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Amanda Aw Zhi Xin YONG

Singapore Management University, aawyong.2018@phdacc.smu.edu.sg

Young Jun CHO

Singapore Management University, yjcho@smu.edu.sg

Holly I. YANG

Singapore Management University, HOLLYYANG@smu.edu.sg

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Do Managers Learn from Analyst Participation in Conference Calls?

Amanda Awyong
aawyong.2018@phdacc.smu.edu.sg
School of Accountancy
Singapore Management University

Young Jun Cho*
yjcho@smu.edu.sg
School of Accountancy
Singapore Management University

Holly Yang
hollyyang@smu.edu.sg
School of Accountancy
Singapore Management University

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Do Managers Learn from Analyst Participation in Conference Calls?

Abstract

While research finds that conference calls are informative to the market and analysts, they can also be informative to managers as analysts' questions can provide a feedback effect. Using a sample of conference call transcripts from 2002 to 2018, we find that greater analyst participation, as measured by the number of words spoken by analysts relative to the number of words spoken by managers during conference calls, is associated with higher accuracy in managers' subsequent earnings forecasts. Cross-sectional tests show that this positive association is more pronounced when managers use more uncertain words in conference calls, when analysts use a more negative tone to question management, and when participating analysts have higher industry expertise. We also employ a topic modeling approach and find that managers are more likely to benefit from conference calls when analysts question management about the company's revenues, margins, customers, or business outlooks. Overall, our results are consistent with analyst participation in conference calls contributing to managerial learning.

JEL Classification: G20; D83; M41

Keywords: conference calls, financial analysts, managerial learning, earnings forecasts

I. Introduction

Prior research on conference calls finds that the question and answer (Q&A) session is the most informative portion of the conference call event, providing incremental information to market participants over the managers' presentation session and accompanying press release (Matusumoto, Pronk, and Roelofsen 2011). This finding has led to several follow-up studies that further examine how analyst behavior or manager-analyst interactions in the Q&A session affect its information content, as captured by stock-price movements during the Q&A session of the call (e.g., Millian and Smith 2017; Chen, Nagar, and Schoenfeld 2018; Mayew, Sethuraman, and Venkatachalam 2020; Rennekamp, Sethuraman, and Steenhoven 2020). Prior studies have also examined how analyst behavior in the Q&A session reflects analysts' information advantages, as measured by analysts' subsequent forecast accuracy (Mayew, Sharp, and Venkatachalam 2013; Millian, Smith, and Alfonso 2017). However, an interesting and important aspect missing from this line of research is the extent to which managers also benefit from questions raised by analysts during the Q&A session. In this study, we examine whether managers also learn from analyst participation in conference calls.¹

Our study is motivated by the role of questions in learning theory, together with extant research in financial economics that suggests managers learn from external parties such as investors. Prior studies provide empirical evidence that managers glean information from investors through stock price or direct interactions with institutional investors (e.g., Luo 2005; Chen, Goldstein, and Jiang 2007; Zuo 2016; Zhang 2020). While these studies focus on informed investors who either trade on private information or have strong incentives to impart their

¹ Throughout the paper, we define participating analysts as analysts asking questions and speaking up during the conference call rather than those merely attending the call. Conference call transcripts do not record the names of analysts who attend but do not "participate" in the call.

knowledge to managers due to their significant stakes in the firm, we argue that managers are also likely to learn from financial analysts seeking answers from managers to disseminate information to investors. Unlike institutional investors searching for private information for trading or advisory purposes, financial analysts are generally viewed as information intermediaries of public information, facilitating information flows from the firm to the market (e.g., Chen, Goldstein, and Jiang 2007). However, it is still conceivable that managers can learn from analysts, as prior studies find that management forecasts are more accurate than analysts' forecasts only about 50% of the time and that the two parties have different information advantages (Ruland 1978; Hutton, Lee, and Shu 2012). To our knowledge, however, no studies provide clear evidence that information can flow from analysts to managers, helping improve corporate decisions.

For managers to learn from outsiders, the theory of managerial learning does not require outsiders to be more informed than managers. Although managers are generally more informed about their firms, as long as the two parties hold different sets of information, managers can learn from outsiders and vice versa (Bond, Edmans, and Goldstein 2012). We thus argue that managers learn from conference calls through their interactions with analysts during the Q&A session as analysts' questions can provide a feedback effect. Prior research suggests that analysts are not equally informed and analysts' questions in conference calls are conditioned on the participants' unique private information (Mayew 2008). Hence, conversations with analysts in conference calls can help reveal analysts' private information, particularly more so after the enactment of Regulation Fair Disclosure (Reg FD), where analysts are not allowed to privately access firm management and thus have to expend more efforts to discover information on their own (Mohanram and Sunder 2006; Wang 2007).

In general, questions can reinforce or change the existing interpretation of certain issues by highlighting gaps in knowledge (Chin and Osborne 2008). Therefore, managerial learning through analyst feedback from conference calls does not necessarily occur only in the middle of conference calls. To the extent that analysts' questions reveal any knowledge gap between managers and analysts, they can further induce managers to reflect on what they know and do not know, prompting managers to collect more information *after* conference calls. Even if there is no knowledge gap between the two parties and analysts' questions contain no information unknown to managers, the questions can still expose managers to alternative standpoints and different interpretations of the common knowledge, helping improve the precision of the information that managers already have or triggering managers to search for new information to confirm or dismiss the analysts' points of view. For example, questions about new technologies or products introduced to the market may alert managers to conduct more research on market trends. Although the firm is already aware of the new technologies or products, the questions can still signal to the manager that their forecasted margins may need to be revised downwards. Even when managers find certain changes in industry landscapes favorable to their firms, to the extent that analysts challenge managers' optimism, interactions with analysts in conferences call can cause managers to revise their beliefs about the firm's prospects.²

Given that private information flowing from analysts to managers is not observable, we use management forecasts to test for the effect on managerial learning. Management forecasts are frequently issued after conference calls and have been used in prior studies to capture managers'

² Luo (2005) finds that the market reaction to an M&A announcement predicts whether the firm later completes the deal, suggesting that learning outsiders' view about the firm's investment plan can induce managers to change the firm's actual investment. Similarly, analyst questions in conference calls can also reveal the market's expectations or concerns about the firm's future investment.

information sets (Zuo 2016). Managers with internal information of higher quality have also been shown to provide forecasts with higher accuracy (Cheng, Cho, and Yang 2018). Therefore, to the extent that questions raised by analysts contain private information sufficient to update managers' beliefs on their firms, the effect from analyst feedback is likely to be reflected in managers' subsequent earnings forecasts. We thus expect to find a significantly positive association between analysts' active participation in conference calls and the accuracy of earnings forecasts issued by managers after the conference calls. However, we may not find the result expected above if financial analysts, as information intermediaries of public information, merely facilitate information flows from managers to the market. Analysts may simply use the Q&A session to clarify issues or may not want to reveal their private information in the public sphere (Brown et al. 2015). Therefore, whether analysts' active participation in Q&As would lead to managerial learning as reflected in managers' subsequent earnings forecasts is an empirical question.

Using a sample of conference call transcripts from 2002 to 2018, we find that analyst participation during the Q&A session, as captured by the total number of words spoken by analysts relative to the total number of words spoken by managers, is significantly associated with higher accuracy of the earnings forecasts first issued at least three days after the conference call.³ The effect is not economically trivial; the improvement in forecast accuracy associated with the increase in analyst participation from the bottom to top decile amounts to more than one-third of the accuracy's interquartile range in our sample. This result is unlikely due to managers learning from stock price from which analysts could also have learned prior to the conference call, because we control for the information embedded in stock price during the days leading up to the

³ The 3-day requirement allows managers to have sufficient time to process the information they obtain during conference calls and update their beliefs on their firms.

conference call.⁴ This result is also robust to controlling for the number of analysts participating in the conference call, the duration of the conference call, and the earnings news released during the conference call, as well as other firm and forecast characteristics that prior studies have shown to be associated with management forecast accuracy. Overall, our result suggests that analysts' questions provide feedback to managers enough to update their beliefs and improve the accuracy of the earnings expectations on their own firms, consistent with managerial learning from analyst participation in conference calls.⁵

We also examine how the effect on managerial learning varies cross-sectionally with manager or analyst characteristics as revealed during the call. First, we expect to find a greater effect on managerial learning when managers are in greater need of learning, i.e., when managers are more uncertain about their firms' outlook and operating environment. Hence, using the Loughran and McDonald (2011) dictionary, we construct a measure of managerial uncertainty based on the proportion of times managers use at least one uncertain word in a sentence during the conference call. We then split our sample into two groups at the median of this variable and find that the positive association between analyst participation and management forecast accuracy documented above is more pronounced for managers who display greater uncertainties in their conversations with analysts. This result suggests that analyst feedback from questions benefits managers more when managers are more uncertain about their own business.

⁴ Managers can also learn from stock price after the conference call. However, learning from stock price after the conference call cannot explain why managers' forecast accuracy varies conditional on analyst participation during the conference call. That said, to the extent that the market also learns from analysts during the conference call, stock price after the conference call may also incorporate analyst information released during the conference call.

⁵ A manager can achieve higher forecast accuracy through earnings management (Kasznik 1999). However, our results are unlikely to be due to earnings management because we do not find a significant relationship between analyst participation and earnings management proxied for by either absolute or signed discretionary accruals (results untabulated). Furthermore, when we split the sample into two groups based on absolute or signed discretionary accruals, we find no significant difference in the effect of analyst participation on forecast accuracy between the two subsamples (results untabulated), ruling out earnings management as a potential explanation for our results.

Second, given that analysts have incentives to please and maintain a good relationship with managers (e.g., Richardson, Teoh, Wysocki 2004; Ke and Yu 2006), managers may find dissident analysts more informative and hence exert more cognitive effort when responding to analysts with a more negative tone. Analysts are more likely to have a negative tone when they disagree with managers' optimism. Thus the negative tone may also motivate managers to gather more information after the call because they see the need to fill in the knowledge gap or to justify the information they divulged during back-and-forth iterations with the analyst. Furthermore, Mayew, Sethuraman, and Venkatachalam (2020) find that managers' conversations with analysts are more informative when analysts are bearish and have longer dialogues with a more negative tone. Accordingly, we expect to find a greater effect on managerial learning when analysts' questions are of more negative tones. Consistent with this expectation, again, using the Loughran and McDonald (2011) dictionary, we find that the positive association between analyst participation and management forecast accuracy documented above is more pronounced for conference calls when analyst tone is more negative than positive.

