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Concurrent Earnings Announcements and Analysts' Information Production

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ABSTRACT: We examine whether financial analysts are subject to limited attention. We find that when analysts have another firm in their coverage portfolio announcing earnings on the same day as the sample firm (a "concurrent announcement"), they are less likely to issue timely earnings forecasts for the sample firm's subsequent quarter than analysts without a concurrent announcement. Among the analysts who issue timely earnings forecasts, the thoroughness of their work decreases as their number of concurrent announcements increases. In addition, analysts are more sluggish in providing stock recommendations and less likely to ask questions in earnings conference calls as their number of concurrent announcements increases. Moreover, when analysts face concurrent announcements, they tend to allocate their limited attention to firms that already have rich information environments, leaving behind firms in need of attention. Overall, our evidence suggests that even financial analysts, who serve as information specialists, are subject to limited attention.

JEL Classifications: G10; G11; G17; G14.

Data Availability: Data are publicly available from the sources identified in the paper.

Keywords: limited attention; analyst forecasts; earnings announcements; clustering.

I. INTRODUCTION

The behavioral revolution has been one of the most prominent phenomena in economics, finance, and accounting in recent decades. Behavioral economics has relaxed the assumptions in traditional economics about preferences, belief formation, and decision making (DellaVigna 2009). One such assumption about decision making is that individuals analyze all information available to them. When individuals face a rich supply of information, however, attention may become a scarce cognitive resource (Falkinger 2008). Limited attention as a psychological concept was neglected in behavioral economics until the early 2000s (Camerer 2003).[1] Our study adds to the growing literature of limited attention by examining whether financial analysts are subject to limited attention and, if they are, how they allocate their limited attention.

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[1] In psychology, "attention" and "effort" are treated almost as synonymous. The capacity theory of attention assumes that the amount of total attention that can be deployed at a given time is limited. The bottleneck theory of attention argues that when two messages are presented at once, often only one of them is perceived; if both are perceived, then the responses are often made in succession. Both theories predict that a decision maker can fully attend to only one task at a time (Kahneman 1973, 4–9). In our study, "limited attention" means that the effort that an analyst can allocate to multiple tasks at a given time is limited. This definition is consistent with Kahneman (1973).

The accounting and finance literatures have already accumulated evidence that *investors* are subject to limited attention (Hirshleifer, Lim, and Teoh 2009; DellaVigna and Pollet 2009; Louis and Sun 2010; deHaan, Shevlin, and Thornock 2015). Investors do not fully process news of corporate events, such as earnings and merger announcements, when those announcements are made on Fridays, after hours, or at about the same time as other firms' announcements. The evidence of investors' limited attention, however, does not necessarily generalize to sophisticated market participants, especially financial analysts, who are hired and trained as information specialists.[2]

It is important to investigate whether financial analysts are subject to limited attention and, if they are, how they then allocate their attention. In recent decades, business activities have increasingly expanded beyond borders due to globalization; business transactions have become more complex; and abundant data have become publicly available, thanks to information technology that generates and disseminates data (Bradshaw, Ertimur, and O'Brien 2017, 31). These changes have made the role of analysts as information intermediaries in the capital markets more crucial than ever.[3] Evidence of analysts' limited attention would have implications for companies that seek *active* coverage by analysts; brokerages, whose resource constraints might be loosened through early planning; and sophisticated investors, who may allocate more of their own resources when expecting limited attention from analysts.

So far, there is little evidence in the literature about whether analysts are subject to limited attention. Several studies simply *assume* that analysts have limited attention. For example, deHaan et al. (2015) use the speed with which all analysts following a firm respond collectively to a given earnings announcement as a proxy for analysts' attention. They state, "During times when analysts are distracted, we assume that it will take them longer to update their future forecasts" (deHaan et al. 2015, 46). Koester, Lundholm, and Soliman (2016) also assume that analysts have limited attention, and examine whether firms use the announcement of extreme positive earnings surprises to attract analysts' attention. Choi and Gupta-Mukherjee (2016) assume that analysts have limited attention and, therefore, rely more on industry information than on firm-specific information. They examine whether such a reliance is associated with reductions in forecast accuracy, forecast frequency, and price impact of forecasts.

Our study directly tests the important assumption that analysts are subject to limited attention. We examine whether analysts delay their earnings forecasts and put less effort into generating these forecasts when another firm in their coverage portfolio announces earnings on the same day as the sample firm ("concurrent announcement"). In addition, we examine whether analysts are sluggish in other information production activities, such as issuing stock recommendations and asking questions in conference calls. Moreover, we examine how analysts allocate their limited attention when they face concurrent announcements.

It may seem obvious that when analysts face the tasks of analyzing multiple firms at the same time, their information production is hindered. There are four reasons why analysts may escape limited attention even if some other types of sophisticated market participants cannot. First, brokerages are highly selective in hiring analysts and then train them to process financial information and multitask. Second, analysts can extend their capability substantially during the earnings announcement season and work for notoriously long hours (Bradshaw et al. 2017, 8). Third, analysts often work in teams and can free up an individual analyst's attention capacity (Fang and Hope 2018). Last, analysts typically cover related firms; what they learn about one firm could be useful in processing information about another firm (Groysberg and Healy 2013, 23).

We are aware of only one study that empirically examines whether analysts are subject to limited attention. Dong and Heo (2014) provide evidence that analysts have limited attention when the region in which they live experiences flu epidemics. The authors examine analysts' target price (i.e., forecasted stock price in a year) projections and find that such projections by analysts in New York or New Jersey during a flu epidemic season are more dispersed and less accurate than by the control group of analysts in the Midwest. In their study, analysts' limited attention is due to *distractions* of the sickness of family members, relatives, and colleagues. In contrast, our study examines analysts' limited attention that arises from a rich supply of information in their *normal course of work*. Moreover, in Dong and Heo (2014), the effects of flu epidemics are indirect and whether an analyst or her family members, relatives, or colleagues have contracted the flu is unobservable to researchers. In contrast, whether an analyst has divided attention for a given firm is observable in our study. Our setting provides more direct evidence on the issue of analysts' limited attention than Dong and Heo (2014).

[2] For example, Frederickson and Zolotoy (2016) find evidence of investors' delayed reaction to clustered earnings announcements made by firms with low institutional ownership, but not by firms with high institutional ownership. On the other hand, Kempf, Manconi, and Spalt (2017) conclude that institutional investors pay limited attention to a firm when their holdings in unrelated industries experience attention-grabbing events. Corwin and Coughenour (2008) and Chakrabarty and Moulton (2012) report that market makers provide less liquidity to firms that have fewer trades in recent months or are not announcing earnings than to active or announcing firms.

[3] Altinkilic and Hansen (2009) examine return reaction around analysts' stock recommendation revisions and conclude that analysts merely piggyback on corporate news. However, their test sample excludes revisions made after trading hours, which comprise 70 percent of all analyst revisions. Li, Ramesh, Shen, and Wu (2015) reach the opposite conclusion after finding that after-hours revisions are associated with greater return reaction than regular-hours revisions, and that only less than a third of analyst revisions directionally confirm the information in the preceding corporate news.

We conduct empirical analyses using a sample period of 1999–2014. We confirm Hirshleifer et al.'s (2009) finding that earnings announcement clustering is common. During our sample period, the median number of other firms that announce earnings on the same day as the sample firm is 242 and the first percentile is 17 firms.

Earnings announcement clustering does not necessarily lead to concurrent announcements for an analyst. Even if multiple firms announce earnings on the same day, among analysts who follow the same firm, some analysts only need to analyze that firm and, therefore, have undivided attention, but other analysts face at least one concurrent announcement. Thus, there is cross-sectional variation in analysts' numbers of concurrent announcements (referred to as "busyness" in our study). Moreover, there is time-series variation in analysts' busyness: an analyst who is busy on a firm's earnings announcement day for one quarter might *not* be busy on that firm's announcement day for a different quarter. In our research design, we exploit both cross-sectional and time-series variation to isolate the effect of concurrent announcements on analysts' information production and, therefore, provide direct evidence on analysts' limited attention.

In our primary analysis, we focus on the speed of analysts' earnings forecasts for the subsequent quarter after the current-quarter earnings announcement. Zhang (2008) finds that the underreaction to earnings announcement news, known as the post-earnings announcement drift (PEAD), is mitigated when at least one of the analysts following the firm is able to issue a forecast for the subsequent quarter on the day of or after the current-quarter earnings announcement ("Timely Window"). Following her study, we define analyst forecasts issued on these two days as "timely" forecasts and examine whether the likelihood of an analyst issuing a timely forecast is negatively associated with the number of her concurrent announcements.

We test this hypothesis in two alternative research designs. First, we exploit variation in busyness within a firm-analyst pair across quarters, and find that the likelihood of issuing timely forecasts for the same firm decreases significantly from the quarters when she only needs to analyze that firm's announcement to the quarters when the analyst also has to analyze a concurrent announcement. Second, we exploit variation in busyness among analysts who follow the same firm-quarter, and find that the analysts with a concurrent announcement are more sluggish than those who only need to analyze that sample firm. In both analyses, we find that sluggishness increases with the number of concurrent announcements.

We then examine whether the thoroughness of an analyst's earnings forecast issued in the Timely Window is associated with her number of concurrent announcements.[4] Forecasting earnings involves predicting the timing of major transactions. If an analyst provides earnings forecasts for other horizons (e.g., future quarters and fiscal year earnings) to accompany the forecast for the subsequent quarter, it is a sign that she has expended more effort and is, therefore, thorough in developing that earnings forecast. Forecasting earnings also involves predicting the major components of earnings, such as revenue, cash flows, and gross margin. Analysts who provide such component forecasts to accompany the earnings forecast are more thorough in developing that earnings forecast than those who do not. We find that analysts' thoroughness decreases with their number of concurrent announcements, consistent with the idea that analysts have limited attention.

We next consider analysts' other information production activities beyond predicting earnings. The first activity is issuing stock recommendations. We find that the timeliness of an analyst's stock recommendation issued after a firm's current-quarter earnings announcement is negatively associated with her number of concurrent announcements. The second activity is asking questions in the conference call that accompanies the current-quarter earnings announcement. If an analyst is subject to limited attention, she will be less likely to have done the groundwork in order to ask questions in the call. We find that the analyst's likelihood of asking questions during the earnings call is negatively associated with her number of concurrent announcements. Thus, analysts' limited attention manifests in a broad range of information production activities.

After concluding that analysts are subject to limited attention, we move on to examine how they allocate their limited attention. For this analysis, we retain only the firm-quarter analysts who face at least one concurrent announcement. We examine whether these analysts issue timely forecasts for certain firms depending on a firm's visibility, its economic significance to the analyst's brokerage, and the complexity of its announced news. We find that analysts tend to allocate their attention to visible firms that already have quite rich information environments and firms that are important for the brokerage to generate commissions and obtain investment banking business. In other words, analysts' limited attention is allocated to firms that do not urgently need attention, whereas firms that have poor information environments and are, therefore, in more urgent need of attention do not receive it. We find some evidence that when the announced news is more complex and, therefore, investors could benefit more from analysts' insights, analysts are less likely to act in a timely manner, perhaps because analysts need time to digest the news. These results suggest that analysts' allocation of limited attention is influenced by their brokerage's financial incentives and their own difficulty in processing complex information.

