	0.5761	0.5755	0.5756	0.4295	0.4253	0.4260	0.4259	0.6196	0.6127	0.6092	0.6093

Appendix Tables

to Accompany

Information Percolation and Informed Short Selling: Evidence from Earnings Announcements

Table A.1. Short Selling Subsequent to the Scheduling Pre-announcements

The table reestimates results from Table 3 by regressing earnings announcement returns, CAR(0, 1), on one of the four short selling measures, SHORT, where SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated during the five-day period, day 1 to 5, following the scheduling pre-announcement (PA) date (day 0). All PA dates are at least **11** days, as opposed to 6 days in Table 3, before their corresponding EA dates. CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_Q1 (SHORT_Q5) is an indictor variable for firms in the lowest (highest) SHORT quintile. SHORT_Q2, Q3, and Q4 are indicator variables for firms in the second, third, and fourth SHORT quintiles, respectively. Delay is an indicator variable for firms announcing that it is expected to delay reporting its earnings. RScore1 to RScore5 are indicator variables whose values equal to one if REV is within a specified range and zero otherwise. REV is the difference in trading days between the unconfirmed and confirmed EA dates. See Table 1 for the definitions of other control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	SHORT = SIRN				**SHORT = SIRV**				**SHORT = UTI**				**SHORT = UTV**			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]
SHORT(1, 5)	-0.0457***		-0.0454***		-0.0387***		-0.0387***		-0.0129***		-0.0127***		-0.0127***		-0.0125***	
	(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)	
SHORT(1, 5)*SHORT_Q1		0.5747				0.6818**				0.0278				0.0157		
		(0.1141)				(0.0449)				(0.6699)				(0.8069)		
SHORT(1, 5)*SHORT_Q2		-0.0574				0.0289				-0.0217				-0.0144		
		(0.6234)				(0.8000)				(0.3727)				(0.5463)		
SHORT(1, 5)*SHORT_Q3		-0.0642				-0.0321				-0.0265**				-0.0264**		
		(0.2676)				(0.5670)				(0.0218)				(0.0187)		
SHORT(1, 5)*SHORT_Q4		-0.0605**				-0.0518*				-0.0143**				-0.0133**		
		(0.0422)				(0.0758)				(0.0195)				(0.0281)		
SHORT(1, 5)*SHORT_Q5		-0.0438***				-0.0343***				-0.0132***				-0.0129***		
		(0.0007)				(0.0020)				(0.0001)				(0.0001)		
Delay			0.0119				-0.0021				0.0332*				0.0332	
			(0.4470)				(0.9318)				(0.1000)				(0.1015)	
SHORT(1, 5)*Delay			-0.2637				-0.0362				-0.1421				-0.1414	
			(0.2462)				(0.8723)				(0.1393)				(0.1406)	
SHORT(1, 5)*RScore1				-0.1374***				-0.1229***				-0.0381***				-0.0377***
				(0.0022)				(0.0007)				(0.0005)				(0.0006)
SHORT(1, 5)*RScore2				-0.0703***				-0.0692***				-0.0216***				-0.0214***
				(0.0047)				(0.0009)				(0.0011)				(0.0011)
SHORT(1, 5)*RScore3				-0.0390***				-0.0315***				-0.0103***				-0.0101***
				(0.0007)				(0.0011)				(0.0004)				(0.0004)
SHORT(1, 5)*RScore4				-0.0210				-0.0145				-0.0075				-0.0076
				(0.6036)				(0.6650)				(0.4615)				(0.4511)
SHORT(1, 5)*RScore5				0.0333				-0.0115				0.0054				0.0061
				(0.6882)				(0.9626)				(0.7700)				(0.7412)
Intercept	0.0105*	0.0106*	0.0105*	0.0101*	0.0107*	0.0109*	0.0107*	0.0103*	0.0135**	0.0143**	0.0135**	0.0129**	0.0135**	0.0141**	0.0135**	0.0129**
	(0.0679)	(0.0637)	(0.0681)	(0.0787)	(0.0629)	(0.0584)	(0.0626)	(0.0739)	(0.0210)	(0.0149)	(0.0215)	(0.0276)	(0.0213)	(0.0153)	(0.0218)	(0.0278)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096	27,096
R^2	0.0089	0.0090	0.0089	0.0094	0.0088	0.0090	0.0088	0.0093	0.0091	0.0092	0.0093	0.0098	0.0090	0.0092	0.0093	0.0098