Third, we expect to find a greater effect of analyst participation on managerial learning when participating analysts have higher industry expertise. Analysts are generally viewed as industry experts and prior research finds that analyst forecast accuracy improves with industry specialization (Clement 1999; Jacob, Lys, and Neale 1999). Mayew, Sharp, and Venkatachalam (2013) find that analysts who participate in conference calls by asking questions possess superior private information relative to those who do not ask questions. We thus reason that analysts who participate in conference calls held by firms in the same industry more often are more likely to have industry expertise or industry-related private information. Consistent with our expectation, we find that the positive association between analyst participation and management forecast

accuracy documented above is more pronounced when analysts have higher expertise in the firm's industry as measured by the number of conference calls in the same industry where the analyst participated and asked questions during the previous year.

We next perform several additional analyses for further insights into our findings. First, to better understand analysts' questions facilitating managerial learning, we use Latent Dirichlet Allocation (LDA), a topic modeling approach that reveals underlying topics discussed based on statistical correlations among words in the conference call transcripts (Blei, Ng, and Jordan 2003; Huang et al. 2018). Our analyses reveal that of the various topics identified by LDA, managers are more likely to benefit from analyst feedback when analysts question management about the company's revenues, margins, customers, or business outlooks.⁶ Second, if managers learn from conference calls, they should be able to provide forecasts after conference calls not only with higher accuracy but also with higher precision. Consistent with this expectation, we find that analyst participation is significantly associated with higher precision of the earnings forecasts first issued at least three days after the conference. Lastly, we find that managers revise their forecasts upwards (downwards) when analysts use a more positive (negative) tone during conference calls, providing further evidence that managers incorporate information from analysts in their forecasts.

An alternative explanation to our finding is that analysts would ask more questions when managers hold superior information or analysts tend to respond more greatly to conference call presentations by high-quality managers. Analyst participation during the conference call would then be a mere reflection of analysts learning from managers. However, information flowing from managers to analysts is unlikely to explain our result since, as discussed above, we find a stronger

⁶ It is important to note that we do not argue that managers acquire firm-specific information, such as revenues, from analysts. The LDA results only suggest that the feedback effect is more facilitated and is so managerial learning when analysts' questions pertain to certain topics.

effect of analyst participation on managers' forecast accuracy when managers are more uncertain and thus are more likely to have a greater need to learn about their business. Although analysts asking questions in conference calls provide analyst forecasts with higher accuracy relative to those not asking questions, the participating analysts' superior forecasting ability does not stem from the information received during the call (Mayew, Sharp, and Venkatachalam 2013). Nonetheless, to further mitigate this concern, we split the sample into two groups based on CEO tenure, a proxy for CEO experience and ability (Milbourn 2003). To the extent that our results are attributable to managers' superior information, we should find a strong effect of analyst participation in a subsample of firms with longer CEO tenure. However, we find the opposite (results untabulated).⁷

In addition, while the analyst literature suggests that financial analysts serve as corporate monitors (e.g., Yu 2008; Irani and Oesch 2013; Chen, Harford, and Lin 2015), the monitoring channel is also unlikely to explain our results. The monitoring story assumes that managers with agency conflicts already know the information but choose not to use the information in forecasting for private benefits. However, this assumption is not very plausible in our setting because managers are unlikely to enjoy private benefits by issuing inaccurate forecasts. Furthermore, Kasznik (1999) suggests that managers have incentives to reduce their forecast errors by managing reported earnings, and Yu (2008) and Irani and Oesch (2013) find that analyst monitoring reduces earnings management. Hence, analyst monitoring, if any, would result in lower, not higher, forecast accuracy. However, to further mitigate this concern, in untabulated analyses, we split the sample into two groups based on governance variables (such as institutional ownership and board

⁷ Moreover, in an untabulated analysis, we continue to find similar results using manager-fixed effects, mitigating the possibility that our results are due to manager-fixed factors (correlated with higher management forecast accuracy) eliciting greater responses from analysts.

independence) and do not find significant differences in the effect of analyst participation on forecast accuracy between the subsamples of high and low agency costs. We also do not find a significant relationship between analyst participation and earnings management (results untabulated), mitigating the possibility that analyst participation in our study simply captures the effect of analyst monitoring.

Our study provides several contributions to the literature. First, we extend the literature on the Q&A session of conference calls by examining the effect of the Q&A on managerial learning. Prior literature has only considered the information content of conference calls to investors and analysts, but our results suggest that information can also flow from analysts to managers through their conversations during the Q&A session. Note that the theory of managerial learning does not require outsiders to know more than managers about the firm, the industry, or even the market (Bond, Edmans, and Goldstein 2012). To the extent that analysts' information is not a pure subset of managers' information, analysts must possess private information not entirely observed by managers and thus managers can learn from analysts. Second, we extend the literature on the managerial learning hypothesis by examining an alternative source of learning. While the existing literature has predominantly focused on investors equipped with private information as external parties that managers can learn from (through either stock price or direct interactions), we extend this growing stream of research by presenting evidence that managers can also learn from financial analysts through the Q&A session of conference calls. Third, we contribute to the studies on the role of financial analysts in corporate behavior. Prior studies find that financial analysts serve as corporate monitors and hence affect the firm's financial reporting and investment decisions (e.g., Yu 2008; Irani and Oesch 2013; Chen, Harfod, and Lin 2015). Adding to this line of literature, our

study further suggests that analysts can influence corporate actions not only through monitoring but also by providing information useful for managerial decisions.

The remainder of the paper is organized as follows. In section two, we review the literature and develop our hypotheses. Section three describes the sample and empirical design. Sections four and five present the results from our analyses. Finally, section six concludes.

II. Literature Review and Hypotheses Development

2.1 Informativeness of Conference Call Q&A Sessions

Prior research finds that conference calls are important disclosure events that generate considerable intraday stock price movements, with most of the movement occurring during the Q&A session (Frankel, Johnson, and Skinner 1999; Matusumoto, Pronk, and Roelofsen 2011). The availability of conference call transcripts and the Loughran and McDonald (2011) dictionary for business text has allowed researchers to further analyze factors that affect the information content of Q&As. For example, Chen, Nagar, and Schoenfeld (2018) measure the linguistic tones of managers and analysts during the Q&A session and find that intraday prices react significantly to analyst tone, but not to management tone. Moreover, the use of complimentary phrases by analysts during the call reflects the nature of the information released during the call, with the amount of praises being positively associated with the firm's earnings surprise and abnormal returns (Millian and Smith 2017). Analysts' stock recommendations and earnings forecasts *before* the call also affect the information content of their conversations with managers. Mayew, Sethuraman, and Venkatachalam (2020) find that analysts with more bearish recommendations and whose forecasts are missed have more informative dialogues with managers during Q&A. They also find that such analysts have longer conversations with more back-and-forth iterations

and also exhibit a more negative tone during conference calls. Overall, the findings from this stream of research suggest that analyst participation, in particular with negative tones, contribute to the informativeness of Q&A sessions.

Another line of research has examined how analyst behavior during conference calls reflects analysts' information advantages. Mayew, Sharp, and Venkatachalam (2013) find that analysts who participate by asking questions during the conference calls issue more accurate and timelier annual forecasts immediately after the call than those who do not participate. However, they do not find any evidence that the superior information held by participating analysts originates from the call, suggesting that participation itself is likely a signal of the participating analyst's information advantage *before* the call. Millian, Smith, and Alfonso (2017) further show that analysts who use more positive tones or praise the firm's management tend to issue earnings forecasts with higher accuracy in the following quarter. Their results suggest that analysts can build a relationship with the firm's management through the use of favorable language during conference calls, which in turn can allow them to better access the management's private information. This result is consistent with management discriminating among analysts during conference calls, where analysts with favorable recommendations are more likely to be allowed to participate and ask questions (Mayew 2008).

2.2 Managerial Learning Hypothesis

The managerial learning hypothesis posits that managers can obtain private information from external parties, such as informed investors, and use that information in their subsequent corporate decisions. One of the channels through which managers learn from investors is stock price because private information discovered by investors can be transmitted in aggregate through

trading into stock price.⁸ For example, Luo (2005) finds a positive correlation between announcement returns and the completion of mergers, suggesting that managers use market feedback to assess the potential of planned acquisitions. Chen, Goldstein, and Jiang (2007) find that the amount of investors' private information in price has a strong positive effect on the sensitivity of investment to stock price, suggesting that private information embedded in stock price guides managers' investment decisions. Investors' private information gleaned from price is also incorporated in managers' forecasting decisions (Zuo 2016). Specifically, Zuo (2016) finds that the sensitivity of forecast revisions to contemporaneous returns is positively associated with investors' private information in price and that the private information also helps improve managers' forecasting accuracy.

Direct interaction with investors is another channel through which managers learn from investors. For example, venture capitalists can play the role of corporate advisors, engaging in many value-adding activities beyond the provision of capital. Bottazzi, Da Rin, and Hellmann (2008) find that hands-on involvement by venture capitalists with prior business experience is significantly associated with a portfolio company's future success, suggesting that active investors help firms succeed by imparting their knowledge and experience to managers through their interactions. Brav et al. (2008) also find that active hedge funds propose strategic, operational, and financial remedies to their target firms, rather than seeking control or being confrontational, indicating that active investors can serve an advisory role. While the above studies suggest that institutional investors with significant stakes in their firms have incentives to impart their knowledge to managers, a recent study by Zhang (2020) suggests that managers also seek

⁸ The idea that market prices aggregate information from investors and can have real effects dates back to Hayek (1945). See Bond, Edmans, and Goldstein (2012) for a review of both the theoretical and empirical evidence on the real effects of financial markets stemming from the informational role of stock price.

interactions with institutional investors to acquire private information. She finds that managers are likely to use information obtained during investor conferences in their subsequent forecasting and trading decisions, consistent with managers actively seeking to learn from institutional investors for private information through direct interactions.

An important point to highlight is that the managerial learning hypothesis does not require outsiders to be more informed than managers. Although managers are in general more informed about their firms than outsiders, they can still learn from outsiders to the extent that they do not have perfect information and, at the same time, the outsiders hold any incremental information relevant to the firm's projects (Bond, Edmans, and Goldstein 2012). Although financial analysts, unlike institutional investors, are known as information intermediaries of public information, prior studies suggest that managers and analysts are likely to have different information advantages (Ruland 1978; Hutton, Lee, and Shu 2012). Moreover, prior research suggests that analysts are not equally informed and analysts' questions in conference calls are often conditioned on analysts' existing unique private information (Mayew 2008). Hence, we reason that managers can also learn from analysts to the extent that analysts hold information not observed by managers. This is likely more so, in particular, after the enactment of Regulation Fair Disclosure (Reg FD), where analysts are not allowed to privately access firm management and thus have to expend more efforts to discover information on their own (Mohanram and Sunder 2006; Wang 2007). Therefore, to the extent that conversations with analysts in conference calls can help reveal analysts' private information, managers can learn from analysts through the questions raised during the conference calls.