[4] We do not examine common metrics of earnings forecast quality, such as forecast accuracy improvement and forecast innovation (or boldness), to avoid using benchmarks existing before the earnings announcement. We also do not examine the price impact of a forecast as an indicator of forecast quality because of the confounding news of earnings announcements, management earnings guidance, and peer analysts' forecasts.

Our study contributes to the capital market research on limited attention. Prior research examines how clustered information events (e.g., earnings announcements) create a limited attention effect on investors and impair price discovery.[5] We complement and extend this research by examining analyst behavior. As sophisticated capital market participants, analysts represent a unique user group because investors and other participants expect to rely on analysts for information analysis, especially when under capability and time constraints. Our finding that even analysts are sluggish when facing concurrent announcements implies that the effect of limited attention has wider implications than what has been previously documented.

Our study contributes to corporate disclosure by highlighting widespread earnings announcement clustering and its effects on market participants. Firms actively seek analyst following, and some firms even pay for coverage (Kirk 2011; Anantharaman and Zhang 2011). If the benefits of coverage are curtailed when analysts face concurrent announcements, then managers may find it worthwhile to schedule earnings announcements that avoid clustering with certain firms. This advice may be particularly pertinent for small, risky firms with low institutional ownership because analysts are more likely to ignore these firms in cases of limited attention.

Finally, our study contributes to research on individual analysts' information production. Prior research has examined the effects of analyst characteristics such as brokerage size, portfolio size, experience, and reputation on forecast timeliness and quality (e.g., Stickel 1992; Mikhail, Walther, and Willis 1997; Clement 1999; Bonner, Hugon, and Walther 2007). Despite such research, the process by which analysts produce information is still not well understood (Bradshaw 2011). We highlight the importance of *information processing* by introducing a new factor: whether an analyst must analyze concurrent announcements. This factor affects analysts' information production and is distinct from other previously identified factors in that it (1) may change from quarter to quarter, and (2) is largely determined by the firms that analysts cover.

II. HYPOTHESIS DEVELOPMENT

Behavioral economics has its roots in theories of bounded rationality proposed by Simon (1955, 1959, 1972). Such theories were developed in parallel to traditional economic theories, which assume perfect rationality, to explain and predict how people use information in decision making (Sheffrin 1996). After decades of preparation, behavioral economics "as a serious alternative to models rooted in strong rationality" suddenly took off "like a rocket launch" in the early 2000s (Camerer 2003). Behavioral economics reexamines some of the questions and solutions offered by traditional economics.

Traditional economic theories assume that an agent is an "economic man," who has well-specified and stable preferences, holds rational expectations, and fully considers all information before reaching an optimal solution. Theories of bounded rationality argue that agents may hold nonstandard preferences, exhibit cognitive biases in forming beliefs, and take mental shortcuts in processing information with the goal of reaching acceptable solutions that satisfy some, often self-imposed, constraints (Simon 1959, 1972; DellaVigna 2009; Nobel Committee 2017).[6] Under these theories, information processing is costly, so analyzing the *process* of decision making is crucial. In these theories, attention is such a scarce cognitive resource that a decision maker may focus on subsets of available information (Falkinger 2008) and can fully attend to only one task at a time (Kahneman 1973). Our study adds to the literature of limited attention in the capital markets.

Prior research argues that investors may be subject to limited attention. Hirshleifer and Teoh (2003) derive theoretical models in which investors' ability to process financial information may be impaired due to the salience of information, leading to mispricing of a stock in the short run. Hirshleifer and Teoh (2003, 341) define limited attention more broadly than Kahneman (1973) as "a necessary consequence of the vast amount of information in the environment, and of limits of information processing power." Under this definition, Hirshleifer (2015, 21) uses the limited attention of investors to interpret the well-known phenomenon of PEAD.[7] We use the stricter definition of limited attention, consistent with Kahneman (1973).

Investors may display limited attention to corporate news released during non-trading hours or on Fridays when they are distracted by other activities. DellaVigna and Pollet (2009) report delayed stock return responses to Friday earnings announcements. Louis and Sun (2010) find muted market reaction to merger announcements made on Fridays, suggesting that

[5] Limited attention of investors may result in inefficient stock prices (Hirshleifer 2015). Dong and Hu (2016) and Rees, Sharp, and Wong (2017) find that analysts take advantage of investors' low attention on weekends and release unfavorable stock recommendations on weekends.

[6] Simon (1972) illustrates the idea with the example of a chess player making "satisficing," rather than optimal, choices. The chess player does not have the cognitive capability or time to consider every possible permutation of subsequent moves and then choose the optimal move, so "in these situations, optimization becomes approximate optimization—the description of the real-world situation is radically simplified until reduced to a degree of complication that the decision maker can handle" (Simon 1972, 170).

[7] Under this definition, evidence of analyst inefficiency can be considered evidence of the limited attention of analysts. For example, analyst forecast revisions do not impound all the accounting information that is relevant for predicting future earnings and, therefore, analysts appear to underreact to accounting information (Abarbanell and Bernard 1992; Abarbanell and Bushee 1997; Bradshaw, Richardson, and Sloan 2001; Teoh and Wong 2002; Libby, Bloomfield, and Nelson 2002; Plumlee 2003).

investors are distracted on Fridays from processing corporate news that is clearly significant and not routine. deHaan et al. (2015) use the speed with which analysts issue forecasts as one of their four attention measures. The authors find that market attention varies for earnings announcements made before versus after normal trading hours, Fridays versus other weekdays, and slow versus busy days, and conclude that managers hide bad news by releasing it in periods of low attention. When earnings announcements cluster, market participants face multiple tasks at the same time and must allocate their attention. Hirshleifer et al. (2009) find delayed return reaction on more clustered earnings announcement dates.

It is unclear whether financial analysts are subject to limited attention. On the one hand, analysts are human and, thus, may exhibit limited attention.[8] When they face concurrent announcements, analysts may not be able to process all the information about each firm in their coverage portfolio in a timely fashion, even though other market participants expect them to do so. As a result, analysts may delay issuing forecasts for some or all firms that they cover.

On the other hand, analysts may escape limited attention for four reasons. First, as *sophisticated* information intermediaries, analysts are trained to process information and multitask (Murphy and Smith 2015). Those who are more capable of meeting such information processing demands survive and excel; others leave the profession in a short period of time (Bradshaw et al. 2017, 8). Second, analysts work for notoriously long hours during the earnings announcement season to avoid inattention. The grueling work schedule even alarmed the profession in 2015 and, as a result, new policies were introduced to soothe the image of hard-working analysts (La Roche 2015). Third, analysts often have strong support systems in their brokerages and, therefore, may delegate or outsource certain tasks or form teams to free up their own attention capacities (Brown and Hugon 2009; Groysberg and Healy 2013, 30–32). Earnings announcements are typically scheduled about two weeks in advance (deHaan et al. 2015), so brokerages have time to mobilize their resources. For example, based on hand-collected analyst research reports, Fang and Hope (2018) and Brightbill (2018) report that over 70 percent of the reports are prepared by analyst teams. While a lead analyst ("senior research analyst") typically covers 15 to 18 firms, her team may allocate workload among her three or four associates as attention demands (Groysberg and Healy 2013, 25; Bradshaw et al. 2017, 10). Last, analysts typically cover related firms. Information transfer across related firms may help analysts digest each particular firm's disclosure more efficiently. Thus, whether concurrent announcements constrain analysts' attention and delay their information production is an empirical question.

To gauge analysts' responses, we focus on the timeliness of their earnings forecasts for the subsequent quarter. Forecast timeliness and accuracy are arguably the two most important qualities of an analyst forecast. There is a trade-off between these two qualities because accuracy increases if an analyst waits to gather and incorporate more and new information (Cooper, Day and Lewis 2001; Clement and Tse 2003). We do not examine forecast accuracy because analysts can improve accuracy by waiting. We do not examine accuracy improvement from an existing forecast because the analysis would require us to compare the first forecast issued after the current-quarter earnings announcement with a forecast that existed before this information event.

Timely forecasts are more valuable than delayed forecasts because investors need information to exploit trading opportunities in real time. Prior research finds that timely forecasts have become increasingly common. For example, the frequency of timely forecasts has grown substantially over time, from roughly 26 percent in 1996 to almost 53 percent in 2002 (Zhang 2008). Keskek, Tse, and Tucker (2014) report that 47 percent of all analyst forecasts of forthcoming fiscal year earnings are released in the Timely Window and that analysts' participation declines precipitously afterward. Timely forecasts are also important for market efficiency. Zhang (2008) finds that firms with at least one timely forecast experience larger magnitudes of event-window return responses and smaller magnitudes of PEAD, suggesting that analysts' capability to promptly respond to earnings news facilitates price discovery. Therefore, we examine the association between the number of an analyst's concurrent announcements and her likelihood of issuing a timely forecast. We state the hypothesis in the null form as follows:

H1: The number of an analyst's concurrent announcements is not associated with her likelihood of issuing a timely forecast for the subsequent quarter after the current-quarter earnings announcement.

If analysts are subject to limited attention, then a very relevant question is how they allocate that attention. Frederickson and Zolotoy (2016) ask a similar question about investors. They predict that when multiple firms in an investor's investment portfolio announce earnings on the same day, the investor allocates his limited attention to firms that are more visible and whose news is more informative. The authors find evidence that investors select firms based on visibility, but do not find evidence for selection based on the informativeness of earnings news.

[8] Recent studies find that analysts are inefficient in processing information due to their mood in bad weather (deHaan, Madsen, and Piotroski 2017), depression during the winter blues (Lo and Wu 2018), decision fatigue over the course of a day (Hirshleifer, Levi, Lourie, and Teoh 2019), and influence by market sentiment (Hribar and McInnis 2012).

The findings of Frederickson and Zolotoy (2016) about investors may not generalize to analysts because the two groups of market participants play different roles and have different incentives. The actions of investors include buying or selling stocks or doing nothing. In contrast, the actions of analysts include providing information products to investors, especially to institutional investors who are clients of the brokerage. Investors have incentives to profit from buying or selling a firm's stocks. In contrast, analysts have incentives to build their professional reputations, generate trading commissions, and increase investment banking opportunities for their brokerages. Thus, analysts may allocate their limited attention to firms based on different factors than investors.

The first factor we consider is firm visibility. Firms that are popular in the media and among institutional investors and other analysts are quite visible. Affiliation with visible firms may increase an analyst's or her brokerage's name recognition and, therefore, attract future business. We expect visibility to be positively associated with the allocation of analysts' attention and state the hypothesis in the alternative form, as follows:

H2a: An analyst with concurrent announcements is more likely to issue timely forecasts for firms that are more visible.

The second factor we consider is a firm's economic significance to the analyst or her brokerage.[9] If a firm is one of the largest members of the analyst's portfolio, is growing, or is frequently traded in the equity market, then it represents important earnings opportunities for the analyst or her brokerage. Thus, we expect a firm's economic significance to be positively associated with the allocation of analysts' attention and state the hypothesis in the alternative form, as follows:

H2b: An analyst with concurrent announcements is more likely to issue timely forecasts for firms that are more economically important to the analyst or her brokerage.

