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# Financial Analysts' Questioning in Conference Calls

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**JEL codes**: G24; G29; M41.
**Current version:** August, 2020.

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# I. INTRODUCTION

We study strategic behavior among financial analysts during earnings conference calls. Earnings conference calls represent a strategic information exchange between a group of financial analysts and the firm's management, whereby the analysts depend on management-provided information for generating accurate earnings forecasts (Bowen et al. 2002). Prior literature emphasizes the strategic information exchange *between* analysts and the firm's management. For instance, Mayew (2008) provides evidence that the firm's management discriminates among analysts by granting participation in earnings conference calls for analysts with favorable stock recommendations. Haag et al. (2020) find that analysts encourage the firm's management to provide more (accurate) information via their question phrasing. However, during earnings conference calls, there is also a strategic information exchange *among* the group of analysts, as analysts are evaluated based on relative forecast accuracy (see e.g., Hong and Kubik 2003; Brown et al. 2015; Emery and Li 2009). We examine how analysts with superior information engage in earnings conference calls, and how this information-sharing behavior is associated with subsequent information advantages.

We expect analysts with superior information to share information selectively. In particular, analysts trade off the benefits and cost of revealing information via their questions. In the negotiation context, Minson et al. (2018) provide experimental evidence that the questioner can increase the quality of information provided by the respondent by revealing information in the question. Consequently, analysts may increase the quality of management-provided information by revealing information in their questions. However, analysts have incentives to outperform their peers (Brown et al. 2015; Emery and Li 2009; Bowers et al. 2014). By revealing information in their questions, they would enhance other analysts' information, potentially reducing their information advantage. In other words, analysts with superior information arguably try to prevent peers from freeriding on their information advantage. Thus, we expect financial

analysts with superior information to reveal less information in their questions during conference calls. In particular, as better-informed analysts depend less strongly on management-provided information and care more about maintaining or increasing their information advantage, we expect them to be less willing to share their superior information in questions during conference calls.

We test our predictions using 9,672 analyst-manager dialogues in the quarterly earnings conference calls of the S&P 500 firms in the time-period 2009 to 2019. We identify analysts with superior information by ranking analysts on their forecast accuracy prior to the conference call. In particular, we rank analysts in terms of absolute forecast accuracy per quarterly conference call, considering forecasts by participating as well as non-participating analysts[1]. We measure analysts' information sharing as the inverse cosine similarity (i.e., cosine modification) between the management's presentation and the corresponding analysts' questions. Cosine modification captures the degree to which analysts' questions differ thematically from management's presentation and thus, the extent to which analysts share 'new' information during earnings conference calls (see Lee 2016; Cicon 2017).[2]

We document an inverse U-shaped association between analysts' ranked forecast accuracy and the ranked cosine modification between management's presentation and the respective analysts' questions. This finding implies that analysts with superior information share less information compared to analysts with mediocre information. Moreover, analysts with inferior information also share less information compared to analysts with mediocre information. The former finding is consistent with our prediction. In particular, analysts with superior information would be able to share 'new' information, but are less willing to do so since they depend

[1] We cannot match all participating analysts by their name, but we use the forecasts of all analysts to infer the relative quality of the questioning analyst's information advantage.
[2] Asking questions that thematically differ from management's presentations arguably requires superior information compared to asking thematically similar questions that partly rephrase management's statements.

less on management-provided information and care more strongly about maintaining their information advantage. The latter finding can be explained by the fact that analysts with inferior information arguably are not able to share 'new' information. Overall, the result provides support for our prediction that analysts with superior information selectively share information.

In the next step, we study whether sharing less information in questions benefits better-informed analysts by examining its consequences for analysts' ex-post information advantage, and find that it does. More specifically, we show that the likelihood of analysts' maintaining or enhancing their forecast accuracy ranking position decreases in the amount of 'new' information they share in their questions during conference calls. This result can be explained by a direct effect of information sharing on other analysts' forecast accuracy, but also an indirect effect through the management's answer. More specifically, we find a positive association between the cosine modification of managements' presentations and analysts' questions and the cosine modification of managements' presentations and managements' answers. This result implies that the management discloses more 'new' information when financial analysts include 'new' information in their questions, incentivizing analysts with superior information to ask more informative questions. We argue that sharing information in questions is also costly for analysts with superior information since peer analysts can freeride on their information advantage by simply listening to their questions, thereby potentially reducing their relative forecast accuracy. Consequently, we find it is beneficial for better-informed analysts to share information but the marginal benefits of sharing information are lower compared to less-informed analysts. Taken together, the evidence suggests that analysts with superior information are less willing to share 'new' information, as it allows peer analysts to freeride on their information advantage, thereby especially increasing the quality of peer analysts' information and, thus, weakening their relative performance.

Finally, we provide further evidence that analysts selectively share information in their questions by examining analysts' competitive environment. In particular, we find that analysts on average ask more informative questions when they are more uncertain about future earnings, i.e., when their demand for accurate information from management increases. Additionally, we find that analysts ask less informative questions when they are less certain about the information of other analysts, i.e., when fewer peer analysts provide earnings forecasts before the conference call.

This study contributes to three strands of research. First, we contribute to the literature on the informativeness of earnings conference calls. Matsumoto et al. (2011) provide evidence that the Q&A section of earnings conference calls is more informative than the presentation section. Moreover, Mayew et al. (2020) find that financial analysts differ in the extent to which they contribute to the informativeness of the Q&A section. They find that individual analysts' forecasts and their stock recommendations affect individual analysts' informativeness to the capital market. We add to this literature by suggesting that analysts' relative performance evaluation significantly affects the extent to which they share information in questions during earnings conference calls. More specifically, financial analysts with superior information before the call share less 'new' information, thereby triggering management's answers to also contain less 'new' information.

Second, we indirectly contribute to the literature on learning among financial analysts. For instance, Kumar et al. (2020) find that analysts learn from peer analysts with similar personal characteristics (e.g., gender, ethnicity). Following Kumar et al. (2020), analysts can learn from their own experience as well as from peers' observed actions and outcomes. Thereby, the strength of analysts' incentives affects the degree to which they substitute or complement their individual effort by learning from peers (Bloomfield and Hales 2009). To the best of our knowledge, we provide first evidence on how analysts may hinder learning from peers' actions.

Third, we contribute to the literature on strategic questioning. In particular, Minson et al. (2018) provide experimental evidence in the negotiation context that asking questions with higher information content increases the quality of the information provided in the response. We confirm their findings in an archival study in the accounting and finance context.