In general, questions can reinforce or change the existing interpretation of certain issues by highlighting gaps in their knowledge (Chin and Osborne 2008). Hence, managerial learning

through analyst feedback from conference calls does not necessarily occur only in the middle of conference calls. To the extent that analysts' questions reveal any knowledge gap between managers and analysts, they can further induce managers to reflect on what they know and do not know, prompting managers to collect more information *after* conference calls. Even if there is no knowledge gap between the two parties and analysts' questions contain no information unknown to managers, the questions can still expose managers to alternative standpoints and different interpretations of the common knowledge, helping improve the precision of the information that managers already have or triggering managers to search for new information to confirm or dismiss the analysts' points of view. For example, questions about new technologies or products introduced to the market may alert managers to conduct more research on market trends. Although the firm is already aware of the new technologies or products, the questions can still signal to the manager that their forecasted margins may need to be revised downwards. Even when managers find certain changes in industry landscapes favorable to their firms, to the extent that analysts challenge managers' optimism, interactions with analysts in conferences call can cause managers to revise their beliefs about the firm's prospects.

We hence predict that analyst participation during the Q&A session of conference calls has information content helping update managers' beliefs on their own firms and eliciting managerial learning. While analysts' private information flowing to managers is not observable, to measure the extent to which analyst feedback occurs, we focus on the accuracy of earnings forecasts issued by managers after the conference call. Management earnings forecasts are frequently issued after conference calls and have been used in prior studies to capture managers' information sets (Zuo 2016). Managers with internal information of higher quality have also been shown to provide forecasts with higher accuracy (Cheng, Cho, and Yang 2018). Therefore, to the extent that

information privately discovered by analysts somewhere else prior to the conference call is revealed via their questions or if any back-and-forth iterations with managers prompt managers to collect more information after the conference call, we expect to find higher accuracy of management earnings forecasts subsequent to the conference call. We present H1 as follows:

H1: Analyst participation in the Q&A session of a conference call is positively associated with managers' subsequent forecast accuracy.

However, we acknowledge that managerial learning may not occur from conference calls if financial analysts, as information intermediaries of public information, merely facilitate information flows from managers to the market. Analysts may simply use the Q&A session to clarify issues that managers are already aware of, and managers may also handpick some of their favored analysts to ask questions prepared beforehand (Mayew 2008). Survey evidence from Brown et al. (2019) suggests that investor relation officers sometimes receive the questions in advance so they can develop a “script,” preparing a list of possible questions and answers before the call. Moreover, analysts may not want to reveal their private information in public conference calls and choose to ask managers these questions only in private (Brown et al. 2015). If this is the case, then analyst participation may not provide feedback to managers enough to revise managers' beliefs about their firms. Therefore, whether analysts' active participation in Q&As would lead to managerial learning is an empirical question.

To provide more insights into H1, we now develop hypotheses on cross-sectional variations in the effect of analyst participation. We first examine how the effect varies with the extent to which managers are uncertain about their own business or the overall operating environment. Prior studies find that firms operating under greater volatilities are less likely to issue earnings forecasts or, if they do, the forecasts tend to contain greater errors (e.g., Waymire 1985). Hence, managers

would likely have a greater need to learn or collect information prior to issuing forecasts (to minimize forecast errors and associated costs) when they face higher uncertainties. We reason that managers facing higher uncertainties are more likely to use uncertain words during the conference call. To measure the extent to which managers face uncertainties, we focus on the proportion of times managers use uncertain words during the presentation and Q&A sessions in conference calls. Accordingly, we expect managerial learning from analysts to be greater when managers use more uncertain words during the conference call. H2 is thus stated as follows:

H2: The positive association between analyst participation and managers' subsequent forecast accuracy is more pronounced when managers use more uncertain words during the conference call.

We also examine how the effect varies with analysts' tone during the Q&A session. Given that analysts have incentives to please and maintain a good relationship with managers (e.g., Richardson, Teoh, Wysocki 2004; Ke and Yu 2006), managers may find dissident analysts more informative and hence exert more cognitive effort when responding to analysts with a more negative tone. Analysts are more likely to have a negative tone when they disagree with managers' optimism. Hence the negative tone may also motivate managers to gather more information after the call because they see the need to fill in the knowledge gap or to justify the information they divulged during back-and-forth iterations with the analyst. Furthermore, Mayew, Sethuraman, and Venkatachalam (2020) find that managers' conversations with analysts are more informative (as evidenced by a stronger market reaction) when analysts are bearish in stock recommendations while issuing unbeatable forecasts. They also find that such analysts tend to engage in longer dialogues with a more negative tone. Hence, we expect managerial learning from analysts to be

greater when analysts use a more negative tone during the Q&A sessions.⁹ We thus present H3 as follows:

H3: The positive association between analyst participation and managers' subsequent forecast accuracy is more pronounced when analysts use a more negative tone during the conference call.

Last, we examine whether analyst participation has a greater effect on managerial learning when analysts have higher industry expertise. Analysts are generally viewed as industry experts and prior research finds that analyst forecast accuracy improves with industry specialization (Clement 1999; Jacob, Lys, and Neale 1999). Hence, the potential for managers to learn from analysts would also be higher as participating analysts have higher expertise in the firm's industry. Mayew, Sharp, and Venkatachalam (2013) find that analysts who participate in conference calls by asking questions possess superior private information relative to those who do not ask questions. We thus reason that analysts who participate in conference calls held by firms in the same industry more often are more likely to have industry-related private information. To capture an analyst's industry expertise, therefore, we rely on the number of conference calls in the same industry where the analyst participated and asked questions prior to the current conference call. Accordingly, we expect managerial learning from conference calls to be greater when participating analysts exhibit greater expertise in the industry as signaled by their previous participation in conference calls in the same industry. We thus present H4 as follows:

H4: The positive association between analyst participation and managers' subsequent forecast accuracy is more pronounced when a higher number of industry experts participate in the conference call.

⁹ Millian, Smith, and Alfonso (2017) suggest that analysts using more positive tones during conference calls have better access to managers' private information. Their results imply that analysts with more negative tones are more likely to hold information discovered independently of and thus unknown to managers.

III. Sample and Research Design

3.1 Data and Sample

We collect data from several sources: conference call transcripts from Thomson Reuters, financial data from Compustat, stock price and return data from CRSP, institutional holdings data from Thomson Reuters Institutional (13F) Holdings, and management forecasts and analysts following from I/B/E/S. Our sample construction begins with conference calls pertaining to quarterly earnings held by U.S. firms between 2002 and 2018, where at least one manager or analyst is identified. Excluding pre-announcements (i.e., EPS forecasts issued after the forecast period-end), we identify the earliest EPS forecast issued by managers for each forecast period at least 3 days subsequent to the conference call. We require a minimum of 3 days between a conference call and the forecast date to allow managers to have sufficient time to process what they hear from the conference call and update their beliefs on their firms.

More specifically, in Figure 1, which shows the timeline of events from the end of the previous quarter ($t-1$) to the release of the current quarter's (t) result, the EPS forecasts we use in our study are Forecast 2 for qtr t and Forecast 1 for qtr $t+1$. Forecast 1 for qtr t is not selected for our sample because the forecast is issued on the date of the conference call. This forecast is not likely to have been affected by conversations with analysts during the conference call. Forecast 3 for qtr t is also not included in our sample because we only use the earliest forecast issued after the conference call for each forecast period to ensure that managerial learning is attributable to analyst participation during the conference call.

[Insert Figure 1]

Our final sample consists of 54,492 management earnings forecasts issued first subsequent to conference calls for each forecast period after excluding observations with missing variables

required in our main specification.¹⁰ Table 1 provides the distribution of our sample by year in which the forecast is released. There are much fewer observations for forecasts released in 2002 because the transcripts of conference calls in 2001 (following which managers issue forecasts in 2002) are limited. Other than the forecasts in 2002, management forecasts are mostly evenly distributed across the years in our sample.

[Insert Table 1]

3.2 Research Design

We examine the relationship between analyst participation during conference calls and subsequent management forecast accuracy using the following OLS model with firm- and year-fixed effects:

$$\begin{aligned}
 Accuracy = & \alpha_1 AnalystWC + \alpha_2 NumParticipants + \alpha_3 TotalWC + \alpha_4 RetEA \\
 & + \alpha_5 EarningsSurp + \alpha_6 Ret90D + \alpha_7 Size + \alpha_8 Following + \alpha_9 InstOwn \\
 & + \alpha_{10} RetVol + \alpha_{11} MTB + \alpha_{12} ROA + \alpha_{13} Loss + \alpha_{14} Horizon \\
 & + \Sigma Firm FE + \Sigma Year FE + \varepsilon
 \end{aligned} \tag{1}$$

The dependent variable is *Accuracy*, which represents forecast accuracy of the earliest management forecast released at least three days after the conference call. *Accuracy* is measured as $(-1) \times$ forecast error, where forecast error is the absolute difference between management forecast (annual or quarterly) and actual EPS, scaled by the stock price as at the beginning of the fiscal quarter. For comparability between annual and quarterly forecasts, we multiply quarterly forecasts by four in calculating *Accuracy*. The variable of interest is *AnalystWC*, our measure of analyst participation, which is defined as the total number of words spoken by analysts divided by the total number of words spoken by managers in each conference call, then scaled by 100. If

¹⁰ Given that we use firm-fixed effects, we also remove firms issuing the earnings forecast only once throughout our sample period.

analyst participation provides a feedback effect such that managers are able to provide forecasts of higher accuracy, we should find a significantly positive coefficient on α_1 in equation (1).

When it comes to control variables, we first include a set of factors shaping the characteristics of conference calls, such as *NumParticipants*, *TotalWC*, *RetEA*, *EarningSurp*, and *Ret90D*. *NumParticipants* refers to the number of unique analysts who speak up during the call. The mere presence of more analysts who just talk a bit can increase *AnalystWC* but may not facilitate information flows from analysts to managers during the conference call. Hence, to tease out active participation from the mere presence, we control for *NumParticipants*. We also control for *TotalWC*, the total number of words (in thousands) spoken during the call by all parties. This variable captures the duration of the conference call, which bounds the amount of information that can be exchanged between managers and analysts. *RetEA* is earnings announcement returns, measured over the 3-day window around the conference call date, and *EarningSurp* is the earnings surprise of the quarterly earnings presented during the conference call, defined as the actual EPS minus the median of prevailing analyst forecasts, scaled by the stock price as at the beginning of the fiscal quarter.¹¹ We include *RetEA* and *EarningSurp* as control variables as these variables capture the nature of the news released to the markets by the conference call. We also control for *Ret90D*, stock returns compounded for 90 days leading up to the conference call, as a proxy for the news impounded in stock price and publicly available prior to the conference call.¹² To the extent that the public information released during or prior to the conference call prompts analysts (managers) to speak more during the conference call, *RetEA*, *EarningSurp*, and *Ret90D* are expected to be positively (negatively) correlated with *AnalystWC*.

¹¹ In our sample, all conference calls pertain to quarterly earnings announcement.

¹² Following Zuo (2016), we use raw returns instead of market-adjusted or industry-adjusted returns because managers can also learn from market and industry returns.