Finally, we consider the complexity of earnings announcement news. When news is complex, analysts may delay processing it until they have more time to understand the totality of the news. Alternatively, analysts may start to process the complex news, but the end product—the earnings forecast for the subsequent quarter—is not ready for public release until later. Although we, as researchers, cannot empirically distinguish between these two possibilities, the empirical prediction is the same: analysts are less likely to issue timely forecasts for firms with complex news. We state the hypothesis in the alternative form, as follows:

H2c: An analyst with concurrent announcements is less likely to issue timely forecasts for firms with more complex news.

III. SAMPLE AND DESCRIPTIVE STATISTICS

Sample

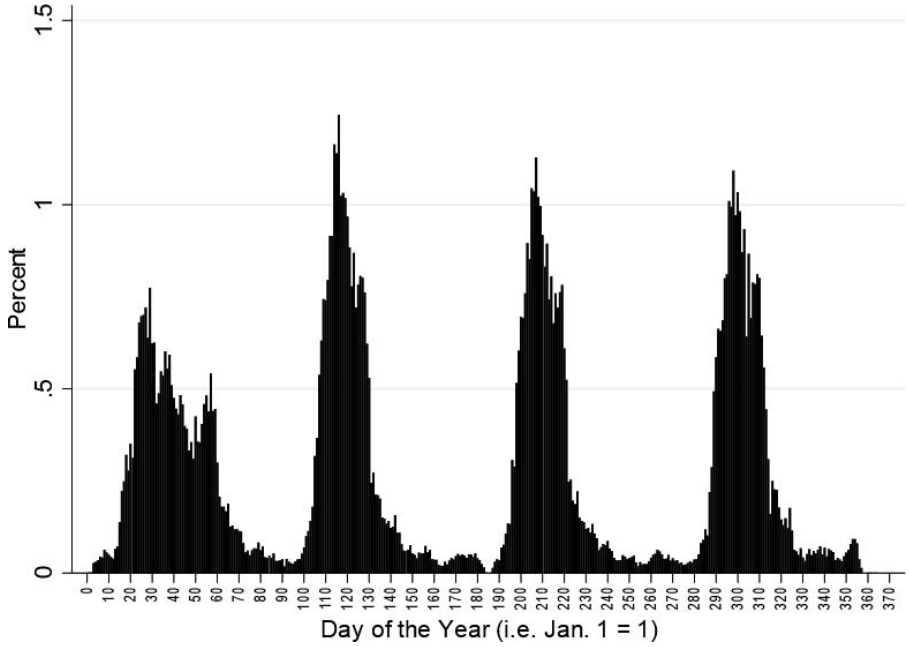
Our sample period begins in 1999, with the wide-scale introduction of time stamps for earnings announcement events and individual analyst forecasts in I/B/E/S, and ends in 2014. We obtain earnings announcement dates from the I/B/E/S Actuals data file and exclude firm-quarters for which the earnings announcement date is more than 90 days after the fiscal quarter-end (also see deHaan et al. 2015). We refer to the quarter whose earnings have just been announced as quarter t, and we are interested in analyst earnings forecasts for quarter t+1. We require the sample of firm-quarter observations to have earnings announcement dates for both quarters t and t+1. To avoid extremely illiquid stocks, we drop a firm-quarter if the stock price at the fiscal end of quarter t is below \$1. There are about 60 trading days between the earnings announcement dates for quarters t and t+1. We label the earnings announcement date for quarter t as trading day 0 and count the trading days onward relative to this date. We refer to days 0 and 1 as the Timely Window.

We obtain analyst forecasts from the I/B/E/S split-adjusted Details data file. We collect all individual analyst forecasts of a sample firm's quarter t+1 earnings issued after quarter t's earnings announcement, but before one day prior to quarter t+1's earnings announcement. We delete forecasts with missing analyst identification and forecasts made by analysts who either initiate or drop coverage of the firm between the earnings announcement dates for quarters t and t+1. Finally, we require a firm-quarter to have forecasts issued in this window by at least two analysts. After these procedures, our original sample has 1,531,277 firm-quarter analyst observations, which include initial and revised forecasts by analysts after quarter t's earnings announcement, from 126,339 firm-quarters during our sample period. Our test sample includes 1,039,583 observations of analysts' initial forecasts.[10] From now on, we only discuss the test sample.

[9] Harford, Jiang, Wang, and Xie (2019) focus on the relative importance of a stock in an analyst's portfolio, and find that this variable is associated with more accurate, more frequent, and more informative earnings forecasts and recommendations from the analyst.

[10] In an untabulated analysis, we find that analysts with more concurrent announcements are more likely to skip forecasting quarter t+1.

FIGURE 1
Earnings Announcements by Day in Calendar Time



The graph plots the percent of earnings announcement dates during a calendar year for our sample firm-quarters collected from 1999 to 2014 (with the fiscal quarter-end dates ending in 1999–2014).

Descriptive Statistics

We first describe the sample at the firm-quarter level. Figure 1 plots the distribution of earnings announcement dates in a calendar year, with the x-axis showing the calendar days from January 1 (day 1) to December 31 (day 365). Firms typically announce earnings three or four weeks after the end of a fiscal quarter. It is not surprising to see that earnings announcement dates peak in late January, late April, late July, and late October. In our sample, 76.5 percent end the fiscal year on December 31, and 88.5 percent end quarters at the end of March, June, September, or December. Thus, earnings announcement clustering shows strong seasonality and, to a large extent, is attributable to firms ending their fiscal quarters on common dates.

Table 1 presents the number of firm-quarter analyst observations by year and the mean statistics of a few variables. Overall, an analyst covers 15 firms on average; annual averages exhibit an upward trend during our sample period from 14 firms in 1999 to 18 in 2014. Growth in the number of firms within an analyst's portfolio increases the probability of her facing concurrent announcements over time. For our sample period, 52.1 percent of the firm-quarter analysts have at least one concurrent announcement. The percentage increases steadily from 48.6 percent in 1999 to 57.9 percent in 2014. The next four columns break down analysts' busyness. *Con 1, Con 2, Con 3,* and *Con* 4^{+} represent the percentage of firm-quarter analysts who have exactly one, two, three, and four or more concurrent announcements, respectively.

The last two columns of Table 1 present the timeliness of analyst forecasts. The percentage of earnings forecasts for quarter $t+1$ issued in the Timely Window is close to 70 percent in the recent decade of our sample period, implying that analysts have become quite responsive to earnings announcements. *Forecast Lag* is the number of trading days that it takes an analyst to issue her initial forecast after quarter t's earnings announcement. The mean forecast lag for the sample period is 7.3 trading days, but the lag has substantially decreased from 13.3 days in 1999 to 5.9 in 2014.

In sum, we make four observations from Table 1. First, analysts' coverage portfolios have grown slightly over time. Second, more than half of the time, an analyst has at least one concurrent announcement to analyze and is, therefore, busy (Busy Analysts). Third, an increasing number of analysts have become busy over time, and most of the increase appears to be driven by those with two or more concurrent announcements. Last, despite their increased workload, an increasing percentage of analysts issue timely forecasts.

We take a closer look of forecast timeliness first in Figure 2, which shows that the percentage of forecasts drops substantially a few days after the earnings announcement. Table 2 shows that Busy Analysts account for 52.1 percent of the test sample. We break down forecasts in two ways. We first sort forecasts into timely forecasts versus other forecasts. In our

TABLE 1

Overview of the Sample

Year	#Firm-Quarter Analyst	#Companies	Busy (%)	How Busy? (%)				Timely (%)	Forecast Lag
				Con 1	Con 2	Con 3	Con 4^{+}		
1999	43,002	14.2	48.6	25.9	11.7	6.0	5.0	39.1	13.3
2000	39,746	13.1	48.0	24.7	12.1	5.7	5.5	42.2	12.9
2001	48,315	13.4	48.9	25.6	12.2	6.0	5.1	55.1	10.0
2002	47,593	13.6	49.4	26.1	12.8	5.5	5.0	60.0	9.7
2003	53,450	13.8	49.6	26.4	12.9	5.8	4.5	65.5	8.3
2004	59,346	13.9	48.5	25.5	13.1	5.5	4.4	68.2	7.6
2005	62,997	14.5	49.6	26.2	12.6	6.1	4.7	69.4	7.0
2006	65,991	14.9	51.0	26.5	13.4	6.2	4.9	70.0	6.6
2007	67,226	15.1	50.7	26.2	13.3	6.2	5.0	69.2	6.6
2008	69,515	15.2	51.0	26.8	13.3	5.7	5.2	67.8	6.3
2009	74,162	15.5	52.9	26.8	14.1	6.4	5.6	68.6	6.0
2010	79,866	15.6	53.4	26.6	13.9	6.8	6.1	67.6	6.4
2011	80,155	15.8	53.8	25.9	14.4	7.3	6.1	68.7	6.4
2012	81,673	16.4	54.5	27.5	14.5	6.8	5.7	69.6	5.9
2013	82,602	17.2	56.0	26.4	15.0	7.7	6.9	69.1	5.9
2014	83,944	17.9	57.9	26.3	15.3	8.1	8.2	68.5	5.9
Overall	1,039,583	15.3	52.1	26.3	13.6	6.5	5.6	65.3	7.3

The table describes our sample of 1,039,583 firm-quarter analyst forecasts during 1999–2014. The first forecast is retained if an analyst issues multiple forecasts of the firm's quarter t+1 earnings in the window between its earnings announcement dates for quarter t and quarter t+1. See Appendix A for the definitions of *#Companies, Busy, Con 1, Con 2, Con 3, Con 4*$^{+}$*, Timely,* and *Forecast Lag* (in trading days). All these variables are defined at the firm-quarter analyst level. The table reports the mean values of these variables.

sample, 65.3 percent are timely, and the percentage is lower at 63.8 percent for Busy Analysts and higher at 67.0 percent for Not-Busy Analysts.

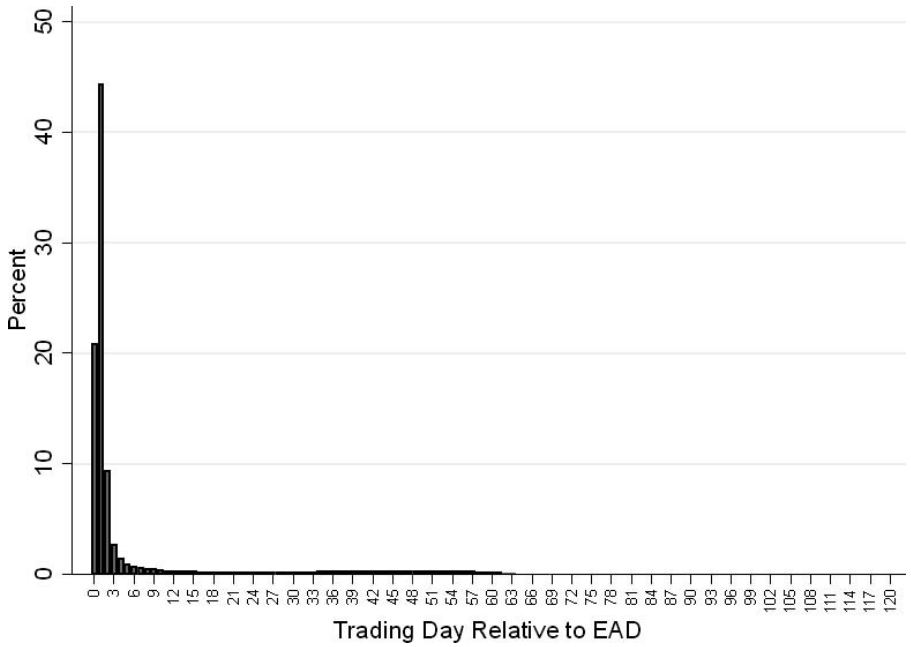
We then sort forecasts by analysts' information production phases, as defined in Keskek et al. (2014). The information analysis phase begins with quarter t's earnings announcement and ends with the fourth trading day after the announcement (equivalent to the first calendar week after the announcement). Analysts' main task in this phase is to process the newly arrived corporate information. Within this phase, we further sort forecasts into the Timely Window versus the other days. The post-analysis phase goes from day 5 to day 29 as analysts transition from analyzing the recent public earnings announcement to discovering private information about future earnings. After the post-analysis phase, analysts enter the information discovery phase, and this phase ends on the day before quarter t+1's earnings announcement.