## II. PRIOR RESEARCH AND HYPOTHESES DEVELOPMENT

*Financial analysts' incentives*

Financial analysts significantly shape firms' information environments. In their role of information intermediaries, they acquire and aggregate information to subsequently disseminate aggregated informational signals - in form of earnings forecasts, stock recommendations, and a report that describes certain selected topics - to their clients and the broader financial market (Asquith et al. 2005). They acquire firm-specific (e.g., Bowen et al. 2002) and macroeconomic information (e.g., Hugon et al. 2015) from a variety of different public as well as private (Healy and Palepu 2001) information sources. Prior literature suggests that analysts' disseminated informational signals contain incremental information content beyond the firm-specific information that is already publicly available (Loh and Stulz 2011; Asquith et al. 2005).

Prior literature offers limited evidence about the inherent aggregation process and therefore frequently considers this process as a "black box" (Ramnath et al. 2008). However, extensive evidence documents large variation in analysts' performance, i.e., some analysts continuously outperform their peers in terms of forecast accuracy and correctness of stock recommendations. Clement (1999) explains that this systematic difference can be attributed to the individual ability, which may arise from their experience, available resources (Clement 1999; Jacob et al. 1999), or availability to insider-information, i.e., geographic proximity and social network ties (Bae et al. 2008; Malloy 2005; Cohen et al. 2010).

Brown et al. (2015) suggest that analysts are exposed to explicit as well as implicit incentives, i.e., they are compensated by performance-based pay and are exposed to career concerns. Among other factors like the amount of generated investment banking business or trading volume, prior literature concludes that the accuracy, in absolute as well as relative terms, is one of the most important determinants of analysts' compensation and reputation. Absolute forecast accuracy compares the individual analyst's forecast with the realized earnings number, whereas the concept of relative forecast accuracy sets the individual absolute forecast accuracy in perspective to the performance of all peers that cover a certain firm (e.g., Hong and Kubik 2003).

Following prior research, we argue that financial analysts are primarily incentivized to increase absolute forecast accuracy (i.e., first-order concern). For instance, Chen et al. (2005) find that investors evaluate analyst's ability based on her record of past absolute forecast accuracy. Consistently, Brown et al. (2015) provide survey-based evidence indicating that the accuracy demand of their clients is one of the top priorities of analysts. Furthermore, analysts are incentivized to generate accurate earnings forecasts as they represent an essential input of their valuation models to derive stock recommendations (Loh and Mian 2006; Brown et al. 2015). Hence, if analysts generate inaccurate earnings forecasts, their valuation model relies on inaccurate input parameters, likely resulting in unprofitable stock recommendations (Ertimur et al. 2007).

Increasing relative forecast accuracy arguably represents analysts' second-order concern, which implies that they have incentives to outperform their peers. Incentives for their second-order concern are primarily termination based and are not explicitly tied to the individual compensation (Groysberg et al. 2011). Mikhail et al. (1999) find that analysts with lower relative forecast accuracy are more likely to be turned over. In a similar vein, Hong and Kubik (2003) show that higher relative forecast accuracy leads to a higher likelihood to experience

career advancements like a transition to a brokerage house that maintains a top-tier status. Furthermore, relative performance is also an important determinant of whether an analyst is considered as a star analyst by established rankings like *Institutional Investors – All American Research Team, The Wallstreet Street Journal – Best on the Street, Refinitiv – Analyst Awards* (Stickel 1992; Emery and Li 2009), whereby a higher rank in those ratings is typically associated with an increase in compensation and career advancements (e.g., Groysberg et al. 2011).[3]

*Information provision during earnings conference calls*

Earnings conference calls represent an important information source for financial analysts (Bowen et al. 2002) especially in times of controversies (Graham et al. 2005; Matsumoto et al. 2011; Tasker 1998). They are organized as a two-staged disclosure process. In the first part, the management gives a brief, scripted presentation that includes the managements' notion of the firms' performance of the past quarter as well as any further voluntary information whereas the subsequent question and answer section provides the participants, mainly analysts, the opportunity to directly address a question to the management. Against the backdrop of Regulation Fair Disclosure (*Reg FD*), this is the only opportunity to directly approach the management for material information. Matsumoto et al. (2011) provide evidence that the Q&A section contains more information than the management presentation. The informativeness of the Q&A section may stem from answers that highlight areas that were not covered in the presentation section (Cicon 2017) as well as the fact that the management cannot prepare answers, i.e., has to spontaneously answer analysts' questions (Lee 2016).

Financial analysts strategically ask questions during earnings conference calls in order to elicit more (precise) information from the firm's management. In particular, analysts participating in the call can influence the information content of the conference call by the way they

[3] We do not consider analyst ratings in our empirical analysis as they are partly survey-based, therefore contain individual judgements about the analyst, and thus 'only' represent a subjective type of relative performance evaluation. This implies that the dichotomous all-star listing only provides a very limited indication about the quality of each respective analyst's underlying information.

*phrase* their question as well as its *content*. Haag et al. (2020) find that phrasing questions unfavorably encourages the firm's management to provide more (accurate) information, suggesting that unfavorable language increases the quality of management-provided information during the conference call. This finding is consistent with evidence from the negotiation context indicating that the questioner can increase the quality of information provided in the response by asking negative assumption questions, which signal knowledgeability (i.e., high quality information) and assertiveness (Minson et al. 2018). Furthermore, Call et al. (2020) show that analysts use of humor leads to longer answers and an increased likelihood to ask follow-up questions. Related to the content of the question, if analysts ask questions referring to critical topics, the managements' likelihood to not answer this question is higher, publicly indicating managements' unwillingness to disclose information on this topic (Gow et al. 2019).

*Hypothesis development*

In addition to the strategic information exchange *between* the group of financial analysts and the firm's management during conference calls, there is also a strategic information exchange *among* the group of financial analysts. Anecdotal evidence from an expert interview with a financial analyst indicates that analysts diligently consider the questions of their peers. They do so in order to not only increase their absolute forecast accuracy (i.e., first-order concern) but also their relative forecast accuracy (i.e., second-order concern). Against this backdrop, we study to what extent financial analysts share information in their questions during earnings conference calls.

On the one hand, analysts have an incentive to ask informative questions during conference calls as they arguably increase the quality of the management's response (Minson et al. 2018), thereby expectedly increasing their absolute forecast accuracy (i.e., first-order concern). This is especially relevant against the background of *Reg FD*, implying that conference calls are the only opportunity to explicitly ask the management for material information.

On the other hand, when analysts share information in their questions, peer analysts may learn from the information shared in their question (e.g., about the informational need of the questioner or contextual information) as well as the accompanied management's response. Thereby, they potentially reduce their information advantage (i.e., second-order concern). In other words, peer analysts may freeride on the respective analyst's information advantage. This does not only hold for the group of analysts participating in the call, who can freely listen to others' questions, but also for non-participating analysts, who can ex-post read the accompanied conference call transcript.