We also include a set of firm characteristics generally used in prior work in the management forecast literature. We include *Size*, *Following*, and *InstOwn* to control for a firm's general information environment (e.g., Ajinkya, Bhojraj, and Sengupta 2005): *Size* is the natural logarithm of the firm's market value as at the end of the previous fiscal quarter; *Following* is the number of unique analysts who issued at least one forecast for the firm during the previous fiscal quarter; *InstOwn* is the percentage of the firm's shares held by institutional owners as at the end of the previous fiscal quarter. In addition, we control for *RetVol* since forecasting would be more difficult when the operating environment is more volatile (Waymire 1985). We define a firm's *RetVol* as the standard deviation of the firm's returns measured over the previous fiscal quarter. We also include *MTB*, the firm's market-to-book ratio as at the end of the previous fiscal quarter, to control for the effect of growth opportunities. Facing higher growth opportunities, firms have greater incentives to provide forecasts of higher quality.

Moreover, a firm's disclosure choice can be influenced by the firm's contemporaneous accounting performance (Miller 2002). Hence, we control for *ROA* and *Loss*. *ROA* is the return-on-assets ratio for the current fiscal quarter, and *Loss* is an indicator variable for loss occurrence. We also control for *Horizon* because managers can issue more accurate forecasts as they are closer to the forecast period-end. In addition, since our sample includes both annual and quarterly forecasts, we further include *Annual* as a control variable to account for potential differences between annual and quarterly forecasts. *Annual* equals one for annual forecasts and zero for quarterly forecasts. Finally, we include firm- and year-fixed effects to control for unobservable firm-specific or year-wide factors affecting forecast accuracy.¹³

¹³ While we control for a broad range of firm and conference call characteristics, we also note a possibility that *AnalystWC*, our variable of interest, can also be determined by manager-specific factors, which in turn can affect

3.3 Descriptive Statistics

Panel A of Table 2 presents the summary statistics of the key variables used in our main analyses. The mean of *Accuracy* is -0.0133, suggesting that the deviation of forecasted EPS from actual EPS amounts to 13.3% of the firm's stock price as at the beginning of the fiscal quarter. The mean of *AnalystWC* is 0.0024, implying that nearly 20% of the time in a conference call is allocated to analysts in our sample. The interquartile range of this variable is 0.0011 from P25 to P75, exhibiting nontrivial variations in analyst participation across conference calls. The mean of *NumParticipants* (i.e., the number of analysts participating in the conference call) is 7.671, lower than the mean of *Following* (i.e., the number of analysts following the firm), consistent with not all analysts following the firm speaking up during the conference call (Mayew, Sharp, and Venkatachalam 2013). *TotalWC* has a mean of 7.946, suggesting that a total of 7,946 words are spoken, on average, by all participants in our conference calls. The conference calls in our sample are also characterized with earnings announcement returns of 0.0049 (*RetEA*), earnings surprises of 0.0052 (*EarningSurp*), and 90-day prior returns of 0.0404 (*Ret90D*), on average.

When it comes to firm characteristics, the mean of *Size* is 7.836, equivalent to a market value of \$2,530 million. Furthermore, the average firm in our sample is followed by 10 analysts (*Following*) with institutional ownership of 80 percent (*InstOwn*), and has return volatility (*RetVol*), market-to-book (*MTB*), and return-on-assets (*ROA*) of 0.022, 3.879 and 0.014, respectively. This table also shows that 16% of our sample firms experience losses (*Loss*). The mean of *Horizon* is 5.27, implying that our sample firms on average issue earnings forecast roughly 194 days prior to

management forecast accuracy. For example, a manager with certain traits may persistently speaks more than listen during the Q&A session. In an untabulated analyses, we include manager-fixed effects and find consistent results.

the forecast period-end, while 58% of the earnings forecasts in our sample are annual forecasts (*Annual*).

Panel B of Table 2 presents the Pearson correlation coefficients between the variables used in our main specification. We find that *Accuracy* is positively correlated with *AnalystAC*, but the correlation falls short of conventional significance before we take into account other factors likely affecting the relationship between the two variables. However, *Accuracy* is significantly positively correlated with *NumParticipants*, *TotalWC*, *RetEA*, and *Ret90D* while significantly negatively correlated with *EarningSurp*. This result is consistent with managers issuing more accurate forecasts subsequent to a conference call characterized with more participating analysts, longer duration, and more positive market reactions during and prior to the conference call, but issuing less accurate forecast subsequent to a conference call where announced earnings have a more positive earnings surprise. Furthermore, consistent with prior research in the management forecast literature, we find that *Accuracy* is significantly positively correlated with *Size*, *Following*, *InstOwn*, *MTB*, and *ROA*, while significantly negatively correlated with *RetVol*, *Loss*, and *Horizon*.^{14, 15}

[Insert Table 2]

IV. Empirical Results

4.1 Main Results: Analyst Participation and Management Forecast Accuracy

¹⁴ *Accuracy* is also significantly positively correlated with *Annual*, but we later find a significantly negative effect of *Annual* on *Accuracy* in multivariate analyses.

¹⁵ *AnalystWC* does not show a significant correlations with control variables. We are not sure about why this is the case, but we only conjecture that this is possibly because changes in control variables would similarly affect the numerator (i.e., the number of words spoken by analysts) and the denominator (i.e., the number of words spoken by managers) of this variable at the same time.

Table 3 presents the results from estimating equation (1). In column (1), we find that the coefficient on *AnalystWC* is 0.0009, significantly positive at the 1% level, consistent with higher analyst participation during the Q&A session in conference calls being associated with the increase in managers' subsequent forecast accuracy. In column (2), for ease of interpretation, we replace *AnalystWC* with *AnalystWC(Deciles)*, a decile-ranked measure of *AnalystWC*, standardized to take values ranging from 0 to 1. We find that the coefficient on *AnalystWC(Deciles)* is 0.0028, significantly positive at the 5% level. This coefficient implies that the improvement in forecast accuracy associated with the increase in analyst participation from the bottom to the top decile of *AnalystWC* amounts to more than one-third of the accuracy's interquartile range in our sample (i.e., 0.0080 as inferred from Table 2). Interestingly, the coefficient on *NumParticipants* is significantly negative in both columns (1) and (2), suggesting that the mere presence of more analysts participating in conference calls does not improve analyst feedback and even impair managerial learning, consistent with not all analysts being equally well-informed. The signs of other control variables are overall consistent with prior research. For example, we find significantly positive coefficients on *Size*, *InstOwn*, and *ROA* and significantly negative coefficients on *RetVol*, *Loss*, *Horizon*, and *Annual* in both columns (1) and (2).¹⁶ Overall, the results in Table 3 are consistent with our H1 that greater analyst participation in Q&A is positively associated with managers' subsequent forecast accuracy.

[Insert Table 3]

4.2 Cross-Sectional Tests: Role of Managerial Uncertainty

¹⁶ We also find that the coefficient on *Following* is significantly negative. This result is consistent with Yu (2008) and Irani and Oesch (2013) suggesting a negative association between analyst coverage and earnings management. To the extent that analyst coverage reduces earnings management, it can also decrease management forecast accuracy.

Table 4 presents the results from our test of H2, where we predict the effect of analyst participation on managerial learning to be more pronounced for managers that use more uncertain words during conference calls. Using the Loughran and McDonald (2011) dictionary, we construct a measure of managerial uncertainty based on the proportion of times managers use at least one uncertain word in a sentence during the conference call. We then split the sample at the median of this variable and re-estimate equation (1) separately for the two sub-samples. The results for the higher managerial uncertainty subsample are presented in column (1), where we find a significantly positive coefficient on *AnalystWC* (coefficient of 0.1371 significant at the 1% level). The results for the lower managerial uncertainty subsample are presented in column (2), where we also find a significantly positive coefficient on *AnalystWC* (coefficient of 0.0009 significant at the 5% level). However, a Chow test for the difference in the coefficients between columns (1) and (2) suggest that the magnitude of the coefficient on *AnalystWC* is significantly greater in column (1) for the higher managerial uncertainty subsample than in column (2) for the lower managerial uncertainty subsample at the 5% level. Consistent with H2, the results from this cross-sectional test suggest that analyst participation benefits managers more when managers have a greater need to learn, i.e., when they are more uncertain about their own business or the operating environment and hence use more uncertain words during the conference call.

[Insert Table 4]

4.3 Cross-Sectional Tests: Role of Analyst Tone

Table 5 presents the results from our test of H3, where we predict the effect of analyst participation on managerial learning to be more pronounced when analysts use a more negative tone. Again, using the Loughran and McDonald (2011) dictionary, we classify each word used by analysts during the Q&A session in a conference call as a positive or negative word and assign the

conference call to a subsample with a positive (negative) analyst tone if the number of positive (negative) words spoken by analysts exceeds the number of negative (positive) words spoken by analysts. We then re-estimate equation (1) separately for the subsample of conference calls with a positive and negative analyst tone. The results for the positive analyst tone subsample are presented in column (1), where we find a significantly positive coefficient on *AnalystWC* (coefficient of 0.0008 significant at the 1% level). The results for the negative analyst tone subsample are presented in column (2), where we also find a significantly positive coefficient on *AnalystWC* (coefficient of 0.3441 significant at the 1% level). However, a Chow test for the difference in the coefficients between columns (1) and (2) suggests that the magnitude of the coefficient on *AnalystWC* is significantly greater in column (2) for the negative analyst tone subsample than in column (1) for the positive analyst tone subsample at the 5% level. Consistent with H3, the results from this cross-sectional test suggest that managers benefit more from analyst participation when analysts use a more negative tone.

[Insert Table 5]

4.4 Cross-Sectional Tests: Role of Analyst Industry Expertise

Table 6 presents the results from our test of H4, where we predict the effect of analyst participation on managerial learning to be more pronounced when a higher number of industry experts participate in conference calls. To identify an industry expert, for each analyst, we count the number of conference calls held by firms in the same industry (based on 2 digit SIC) where the analyst attended and asked questions during the previous year. We regard an analyst as an industry expert if the analyst attended the industry calls more times than the median number of attendance across all analysts during the same year in our conference call transcripts. We then split the sample into two groups based on the number of industry experts participating in each conference call. In

column (1), when we re-estimate equation (1) for a subsample with high industry expertise (where the number of participating industry experts are higher than the sample median during the year), we find a significantly positive coefficient on *AnalystWC* (coefficient of 0.2722 significant at the 5% level). Also, in column (2), for a subsample with low industry expertise (where the number of participating industry experts are lower than or equal to the sample median during the year), we continue to find a significantly positive coefficient on *AnalystWC* (coefficient of 0.0008 significant at the 1% level). However, a Chow test for the difference in the coefficients between columns (1) and (2) suggest that the magnitude of the coefficient on *AnalystWC* is significantly greater in column (1) for the high industry expertise subsample than in column (2) for the low industry expertise subsample at the 1% level. Consistent with H4, the results from this cross-sectional test suggest that analyst participation benefits managers more when participating analysts have higher industry expertise.