Table 2 shows that 79.0 percent of the forecasts are issued in the information analysis phase, 10.0 percent in the post-analysis phase, and 10.9 percent in the information discovery phase. More importantly, the percentage of Busy Analysts in the Timely Window is significantly lower than that of Not-Busy Analysts (test statistic untabulated). In the information discovery phase, when analysts do not face the constraints of analyzing concurrent earnings announcements, the percentages of forecasts for Busy Analysts and Not-Busy Analysts are similar. Figure 3 traces the cumulative distribution of forecasts issued. The chart for Busy Analysts stays below that of Not-Busy Analysts, indicating the sluggishness of the former. These patterns are consistent with the idea that analysts are constrained by concurrent announcements.

Given the observed differences in the patterns of forecast timeliness between Busy Analysts and Not-Busy Analysts, an interesting question is whether there is variation in the status of busyness for the same firm-analyst pair over time. In an untabulated analysis, we track the same firm-analyst pair from quarter t to quarter t+1 based on 903,363 firm-analyst quarters with data available for both quarters. Among the analysts who are busy in quarter t, 67.9 percent remain busy for quarter t+1 and 32.1 percent are not busy. Among the analysts who are not busy in quarter t, 62.5 percent remain not busy for quarter t+1, but 37.5 percent become busy. Thus, there is much variation in an analyst's busyness status from one quarter to the next for the same firm.

Now we examine variation in an analyst's busyness status within the cross-section of analysts who cover the same firm-quarter (and, therefore, the same earnings announcement). As reported in Panel A of Table 3, on average 9.46 analysts cover a sample firm-quarter, and the 25th and 75th percentiles are five and 13 analysts, respectively. For each firm-quarter, we calculate

FIGURE 2
Forecasts Issued Relative to Quarter *t*'s Earnings Announcement Date



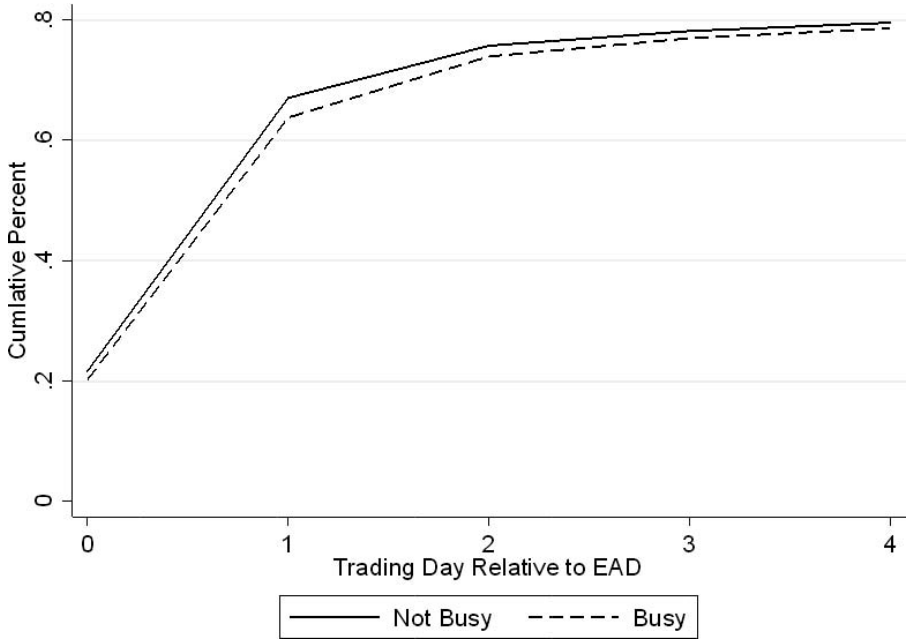
This graph plots the percent of analyst forecasts of a firm's quarter *t*+1 earnings issued on a given trading day relative to its quarter *t*'s earnings announcement date (EAD). If an analyst issues multiple forecasts for the same firm-quarter, then her first forecast is used in this graph. This graph uses 126,339 firm-quarters and 1,039,583 firm-quarter forecasts during our sample period of 1999–2014.

TABLE 2
Distribution of Analyst Forecasts Relative to Quarter *t*'s Earnings Announcement Date

	Trading Days	All Analysts	Busy Analysts	Not-Busy Analysts
Total Firm-Quarter Analyst Forecasts for Quarter *t*+1		1,039,583 (100%)	541,352 (52.1%)	498,231 (47.9%)
Breakdown of Forecasts by the *Timely* Variable				
Timely Forecasts	Day 0 to Day 1	65.3%	63.8%	67.0%
Other Forecasts	Day 2 to Day before next EAD	34.7%	36.2%	33.0%
Total		100%	100%	100%
Breakdown by Analyst Information Production Phases per Keskek et al. (2014)				
Information Analysis Phase				
Timely Window	Day 0 to Day 1	65.3%	63.8%	67.0%
Other Days	Day 2 to Day 4	13.7%	14.8%	12.5%
Post-Analysis Phase	Day 5 to Day 29	10.0%	10.5%	9.5%
Information Discovery Phase	Day 30 to Day before next EAD	10.9%	10.9%	11.0%
Total		100%	100%	100%

The table describes differential timeliness of the sample of each analyst's initial forecast for that firm-quarter. A Busy Analyst has at least one other firm in her coverage portfolio announcing earnings on the sample firm's earnings announcement date for quarter *t* (EAD); a Not-Busy Analyst has only the sample firm announcing earnings on the EAD. Differential timeliness is based on the analyst forecast date relative to EAD (i.e., day 0) in trading days.

FIGURE 3
Cumulative Percent of Forecasts Issued



The graph uses 126,339 firm-quarters and 1,039,583 firm-quarter forecasts during our sample period of 1999–2014. The days marked in the graph are the number of trading days relative to the earnings announcement date (EAD) for quarter *t*. The forecasts are for quarter *t*+1 earnings. The graph plots in the hashed line the cumulative percent of forecasts by analysts with at least one other firm in her coverage portfolio announcing quarter *t*'s earnings on the same day as the sample firm (referred to as "Busy Analysts"), and in the solid line the cumulative percentage of forecasts issued by Not-Busy Analysts. If an analyst issues more than one forecast for the same firm-quarter, then her first forecast is used in this graph.

the percentage of analysts with at least one concurrent announcement and refer to the variable as *Perc Busy*. It has a mean of 0.51 and 25th and 75th percentiles of 0.20 and 0.82. Thus, there is much variation in busyness among the analysts who cover the same firm-quarter.

IV. ARE ANALYSTS SUBJECT TO LIMITED ATTENTION?

Forecast Timeliness

Our first hypothesis predicts that having concurrent announcements is not associated with an analyst's likelihood of issuing her initial earnings forecast for quarter *t*+1 in the Timely Window. The dependent variable *Timely* is 1 if the forecast is issued in the Timely Window, and 0 otherwise. The explanatory variables are *Con 1, Con 2, Con 3,* and *Con* 4^{+}. We use these four indicator variables instead of the count variable for the number of concurrent announcements, *Con Count,* because we expect the incremental effect to taper off after four concurrent announcements, and because we can test the gradual incremental effects from zero to one, two, three, and four or more concurrent announcements.[11]

We estimate two alternative fixed effects models. FE Model 1 exploits variation in busyness across quarters for the same firm-analyst pair by adding *firm-analyst* fixed effects.[12] In this way, we isolate the effect of busyness after controlling for the firm and analyst characteristics that are relatively stable across quarters. In other words, we test whether variation in an analyst's busyness status for *the same firm* from quarter to quarter relates to variation in the timing of her initial forecast.

In FE Model 1, we also add year fixed effects because of the time trends of forecast timeliness and busyness exhibited in Table 1. In addition, we control for firm, news, and analyst characteristics that are found to be associated with forecast

[11] We obtain similar results if we use the count variable or the binary variable *Busy*.

[12] In our test sample, the mean number of earnings forecast observations from the same firm-analyst pair is 7.3, and the 25th percentile, median, and 75th percentile are two, four, and nine, respectively. The forecast observations from the same firm-analyst pair spread within five years for 84.3 percent of the sample and within one year for 31.1 percent of the sample, suggesting that the vast majority of firm-analyst pair formations are not stale.

TABLE 3

Descriptive Statistics

Panel A: Distribution of Main Variables

Variable	n	Mean	P25	Median	P75	Std. Dev.
Measured at the Firm-Quarter Analyst Level						
Busy	1,039,583	0.52	0.00	1.00	1.00	0.50
Con Count	1,039,583	1.01	0.00	1.00	2.00	1.38
Timely	1,039,583	0.65	0.00	1.00	1.00	0.48
Forecast Lag	1,039,583	7.33	1.00	1.00	3.00	14.97
Broker Size	1,039,583	61.17	20.00	46.00	91.00	53.50
Firm Experience	1,039,583	14.45	5.00	10.00	20.00	13.03
#Companies	1,039,583	15.27	11.00	15.00	19.00	6.92
#EPS Horizon	1,039,583	5.67	4.00	5.00	7.00	2.79
#EPS Component	1,039,583	5.57	2.00	6.00	8.00	3.91
#Total Forecasts	1,039,583	30.67	6.00	25.00	46.00	29.65
Timely Recommend	1,039,583	0.03	0.00	0.00	0.00	0.16
OnCall	141,538	0.25	0.00	0.00	1.00	0.43
Relative Cap	1,031,393	1.43	0.20	0.56	1.47	2.50
Measured at the Firm-Quarter Level						
MVE	126,339	7,664	513	1,459	4,738	24,415
Inst. Ownership	126,339	0.66	0.49	0.71	0.87	0.26
Analysts	126,339	9.46	5.00	8.00	13.00	6.36
B/M	126,339	0.52	0.25	0.44	0.69	0.40
Turnover (%)	126,339	1.04	0.46	0.78	1.30	0.88
Leverage	126,339	0.23	0.05	0.20	0.36	0.20
R&D	126,339	0.13	0.00	0.03	0.13	0.36
AUE (%)	126,339	0.45	0.05	0.14	0.40	0.94
Bad News	126,339	0.30	0.00	0.00	1.00	0.46
Special	126,339	0.45	0.00	0.00	1.00	0.50
Loss	126,339	0.22	0.00	0.00	0.00	0.42
Guide	126,339	0.34	0.00	0.00	1.00	0.47
Q4	126,339	0.24	0.00	0.00	1.00	0.43
Perc Busy	126,339	0.51	0.20	0.50	0.82	0.35

(continued on next page)

timeliness in prior research. We include these control variables in case they affect forecast timeliness and busyness, but may run the risk of excess control because our fixed effects already exercise quite strong control.