We argue that financial analysts' marginal benefits from information sharing decrease with the quality of their information as other financial analysts are able to learn about their information from their questions. Hence, we expect analysts with superior information, i.e., analysts with precise earnings forecasts, to more strongly care about their relative forecast accuracy than their absolute forecast accuracy, suggesting that analysts with superior information are less willing to share information in their questions to avoid that their private information is becoming a public good. This assumption is based on the theoretical notion of Verrecchia (1982) and Diamond (1985) stating that private information can be substituted by public information, which is less costly to acquire. Consequently, analysts, who want to maximize their relative forecast accuracy, may anticipate this behavior and hinder peer's learning from the informational signals contained in their own questions and the subsequent management answers by sharing less information in their questions.

To sum up, we expect financial analysts' questions during earnings conference calls to be the outcome of a cost-benefit analysis. While sharing information in questions may increase their absolute forecast accuracy, it potentially harms their relative forecast accuracy. Since analysts with superior information arguably care more about relative forecast accuracy than abso-

lute forecast accuracy (i.e., they less strongly depend on 'new' management-provided information to issue accurate forecasts), we expect them to share less information in questions in order to maintain or increase their information advantage. Hereby, they reduce the likelihood that peers freeride on their informational advantage.[4] This leads to our first hypothesis:

**H1:** *Financial analysts with superior information share relatively less information in their questions during earnings conference calls compared to financial analysts without superior information.*

Furthermore, we test whether this questioning strategy is optimal for analysts with superior information, in the sense that they are able to maintain or enhance their information advantage. When financial analysts share relatively less information in their questions, the firm's management will arguably also share less information in the response (Minson et al. 2018), suggesting that all analysts will learn less form the Q&A pair. This means that even though the financial analyst with the superior information will learn less from the management's response to her question, her peers will also learn less from the management's response as well as the question, suggesting that the financial analyst is able to maintain or enhance her information advantage. This leads to our second hypothesis:

**H2:** *Financial analysts with superior information more likely maintain or enhance their information advantage by sharing relatively less information.*

## III. SAMPLE AND RESEARCH DESIGN

*Sample & data sources*

[4] We argue that not actively participating in the call (i.e., not asking questions) is not an optimal strategy for financial analysts with superior information. By actively participating, analysts can demonstrate visibility and build personal reputation with clients, management, and other listeners (Abraham and Bamber 2017). Clients, that may also listen to the conference call, may view the respective analyst as more credible if they gain the opportunity to socially interact with the senior management of the firm. An arguable consequence could be an improved number of client votes, which is an important determinant of the compensation of analysts (Brown et al. 2015). Reputation building with the management increases the likelihood of getting access to future conference calls as well as facilitates exclusive access to the management after the conference call (Mayew 2008). Other listeners include, among others, headhunters, competing brokerage houses, and investment banks may determine whether they offer an employment contract to an analyst based on its access to the management (Abraham and Bamber 2017).

Our sample covers the S&P500 firms in the time-period 2009 to 2019. The final sample contains 9,672 analyst-manager dialogues from quarterly earnings conference call transcripts. We obtain the quarterly earnings conference call transcripts[5] from Thomson Reuters EIKON. To the transcripts, we match quarterly data from COMPUSTAT, stock market data from CRSP, and analyst data from I/B/E/S[6]. The sample selection process is described in Table 1.

[Please insert Table 1 here]

*Preprocessing of earnings conference call transcripts*

The preprocessing of the earnings conference call transcripts is starting with the identification of the presentation and the opening of the Q&A session. Within both parts, we identify the different speakers and the associated speech portions. Oftentimes, the conference calls contain a third-party participant or an employee from the company's investor relations department who is responsible for the intra-call organization. They typically welcome the participants as well as the listening audience to the call, initiate the transition from the management presentation to the Q&A, and moderate the Q&A. We exclude those elements as they do not contain any information that is relevant to answer our research question. Furthermore, we also limit the management speech portion to C-level executives[7] and exclude any greeting and concluding phrases. Especially the latter can be observed around each speaker transition within the management presentation section and whenever an analyst starts as well as ends its question cascade. Typically, the speakers introduce themselves and start with a greeting phrase, afterwards they end with a concluding phrase and thank the management for answering their question. If

[5] The sample only contains conference call transcripts that are held in conjunction with an earnings announcement. Hence, we do not consider any extraordinary conference calls that are held due to e.g., a merger or an acquisition.
[6] Due to data protection issues, I/B/E/S anonymizes names of specific pre-approval contributors since October, 2018. In such cases, I/B/E/S states "PERMISSION DENIED". Thus, we are not able to match these analysts with our conference call sample set. However, we respect their speech and forecast observations in our relative measures.
[7] With C-level executives, we refer to CEO, CFO, COO, CRO, CIO, and CRO.

the last speech part of an analyst question cascade solely consists of such a phrase, we exclude this part.

*Measurement of information content in question and answer*

We define information content as the degree of thematic difference of each respective analyst question (management answer) and the management presentation. Hence, our measure approximates analysts' (managements') sharing of 'new' information in their question (answer), assuming that thematically different (similar) questions require a better (minor) information and thematically different (similar) answers convey more (less) information[8]. To measure the degree of thematic difference (similarity), we apply the concept of cosine modification (similarity). Thus, we do not include a pre-defined positive selection (dictionary) of specific words or word groups like the calculation of the sentiment of a text (e.g., Loughran and McDonald 2011), but consider every word or phrase that is included in the corpus. In order to reduce the dimensionality of the textual data, prior literature shows that it is rational to exclude highly frequent words ("stop words"; see Manela and Moreira 2017)[9] and word categories that do not maintain any information content with regard to the underlying research question (e.g., Lee 2016)[10]. The respective term-document matrices contain the cleaned management presentation and the analyst's questions, aggregated on analyst-level. Subsequent term weighting is based on mono- and bigram counts for each specific conference call.

[8] The following description also refers to the calculation of the information content of the managements' answer.
[9] We use the stop word list of the Python spaCy package. Link to spaCy package: https://spacy.io/. Furthermore, we exclude words that appear in every question of the earnings conference call.
[10] We use the spaCy part of speech tagger to derive the classes of the words. The final term-document matrix only includes nouns ("NOUN"), adjectives ("ADJ"), verbs ("VERB"), and proper nouns ("PROPN"). Proper noun refers to e.g., names of cities. Link to spaCy part of speech tagger: https://spacy.io/. The decision to use only those specific word categories is derived from evidence of prior literature. Lee (2016) argues that function words (articles, conjunctions, pronouns, prepositions, and auxiliary verbs) mainly have grammatical functions and therefore do not contain any firm-specific content information. They are assumed to convey information about the speaking style and as we measure the content similarity between a statement and a question, those words may naturally differ and therefore would bias the result.