[Insert Table 6]

V. Additional Analyses

5.1 LDA Topics

To better understand analysts' questions facilitating managerial learning, we use a topic modeling approach (Latent Dirichlet Allocation or LDA). Reducing the dimensionality of textual data from words to topics, LDA allows us to classify the sentences spoken by analysts into various topics while not requiring researchers to pre-specify rules or keywords for the underlying topics. More specifically, we start with 37,979 transcripts of conference calls after which managers in our

sample issued earnings forecasts.¹⁷ Before applying the LDA algorithm, we pre-process the corpus of transcripts by removing numbers, punctuations, symbols, hyperlinks, and splitting words that are joined together with hyphens. We require each word to appear at least 10 times throughout the transcript to minimize the cases where words are obscure and difficult to categorize. Setting the total number of topics at 60, we let the LDA generate a cluster of words for each topic together with the probabilities that these words are related to each topic.¹⁸ Using this matrix of word probabilities for each topic, we follow Huang et al. (2018) and assign each analyst sentence to one of 60 topics based on the probabilities that the words in the sentence are related to the topic. We then create 60 topic variables for each conference call, labeled *Topic_N* (where *N* is one of the numbers from 1 to 60), defined as the number of words in analyst sentences assigned to topic *N* divided by the total number of words spoken by analysts during the conference call, further standardized to take values ranging from 0 to 1.

Similar to the empirical approach used in Brown, Crowley, and Elliott (2020), we first estimate 60 regressions separately for each of 60 topics and identify topic variables (*Topic_N*) whose interaction with analyst participation is significantly positive for forecast accuracy. We thus come up with 9 topics, such as topics 1, 9, 13, 24, 29, 33, 39, 51, and 52. We next include all these 9 topics and their interactions with analyst participation in a single regression at the same time to see which topics remain significant. Table 7 presents the results from this regression, where *Analyst Participation* refers to *AnalystWC* and *AnalystWC(Deciles)* in columns (1) and (2), respectively. We first find that the interaction of *Analyst Participation* with *Topic₂₄* is

¹⁷ The number of conference call transcripts we analyze is smaller than the number of our sample forecasts because we include multiple forecasts with different forecast periods issued after the same conference call.

¹⁸ Increasing the number of topics up to 60 improves the diagnostic values for our LDA model (i.e., held-out likelihood and residuals) but does not do so significantly after 70. We choose 60 instead of 70 topics to be consistent with similar research employing LDA for conference call transcripts (e.g., Huang et al. 2018).

significantly positive in both columns (1) and (2), suggesting that managers tend to issue more accurate forecasts subsequent to a conference call where analysts ask and talk more about topic 24. While we do not have an *ex-ante* prediction on what this topic would be, a group of top words for topic 24, as generated by LDA and disclosed in Appendix B, includes “quarter”, “gross”; “question”; “margin”, “custom”, “revenue”, and “busi”. Hence we infer from this analysis that managerial learning is more facilitated after conference calls when analysts are more inquisitive (or possibly more disagreeable with managers’ assessments) about the company’s revenues, margins, customers, or business outlooks during conference calls.

We also find that in column (1), the interactions of *Analyst Participation* with *Topic_33* and *Topic_52* are significantly positive (while they are not so in column (2)). Again, as disclosed in Appendix B, topic 33 includes a group of top words, such as “question”, “advertis”, “revenue”, “market”, “media”, and “talk”, with which analysts ask how the company’s marketing or advertising strategies can help generate future revenues. Also, in topic 52, with using top words such as “question”, “trial”, “data”, “patient”, “studi”, “phase”, and “take”, analysts question the company’s ongoing R&Ds, such as clinical trials, and try to assess how likely they would succeed. Taken together, these results are consistent with managers benefiting from analysts’ questions or doubts when the inquiries prompt managers to reflect on their business strategies or the status of the development of new products.

[Insert Table 7]

5.2 Forecast Precision

If managers learn from conference calls, they should be able to provide forecasts not only with higher accuracy but also with higher precision after conference calls. We, therefore, estimate equation (1) again by replacing *Accuracy* with *Precision* as the dependent variable. *Precision*

refers to forecast precision of the earliest management forecast released at least three days after the conference call, defined as $(-1) \times$ the absolute difference between the upper- and lower-bound of the forecast, scaled by the stock price as at the beginning of the fiscal quarter, for range forecasts, and zero for point forecasts. Table 8 presents the results from the regression of *Precision*. In column (1), we find that the coefficient on *AnalystWC* is significantly positive (coefficient of 0.0002 at the 1% level), consistent with higher analyst participation during the Q&A session in conference calls being associated with the increase in managers' subsequent forecast precision. In column (2), when we replace *AnalystWC* with *AnalystWC(Deciles)*, we continue to find a significantly positive coefficient on *AnalystWC(Deciles)* (coefficient of 0.0006 at the 1% level). This coefficient implies that the improvement in forecast precision associated with the increase in analyst participation from the bottom to the top decile of *AnalystWC* amounts to 20% of the precision's interquartile range in our sample (i.e., -0.003, untabulated). Hence, similar to Table 3, the results in Table 8 also suggest that managers learn from conference calls as evidenced by managers' subsequent earnings forecast properties.

[Insert Table 8]

5.3 Analyst Tone and Forecast Revision

To provide further evidence that information flows from analysts to managers, we examine how managers' forecast revisions are associated with analyst sentiment as revealed during the Q&A session in conference calls. More specifically, we expect managers to revise their forecasts upwards (downwards) after conference calls where analysts use more positive (negative) language. We use the following equation to examine the relation between analyst tone and management forecast revisions:

$$\begin{aligned}
Revision = & \beta_1 NetTone + \beta_2 NumParticipants + \beta_3 TotalWC + \beta_4 RetEA \\
& + \beta_5 EarningsSurp + \beta_6 Ret90D + \beta_7 Size + \beta_8 Following + \beta_9 InstOwn \\
& + \beta_{10} RetVol + \beta_{11} MTB + \beta_{12} ROA + \beta_{13} Loss + \beta_{14} Horizon \\
& + \Sigma Firm FE + \Sigma Year FE + \varepsilon
\end{aligned} \tag{2}$$

Revision is the signed difference between the first management forecast issued after the conference call and the last management forecast issued before the conference call (for the same forecast period), scaled by stock price as at the beginning of the fiscal quarter. *NetTone* is the number of positive words minus the number of negative words spoken by analysts, as classified by the Loughran and McDonald (2011) dictionary, scaled by the total number of words spoken by analysts. If managers revise forecasts incorporating the sentiment in analysts' questions, we should find a significantly positive coefficient on β_1 .

In addition, to separately examine the effect of positive and negative words from analysts, we estimate the following equation:

$$\begin{aligned}
Revision = & \gamma_1 PositiveTone + \gamma_2 NegativeTone + \gamma_3 NumParticipants + \gamma_4 TotalWC \\
& + \gamma_5 RetEA + \gamma_6 EarningsSurp + \gamma_7 Ret90D + \gamma_8 Size + \gamma_9 Following \\
& + \gamma_{10} InstOwn + \gamma_{11} RetVol + \gamma_{12} MTB + \gamma_{13} ROA + \gamma_{14} Loss + \gamma_{15} Horizon \\
& + \Sigma Firm FE + \Sigma Year FE + \varepsilon
\end{aligned} \tag{3}$$

PositiveTone (*NegativeTone*) is the number of positive (negative) words spoken by analysts, as classified by Loughran and McDonald (2011), scaled by the total number of words spoken by analysts. Hence, to the extent that managers incorporate analysts' sentiment during the conference call in their forecasts, we expect to find a significantly positive coefficient on γ_1 but a significantly negative coefficient on γ_2 . Control variables used in equations (2) and (3) are the same as those used in equation (1) discussed earlier.

In Table 9, columns (1) and (2) report the results from estimating equations (2) and (3), respectively. In column (1), we find that the coefficient of *NetTone* is significantly positive (coefficient of 0.1301 at the 1% level), consistent with managers revising their forecasts upwards after a conference call when analysts use more words with a positive tone than words with a negative tone in conference calls. Also, in column (2), we find a significantly positive coefficient on *PositiveTone* (0.1094 at the 1% level) but a significantly negative coefficient on *NegativeTone* (-0.1603 at the 1% level), suggesting that managers revise their forecasts not only upwards when the analyst tone is positive but also downwards when negative. When it comes to control variables, we find that the coefficients on *RetEA*, *EarningSurp*, and *Ret90D* are all significantly positive in both columns (1) and (2), consistent with managers revising their forecasts upwards (downwards) when there is more good (bad) news. Overall, the results in Table 9 provide further evidence that information flows from analysts to managers and hence affects managers' earnings forecasts.

[Insert Table 9]

VI. Conclusion

We examine whether analysts' questions in conference calls provide a feedback effect and contribute to managerial learning. While the extant literature suggests that managers learn from external parties such as informed investors (through stock price or direct interactions), we are not aware of any evidence that managers also learn from financial analysts. Unlike investors searching for private information for trading or advisory purposes, financial analysts are generally viewed as information intermediaries of public information, facilitating information flows from the firm to the market (e.g., Chen, Goldstein, and Jiang 2007). Hence, whether managers can also learn from financial analysts is an empirical question.

Using a sample of conference call transcripts from 2002 to 2018, we find that analyst participation during the Q&A session, as captured by the total number of words spoken by analysts relative to the total number of words spoken by managers, is associated with higher accuracy of earnings forecasts issued after the conference call. We also find that the effect of analyst participation on forecast accuracy is more pronounced when managers display greater uncertainties during the conference call, when analysts use more negative tones in their dialogues with managers, and when participating analysts have higher industry expertise. A textual analysis of analysts' questions suggests that managers benefit more from analysts' questions when analysts inquire about the company's revenues, margins, customers, or business outlooks during conference calls.

Overall, our study extends the literature on the Q&A session of conference calls. While prior studies generally suggest that information flows from firms to investors during conference calls, our results suggest that information can also flow from analysts to managers through their conversations during the Q&A session. We also extend the literature on the managerial learning hypothesis. While the existing literature has predominantly focused on informed investors as external parties that managers can learn from (through either stock price or direct interactions), we provide evidence that managers can also learn from financial analysts. Lastly, while prior studies find that financial analysts serve as corporate monitors and hence affect the firm's financial reporting and investment decisions, our study further suggests that analysts can influence corporate behavior by providing information useful for managerial decisions.