Table A.2. Short Selling Subsequent to Management Forecasts

The table reestimates results from Table 4 by regressing earnings announcement returns, CAR(0, 1), on one of the four short selling measures, SHORT, where SHORT∈{SIRN, SIRV, UTI, UTV}. The four SHORT measures are estimated during the five-day period, day 1 to 5, following the management forecast (MF) date (day 0). All MF dates are at least **11** days, as opposed to 6 days in Table 4, before their corresponding EA dates. CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_Q1 (SHORT_Q5) is an indictor variable for firms in the lowest (highest) SHORT quintile. SHORT_Q2, Q3, and Q4 are indicator variables for firms in the second, third, and fourth SHORT quintiles, respectively. NegNews is an indicator variable whose value equals one if "News" is less than 1 and zero otherwise. News is estimated as the difference between management forecast and analyst consensus forecast, scaled by the absolute value of analyst consensus forecast. See Table 1 for the definitions of additional control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	SHORT = SIRN			**SHORT = SIRV**			**SHORT = UTI**			**SHORT = UTV**		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
SHORT(1, 5)	-0.0643**		-0.1445**	-0.0561**		-0.1017**	-0.0148*		-0.0383***	-0.0149*		-0.0386***
	(0.0266)		(0.0121)	(0.0305)		(0.0264)	(0.0862)		(0.0045)	(0.0827)		(0.0039)
SHORT(1, 5)*SHORT_Q1		-0.2058			-1.5313			-0.2094			-0.0351	
		(0.8552)			(0.2692)			(0.2129)			(0.8282)	
SHORT(1, 5)*SHORT_Q2		-0.0839			-0.2276			-0.0763			-0.0346	
		(0.8227)			(0.5494)			(0.2888)			(0.6251)	
SHORT(1, 5)*SHORT_Q3		0.0406			-0.1240			-0.0655*			-0.0465	
		(0.8256)			(0.5138)			(0.0922)			(0.2218)	
SHORT(1, 5)*SHORT_Q4		-0.0499			-0.0921			-0.0124			0.0030	
		(0.6316)			(0.3361)			(0.5722)			(0.8913)	
SHORT(1, 5)*SHORT_Q5		-0.0602			-0.0678**			-0.0226**			-0.0194*	
		(0.1003)			(0.0423)			(0.0295)			(0.0603)	
NegNews			-0.0152***			-0.0132***			-0.0161***			-0.0162***
			(0.0005)			(0.0023)			(0.0002)			(0.0002)
SHORT(1, 5)*NegNews			0.1182*			0.0770			0.0374**			0.0378**
			(0.0596)			(0.1425)			(0.0222)			(0.0209)
Intercept	-0.0205	-0.0208	-0.0149	-0.0216	-0.0219	-0.0180	-0.0167	-0.0141	-0.0090	-0.0167	-0.0160	-0.0089
	(0.3527)	(0.3458)	(0.5039)	(0.3290)	(0.3288)	(0.4233)	(0.4663)	(0.5450)	(0.7099)	(0.4670)	(0.4872)	(0.7123)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,947	1,947	1,947	1,947	1,947	1,947	1,947	1,947	1,947	1,947	1,947	1,947
R^2	0.0273	0.0277	0.0329	0.0271	0.0278	0.0316	0.0263	0.0285	0.0324	0.0263	0.0290	0.0325

Table A.3. Decomposed Short Selling Prior to Earnings Announcements with Additional Variables

The table reestimates results from Table 6 by regressing earnings announcement returns, CAR(0, 1), on one of the four decomposed short selling measures (SHORT), estimated from five days following a disclosure day (PA date or MF date) to five days before earnings announcement (EA) date. SHORT∈{SIRN, SIRV, UTI, UTV}. These additional regression models include variables from Tables 3 and 4. CAR(0, 1) is cumulative abnormal return from day 0 to 1 in which day 0 is the earnings announcement date. The daily abnormal return is the raw return less the return on a (size, book-to-market, momentum) matched portfolio. SIRN is the average daily number of shares shorted scaled by total shares outstanding during the five-day period. SIRV is the average daily value of shares shorted scaled by market value of equity. The utilization ratio, UTI, is the average fraction of the number of shares lent out to the number of shares available for lending. UTV is the average fraction of the market value of shares lent out to the market value of shares available for lending. SIRN_{DIS}, SIRV_{DIS}, UTI_{DIS}, and UTV_{DIS} are average daily shorting measures during the five-day period following a disclosure date. $\triangle\text{SIRN}_{BF}$=SIRN-$\text{SIRN}_{DIS}$, $\triangle\text{SIRV}_{BF}$=SIRV-$\text{SIRV}_{DIS}$, $\triangle\text{UTI}_{BF}$=UTI-UTI_{DIS}, and $\triangle\text{UTV}_{BF}$=UTV-UTV_{DIS}. In each quarter, we further sort firms into quintiles on the basis of one of the four shorting measures. SHORT_{DIS}-Q1 and $\triangle\text{SHORT}_{BF}$-Q1 ($\text{SHORT}_{DIS}$-Q5 and $\triangle\text{SHORT}_{BF}$-Q5) are indictor variables for firms with the lowest (highest) SHORT_{DIS} and $\triangle\text{SHORT}_{BF}$, respectively. The remaining three quintiles are defined similarly. Delay is an indicator variable for firms announcing that it is expected to delay reporting its earnings. NegNews is an indicator variable whose value equals one if "News" is less than 1 and zero otherwise. News is estimated as the difference between management forecast and analyst consensus forecast, scaled by the absolute value of analyst consensus forecast. RScore1 to RScore5 are indicator variables whose values equal to one if REV is within a specified range and zero otherwise. REV is the difference in trading days between the unconfirmed and confirmed EA dates. See Table 1 for the definitions of control variables. Industry fixed effects are based on Fama-French 30 industry groupings, and year fixed effects are yearly indicator variables during the sample period except for year 2014 to ensure correct model specifications. P values, reported in parentheses, are associated with standard errors adjusted for firm-level clustering. (***), (**), and (*) indicate significance at the 1%, 5%, and 10% levels, respectively.