The computation of the cosine similarity is based on two resulting word count vectors of the management presentation ($MP_{i,t}$) and each respective analyst question part ($Q\&A_{a(m),i,t}$). We get the similarity by using the following formula:

$$\cos\ sim_{a(m),i,t} = \frac{MP_{i,t} \times Q\ \&\ A_{a(m),i,t}}{\left\|MP_{i,t}\right\|\ \left\|Q\ \&\ A_{a(m),i,t}\right\|}$$

The cosine similarity is defined as the dot product of both word count vectors scaled by a function of the word vector's lengths. This score is bounded between 0 and 1 with a smaller (higher) $\cos sim_{a(m),i,t}$ indicating that the angle between both vectors is smaller (greater) and therefore the similarity between the management presentation and the specific analyst question is higher (lower). Similar to Brown and Tucker (2011), and for the ease of interpretation, we subtract the similarity score from 1 to get the cosine modification score ($\cos mod_{a(m),i,t}$).

$$\cos\ \mathrm{mod}_{a(m),i,t} = 1 - \cos\ sim_{a(m),i,t}$$

Raising a question with a high (low) cosine modification score requires relatively better (minor) information. As shown by prior literature, our modification score is negatively correlated with the question length (Brown and Tucker 2011). This can be theoretically explained by the fact that the probability of a certain word appearance increases if the question gets longer as the questioner is facing an increasing number of word choices[11]. Therefore, we perform a Taylor expansion at 0 to empirically calculate and subsequently subtract the document length bias from $\cos mod_{a(m),i,t}$ [12] (Brown and Tucker 2011; Lee 2016). In order to be able to compare the cosine modification within the earnings call with financial analysts' information for firm *i*, we rank analyst's cosine modification scores for each call *t* into deciles.

*Chain of evidence*

[11] For a detailed explanation and the mathematical proof, please refer to appendix B of Brown and Tucker (2011).
[12] We regress up to the third polynomial of the question length on the raw similarity score. The resulting coefficients are subsequently multiplied with the respective polynomials of the number of words in the question.

As elaborated above, we expect financial analysts with superior information to share relatively less information in their questions (Hypothesis 1) to maintain their information advantage (Hypothesis 2). To test Hypothesis 1, we regress *(regression model 1)* our measure of analysts' information sharing on the squared term of analysts' ranked forecast accuracy before the call (as a measure of the ex-ante quality of financial analyst's information) since we expect an inverted U-shaped association between financial analysts with an information advantage and their information sharing in questions. In other words, we predict that financial analysts with superior information share relatively less information compared to analysts with mediocre information and analysts with inferior information share relatively less information compared to analysts with mediocre information. While the former prediction suggests that superior analysts are by definition able to share relatively more information but are not willing to do so in order to maintain or enhance their information advantage, the latter prediction can be explained by the fact that analysts with inferior information are not able to share relatively more information. To test Hypothesis 2, we regress an indicator variable of whether the analyst is able to maintain or enhance her ranking position in terms of forecast accuracy on the level of information included in her question *(regression model 2)*. We particularly analyze how an, ex-ante, higher (lower) quality information and information sharing in the conference call affects the analysts' ex-post information advantage by analyzing the interaction terms of information sharing of the top (bottom) financial analysts.

In subsequent analyses, we further elaborate upon the mechanism behind our main results by exploring the learning effects of the different types of analysts during conference calls. Moreover, we further examine the determinants of information sharing during conference calls by identifying conditions, which may enhance or reduce analysts' willingness to share information during conference calls.

*Regression models*

*Selective information sharing of financial analysts with superior information*

To analyze the relation between financial analyst's information advantage prior to the conference call and their relative level of information sharing during the call, we estimate the following OLS regression with robust standard errors clustered at the analyst-level[13]:

$$Rank\_Information\_Sharing\_in\_Question_{a,i,t} = \gamma Rank\_FA^{2}_{a,i,t-1} + \rho Rank\_FA_{a,i,t-1} + \mathbf{X_{a,i,t}}\boldsymbol{\beta} + \mathbf{Y_{i,t}}\boldsymbol{\delta} + \mu_a + \pi_k + \sigma_t + \varepsilon_{a,i,t} \quad (1)$$

Where *a* is an index for the analyst, *i* an index for the firm, and *t* an index for the quarter; $\mu_a$ captures analyst fixed effects to account for differences in analyst's characteristics; $\pi_k$ refers to year fixed effects to account for differences over time; $\sigma_t$captures quarter fixed effects to account for differences in between quarters.

We expect $\gamma$ to be negative in regression model (1), as we predict that financial analysts with inferior information are not *able* to share 'new' information in the earnings conference calls compared to financial analysts with mediocre information, whereas financial analysts with superior information are not *willing* to share their superior information in the earnings conference calls.

$\boldsymbol{Rank\_Information\_Sharing\_in\_Question_{a,i,t}}$ captures financial analyst *a*'s level of information sharing during the earnings conference call of firm *i* in quarter *t*, as a measure of cosine modification $\left(cos\ mod_{a(m),i,t}\right)$ between management presentation and financial analysts' question. Following prior research, we rank the measure of cosine modification in deciles within each conference call of firm *i* and quarter *t*, as we would like to derive evidence

[13] We cluster by analyst as we assume that the analyst-observations we were able to match across the earnings conference calls are likely not independent.

of whether financial analyst a shares relatively more or less information compared to her colleagues in the same conference call (Lee 2016). Thus,

$$\boldsymbol{Rank\_Information\_Sharing\_in\_Question_{a,i,t}} = \frac{Decile(\cos mod_{a,i,t})}{10}.$$

The variable is bounded between 0.1 and 1; financial analysts that share the largest amount of 'new' information in the conference call show an information sharing rank of 1. To validate the robustness, we estimate several specifications of the rank in cosine modification, where we variate the n-gram specification (monograms only, mono- and bigrams) as well as the term-weighting scheme (term frequency "tf" and term frequency-inverse document frequency "tf-idf").