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Appendix A – Variables Definition

Variables in Main Analyses

<i>Accuracy</i>	The absolute difference between management forecast and actual EPS, scaled by the stock price as at the beginning of the fiscal quarter, multiplied by negative one.
<i>AnalystWC</i>	The total number of words spoken by analysts divided by the total number of words spoken by managers, then divided by 100.
<i>AnalystWC (Deciles)</i>	Decile rankings of <i>AnalystWC</i> based on its distribution each year, then standardized to take a value between 0 and 1.
<i>NumParticipants</i>	The number of unique analysts who speak up at least once during the conference call.
<i>TotalWC</i>	The total number of words in call (in thousands).
<i>RetEA</i>	Stock returns over the 3-day window around the conference call date when the firm's quarterly earnings are announced.
<i>EarningSurp</i>	Earnings surprise of the quarterly earnings presented during the conference call, defined as the actual EPS minus the median of prevailing analyst forecasts, scaled by the stock price as at the beginning of the fiscal quarter.
<i>Ret90D</i>	90-day compounded stock returns leading up to 1 day before the conference call.
<i>Size</i>	Natural logarithm of the market value of common equity (i.e., the number of shares outstanding multiplied by stock price) as at the end of the previous fiscal quarter.
<i>Following</i>	The number of unique analysts that have issued at least one forecast for the firm during the previous fiscal quarter.
<i>InstOwn</i>	Percentage of the firm's shares held by institutional investors as at the end of the previous fiscal quarter.
<i>RetVol</i>	The standard deviation of daily stock returns measured over the previous fiscal quarter.
<i>MTB</i>	Market-to-book ratio, defined as the market value of common equity (i.e., the number of shares outstanding multiplied by

	stock price) divided by the book value of common equity as at the end of the previous fiscal quarter.
<i>ROA</i>	Return on assets, defined as the income before extraordinary items in the current fiscal quarter divided by the total assets as at the end of the previous fiscal quarter.
<i>Loss</i>	A binary variable that equals one if the income before extraordinary items is negative in the current fiscal quarter, and zero otherwise.
<i>Horizon</i>	The natural logarithm of the number of days between the forecast date and the forecast period-end date.
<i>Annual</i>	A binary variable that equals one if the management forecast is for annual earnings, and zero if the management forecast is for quarterly earnings.

Variables in Cross-Sectional Analyses

<i>Managerial Uncertainty</i>	The number of managers' sentences including at least one uncertain word, as classified by Loughran and McDonald (2011), divided by the total number of managers' sentences during the conference call. In a cross-sectional analysis, we split the sample into two groups based on the median value of managerial uncertainty in our sample distribution each year.
<i>Analyst Tone</i>	Either "positive" or "negative". Analyst tone is positive (negative) if the total number of positive (negative) words spoken by analysts exceeds the total number of negative (positive) words spoken by analysts, as classified by Loughran and McDonald (2011), during the conference call.
<i>Industry Expertise</i>	The number of conference calls held by firms in the same industry (based on 2 digit SIC) where the analyst attended and asked questions during the previous year. We regard an analyst as an industry expert if the analyst attended the industry calls more times than the median number of attendance across all analysts during the same year in our conference call transcripts. In a cross-sectional analysis, we split the sample into two groups based on the median number of industry experts participating in the conference call in our sample distribution each year.

Variables in Additional Analyses

<i>Topic_N</i>	The number of words in sentences spoken by analysts pertaining to a certain topic (numbered as <i>N</i>) in a conference call divided by the total number of words spoken by analysts in the same conference call. This ratio is standardized to take a value between 0 and 1. Topics ranging from <i>Topic 1</i> to <i>Topic 60</i> are generated by Latent Dirichlet Allocation (LDA).
<i>Precision</i>	The absolute difference between the upper- and lower-bound of the managers' earnings forecast multiplied by negative one, scaled by the stock price as at the beginning of the fiscal quarter, for range forecasts, and zero for point forecasts.
<i>Revision</i>	The signed difference between the first management forecast issued after the conference call and the last management forecast issued before the conference call (for the same forecast period), scaled by the stock price as at the beginning of the fiscal quarter.
<i>NetTone</i>	The number of positive words minus the number of negative words spoken by analysts, as classified by Loughran and McDonald (2011), scaled by the total number of words spoken by analysts.
<i>PositiveTone</i>	The number of positive words spoken by analysts, as classified by Loughran and McDonald (2011), scaled by the total number of words spoken by analysts.
<i>NegativeTone</i>	The number of negative words spoken by analysts, as classified by Loughran and McDonald (2011), scaled by the total number of words spoken by analysts.

Appendix B – Top Word Stems and Sample Sentences for LDA Topic 24, 33, and 52

For each topic, we select 3 sample sentences with the highest LDA-generated probability that the words in the sentence pertain to the topic.

Topic	Top Word Stems	Sample Sentences
24	quarter; gross; question; margin; custom; revenu; busi	<ol style="list-style-type: none"> <li data-bbox="639 421 1388 741">1. And if I could sneak in a question about the typical environment as well -- obviously, your recent demand trends early into the fourth quarter look pretty strong, but I'm curious -- when you talk to your bigger customers, and I guess recognizing on the core side of the business you don't have a lot of big customers, but when you talk to your customers, what are you hearing from them about their mood, their desire to hire aggressively or not so aggressively? <li data-bbox="639 786 1388 1003">2. Just going back on the revenue per customer point, Matt, could you just talk about how you're thinking about kind of gross additions, or even churn -- what you saw in the second quarter, and how you thinking about gross new customers coming to the platform in the back half, in the current guidance? <li data-bbox="639 1048 1388 1182">3. Going back to the question about the Korean customer's inventory situation in the quarter, did you say that that customer was 2% of revenues or that that customer's revenues declined 2% sequentially?
33	question; advertis; revenu; ad; market; media; talk	<ol style="list-style-type: none"> <li data-bbox="639 1227 1388 1547">1. And then secondly on advertising, as you're approaching the launch of your big game for the year, can you talk about how your advertising spend will ramp, your marketing spend and how that might be different, you know, this time around versus last where you have a lot more opportunity for online advertising, that is, your advertising online and doing advertising and demos and trailers on the consoles themselves that wasn't available in the last gen. <li data-bbox="639 1592 1388 1839">2. Just quickly on the first question, so regarding the online video advertising, are we going to see that you are pretty much targeting the same group of advertisers that are posting ads on the display side, or pretty much these are advertisers originally from the TV advertising which are a quite different group of advertisers. <li data-bbox="639 1883 1388 1984">3. So, if I spin that question to the advertiser side, 40,000-plus advertisers, but is there any, like, 5% or 10% advertiser in terms of [unintelligible] advertisers

		representing what percentage of revenue, has that been consistent within the trend?
52	question; trial; data; patient; studi; phase; take	<ol style="list-style-type: none"> 1. So to make sure I understand this right, the original plan for -- you called it -- previously called it a Phase II open-label trial, now it's a Phase III open-label trial, before that was used sort of as a publication strategy to have some data on efficacy of this drug in pneumonia, before that larger 900 patient Phase III trial would have been done, but here, it looks like it might be sort of an opportunity for you all to learn more about how this drug behaves in some specific -- in particular, I guess MDR Pseudomonas, and you might use that information for this -- the new trial that you're in discussions with the FDA about, the pathogen-specific one. 2. The question, as a follow-up to the prior question was -- if, during the clinical hold, the FDA requires you to change the process or the material in (indiscernible) -- does that change the consistency of the material -- you know, let's say the patients that are in one phase of the trial patients (indiscernible) what patients had in another phase of the trial? 3. Just with regards to the Phase 2/3 trials that are going to start, I know you've had no shortage of patients that want to enter the trials, but could there be any advantage of using the patients that are coming off of the three-month IND trials and having them flow into the Phase 2/3 trials, just in terms of continuity and being able to have data on specific patients for an extended amount of time?

Figure 1 Timeline of Events

Figure 1 shows a timeline of events from the end of the previous quarter ($t-1$) to the release of the current quarter's (t) result. Forecast N for qtr t refers to the Nth forecast issued during the current quarter (i.e., quarter t) for the result for quarter t . Forecast N for qtr $t+1$ refers to the Nth forecast issued during the current quarter (i.e., quarter t) for the result for quarter $t+1$. The forecast sample used in this study includes Forecast 2 for qtr t and Forecast 1 for qtr $t+1$. Forecast 1 for qtr t is not included in the sample due to the requirement of a minimum of 3 days between the conference call and forecast date. Forecast 3 for qtr t is also not included in the sample because we only use the earliest forecast released after the conference call date for each forecast period.

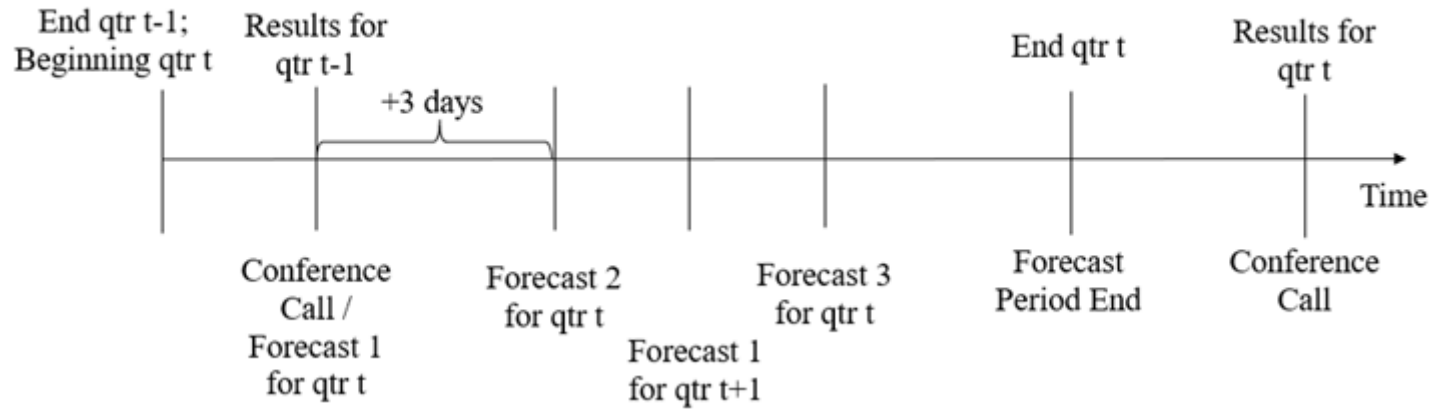


Table 1 Distribution of Forecasts by Year

This table shows the sample distribution of management earnings forecasts throughout the sample period from 2002 to 2018.