	SHORT = SIRN		**SHORT = SIRV**		**SHORT = UTI**		**SHORT = UTV**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
SHORT_{DIS}	-0.0407***		-0.0348***		-0.0120***		-0.0120***	
	(0.0001)		(0.0001)		(0.0001)		(0.0001)	
$\triangle\text{SHORT}_{BF}$	-0.0525*		-0.0467**		-0.0121**		-0.0116**	
	(0.0716)		(0.0469)		(0.0329)		(0.0401)	
Delay	0.0044		-0.0022		0.0008		0.0009	
	(0.6602)		(0.8251)		(0.9410)		(0.9300)	
NegNews	-0.0012		-0.0009		-0.0011		-0.0012	
	(0.5490)		(0.6476)		(0.5654)		(0.5421)	
SHORT_{DIS}*Delay	-0.2741*		-0.1724*		-0.0364		-0.0366	
	(0.0884)		(0.0937)		(0.2190)		(0.2149)	
SHORT_{DIS}*NegNews	0.0784*		0.0698		0.0192*		0.0202*	
	(0.0903)		(0.1012)		(0.0867)		(0.0913)	
SHORT_{DIS}*RScore1		-0.1243***		-0.1144***		-0.0287***		-0.0289***
		(0.0008)		(0.0002)		(0.0005)		(0.0004)
SHORT_{DIS}*RScore2		-0.0711***		-0.0692***		-0.0216***		-0.0216***
		(0.0001)		(0.0001)		(0.0001)		(0.0001)
SHORT_{DIS}*RScore3		-0.0307***		-0.0276***		-0.0096***		-0.0096***
		(0.0001)		(0.0001)		(0.0001)		(0.0001)
SHORT_{DIS}*RScore4		-0.0097		-0.0089		-0.0050		-0.0049
		(0.6935)		(0.6938)		(0.3160)		(0.3198)
SHORT_{DIS}*RScore5		0.0247		0.0140		0.0095		0.0095
		(0.6079)		(0.7090)		(0.3246)		(0.3204)
$\triangle\text{SHORT}_{BF}$*RScore1		-0.2267		-0.1196		-0.050		-0.0454
		(0.1256)		(0.2844)		(0.2191)		(0.2677)
$\triangle\text{SHORT}_{BF}$*RScore2		-0.2681**		-0.1466		-0.0481**		-0.0474**
		(0.0199)		(0.1576)		(0.0327)		(0.0357)
$\triangle\text{SHORT}_{BF}$*RScore3		-0.0130		-0.0229		-0.0108		-0.0103
		(0.6704)		(0.3508)		(0.1349)		(0.1515)
$\triangle\text{SHORT}_{BF}$*RScore4		-0.2048		-0.2142		-0.0331		-0.0318
		(0.1364)		(0.1616)		(0.1858)		(0.2117)
$\triangle\text{SHORT}_{BF}$*RScore5		-0.4000		-0.1789		0.0263		0.0279
		(0.3652)		(0.4350)		(0.5922)		(0.5512)
Intercept	0.0002	0.0000	0.0002	-0.0001	0.0040	0.0018	0.0040	0.0018
	(0.9404)	(0.9931)	(0.9578)	(0.9858)	(0.2114)	(0.5722)	(0.2140)	(0.5772)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	63,857	63,857	63,857	63,857	63,857	63,857	63,857	63,857
R^2	0.0119	0.0121	0.0118	0.0121	0.0124	0.0126	0.0124	0.0126