$\boldsymbol{Rank\_FA_{a,i,t-1}}$ measures financial analyst *a*'s information advantage for firm *i* before the conference call in quarter *t*. Therefore, we construct financial analyst *a*'s inverse absolute forecast error in the last earnings forecast before the conference call in *t*, regarding the earnings for firm *i* in quarter *t+1*, i.e., $AFE(earnings\ in\ t+1)_{a,i,t-1} * (-1)$. Following Hong and Kubik (2003) we rank financial analysts' absolute forecast error to measure relative forecast accuracy. However, we differ from Hong and Kubik (2003) as we do not build a plain ranking of financial analysts' forecast accuracy for firm *i,* but rank financial analysts into percentiles, thus accounting for the distance in between their forecasts. We hereby consider financial analysts who participate in the call but also non-participating analysts who issue a forecast for the respective firm. Thus, financial analyst's rank in forecast accuracy is measured as follows,

$$Rank\_FA_{a,i,t-1} = \frac{Percentile\left[AFE(earnings_{t+1})_{a,i,t-1} \times (-1)\right]}{100}$$

Consequently, the most accurate financial analyst is ranked with 1. For the regression analysis we zero-center $\boldsymbol{Rank\_FA_{a,i,t-1}}$.

For a robustness validation we follow Mikhail et al. (1999) and variate our measure for financial analyst *a*'s information advantage to her industry-related information advantage

($Industry\_Rank\_FA_{a,s,t-1}$) by measuring financial analyst $a$'s average rank in forecast accuracy across all firms she covers in a certain industry. We partition the industry into the one-digit SIC industry classification.

$\boldsymbol{X}_{a,i,t}$ represents a vector of control variables related to analysts' intra-conference call questioning, i.e. *#Questions_per_Analyst* and *Timing_Question*. *#Questions_per_Analyst* is the natural logarithm of the number of questions financial analyst *a* asks during the conference call. We include the number of questions by one financial analyst as we observe that financial analysts mostly ask follow-up questions to clarify the previously discussed information. Thus, a larger number of questions by one analyst only represents a higher quantity of the same information[14]. *Timing_Question* is the natural logarithm of the sequential order of the financial analyst's question as earlier questions from financial analysts may be closer related to the presentation section than later questions[15].

$\boldsymbol{Y}_{i,t}$ represents a vector of control variables related to the information environment of firm *i* in quarter *t* and thus, measures differences in the competitiveness of financial analysts' environment. Since the information environment influences the value of superior information and thus, financial analysts' willingness to share information during the call. To control for the information environment we follow Hope and Wang (2018) and include the control variables *Size*, *BTM*, *Leverage*, *Coverage*, *Beat*, *Surprise*, $\Delta ROA$ and *Loss.*

*Size* is the natural logarithm of total assets in thousands. Prior studies found that information asymmetries decrease with increasing size as percentage spread of bid and ask and firm

[14] Mayew et al. (2020) use the number of questions by one financial analyst, or turns-at-talk, to proxy information quantity as they argue that more turns between manager and analyst enable the analyst to cover a wider span of topics. Given their argumentation, controlling for the number of questions would work against us.

[15] Cen et al. (2020) use the order of the question as a measure for analyst's connection to management, which could also be related to insider-information of financial analysts, thus diminishing our measure for information advantages. We believe our measure for information advantages, focusing on the content of the question, is a more precise measure for information advantages than the simple point in time financial analysts are offered to ask their questions.

size are negatively correlated (Glosten and Harris 1988; Leuz 2003). *BTM* is the book value of equity divided by the market value of equity and represents a proxy for growth opportunities or risk, thus, for these firms' information asymmetries are regarded to be higher. *Leverage* is the leverage share of equity defined as the sum of long-term debt and short-term liabilities divided by common equity. Firm-investor-asymmetries are negatively related to leverage, as firms with higher leverage are regarded to be monitored more closely. $\Delta ROA$ is the return on assets between the current and the past quarter and controls for firm's financial performance change as prior studies have shown that firm-investor information asymmetries are more likely to increase with performance variability (Brown and Hillegeist 2007). *Coverage* is the natural logarithm of the average number of forecasts provided at *t-1* and *t,* and thus controls for variances in the competitiveness of the information environment for financial analysts (Hong and Kacperczyk 2010). *Beat* is an indicator variable that is equal to 1 if the firm's reported earnings exceeds the analysts' consensus earnings forecast. Prior literature shows that firms that beat the consensus experience a decrease in information asymmetry (Brown et al. 2009). *Surprise* is the difference between quarterly EPS and the mean consensus analyst forecast, it is intended to control for the amount of 'new' information provided to the market by announced earnings (Bushee et al. 2010) and thus might also reflect how much 'new' information regarding the last quarter is shared in the earnings conference call. *Loss* is an indicator variable, which equals 1 for firms reporting negative earnings, and 0 otherwise. As some studies provide evidence that managers provide more insights and supplemental disclosures when disclosing bad news (Baginski et al. 2004), we control for quarters when the firm reports a loss, as the discussion might more strongly focus on explaining current earnings rather than future earnings.

*The relation between financial analysts' selective information sharing and their performance after the conference call*

In order to analyze, whether sharing relatively less information during the earnings conference call helps superior financial analysts to maintain or enhance their information advantage (Hypothesis 2), we estimate the following Probit model with robust standard errors clustered at the analyst-level.

$$Keep\_Rank_{a,i,t+1} = \gamma Rank\_Information\_Sharing\_in\_Question_{a,i,t} \times Top\_25\%\_Analyst_{a,i,t-1} + \rho Rank\_Information\_Sharing\_in\_Question_{a,i,t} + \tau Rank\_Information\_Sharing\_in\_Question_{a,i,t} \times Bottom\_25\%\_Analyst_{a,i,t-1} + \theta Top\_25\%\_Analyst_{a,i,t-1} + \upsilon Bottom\_25\%\_Analyst_{a,i,t-1} + \mathbf{X_{a,i,t}}\boldsymbol{\beta} + \mathbf{Y_{i,t}}\boldsymbol{\delta} + \mu_a + \pi_k + \sigma_t + \varepsilon_{a,i,t} \quad (2)$$

Where *a* is an index for the analyst, *i* an index for the firm, and *t* an index for the quarter; $\mu_a$ captures analyst fixed effects to account for differences in analyst's characteristics; $\pi_k$ refers to year fixed effects to account for differences over time; $\sigma_t$captures quarter fixed effects to account for differences in between quarters.

$\boldsymbol{Keep\_Rank_{a,i,t+1}}$ measures financial analyst *a*'s information advantage after the conference call of firm *i*. The indicator variable takes the value of 1 if the financial analyst's rank in forecast accuracy for firm *i* is not more than one (0.5) standard deviation(s) of the ranking positions for firm *i* in quarter *t* below her percentile rank in forecast accuracy before the conference call, and 0 otherwise.

$\boldsymbol{Rank\_Information\_Sharing\_in\_Question_{a,i,t}}$ measures financial analyst's relative information sharing during the earnings conference call, as explained above.