	Total Earnings Forecasts	Annual Earnings Forecasts	Quarterly Earnings Forecasts
<i>2002</i>	91	41	50
<i>2003</i>	1,468	742	726
<i>2004</i>	2,810	1,370	1,440
<i>2005</i>	3,262	1,693	1,569
<i>2006</i>	3,814	2,090	1,724
<i>2007</i>	3,843	2,208	1,635
<i>2008</i>	3,879	2,275	1,604
<i>2009</i>	3,304	1,893	1,411
<i>2010</i>	3,564	2,059	1,505
<i>2011</i>	3,310	1,956	1,354
<i>2012</i>	3,445	2,069	1,376
<i>2013</i>	3,523	2,147	1,376
<i>2014</i>	3,658	2,238	1,420
<i>2015</i>	3,582	2,188	1,394
<i>2016</i>	3,677	2,293	1,384
<i>2017</i>	3,729	2,312	1,417
<i>2018</i>	3,533	2,119	1,414
Total	54,492	31,693	22,799

Table 2 Descriptive Statistics

This table reports the descriptive statistics for variables used in the main analysis. Panel A shows summary statistics and Panel B shows the Pearson pairwise correlation coefficients. Coefficients significant at the 10% level are in bold in Panel B. All variables are defined in Appendix A.

Panel A Summary Statistics

	N	Mean	St.Dev	P25	P50	P75
<i>Accuracy</i>	54,492	-0.0133	0.0430	-0.0092	-0.0034	-0.0012
<i>AnalystWC</i>	54,492	0.0024	0.0547	0.0015	0.0020	0.0026
<i>NumParticipants</i>	54,492	7.6713	3.6996	5.0000	7.0000	10.0000
<i>TotalWC</i>	54,492	7.9463	2.1466	6.4400	8.0390	9.3550
<i>RetEA</i>	54,492	0.0049	0.0804	-0.0375	0.0042	0.0485
<i>EarningSurp</i>	54,492	0.0052	0.0182	0.0000	0.0023	0.0069
<i>Ret90D</i>	54,492	0.0404	0.1678	-0.0560	0.0392	0.1301
<i>Size</i>	54,492	7.8357	1.5629	6.7156	7.7731	8.8972
<i>Following</i>	54,492	10.0677	6.4601	5.0000	9.0000	14.0000
<i>InstOwn</i>	54,492	0.7958	0.2101	0.7026	0.8373	0.9274
<i>RetVol</i>	54,492	0.0219	0.0108	0.0141	0.0194	0.0268
<i>MTB</i>	54,492	3.8786	4.3335	1.7118	2.6645	4.2378
<i>ROA</i>	54,492	0.0135	0.0278	0.0047	0.0142	0.0254
<i>Loss</i>	54,492	0.1629	0.3692	0.0000	0.0000	0.0000
<i>Horizon</i>	54,492	5.2652	0.6514	5.0304	5.4806	5.6490
<i>Annual</i>	54,492	0.5816	0.4933	0.0000	1.0000	1.0000

Table 2 – Continued

Panel B Pearson Correlation Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) <i>Accuracy</i>	1.000														
(2) <i>AnalystWC</i>	0.001	1.000													
(3) <i>NumParticipants</i>	0.074	0.005	1.000												
(4) <i>TotalWC</i>	0.039	0.004	0.599	1.000											
(5) <i>RetEA</i>	0.044	0.003	-0.003	-0.044	1.000										
(6) <i>EarningSurp</i>	-0.154	-0.001	-0.062	-0.061	0.219	1.000									
(7) <i>Ret90D</i>	0.067	0.000	-0.011	-0.046	0.024	0.107	1.000								
(8) <i>Size</i>	0.224	-0.001	0.491	0.426	0.035	-0.106	0.040	1.000							
(9) <i>Following</i>	0.076	0.004	0.626	0.460	-0.009	-0.055	-0.018	0.595	1.000						
(10) <i>InstOwn</i>	0.108	0.002	0.120	0.117	0.030	-0.078	0.012	0.065	0.133	1.000					
(11) <i>RetVol</i>	-0.270	0.004	-0.123	-0.095	-0.015	0.121	-0.088	-0.506	-0.124	-0.060	1.000				
(12) <i>MTB</i>	0.097	-0.002	0.109	0.106	0.051	-0.031	0.094	0.210	0.134	0.063	-0.086	1.000			
(13) <i>ROA</i>	0.240	0.000	0.129	0.050	0.087	-0.048	0.093	0.207	0.119	0.076	-0.180	0.177	1.000		
(14) <i>Loss</i>	-0.232	-0.003	-0.106	-0.051	-0.073	0.066	-0.066	-0.224	-0.071	-0.058	0.236	-0.024	-0.655	1.000	
(15) <i>Horizon</i>	-0.075	-0.001	0.043	0.036	0.011	-0.003	0.016	0.023	0.047	0.018	0.002	0.011	0.002	-0.002	1.000
(16) <i>Annual</i>	0.044	-0.005	-0.038	0.000	0.002	-0.035	-0.002	0.106	-0.121	0.011	-0.134	0.015	0.000	-0.027	-0.212

Table 3 Analyst Participation and Management Forecast Accuracy

This table reports the results from the regression of *Accuracy*. All variables are defined in Appendix A. All continuous variables are winsorized at the first and ninety-ninth percentiles. t-statistics appear in parentheses and are calculated based on standard errors adjusted for firm and year clustering. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels (based on a two-tailed test), respectively.

	(1) Dep. Var.: <i>Accuracy</i>	(2) Dep. Var.: <i>Accuracy</i>
<i>AnalystWC</i>	0.0009*** (3.2248)	
<i>AnalystWC (Deciles)</i>		0.0028** (2.6832)
<i>NumParticipants</i>	-0.0002* (-1.9758)	-0.0004*** (-3.3312)
<i>TotalWC</i>	-0.0001 (-0.3613)	0.0000 (0.0213)
<i>RetEA</i>	0.0021 (0.5730)	0.0022 (0.5832)
<i>EarningSurp</i>	0.0128 (0.4050)	0.0126 (0.4008)
<i>Ret90D</i>	0.0021 (1.2131)	0.0020 (1.1901)
<i>Size</i>	0.0151*** (8.0331)	0.0152*** (8.0538)
<i>Following</i>	-0.0003*** (-4.3996)	-0.0003*** (-4.2450)
<i>InstOwn</i>	0.0066* (2.1156)	0.0066* (2.1055)
<i>RetVol</i>	-0.3956*** (-7.8469)	-0.3962*** (-7.8792)
<i>MTB</i>	-0.0002 (-1.5746)	-0.0002 (-1.6303)
<i>ROA</i>	0.1592*** (3.6566)	0.1587*** (3.6528)
<i>Loss</i>	-0.0055** (-2.5663)	-0.0055** (-2.5726)
<i>Horizon</i>	-0.0063*** (-12.0175)	-0.0063*** (-12.0103)
<i>Annual</i>	-0.0017*** (-3.1178)	-0.0017*** (-3.1172)
Firm-Fixed Effect	Yes	Yes
Year-Fixed Effect	Yes	Yes
Observations	54,492	54,492
Adjusted R ²	0.5299	0.5301

Table 4 Cross-Sectional Test on Managerial Uncertainty

This table reports the results of the cross-sectional test based on managerial uncertainty. Managerial uncertainty is measured as the number of managers' sentences including at least one uncertain word, as classified by Loughran and McDonald (2011), divided by the total number of managers' sentences during the conference call. We split the sample into two groups based on the median value of managerial uncertainty in our sample distribution each year. Columns (1) and (2) present the results using the subsample of firms with high and low managerial uncertainty, respectively. All variables are defined in Appendix A. All continuous variables are winsorized at the first and ninety-ninth percentiles. t-statistics appear in parentheses and are calculated based on standard errors adjusted for firm and year clustering. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels (based on a two-tailed test), respectively.

Table 4 – Continued

	(1) High Managerial Uncertainty Dep. Var.: <i>Accuracy</i>	(2) Low Managerial Uncertainty Dep. Var.: <i>Accuracy</i>
<i>AnalystWC</i>	0.1371***	0.0009**
	(3.1010)	(2.9020)
<i>NumParticipants</i>	-0.0000	-0.0004***
	(-0.2703)	(-3.0763)
<i>TotalWC</i>	-0.0001	0.0000
	(-0.3736)	(0.0913)
<i>RetEA</i>	0.0023	0.0009
	(0.5164)	(0.1868)
<i>EarningSurp</i>	-0.0118	0.0251
	(-0.2831)	(0.7484)
<i>Ret90D</i>	0.0031	0.0013
	(1.2511)	(0.6528)
<i>Size</i>	0.0140***	0.0166***
	(5.7504)	(8.3828)
<i>Following</i>	-0.0003**	-0.0003**
	(-2.7742)	(-2.4570)
<i>InstOwn</i>	0.0062	0.0045
	(1.5213)	(1.4814)
<i>RetVol</i>	-0.3013***	-0.4741***
	(-4.7207)	(-7.8142)
<i>MTB</i>	-0.0001	-0.0002
	(-1.0564)	(-1.3356)
<i>ROA</i>	0.1345***	0.1893***
	(3.0676)	(3.4228)
<i>Loss</i>	-0.0053**	-0.0046*
	(-2.3627)	(-1.9182)
<i>Horizon</i>	-0.0059***	-0.0065***
	(-10.5560)	(-10.2556)
<i>Annual</i>	-0.0014*	-0.0018***
	(-2.0874)	(-3.0308)
Firm-Fixed Effect	Yes	Yes
Year-Fixed Effect	Yes	Yes
Observations	26,563	27,601
Adjusted R ²	0.5190	0.5617

Chow test for the difference in the coefficients on *AnalystWC* between columns (1) and (2)
Difference: 0.1362 [p=0.0141]

Table 5 Cross-Sectional Test on Analyst Tone

This table reports the results of the cross-sectional test based on analyst tone. Analyst tone is positive (negative) if the total number of positive (negative) words spoken by analysts exceeds the total number of negative (positive) words spoken by analysts, as classified by Loughran and McDonald (2011), during the conference call. Columns (1) and (2) present the results using the subsample of firms with positive and negative analyst tone, respectively. All variables are defined in Appendix A. All continuous variables are winsorized at the first and ninety-ninth percentiles. t-statistics appear in parentheses and are calculated based on standard errors adjusted for firm and year clustering. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels (based on a two-tailed test), respectively.