The firm characteristic variables, measured at the firm-quarter level, are as follows. Firm size, *Log*(*MVE*), reflects a firm's operational complexity, and we expect that it takes longer for analysts to respond to larger firms' announcements. Institutional ownership, *Inst. Ownership,* represents the demand for an analyst's interpretation and immediate response to an earnings announcement by her important clients. Analyst following, *Log*(1 + *Analysts*), captures the competitive environment of analysts in providing timely and useful forecasts. Analysts are more likely to issue timely forecasts when the competition is more intense. The book-to-market ratio, *B/M,* proxies for the firm's growth prospects. The demand for timely information about growth firms may speed up analysts' responses. The firm's stock liquidity, proxied by *Turnover,* could be another factor. Because more liquid stocks are associated with lower trading costs and more efficient pricing, we expect investors in liquid stocks to derive less marginal benefit from timely analyst forecasts. The firm's riskiness is captured by its leverage ratio, *Leverage*. It may take longer to analyze riskier firms. Intangible assets, proxied by *R&D,* reflect the firm's opaqueness in financial reporting due to operational reasons. The demand for information about opaque firms is high, but the supply of information may be low because analysts have less information to work with. See Appendix A for detailed definitions of all variables.

We include six news variables, measured at the firm-quarter level. The first four are *AUE* for the magnitude of the earnings surprise, *Bad News* for not meeting analyst expectations for quarter *t, Loss* for incurring a loss in quarter *t,* and *Special* for reporting special items for quarter *t*. We have no directional predictions for these variables because investors' demand for

TABLE 3 (continued)

Panel B: Pearson Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) *Busy*									
(2) *Con Count*	**0.70**								
(3) *Timely*	**−0.03**	**−0.07**							
(4) *Log*(1 + *Forecast Lag*)	**0.02**	**0.04**	**−0.79**						
(5) *Log*(*MVE*)	**0.01**	**0.01**	**0.04**	0.00					
(6) *Inst. Ownership*	**0.01**	**−0.03**	**0.10**	**−0.10**	**0.06**				
(7) *Log*(1 + *Analysts*)	**0.02**	**0.01**	**0.09**	**−0.06**	**0.66**	**0.24**			
(8) *B/M*	**0.06**	**0.07**	**−0.08**	**0.05**	**−0.24**	**−0.07**	**−0.13**		
(9) *Turnover*	**−0.03**	**−0.05**	**0.08**	**−0.07**	**−0.09**	**0.19**	**0.22**	**0.03**	
(10) *Leverage*	**0.02**	**0.04**	**−0.08**	**0.05**	**0.01**	**−0.02**	**−0.05**	**−0.02**	**−0.07**
(11) *R&D*	**−0.01**	**−0.02**	**0.05**	**−0.04**	**−0.13**	**−0.05**	**−0.10**	**−0.12**	**0.08**
(12) *AUE*	**0.00**	**0.01**	**−0.02**	**−0.01**	**−0.26**	**−0.09**	**−0.17**	**0.31**	**0.14**
(13) *Bad News*	**0.01**	**0.02**	**−0.03**	**0.01**	**−0.08**	**−0.05**	**−0.08**	**0.08**	**−0.00**
(14) *Loss*	**−0.01**	**−0.02**	**0.00**	**−0.01**	**−0.28**	**−0.09**	**−0.14**	**0.14**	**0.18**
(15) *Special*	**−0.01**	**−0.02**	**0.06**	**−0.06**	**0.15**	**0.08**	**0.12**	**0.05**	**0.04**
(16) *Guide*	**−0.04**	**−0.07**	**0.12**	**−0.09**	**0.13**	**0.21**	**0.13**	**−0.15**	**−0.03**
(17) *Q4*	**−0.07**	**−0.07**	**0.01**	**−0.01**	**0.03**	**0.01**	**0.01**	**−0.01**	0.00
(18) *Broker Size*	**0.02**	**0.02**	**−0.04**	**0.05**	**0.28**	**−0.02**	**0.04**	**−0.02**	**−0.17**
(19) *Firm Experience*	**0.05**	**0.04**	**0.03**	**−0.03**	**0.35**	**0.16**	**0.24**	**0.08**	**−0.10**
(20) *#Companies*	**0.17**	**0.24**	**−0.04**	0.00	**0.02**	**0.02**	**0.03**	**0.09**	**−0.11**

Panel C: Correlation Variables (cont.)

	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(11) *R&D*	**−0.07**									
(12) *AUE*	**0.12**	**0.08**								
(13) *Bad News*	**0.08**	**0.03**	**0.14**							
(14) *Loss*	**0.08**	**0.29**	**0.32**	**0.16**						
(15) *Special*	**0.11**	**−0.02**	**0.06**	**0.02**	**0.11**					
(16) *Guide*	**−0.09**	**−0.07**	**−0.16**	**−0.13**	**−0.14**	**0.08**				
(17) *Q4*	**−0.00**	**−0.01**	**0.02**	**0.01**	**0.02**	**0.10**	**0.01**			
(18) *Broker Size*	**0.22**	**−0.07**	**−0.04**	**−0.02**	**−0.06**	**0.07**	**0.03**	**0.03**		
(19) *Firm Experience*	**0.05**	**−0.15**	**−0.04**	**−0.01**	**−0.14**	**0.14**	**0.13**	**0.02**	**0.18**	
(20) *#Companies*	**0.13**	**−0.10**	**0.01**	**0.05**	**−0.08**	**−0.03**	**−0.04**	**0.02**	**0.08**	**0.22**

Panel A presents descriptive statistics for our test sample of 1,039,583 firm-quarter analyst forecasts during 1999–2014. Panels B and C present the pairwise Pearson correlations of variables that we use in our primary empirical model. Numbers in bold represent statistical significance at the 5 percent level in a two-tailed test.
See variable definitions in Appendix A.

analysts' timely responses increases when the announced news is alarming and complex, but it takes analysts more time to process such news. The fifth news variable, *Guide,* captures whether the firm provides earnings guidance for quarter t+1 at the earnings announcement event. We expect more timely analyst forecasts when firms provide such guidance. Our last news variable, *Q4,* controls for whether the announced quarter is the fourth fiscal quarter. Announcements for the fourth fiscal quarter are announcements for the fiscal year and contain more information than interim quarter announcements because accounting policy changes, impairment tests, and major accounting adjustments typically occur in the fourth quarter, and financial statements are audited only for fiscal years. We expect analysts to take more time to process fourth-quarter announcements.

We include three analyst characteristic variables, measured at the firm-quarter analyst level: *Broker Size* for brokerage size, *Firm Experience,* and *#Companies* for the size of the analyst's coverage portfolio. We expect analysts from larger brokerages to have more resources and, therefore, issue more timely forecasts, analysts with more experience with the firm to have better cognitive capacity to process news, and analysts with larger portfolios to be more sluggish. FE Model 1 is represented by Equation (1):

$$\begin{aligned}\text{Prob}(Timely = 1) = f(&a_0 + a_1 Con\ 1 + a_2 Con\ 2 + a_3 Con\ 3 + a_4 Con\ 4^{+} + a_5 Log(MVE) + a_6 Inst.\ Ownership \\ &+ a_7 Log\ Analysts + a_8 B/M + a_9 Turnover + a_{10} Leverage + a_{11} R\&D + a_{12} AUE + a_{13} Bad\ News \\ &+ a_{14} Loss + a_{15} Special + a_{16} Guide + a_{17} Q4 + a_{18} Broker\ Size + a_{19} Firm\ Experience \\ &+ a_{20} \#Companies + Firm\text{-}Analyst\ Fixed\ Effects + Year\ Fixed\ Effects).\end{aligned} \tag{1}$$

FE Model 2 exploits variation in busyness among the analysts who cover the same firm-quarter by adding *firm-quarter* fixed effects. This research design is used in deHaan et al. (2017). In this way, we isolate the effect of busyness after controlling for firm characteristics and properties of the released news. In other words, we test whether variation in an analyst's busyness status among all analysts for *the same earnings announcement* relates to variation in the timing of her initial forecast.

It is possible that the difference in forecast timeliness among analysts covering the same earnings announcement is due to differences in analyst characteristics (e.g., general experience, inherent ability, portfolio size, and brokerage resources) instead of her number of concurrent announcements. To rule out this possibility, we follow deHaan et al. (2017) and add analyst calendar-quarter fixed effects so that we compare the analyst's timeliness for the sample firm-quarter with her timeliness for all the other firms in her coverage portfolio in the same *calendar quarter* that contains the fiscal end date of the sample firm's quarter *t*.

The fixed effect structure in FE Model 2 permits us to estimate a parsimonious model without the control variables that are included in FE Model 1. Equation (2) represents FE Model 2. Following deHaan et al. (2017), we estimate Equation (2) in ordinary least squares (OLS), which is easier for estimation and interpretation than a fixed effect logit model.

$$\begin{aligned}Timely = &b_0 + b_1 Con\ 1 + b_2 Con\ 2 + b_3 Con\ 3 + b_4 Con\ 4^{+} + Firm\text{-}Quarter\ Fixed\ Effects \\ &+ Analyst\ Calendar\text{-}Quarter\ Fixed\ Effects\end{aligned} \tag{2}$$

Panel A of Table 3 presents the descriptive statistics of the variables. The average analyst has 14 quarters of firm-specific experience, is from a brokerage with 61 analysts, has at least one concurrent announcement for 52 percent of the earnings events, and issues a timely forecast 65 percent of the time. The average firm in our sample has a mean market value of equity of over $7 billion and is followed by nine analysts. Our sample firms skew larger than the population in Compustat due to the data requirement of analyst coverage.

Panels B and C of Table 3 present Pearson correlations of the variables at the firm-quarter analyst level. The correlations are as expected. Analyst coverage is positively related to size, institutional ownership, and turnover. The likelihood of issuing a timely forecast has a positive correlation with firm size and institutional ownership, and a negative correlation with the magnitude of the earnings surprise (*AUE*). There is preliminary univariate evidence that having at least one concurrent announcement (*Busy*) and the number of concurrent announcements (*Con Count*) are negatively related to issuing a timely forecast.

Table 4 presents the estimation results of Equations (1) and (2). The number of observations used is less than the number of our test sample because a fixed effect group (e.g., a firm-analyst pair) is dropped from the estimation if the observations in that group are either all timely or all non-timely—that is, if there is no variation in *Timely* within the observations of that group. For FE Model 1, the coefficients on *Con 1* through *Con* 4^{+} are all significantly negative, meaning that analysts with at least one concurrent announcement to analyze, regardless of the number of concurrent announcements, are all more sluggish than analysts who only need to analyze the sample firm's announcement.