$\boldsymbol{Top\_25\%\_Analyst_{a,i,t-1}}$ ($\boldsymbol{Bottom\_25\%\_Analyst_{a,i,t-1}}$) is an indicator variable taking the value of 1 for financial analysts in the upper 75th (lower 25th) quantile in the forecast accuracy ranking of firm *i* for the earnings forecast for quarter *t+1* provided in quarter *t-1*.

Equivalent to Equation (1), $\boldsymbol{X}_{a,i,t}$ represents a vector of control variables related to financial analyst's questioning. Apart form #*Questions_per_Analyst* and *Timing_Question,* the vector includes *Rank_Information_Sharing_in_Answer, Average_Information_Sharing_in_Question_excl_Analyst_Question, Average_Information_Sharing_in_Answer_excl_Answer_to_Analyst_Question* to account for the information provided in the conference call apart from the information in analyst *a*'s question.

*Rank_Information_Sharing_in_Answer* measures manager's relative information sharing in his answer to analyst *a*'s question, ranking the informativeness of the manager's answer to the analyst *a*'s question in comparison to all answers provided in the conference call. It is measured as the decile rank of the cosine modification between the management presentation and the manager's answer. *Average_Information_Sharing_in_Question_excl_Analyst_Question* indicates the average information provided in analyst's questions during the conference call of firm *i* in quarter *t*, excluding the information provided by analyst *a*, measured again as the average rank of the cosine modification of analysts' questions. *Average_Information_Sharing_in_Answer_excl_Answer_to_Analyst_Question* represents the average information shared in the manager's answers, excluding the level of information shared by the answer to analyst *a*'s question during conference call t. This measure is also derived from the average rank of the cosine modification of manager's answers.

Equivalent to Equation (1), $\boldsymbol{Y}_{i,t}$ represents a vector of control variables related to the information environment of firm *i* in quarter *t* and, thus is related to differences in the competitiveness for financial analysts. As explained above, the vector includes the control variables *Size*, *BTM*, *Leverage*, *Coverage*, *Beat*, *Surprise*, $\Delta ROA$, and *Loss.* For this analysis the variance inflation factors for the control variables Size, #*Questions_per_Analyst, Coverage* are fairly high (above 5), thus we perform a principal component analysis of the three variables and only include the uncorrelated linear combinations of the three variables.

We expect $\gamma$ to be negative in regression model (2), as we expect that analysts with superior information experience lower marginal benefits than analysts with mediocre information when they share information during the earnings conference call. We also expect $\tau$ to be positive, as we assume that especially analysts with inferior information can gain from the conference call by sharing information and thus receiving informative answers.

*Descriptive statistics*

Table 2 reports the descriptive statistics of the variables. Compared to all questions raised in the included conference calls, the analyst-speech portions we were able to match contain below average information *(decile=0.4)*[16]. However, on average with respect to forecast accuracy, the matched financial analysts rank in the 57$^{th}$ percentile, and thus are more accurate than the mean financial analyst providing a forecast for the quarter. These descriptive statistics already point towards our expectations that financial analysts with information advantages tend to share relatively less information during the earnings conference call. Overall, financial analysts' individual information advantages are volatile across quarters, the standard deviation of percentile rank in forecast accuracy for the mean analyst is 28.16, underlining that superior information is quarter-specific. 75% of analysts are able to lose less than one standard deviation (i.e., on average 0.29 percentiles) in their forecast accuracy ranking. 34% of analysts in our sample belong to the best 25% of all analysts providing a forecast for the S&P 500 firms. Only 17% of the analysts in our sample belong to the bottom 25% of analysts for the S&P 500 firms. To our understanding, the bias in our data towards more accurate financial analysts does not harm our predictions as we compare financial analysts' relative forecast accuracy to the total amount of forecasts provided in a quarter for firm *i*. The bias is consistent with the findings by Mayew et

[16] As we derive the relative information shared from all questions provided in the conference call, we are able to make inferences on the total amount of information shared, despite the fact that we were not able to match every financial analyst's statement.

al. (2013), suggesting that especially financial analysts with superior information participate in conference calls.

[Please insert Table 2 here]

On average each analyst in our sample asks about 2 questions and each firm is covered by about 15 analysts. In 68 out of 100 times, firms are able to beat analysts' consensus forecast, on average by 0.09 EPS.

## IV. RESULTS

*Correlation results*

Table 3 reports the Pearson correlations among the variables used in the regression analysis. In line with our expectations, we find a negative and statistically significant (p-value < 0.1) relation between relative information sharing and the squared rank in forecast accuracy. This result suggests that financial analysts with inferior information and financial analysts with superior information share relatively less information in the earnings conference call compared to financial analysts with mediocre information. The association between the unsquared rank of forecast accuracy and relative information sharing is not significant, further supporting our expectations of a U-shaped relation between financial analysts' information advantage and information sharing in earnings conference calls.

On average, information sharing is statistically significantly (p-value < 0.01) and positively related to maintaining the ranking position. However, in order to analyze whether financial analysts with information advantages suffer from information sharing, we have to look at the cross-section of the top financial analysts and information sharing in regression model (2). The upper 25th quantile of financial analysts is negatively and statistically significantly (p-value < 0.01) associated with loosing less than one standard deviation in the forecast accuracy

ranking after the conference call, suggesting a higher chance of losing in the forecast accuracy ranking when starting at a high position.

[Please insert Table 3 here]

*Regression results*

*Selective information sharing of financial analysts with superior information*

Table 4 reports the results for the relation between financial analysts' information advantage and their relative information sharing during the conference call *(regression model 1).* We vary our measure for information sharing, i.e. the cosine modification between the management presentation and analysts' questions by different n-grams specifications as well as term-weighting-schemes, as described above.

[Please insert Table 4 here]

In line with our expectations, we find a negative and statistically significant (p-value < 0.01) coefficient on the variable *Rank_FA_before_Call² (mono- and bigram, term frequency-weighting),* suggesting an inverted U-shaped relation between financial analysts' ex-ante information and their information sharing during the conference call. Variations in the n-gram specification and term-weighting-scheme result in qualitatively similar results (*Model 1b-d).* Also, the coefficient of *Industry_Rank_FA_before_Call² (Model 1e)* is negative and statistically significant (p-value < 0.1), suggesting a negative, although less strong relation between financial analysts' industry-related information advantage and information sharing during the conference call. The negative and statistically significant inverted U-shaped relation between financial analysts' ex-ante forecast accuracy and information sharing during the conference call supports our first hypothesis, suggesting that financial analysts with superior information are not willing to share more information than the average level of information shared.