Table 5 – Continued

	(1) Positive Analyst Tone Dep. Var.: <i>Accuracy</i>	(2) Negative Analyst Tone Dep. Var.: <i>Accuracy</i>
<i>AnalystWC</i>	0.0008*** (3.0757)	0.3441*** (2.9377)
<i>NumParticipants</i>	-0.0002* (-1.9819)	-0.0002 (-1.1299)
<i>TotalWC</i>	0.0000 (0.1779)	-0.0002 (-0.7474)
<i>RetEA</i>	0.0052 (1.0965)	-0.0055* (-1.8036)
<i>EarningSurp</i>	-0.0222 (-0.5987)	0.0500 (0.9564)
<i>Ret90D</i>	0.0015 (0.7838)	0.0008 (0.3443)
<i>Size</i>	0.0148*** (7.4142)	0.0160*** (7.0706)
<i>Following</i>	-0.0003*** (-3.7390)	-0.0003*** (-3.1174)
<i>InstOwn</i>	0.0088** (2.4064)	0.0022 (0.4440)
<i>RetVol</i>	-0.3576*** (-5.9543)	-0.4554*** (-6.5454)
<i>MTB</i>	-0.0002 (-1.4536)	-0.0001 (-0.4891)
<i>ROA</i>	0.1665*** (3.0980)	0.1133*** (3.6001)
<i>Loss</i>	-0.0047** (-2.1439)	-0.0072*** (-3.0962)
<i>Horizon</i>	-0.0060*** (-10.9584)	-0.0071*** (-10.1534)
<i>Annual</i>	-0.0016** (-2.3086)	-0.0020*** (-3.1643)
Firm-Fixed Effect	Yes	Yes
Year-Fixed Effect	Yes	Yes
Observations	30,126	21,314
Adjusted R ²	0.5513	0.5226

Chow test for the difference in the coefficients on *AnalystWC* between columns (1) and (2)
Difference: -0.3433 [p=0.0210]

Table 6 Cross-Sectional Test on Analyst Industry Expertise

This table reports the results of the cross-sectional test based on the industry expertise of participating analysts. An analyst's industry expertise is measured as the number of conference calls held by firms in the same industry (based on 2 digit SIC) where the analyst attended and asked questions during the previous year. We regard an analyst as an industry expert if the analyst attended the industry calls more times than the median number of attendance across all analysts during the same year in our conference call transcripts. We split the sample into two groups based on the median number of industry experts participating in the conference call in our sample distribution each year. Columns (1) and (2) present the results using the subsample of firms with high and low industry expertise, respectively. All variables are defined in Appendix A. All continuous variables are winsorized at the first and ninety-ninth percentiles. t-statistics appear in parentheses and are calculated based on standard errors adjusted for firm and year clustering. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels (based on a two-tailed test), respectively.

Table 6 – Continued

	(1) High Industry Expertise Dep. Var.: <i>Accuracy</i>	(2) Low Industry Expertise Dep. Var.: <i>Accuracy</i>
<i>AnalystWC</i>	0.2722** (2.8081)	0.0008*** (4.3940)
<i>NumParticipants</i>	-0.0002 (-1.6486)	-0.0002 (-1.0996)
<i>TotalWC</i>	-0.0001 (-0.7748)	0.0001 (0.3417)
<i>RetEA</i>	0.0032 (1.0478)	0.0013 (0.2225)
<i>EarningSurp</i>	0.0474 (1.0475)	-0.0022 (-0.0549)
<i>Ret90D</i>	0.0012 (0.4831)	0.0023 (1.1566)
<i>Size</i>	0.0126*** (5.6986)	0.0174*** (8.2807)
<i>Following</i>	-0.0002** (-2.8694)	-0.0004** (-2.7829)
<i>InstOwn</i>	0.0011 (0.2552)	0.0091* (2.1045)
<i>RetVol</i>	-0.4397*** (-5.3192)	-0.3571*** (-5.5520)
<i>MTB</i>	0.0000 (0.1237)	-0.0004** (-2.6237)
<i>ROA</i>	0.0663** (2.1985)	0.2136*** (3.6303)
<i>Loss</i>	-0.0070*** (-3.1307)	-0.0043* (-1.8086)
<i>Horizon</i>	-0.0052*** (-9.1046)	-0.0072*** (-11.1249)
<i>Annual</i>	-0.0018** (-2.6681)	-0.0017** (-2.2092)
Firm-Fixed Effect	Yes	Yes
Year-Fixed Effect	Yes	Yes
Observations	23,945	30,373
Adjusted R ²	0.5580	0.5193

Chow test for the difference in the coefficients on *AnalystWC* between columns (1) and (2)
Difference: 0.2714 [p=0.0013]

Table 7 LDA Topics and Forecast Accuracy

This table reports the results from the regression of *Accuracy*, where we add various LDA topic variables (i.e., topics 1, 9, 13, 24, 29, 33, 39, 51, and 52) and their interactions with analyst participation as additional independent variables. *Analyst Participation* refers to *AnalystWC* and *AnalystWC(Deciles)* in columns (1) and (2), respectively. All variables are defined in Appendix A. All continuous variables are winsorized at the first and ninety-ninth percentiles. t-statistics appear in parentheses and are calculated based on standard errors adjusted for firm and year clustering. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels (based on a two-tailed test), respectively.

Table 7 – Continued

	(1) Using <i>AnalystWC</i> for Analyst Participation Dep. Var.: <i>Accuracy</i>	(2) Using <i>AnalystWC(Deciles)</i> for Analyst Participation Dep. Var.: <i>Accuracy</i>
<i>Analyst Participation</i>	0.0007** (2.8673)	0.0017 (1.1615)
<i>Topic1</i>	-0.0061 (-0.3414)	-0.0264 (-0.8623)
<i>Analyst Participation</i> × <i>Topic1</i>	1.4291 (0.4359)	0.0500 (1.0718)
<i>Topic9</i>	-0.0000 (-0.0034)	-0.0008 (-0.0781)
<i>Analyst Participation</i> × <i>Topic9</i>	4.0098 (1.0214)	0.0202 (0.9274)
<i>Topic13</i>	0.0043 (0.8194)	-0.0044 (-0.7622)
<i>Analyst Participation</i> × <i>Topic13</i>	-1.6149 (-0.4992)	0.0125 (0.8741)
<i>Topic24</i>	-0.0287* (-1.7562)	-0.0293* (-1.9252)
<i>Analyst Participation</i> × <i>Topic24</i>	10.8262* (1.8432)	0.0443** (2.1894)
<i>Topic29</i>	0.0077** (2.7677)	0.0057 (1.6143)
<i>Analyst Participation</i> × <i>Topic29</i>	-0.2261 (-0.4076)	0.0031 (0.4296)
<i>Topic33</i>	-0.0107 (-0.7289)	-0.0116 (-0.7481)
<i>Analyst Participation</i> × <i>Topic33</i>	5.1842* (1.7587)	0.0274 (1.3175)
<i>Topic39</i>	-0.0088 (-1.4200)	-0.0090 (-0.9346)
<i>Analyst Participation</i> × <i>Topic39</i>	-0.4002 (-0.2343)	-0.0018 (-0.0992)
<i>Topic51</i>	-0.0062 (-0.5082)	-0.0084 (-0.8667)
<i>Analyst Participation</i> × <i>Topic51</i>	3.8797 (1.0698)	0.0250 (1.1677)
<i>Topic52</i>	0.0061 (0.4260)	0.0205 (1.2415)
<i>Analyst Participation</i> × <i>Topic52</i>	6.0898*** (3.6240)	-0.0089 (-0.4199)
Controls	Yes	Yes
Firm-Fixed Effect	Yes	Yes
Year-Fixed Effect	Yes	Yes
Observations	54,492	54,492
Adjusted R ²	0.5302	0.5303

Table 8 Analyst Participation and Management Forecast Precision

This table reports the results from the regression of *Precision*. All variables are defined in Appendix A. All continuous variables are winsorized at the first and ninety-ninth percentiles. t-statistics appear in parentheses and are calculated based on standard errors adjusted for firm and year clustering. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels (based on a two-tailed test), respectively.

	(1) Dep. Var.: <i>Precision</i>	(2) Dep. Var.: <i>Precision</i>
<i>AnalystWC</i>	0.0002*** (3.7939)	
<i>AnalystWC (Deciles)</i>		0.0006*** (3.2681)
<i>NumParticipants</i>	-0.0000 (-1.6873)	-0.0001*** (-2.9652)
<i>TotalWC</i>	-0.0000 (-1.1766)	-0.0000 (-0.7123)
<i>RetEA</i>	0.0013** (2.8302)	0.0013** (2.8339)
<i>EarningSurp</i>	-0.0040 (-0.6406)	-0.0041 (-0.6446)
<i>Ret90D</i>	0.0011*** (6.0081)	0.0011*** (5.9138)
<i>Size</i>	0.0036*** (8.2892)	0.0036*** (8.3115)
<i>Following</i>	-0.0001*** (-4.0325)	-0.0001*** (-3.9034)
<i>InstOwn</i>	0.0018*** (3.5170)	0.0018*** (3.4917)
<i>RetVol</i>	-0.0395*** (-4.0739)	-0.0397*** (-4.0875)
<i>MTB</i>	0.0000 (0.0574)	0.0000 (0.0177)
<i>ROA</i>	0.0131** (2.7837)	0.0129** (2.7718)
<i>Loss</i>	-0.0006* (-1.8528)	-0.0006* (-1.8573)
<i>Horizon</i>	-0.0012*** (-10.8061)	-0.0012*** (-10.8061)
<i>Annual</i>	-0.0026*** (-10.9941)	-0.0026*** (-11.0204)
Firm-Fixed Effect	Yes	Yes
Year-Fixed Effect	Yes	Yes
Observations	54,492	54,492
Adjusted R ²	0.6871	0.6873

Table 9 Analyst Tone and Management Forecast Revision

This table reports the results from the regression of *Revision*. All variables are defined in Appendix A. All continuous variables are winsorized at the first and ninety-ninth percentiles. t-statistics appear in parentheses and are calculated based on standard errors adjusted for firm and year clustering. ***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels (based on a two-tailed test), respectively.

	(1) Dep. Var.: <i>Revision</i>	(2) Dep. Var.: <i>Revision</i>
<i>NetTone</i>	0.1301*** (5.6307)	
<i>PositiveTone</i>		0.1094*** (3.9154)
<i>NegativeTone</i>		-0.1603*** (-4.8927)
<i>NumParticipants</i>	-0.0001 (-1.5362)	-0.0001 (-1.4949)
<i>TotalWC</i>	0.0001 (0.5711)	0.0001 (0.5016)
<i>RetEA</i>	0.0129*** (7.6318)	0.0129*** (7.4404)
<i>EarningSurp</i>	0.1511*** (6.8789)	0.1512*** (6.8840)
<i>Ret90D</i>	0.0103*** (9.2663)	0.0103*** (9.2503)
<i>Size</i>	0.0066*** (6.8514)	0.0066*** (6.8343)
<i>Following</i>	-0.0004*** (-5.0871)	-0.0004*** (-5.0981)
<i>InstOwn</i>	-0.0013 (-0.8600)	-0.0013 (-0.8549)
<i>RetVol</i>	-0.1803*** (-4.0189)	-0.1801*** (-4.0178)
<i>MTB</i>	-0.0000 (-0.2623)	-0.0000 (-0.2701)
<i>ROA</i>	0.0757*** (6.8946)	0.0756*** (6.8829)
<i>Loss</i>	-0.0014 (-1.0759)	-0.0014 (-1.0769)
<i>Horizon</i>	0.0006* (1.8419)	0.0006* (1.8225)
<i>Annual</i>	0.0016 (1.6525)	0.0016 (1.6564)
Firm-Fixed Effect	Yes	Yes
Year-Fixed Effect	Yes	Yes
Observations	25,925	25,925
Adjusted R ²	0.2715	0.2715