If limited attention is the determinant of sluggishness, we expect that the magnitude of sluggishness increases with the number of concurrent announcements. This is indeed the case in Table 4. The coefficient on *Con 1* is −0.08 (z-stat. = −10.76) and decreases to −0.17 for *Con 2*, −0.31 for *Con 3*, and −0.45 for *Con* 4^{+}; all these coefficients are statistically different from one another at the 1 percent level. We use the percent change in the odds to get a sense of the economic significance: a one-unit increase in *Con 1*, *Con 2*, *Con 3*, and *Con* 4^{+} relates to percentage decreases of 7.3, 16.0, 26.4, and 36.0, respectively, in the odds of a forecast being timely (untabulated). We obtain consistent results from estimating FE Model 2. These findings are consistent with H1, suggesting that concurrent announcements within an analyst's coverage portfolio slow down her response.[13]

Firm-analyst fixed effects complicate the interpretation of the control variables in FE Model 1 because the research design focuses on within-firm analyst variation over the quarters. Sticky variables, such as firm size and brokerage size, are unlikely to vary much from quarter to quarter and will be captured by firm-analyst fixed effects. With this caveat, we find that timely forecasts are more likely to be issued for firms with larger institutional ownership and analyst following, and less likely for

[13] We find consistent results using a matched research design (untabulated). For this analysis, we restrict the sample to only two observations from each firm-analyst pair, in which we match the busy quarter with a not-busy quarter within 365 days and end up with 77,006 firm-analyst pairs. The Busy group has significantly fewer timely forecasts than the Not-Busy group (63.3 percent versus 65.8 percent, p-value < 0.01).

TABLE 4

Timeliness of Analysts' First Earnings Forecasts

	Timely		*Log*(1 + *Forecast Lag*)	
Variables	**FE Model 1**	**FE Model 2**	**FE Model 1**	**FE Model 2**
Con 1	−0.08***	−0.01***	0.02***	0.03***
	(−10.76)	(−10.46)	(6.71)	(11.30)
Con 2	−0.17***	−0.02***	0.05***	0.06***
	(−19.46)	(−14.49)	(12.92)	(14.76)
Con 3	−0.31***	−0.04***	0.09***	0.08***
	(−25.66)	(−16.28)	(14.60)	(14.17)
Con 4^{+}	−0.45***	−0.05***	0.13***	0.11***
	(−32.52)	(−18.17)	(15.25)	(16.37)
Log(*MVE*)	−0.05***		0.02**	
	(−5.17)		(2.48)	
Inst. Ownership	0.31***		−0.11***	
	(11.08)		(−6.86)	
Log(1 + *Analysts*)	0.16***		−0.04***	
	(10.83)		(−4.35)	
B/M	0.03*		−0.04***	
	(1.83)		(−3.37)	
Turnover	−2.45***		0.66*	
	(−3.72)		(1.74)	
Leverage	−0.04		0.02	
	(−0.99)		(0.72)	
R&D	−0.03		0.01	
	(−1.38)		(0.77)	
AUE	0.95**		−1.59***	
	(2.11)		(−7.89)	
Bad News	0.04***		−0.02***	
	(6.04)		(−8.10)	
Loss	−0.04***		0.00	
	(−3.80)		(0.54)	
Special	−0.02***		0.01**	
	(−2.62)		(2.00)	
Guide	0.22***		−0.09***	
	(23.26)		(−16.85)	
Q4	−0.13***		0.04***	
	(−20.36)		(8.59)	
Broker Size	0.00***		−0.00***	
	(32.47)		(−9.01)	
Firm Experience	−0.03***		0.03***	
	(−24.95)		(13.28)	
#Companies	0.03***		−0.01***	
	(29.17)		(−11.54)	
Firm-Analyst FE	Yes	—	Yes	—
Year Fixed Effects	Yes	—	Yes	—
Firm-Quarter FE	—	Yes	—	Yes
Analyst Calendar-Quarter FE	—	Yes	—	Yes
n	827,405	1,013,444	1,013,397	1,013,444
Adjusted R^2	—	42.1%	26.5%	41.3%
LR χ^2	13,056.44***	—	—	—

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

We use firm-quarter analyst observations. FE Model 1 estimates a logit model in which *Timely* is the dependent variable and an OLS regression in which *Log*(1 + *Forecast Lag*) is the dependent variable. This model includes firm-analyst fixed effects and year fixed effects, with standard errors robust to heteroscedasticity and clustered by analyst. FE Model 2 estimates an OLS regression for both dependent variables and includes firm-quarter (i.e., same earnings announcement) fixed effects and analyst calendar-quarter fixed effects, with standard errors robust to heteroscedasticity and clustered by the earnings announcement date. t- or z-statistics are in parentheses.

See Appendix A for variable definitions.

larger and more liquid firms and firms that have just reported losses or special items. Forecasts after fourth-quarter earnings announcements are less timely. Forecasts issued by analysts from larger brokerage firms are more likely to be timely. Yet the coefficients on *Firm Experience* and *#Companies* are unexpected and puzzling.

In the last two columns of Table 4, we explore an alternative measure of timeliness—*Forecast Lag*. We treat *Timely* as a primary measure and *Forecast Lag* as a secondary measure because prior research focuses on the Timely Window and because we do not know the functional form of the relation between *Con 1* through *Con* 4^{+} and *Forecast Lag*. We replace *Timely* with *Log*(1 + *Forecast Lag*) in Equations (1) and (2) and estimate both models in OLS with the specified fixed effects. Note that because the longer the lag, the less timely the forecast, a result in these columns consistent with the previous two columns would require a sign flip on the coefficient. *Con 1* through *Con* 4^{+} are all positively associated with *Log*(1 + *Forecast Lag*). Consistent with analysts' sluggishness increasing with the number of concurrent announcements, the coefficients again increase monotonically and significantly from *Con 1* to *Con* 4^{+} in both fixed effect models.

To gauge the economic significance, we use raw *Forecast Lag* as the dependent variable for convenient interpretation in an untabulated analysis. The coefficients on *Con 1* through *Con* 4^{+} are significantly positive at 0.223, 0.338, 0.411, and 0.690, respectively, suggesting that relative to analysts without any concurrent announcement, analysts with one concurrent announcement delay their forecasts by 0.223 of a day, and those with four or more concurrent announcements delay their forecasts by 0.690 of a day. Given the importance of the Timely Window, in which 65.3 percent of analysts issue forecasts within days 0 and 1, such delays may move an analyst's forecast down in the queue substantially or even move it out of the Timely Window.

In sum, we find evidence that on days with concurrent announcements, analysts are more likely to delay their initial earnings forecasts. More importantly, the delay is stronger as the number of concurrent announcements increases, suggesting that it is the cognitive constraint related to limited attention that drives the delay. These results provide direct evidence that limited attention influences the information processing of even sophisticated capital market participants who are considered information specialists.

Thoroughness of Timely Earnings Forecasts

To more fully investigate the role of limited attention in analysts' information production, we examine the thoroughness of timely earnings forecasts. If analysts are subject to limited attention, then we expect that among those who are able to issue timely forecasts, analysts facing more concurrent announcements have less time and energy to develop forecasts and, therefore, these forecasts are less thorough.

To assess thoroughness, we first collect earnings forecasts for a sample firm's horizons beyond quarter t+1 issued on the date of the timely earnings forecast for quarter t+1. An important task in predicting earnings is to estimate the timeliness of major transactions. The existence of earnings forecasts for longer horizons would reflect an analyst's effort in making the earnings forecast for quarter t+1. *#EPS Horizon* is the number of earnings forecasts issued for multiple horizons. For example, if an analyst issues only the earnings forecast for quarter t+1, the value of *#EPS Horizon* is 1; if the analyst issues earnings forecasts for quarter t+1, quarter t+2, and the forthcoming year, the value is 3.

Second, we collect forecasts of earnings components, such as revenue, cash flows, and gross margin, and forecasts of different definitions of earnings (the difference implies an earnings component), issued on the date of the timely earnings forecast for quarter t+1.[14] If analysts additionally forecast the components of earnings, then their earnings forecasts should be more thorough. *#EPS Component* is the number of *types* of earnings component forecasts that an analyst issues on that day, regardless of forecast horizon. For convenience, if she does not provide any earnings component forecasts, then we set the value of *#EPS Component* at 1.[15]

A third variable for thoroughness, *#Total Forecasts,* counts all forecasts (for any horizon and any incidences of earnings or earnings components) issued by an analyst for the sample firm on the day of her timely earnings forecast for quarter t+1. The descriptive statistics of these three variables are included in Table 3. The median analyst issues an earnings per share (EPS) forecast across five horizons, for six different types of earnings or earnings components, and 25 total forecasts on the day of her earnings forecast for quarter t+1. We estimate Equation (3) using OLS, where *Thoroughness* is a place holder for *#EPS Horizon, #EPS Component,* and *#Total Forecasts:*

[14] The agreements between brokerages and our analyst database provider might be complex and vary in the extent of detail of analysts' line-item forecasts. Firm-analyst fixed effects in regression analyses allow us to overcome such variation and instead focus on the variation in busyness and thoroughness with the same firm-analyst pair.

[15] If, for example, she provides one revenue forecast for quarter t+1, in addition to the earnings forecast for quarter t+1, the value is 2. If she provides one revenue forecast for quarter t+1 and one revenue forecast for quarter t+2, in addition to the earnings forecast, the value is still 2.

$$\begin{aligned} Thoroughness = {} & c_1 Con\ 1 + c_2 Con\ 2 + c_3 Con\ 3 + c_4 Con\ 4^{+} + c_5 Log(MVE) + c_6 Inst.\ Ownership + c_7 Log\ Analysts \\ & + c_8 B/M + c_9 Turnover + c_{10} Leverage + c_{11} R\&D + c_{12} AUE + c_{13} Bad\ News + c_{14} Loss + c_{15} Special \\ & + c_{16} Guide + c_{17} Q4 + c_{18} Broker\ Size + c_{19} Firm\ Experience + c_{20} \#Companies \\ & + Firm\text{-}Analyst\ Fixed\ Effects + Year\ Fixed\ Effects. \end{aligned} \tag{3}$$

Table 5 presents the estimation results. The coefficients on the explanatory variables are significantly negative across the three dependent variables except for the coefficient on *Con 3* in the *#EPS Component* regression. As the number of concurrent announcements increases, thoroughness decreases. For example, for the *#Total Forecasts* regression, the coefficients move from −0.24 for *Con 1* to −1.36 for *Con* 4^{+}. The results are similar if we use the fixed effects structure of FE Model 2. These findings reinforce our primary finding that analysts are subject to limited attention.

Before closing this subsection, we provide a placebo test that shows that the number of concurrent announcements has no relation with the thoroughness of an analyst's forecast in the subsequent information discovery phase when the limited attention constraint is relaxed. This analysis reestimates Equation (3) using forecasts issued in the information discovery phase.[16] In contrast to the findings in Table 5, Table 6 reports no statistically significant association between the number of concurrent announcements and thoroughness measured later in quarter t+1, except for *Con 3* in the *#EPS Component* regression. The lack of association implies that limited attention is a significant driver of the deterioration of thoroughness in analysts' initial forecasts, and that the effect of limited attention disappears after the attention constraint is lifted later in the quarter.