*The relation between financial analysts' selective information sharing and their performance after the conference call*

Table 5 presents the results for the relation between financial analysts' relative information sharing and their relative performance after the conference call. We find a positive and statistically significant (p-value < 0.01) coefficient on the variable *Rank_Information_Sharing_in_Question*, suggesting that a higher rank in information sharing is associated with a greater likelihood of maintaining or improving the ranking position within one standard deviation to the ranking position before the conference call. Thus, information sharing by financial analysts is on average beneficial to financial analysts.

However, we find that the strength of the effect differs with the financial analyst's information advantage. We find a negative and statistically significant (p-value < 0.01) coefficient on the interaction term of relative information sharing and the best 25% of financial analysts *(Rank_Information_Sharing_in_Question x Top_25%_Analyst)*, suggesting that the marginal benefit of sharing information in the conference call decreases with a higher ex-ante rank in forecast accuracy. The best financial analysts also have per-se a higher likelihood of losing their superior position as indicated by the negative and statistically significant (p-value < 0.01) coefficient on *Top_25%_Analyst.* We find a positive and statistically significant (p-value < 0.05) coefficient on the interaction term of relative information sharing and the bottom 25% of financial analysts (*Rank_Information_Sharing_in_Question x Bottom_25%_Analyst).* This finding implies that especially the bottom 25% of analysts can benefit from sharing information in their questions. However, the bottom financial analysts are constrained by the quality of their information and thus, their ability to ask informative questions.

In Model 2b, we variate the cut-off between financial analysts with superior information, and compare the best 50% of financial analysts with the bottom 50% of financial analyst. In line with the previous results, we find a negative and statistically significant (p-value < 0.01)

coefficient on the interaction term of the best 50% of analysts with their rank of information sharing (Model 2b).

For a variation of the dependent variable (Model 2c and 2b), i.e., a stricter performance measure of financial analysts, we find a negative, however not significant coefficient on the interaction between relative information sharing and the best 25% of financial analysts (Model 2c). And a negative and statistically significant coefficient on the interaction term between *Rank_Information_Sharing_in_Question* and *Top_50%_Analyst*, suggesting again, that already the financial analysts between the upper 50$^{th}$ and 75$^{th}$ quantile experience marginal costs to sharing information.

*Additional analysis – The role of question and answer*

In the next step, we further elaborate upon the mechanism behind our main findings by exploring how information is generated in conference calls, i.e., we differentiate between the information generated through analysts' questions versus management's answers as well as questions asked by analysts with superior, average, or inferior information.

Our main analyses suggest that analysts with superior information share relatively less information and thereby increase the likelihood to maintain or enhance their information advantage. There may be two (potentially complementary) explanations for this finding. First, superior analysts share relatively less information in their questions to avoid that peer analysts learn from their questions. Second, they share relatively less information to reduce the informativeness of the management's answers, as informative questions are arguably associated with informative answers. To elaborate upon this question, we run the following mediation analysis, in which $Rank\_Information\_Sharing\_in\_Question_{a,i,t}$ is defined as treatment variable,

$Rank\_Information\_Sharing\_in\_Answer_{m,i,t}$ as mediator variable, and $Keep\_Rank_{a,i,t+1}$ as outcome variable:[17]

$$\begin{aligned} Rank\_Information\_Sharing\_in\_Answer_{m,i,t} &= \rho Rank\_Information\_Sharing\_in\_Question_{a,i,t} + \\ &\gamma Rank\_Information\_Sharing\_in\_Question_{a,i,t} \times Top\_25\%\_Analyst_{a,i,t-1} + \\ &\tau Rank\_Information\_Sharing\_in\_Question_{a,i,t} \times Bottom\_25\%\_Analyst_{a,i,t-1} + \\ &\theta Top\_25\%\_Analyst_{a,i,t-1} + \upsilon Bottom\_25\%\_Analyst_{a,i,t-1} + \mathbf{X_{a,i,t}}\boldsymbol{\beta} + \mathbf{Y_{i,t}}\boldsymbol{\delta} + \omega_j + \pi_k + \sigma_t + \varepsilon_{m,i,t} \end{aligned} \quad (3a)$$

$$\begin{aligned} Keep\_Rank_{a,i,t+1} &= \gamma Rank\_Information\_Sharing\_in\_Question_{a,i,t} \times Top\_25\%\_Analyst_{a,i,t-1} + \\ &\rho Rank\_Information\_Sharing\_in\_Question_{a,i,t} + \tau Rank\_Information\_Sharing\_in\_Question_{a,i,t} \times \\ &Bottom\_25\%\_Analyst_{a,i,t-1} + \theta Top\_25\%\_Analyst_{a,i,t-1} + \upsilon Bottom\_25\%\_Analyst_{a,i,t-1} + \\ &\varphi Rank\_Information\_Sharing\_in\_Answer_{m,i,t} \times Top\_25\%\_Analyst_{a,i,t-1} + \\ &\omega Rank\_Information\_Sharing\_in\_Answer_{m,i,t} \times Bottom\_25\%\_Analyst_{a,i,t-1} \\ &\mathbf{X_{a,i,t}}\boldsymbol{\beta} + \mathbf{Y_{i,t}}\boldsymbol{\delta} + \omega_j + \pi_k + \sigma_t + \varepsilon_{a,i,t} \end{aligned} \quad (3b)$$

Where *a* is an index for the analyst, *m* an index for the manager, *i* an index for the firm, and *t* an index for the quarter. $\omega_j$ captures industry fixed effects to account for industry-related differences in the informativeness of the conference call; $\pi_k$ refers to year fixed effects to account for differences over time; and $\sigma_t$ captures quarter fixed effects to account for differences between quarters.

$\boldsymbol{Rank\_Information\_Sharing\_in\_Answer_{m,i,t}}$ is the manager's decile rank of the cosine modification between presentation section and the manager's answer to analyst *a*'s question. All other variables are equal to the above presented variables.

[17] We run the mediator model via the *medeff* function in Stata. For continuous mediator and outcome variables, the results are identical to the Baron and Kenny method (Baron and Kenny 1986; Hicks and Tingley 2011). Following Imai et al. (2011), we include the same control variables in the first- and second-stage regression model.

Regression model (3a) is estimated with OLS, while regression model (3b) is estimated as Probit. Both models are estimated with robust standard errors.

Table 6 presents the results of the mediation analysis. In column (3a), we present the results of the first-stage model (i.e., regression model (3a)). In column (3b), we present the results of the second-stage model (i.e., regression model (3b)).

[Please insert Table 6 here]

We find a positive and statistically significant ($p < 0.01$) coefficient on the variable $Rank\_Information\_Sharing\_in\_Question_{a,i,t}$ in regression model (3a), suggesting that informative questions by analysts are associated with informative answers by the management. This finding holds for all analysts participating in the call. Moreover, we differentiate between the top 25% analysts and the bottom 25% analysts by including an interaction term between $Rank\_Information\_Sharing\_in\_Question_{a,i,t}$ and $Top\_25\%\_Analyst_{a,i,t-1}$ and $Bottom\_25\%\_Analyst_{a,i,t-1}$, respectively. We do not find statistically significant results for analysts receiving more (less) accurate answers when asked by the top (bottom) 25% of analysts.