Other Analyst Activities Soon After an Earnings Announcement

We examine whether analysts' limited attention due to concurrent announcements manifests in other analyst activities. The first activity is issuing stock recommendations. We examine whether an analyst's likelihood of issuing a recommendation in the Timely Window is negatively associated with her number of concurrent announcements. We obtain the recommendation dates from the I/B/E/S Recommendation data file. We assign the value of 1 to *Timely Recommend* if the analyst issues a recommendation in the Timely Window, and 0 otherwise. Column (1) of Table 7 shows results consistent with our primary analysis.

The second activity we examine is an analyst's active participation in the earnings conference call for quarter t. For this analysis, we create a subsample of firm-quarters whose call transcripts are available from Seeking Alpha for sample years 2005–2014.[17] We obtain 10,898 conference call transcripts, use Perl to extract from the transcript the names of analysts who asked questions during a call, as well as their brokerage affiliations, and then match them with the identifications in I/B/E/S. Following Mayew (2008), we assign the value of 1 to *OnCall* if the analyst appears in the transcript, and 0 otherwise. The results in Column (2) of Table 7 show that an analyst's likelihood of asking questions in the sample firm's conference call decreases if she has at least one concurrent announcement. Moreover, the negative association becomes stronger as the number of concurrent announcements increases. These findings provide further evidence that limited attention has multifaceted influences on analysts' information production.

V. WHEN ANALYSTS ARE BUSY, WHICH FIRMS GET THEIR ATTENTION?

In the second hypothesis, we examine to which firms an analyst allocates her limited attention when she faces concurrent announcements. This analysis is conditional on an analyst having at least one concurrent announcement. We retain the firm-quarter analyst observations of such analysts and regress their likelihood of issuing timely earnings forecasts on sample firms' characteristics.

To test the visibility factor in H2a, we use three variables: *Log*(*MVE*) for firm size, capturing media attention; *Inst. Ownership* for the firm's popularity with institutional investors; and *Log*(1 + *Analysts*) for the firm's popularity with analysts. We test the economic significant factor in H2b using three variables: *Relative Cap,* measured as the sample firms' market value of equity divided by the mean market value of equity of the other firms in the analyst's coverage portfolio (Harford et al. 2019); *B*/*M* for the firm's growth opportunities; and *Turnover* for the firm's opportunities to generate trading commissions for the analyst. For the news complexity factor in H3a, we use eight variables: *Leverage* for riskiness; *R&D*

[16] Because these forecasts are issued over 30 days, in an untabulated analysis, we include a variable *Horizon* to control for the number of days between the forecast date and the earnings announcement for quarter t+1 and find qualitatively similar results.

[17] The coverage of Seeking Alpha, which is freely available, begins sparsely in 2005 and is more heavily populated by 2007 or 2008. We obtained two other conference call datasets: (1) 89,198 analyst call participation observations for about 15,000 conference calls of Standard & Poor's (S&P) 500 companies during January 2003 to June 2013, collected by Jonathan Milian, and (2) 148,708 analyst call participation observations for about 19,677 conference calls of all U.S. firms during 2002–2004, collected by Bill Mayew. Our results using these datasets are similar to what we report in Table 7.

TABLE 5

Thoroughness of Timely Earnings Forecasts

Variables	*#EPS Horizon*	*#EPS Component*	*#Total Forecasts*
Con 1	−0.03***	−0.02**	−0.24***
	(−4.02)	(−2.35)	(−3.99)
Con 2	−0.04***	−0.03**	−0.36***
	(−4.35)	(−2.36)	(−4.07)
Con 3	−0.06***	−0.02	−0.46***
	(−4.18)	(−1.04)	(−3.46)
Con 4^{+}	−0.12***	−0.11***	−1.36***
	(−5.73)	(−3.79)	(−6.45)
Log(*MVE*)	0.06***	−0.11***	−0.38*
	(3.73)	(−3.54)	(−1.69)
Inst. Ownership	0.00	0.01	1.66***
	(0.02)	(0.20)	(2.76)
Log(1 + *Analysts*)	0.06**	0.13***	0.73**
	(2.05)	(2.95)	(2.18)
B/M	−0.03	−0.15***	−0.68*
	(−0.96)	(−2.74)	(−1.83)
Turnover	1.82	0.17	−32.36**
	(1.60)	(0.09)	(−2.43)
Leverage	−0.02	−0.32***	−1.60**
	(−0.40)	(−3.20)	(−2.12)
R&D	0.03	0.05	0.27
	(1.16)	(1.29)	(1.16)
AUE	6.42***	−2.16***	2.13
	(11.76)	(−3.16)	(0.36)
Bad News	0.07***	0.02**	0.28***
	(11.03)	(2.24)	(4.85)
Loss	0.04***	−0.05***	−0.17
	(3.60)	(−3.56)	(−1.59)
Special	−0.02**	−0.05***	−0.39***
	(−2.11)	(−5.25)	(−5.33)
Guide	−0.03***	0.00	−0.18
	(−2.62)	(0.03)	(−1.43)
Q4	0.84***	−0.01	3.48***
	(45.29)	(−0.54)	(21.80)
Broker Size	−0.00***	−0.00**	−0.03***
	(−3.66)	(−2.18)	(−3.26)
Firm Experience	−0.03***	0.02**	−0.17**
	(−7.70)	(2.11)	(−2.48)
#Companies	0.00	0.01**	0.08**
	(1.34)	(2.50)	(2.12)
Firm-Analyst Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
n	651,816	651,816	651,816
Adjusted R^2	49.7%	74.2%	72.6%

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

We retain only the earnings forecasts for a firm's quarter *t*+1 issued in the Timely Window (days 0 and 1 relative to the firm's quarter *t* earnings announcement). We estimate OLS regressions in which the dependent variable is either *#EPS Horizon, #EPS Component,* or *#Total Forecasts*. Standard errors are robust to heteroscedasticity in all models and clustered by analyst. t-statistics are in parentheses.

See Appendix A for variable definitions.

TABLE 6

Analyst Behavior in the Information Discovery Phase when Attention Is Not an Issue

Variables	*#EPS Horizon*	*#EPS Component*	*#Total Forecasts*
Con 1	−0.02*	−0.00	0.05
	(−1.67)	(−0.15)	(0.54)
Con 2	0.00	0.01	0.10
	(0.06)	(0.40)	(0.77)
Con 3	0.02	0.05*	0.28
	(0.81)	(1.73)	(1.49)
Con 4^{+}	0.04	0.04	0.31
	(1.35)	(1.12)	(1.27)
Log(*MVE*)	0.08***	−0.12**	−0.50
	(3.07)	(−2.54)	(−1.62)
Inst. Ownership	0.03	−0.08	0.51
	(0.36)	(−0.94)	(0.69)
Log(1 + *Analysts*)	−0.11**	0.09	0.42
	(−2.40)	(1.45)	(0.85)
B/M	0.13***	−0.20***	−0.58
	(3.26)	(−2.89)	(−1.18)
Turnover	−0.77	0.03	−28.26
	(−0.42)	(0.01)	(−1.54)
Leverage	0.26**	0.06	0.91
	(2.50)	(0.39)	(0.80)
R&D	0.14***	0.00	0.16
	(3.22)	(0.04)	(0.45)
AUE	0.47	−3.02***	−15.59**
	(0.56)	(−3.15)	(−2.16)
Bad News	0.05***	0.01	0.16*
	(5.03)	(0.72)	(1.90)
Loss	−0.01	−0.04**	−0.19
	(−0.48)	(−1.97)	(−1.37)
Special	−0.00	−0.02*	−0.15
	(−0.34)	(−1.83)	(−1.46)
Guide	−0.06***	−0.01	−0.34*
	(−3.20)	(−0.27)	(−1.84)
Q4	0.33***	−0.16***	0.99***
	(16.52)	(−8.05)	(5.78)
Broker Size	−0.00***	0.00	0.00
	(−2.61)	(1.24)	(0.10)
Firm Experience	−0.00	0.02**	0.07
	(−0.61)	(2.29)	(1.13)
#Companies	−0.01***	−0.01	−0.11**
	(−3.62)	(−1.21)	(−2.32)
Firm-Analyst Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
n	418,304	418,304	418,304
Adjusted R^2	43.7%	67.6%	64.9%

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.
This is a placebo test. We examine the thoroughness of earnings forecasts for quarter *t*+1 issued in the 30 trading days before the earnings announcement for quarter *t*+1 ("Information Discovery Phase"). We first identify an earnings forecast for quarter *t*+1 issued in this phase. Then, we recollect *#EPS Horizon, #EPS Component, and #Total Forecasts* at the date of this earnings forecast.
See other notes in Table 5.

TABLE 7

Analyst Activity in Stock Recommendations and Conference Call

Variables	*Timely Recommend*	*OnCall*
Con 1	−0.05***	−0.12***
	(−2.99)	(−5.28)
Con 2	−0.09***	−0.21***
	(−3.82)	(−7.25)
Con 3	−0.16***	−0.27***
	(−4.98)	(−6.85)
Con 4^{+}	−0.24***	−0.35***
	(−6.12)	(−7.67)
Log(*MVE*)	−0.04*	0.08*
	(−1.80)	(1.93)
Inst. Ownership	0.21***	0.20*
	(3.01)	(1.88)
Log(1 + *Analysts*)	0.17***	−0.32***
	(4.85)	(−4.89)
B/M	−0.00	−0.00
	(−0.13)	(−0.01)
Turnover	3.92***	2.32
	(2.77)	(0.97)
Leverage	−0.00	−0.31*
	(−0.04)	(−1.75)
R&D	−0.05	−0.03
	(−1.08)	(−0.15)
AUE	7.24***	1.54
	(7.08)	(0.98)
Bad News	0.24***	−0.01
	(15.71)	(−0.27)
Loss	−0.06***	−0.05
	(−2.76)	(−1.54)
Special	0.00	0.02
	(0.20)	(1.01)
Guide	0.16***	0.02
	(7.03)	(0.58)
Q4	0.03*	−0.00
	(1.76)	(−0.21)
Broker Size	−0.00	0.01***
	(−1.62)	(19.78)
Firm Experience	−0.02***	−0.03
	(−6.30)	(−0.44)
#Companies	−0.00	0.01***
	(−0.57)	(2.88)
Firm-Analyst Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
n	303,417	70,885
LR χ^2	1,102.56***	2,206.03***

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table uses firm-quarter analyst observations to estimate two logit models. The *Timely Recommend* model tests the likelihood of an analyst issuing a stock recommendation in the Timely Window. The *OnCall* model tests the likelihood of an analyst asking a question during the conference call right after quarter *t*'s earnings announcement. The conference call transcripts are obtained from Seeking Alpha for sample years 2005–2014. We lose many of the original 141,538 observations due to firm-analyst fixed effects: 25 percent are dropped because the panel size is 1, and the remaining loss is because of no variation within the panel. z-statistics are in parentheses.

See Appendix A for variable definitions.

for opacity; *AUE* for the magnitude of announced news; *Bad News* for missing analyst expectations; *Loss* for reporting losses; *Special* for reporting special items; *Guide* for the existence of management earnings guidance; and *Q4* for the fourth fiscal quarter.

For this analysis, we use a different fixed effects structure. Our main interest is in an analyst's choices on a given day when she faces multiple earnings announcements in her portfolio. We include earnings announcement date (EAD) fixed effects so that we compare response time for the earnings announcements released on the same day (some are in her portfolio and others are not). We add analyst calendar-quarter fixed effects so that we compare the same analyst's response time for all firms that she covers with a fiscal quarter-end date in the same calendar quarter.[18] Our model is Equation (4).

$$\begin{aligned} Timely = 1 \\ = d_0 + d_1 Log(MVE) + d_2 Inst.\ \ Ownership + d_3 Log(1{+}Analysts) + d_4 Econ\ Importance + d_5 B/M + d_6 Turnover \\ + d_7 Leverage + d_8 R\&D + d_9 AUE + d_{10} Bad\ News + d_{11} Loss + d_{12} Special + d_{13} Guide + d_{14} Q4 \\ + EAD\ Fixed\ Effects + Analyst\ Calendar\text{-}Quarter\ Fixed\ Effects \end{aligned} \tag{4}$$

We estimate the model using OLS in Table 8. Column (1) of Table 8 reports the model estimation. The coefficients on the three visibility factors ($Log(MVE)$, *Inst. Ownership,* and $Log(1 + Analysts)$) are all significantly positive, consistent with H2a. Among the three variables for the economic significance factor, *Relative Cap* is insignificant; *B/M* has a significantly negative coefficient, suggesting that growth firms are more likely to get timely forecasts from Busy Analysts who follow the firm; and *Turnover* has a significantly positive coefficient, suggesting that firms with liquid stocks are more likely to get Busy Analysts' attention. Thus, two of the three variables load as predicted by H2b. Among the eight variables for the news complexity factor, four variables, *Leverage, Special, Guide,* and *Q4,* load as predicted by H2c; three variables, *R&D, Bad News,* and *Loss,* have insignificant coefficients; and *AUE* has the opposite sign as predicted, perhaps because an earnings announcement of a larger magnitude of news naturally draws more attention from analysts.

In Column (2), we add an interaction term between firm size and brokerage size, as well as the main effect of brokerage size for proper interpretation of the interaction, to examine the idea that analysts at small brokerages specialize in small firms, whereas analysts at large brokerages prioritize large firms. The positive coefficient on the interaction term is consistent with this idea.

Overall, these findings suggest that when facing concurrent announcements, an analyst shifts her attention toward firms that are more likely to benefit her or her brokerage and away from firms that, paradoxically, are more likely to benefit from her attention (e.g., small, risky firms with already low attention from sophisticated investors and other analysts).

VI. CONCLUSION

Researchers have started to investigate how the scarcity of resources such as attention can influence information processing in the capital markets. Most of the studies so far use price movements, which are aggregate and indirect measures of individual agents' actions, to conclude whether investors are subject to limited attention. Our study uses *direct* measures of actions to examine whether sophisticated market participants such as financial analysts are also subject to limited attention.

We find strong evidence that analysts' information production is more sluggish and less thorough when they face concurrent announcements within their coverage portfolio than when they only need to analyze a single sample firm's announcement. Moreover, the effect of analysts' limited attention increases with their number of concurrent announcements. Unfortunately for firms that have relatively weak information environments and, therefore, could benefit from analysts' attention, analysts tend to allocate their limited attention to firms that already have rich information environments and present opportunities of commissions and business for the analysts or their brokerages.

We extend the research of limited attention by providing more direct evidence and by expanding evidence to groups that are *ex ante* less susceptible to limited attention. Our study has implications for corporate managers, brokerages, and investors.

[18] We cannot use fixed effects for the firms in her portfolio that announce earnings on the same day (i.e., analyst-EAD fixed effects) to replace the above two types of fixed effects because the panel would be too short.

TABLE 8

Which Firms Are More Likely to Have a Timely Forecast when Analysts Are Busy?

Variables	(1) *Timely*	(2) *Timely*
Log(MVE)	0.01***	0.01***
	(8.31)	(3.61)
*Log(MVE) * Broker Size*		0.00***
		(5.68)
Inst. Ownership	0.02***	0.02***
	(4.56)	(4.70)
Log(1 + Analysts)	0.03***	0.03***
	(8.90)	(9.17)
Relative Cap	0.00	0.00
	(0.92)	(1.13)
B/M	−0.02***	−0.02***
	(−5.64)	(−5.63)
Turnover	0.79***	0.82***
	(6.34)	(6.61)
Leverage	−0.07***	−0.07***
	(−12.12)	(−12.01)
R&D	0.00	0.00
	(0.71)	(0.74)
AUE	0.39***	0.37***
	(3.59)	(3.41)
Bad News	0.00	0.00
	(1.30)	(1.28)
Loss	0.00	0.00
	(1.52)	(1.39)
Special	−0.01***	−0.01***
	(−3.88)	(−3.82)
Guide	0.02***	0.02***
	(10.88)	(10.81)
Q4	−0.01***	−0.01***
	(−2.95)	(−2.98)
Broker Size		−0.00***
		(−4.61)
EAD Fixed Effects	Yes	Yes
Analyst Calendar-Quarter Fixed Effects	Yes	Yes
n	520,779	520,779
Adjusted R^2	34.9%	35.0%

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.
We retain only the first forecast for a firm's quarter *t*+1 issued by Busy Analysts (i.e., those with more than one firm in their coverage portfolio announcing earnings for quarter *t*) after the firm's quarter *t* earnings announcement. We estimate an OLS model, with *Timely* being the dependent variable, and include earnings announcement date (EAD) fixed effects and analyst calendar-quarter fixed effects, with standard errors robust to heteroscedasticity and clustered by analyst. t-statistics are in parentheses.
See Appendix A for variable definitions.

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APPENDIX A

Variable Definitions

Variable		Definition
Variables Measured at the Firm-Quarter Analyst Forecast Level		
Busy	=	1 if the analyst has at least one other firm in her coverage portfolio announcing earnings on the same day as the sample firm (a "concurrent announcement"), and 0 otherwise.
Con Count	=	the number of concurrent announcements. If the sample firm is the only firm in the analyst's portfolio announcing earnings, then the value of *Con Count* is 0.
Con 1, 2, 3, 4^{+}	=	*Con 1, Con 2, Con 3,* and *Con 4*$^{+}$ are separate indicator variables that are equal to 1 if the analyst has exactly one, two, three, and four or more concurrent announcements, respectively, and 0 otherwise.
Timely	=	1 if the analyst issues an earnings forecast for quarter t+1 on the day of or the day after the firm's quarter t earnings announcement date, and 0 if the forecast is released at a later date. "Day" is trading day.
Forecast Lag	=	the difference between the analyst earnings forecast date for quarter t+1 and the earnings announcement date for quarter t. The variable is measured in trading days.
Broker Size	=	the number of analysts employed (i.e., have earnings forecasting activity) by the brokerage with which the analyst is affiliated during the calendar-quarter that includes the fiscal quarter-end date of the sample firm-quarter.
Firm Experience	=	the number of quarters in which the analyst has issued earnings forecasts for the firm by the firm's quarter t earnings announcement date.
#Companies	=	the number of companies for which the analyst issues an earnings forecast during the calendar-quarter that includes the fiscal quarter-end date of the sample firm-quarter.
#EPS Horizon	=	the number of earnings forecasts for different horizons of the sample firm issued by the analyst on the date of her earnings forecast for quarter t+1. The value is 1 if the analyst issues only an earnings forecast for quarter t+1.
#EPS Component	=	the number of types of earnings or earnings component forecasts (e.g., earnings, revenue, cash flow) for the sample firm issued by the analyst on the date of her earnings forecast for quarter t+1. The value is 1 if the analyst issues only the earnings forecast and does not issue any earnings component forecasts.
#Total Forecasts	=	the total number of forecasts, counting each combination of forecast horizon and forecast item separately, for the sample firm issued by the analyst on the date of her earnings forecast for quarter t+1.
Timely Recommend	=	1 if the analyst issues a stock recommendation on the day of or the day after the firm's quarter t earnings announcement date, and 0 otherwise. "Day" is trading day.
OnCall	=	1 if the analyst asked a question during the firm's earnings conference call for quarter t, and 0 otherwise. We measure the variable based on the conference call transcripts gathered from Seeking Alpha and analyzed using Perl.
Relative Cap	=	the firm's market value of common equity (stock price times the number of common shares outstanding) divided by the mean market value of common equity of the other firms for which the analyst issues an earnings forecast during the calendar-quarter that includes the fiscal quarter-end date of the sample firm-quarter.
Variables Measured at the Firm-Quarter Level		
MVE	=	the firm's market value of common equity (stock price times the number of common shares outstanding) at the fiscal end of quarter t.
Inst. Ownership	=	the percentage of institutional holdings based on the most recent 13F institutional ownership report issued before the fiscal end of quarter t. The variable is assumed to be 0 if no data are available in the 13F filings.
Analysts	=	the number of analysts who cover the firm prior to quarter t's earnings announcement, including analysts who will issue forecasts of quarter t+1's earnings and analysts who will skip forecasting quarter t+1, but have forecasted quarter t and will forecast quarter t+2 of the firm. The variable is assumed to be 0 if no data are available in I/B/E/S.
B/M	=	the firm's book-to-market ratio, calculated at the fiscal end of quarter t (book value of common equity divided by the market value of equity).
Turnover	=	the average daily turnover (trading volume divided by the number of shares outstanding) over the 250 calendar days before the fiscal end of quarter t.
Leverage	=	long-term liabilities plus long-term debt due in the coming 12 months at the fiscal end of quarter t scaled by total assets on the same date.
R&D	=	research and development expenses for quarter t divided by net sales in the quarter. Following Koh and Reeb (2015), we replace missing values with the two-digit SIC industry median of R&D Intensity in the same year. If the latter is also missing, then we then set the variable to 0.

(continued on next page)

APPENDIX A (continued)

Variable		Definition
UE	=	the earnings surprise for quarter *t,* scaled by the stock price at the fiscal end of quarter *t*. Earnings surprise is the difference between the firm's realized earnings in I/B/E/S and the most recent analyst forecast before quarter *t*'s earnings announcement date (we use the mean if there are multiple forecasts on that day).
AUE	=	the absolute value of *UE*.
Bad News	=	1 if the firm's realized earnings for quarter *t* as recorded in I/B/E/S are less than the most recent analyst forecast before quarter *t*'s earnings announcement (we use the mean if there are multiple forecasts on that day), and 0 otherwise.
Special	=	1 if the firm reports non-zero special items for fiscal quarter *t,* and 0 otherwise, according to Compustat.
Loss	=	1 if the firm's quarter *t* net income before extraordinary items is negative, and 0 otherwise, according to Compustat.
Guide	=	1 if the firm issues earnings guidance on the day of or the day after the firm's quarter *t* earnings announcement date, according to the I/B/E/S Guidance database, and 0 otherwise. "Day" is trading day.
Q4	=	1 if quarter *t* is the fourth fiscal quarter, and 0 otherwise.
Perc Busy	=	the percentage of the firm-quarter's analysts who have at least one concurrent announcement.