In column (1b), we report on the results of regression model (3b), which represents the second-stage model of the mediation analysis. The coefficient on the variable $Rank\_Information\_Sharing\_in\_Question_{a,i,t}$ captures the direct effect of informative questions on the analysts' likelihood of maintaining or enhancing their ranking positions in terms of forecast accuracy after the call. The coefficient on the variable $Rank\_Information\_Sharing\_in\_Answer_{m,i,t}$ captures the indirect effect of informative questions on the analysts' likelihood of maintaining or enhancing their ranking positions in terms of forecast accuracy after the call through informative answers by the firm's management. Starting with the latter, we find a positive and statistically significant ($p < 0.01$) coefficient on

the variable $Rank\_Information\_Sharing\_in\ \_Answer_{i,t}$, suggesting that all analysts have an incentive to ask informative questions since it increases the informativeness of the management's responses and in turn the likelihood of maintaining or enhancing their ranking positions after the call. However, we find that the strength of the effect depends on the quality of analysts' information. More specifically, we find a positive and statistically significant coefficient on the interaction between $Rank\_Information\_Sharing\_in\ \_Answer_{m,i,t}$ and $Bottom\_25\%\_Analyst_{a,i,t-1}$, suggesting that analysts with inferior information learn more from informative answers by the firm's management compared to financial analysts with mediocre information. Thus, analysts with inferior information have stronger incentives to share information in questions but are constrained by the quality of their information. We do not find that analysts with superior information can learn more from informative management's answers elicited by them asking more informative questions, compared to analysts with mediocre information. This finding could be explained as superior financial analysts depend less strongly (compared to analysts with inferior information) on 'new' information provided by management.

Coming to the direct effect, we find a positive and statistically significant ($p < 0.01$) coefficient on the variable $Rank\_Information\_Sharing\_in\ \_Question_{a,i,t}$, suggesting that on average financial analysts more likely maintain or enhance their information advantages after the call, the more information they share in their questions. This finding holds for all analysts. When we differentiate between the top and bottom 25% analysts by interacting the indicators variable $Top\_25\%\_Analyst_{a,i,t-1}$ ($Bottom\_25\%\_Analyst_{a,i,t-1}$) with the measure of information sharing in questions $Rank\_Information\_Sharing\_in\ \_Question_{a,i,t}$, we find a negative and statistically significant ($p < 0.01$) coefficient on the interaction with the top 25% analysts, the coefficient on the questions of the bottom 25% analysts is not significant. This finding implies that analysts with superior information less likely maintain or enhance their

ranking positions in terms of forecast accuracy, the more information they share in their questions. Thus, while we find a positive direct effect of asking informative questions on the likelihood of maintaining or enhancing the ranking position in terms of forecast accuracy after the call, the magnitude of the effect depends on the type of financial analysts. Compared to analysts with mediocre information, analysts with superior information less likely maintain or enhance their ranking positions by asking informative questions. Since we control for the indirect effect of asking informative questions on the likelihood of maintaining or enhancing their ranking positions, the previously described results on the direct effect contain the effect of asking informative questions. As superior analysts cannot learn anything from asking informative questions itself, the negative coefficient on the interaction between $Rank\_Information\_Sharing\_in\_Question_{a,i,t}$ and $Top\_25\%\_Analyst_{a,i,t-1}$ can only be explained by the fact that peer analysts learn from superior analysts' questions. For instance, superior analysts' questions may emphasize relevant topics or may already provide some informative statements.

Overall, our results suggest that financial analysts learn from peers' questions as well as the accompanied management's answers. More specifically, the informativeness of the management's response increases in the extent of shared information in analysts' questions, increasing analysts' likelihood of maintaining or enhancing their ranking positions. However, the benefits of sharing information depend on the quality of analysts' information before the call. Especially analysts with inferior information benefit from managements' answers. Thus, we provide evidence that financial analysts' marginal benefits from information sharing decrease with the quality of their information as other financial analysts are able to learn about their information from their questions and they are not able to compensate this effect by learning more form their answers than their competitors. In contrast, analysts with inferior information

strongly benefit from sharing information in their questions, but they are constrained by the quality of their information.

*Additional analysis – determinants of information in questioning*

Additionally, we try to understand whether information sharing in financial analysts' questions on average varies with the competitiveness of financial analysts' environment, thus we compare the level of information shared across the firms and quarters in our sample

Therefore, we estimate the following regression model with robust standard errors clustered at the firm-level:

$$Average\_Information\_Sharing\_in\_Questions_{i,t} = \gamma Average\_FE\_before\_Call^2_{i,t-1} + \rho Average\_FE\_before\_Call_{i,t-1} + Uncertainty\_before\_Call_{i,t} + \Delta Information\_Sharing_{i,t} + \mathbf{X_{a,i,t}\beta} + \mathbf{Y_{i,t}\delta} + \omega_j + \pi_k + \sigma_t + \varepsilon_{a,t} \quad (4)$$

Where *a* is an index for the analyst, *i* an index for the firm, and *t* an index for the quarter; $\omega_j$ captures industry fixed effects to account for industry-related differences in the information environment of the firm; $\pi_k$ refers to year fixed effects to account for differences over time; $\sigma_t$ captures quarter fixed effects to account for differences in between quarters.

$\boldsymbol{Uncertainty\_before\_Call_{i,t}}$ is the standard deviation in the absolute earnings per share forecast error for quarter *t+1* before the conference call in *t* and thus measures the certainty of information on future earnings. $\boldsymbol{\Delta Information\_Sharing_{i,t}}$ is the difference between analysts' number of forecasts provided in *t-1* and the number of forecasts provided in *t+1*. Providing an earnings forecast for a firm, arguably already provides some information to competitors. Thus, positive values measure analysts' withholding of information, as some analysts do not share their earnings forecast before the conference call but wait until after the earnings conference call, while negative values indicate that analysts already provide their full information before the conference call, and do not care on updating their earnings forecast.

We find a positive and statistically significant (p-value < 0.01) coefficient on *Uncertainty_before_Call*. Indicating, that analysts on average share more information in earnings conference calls, when their need for accurate information, i.e., their first-order concern, increases. This argumentation is supported by the negative and statistically significant (p-value < 0.05) coefficient on *Information_Sharing_before_Call*, suggesting that financial analysts on average share less information during the call, when less competitors provide insights into their current information before the conference call. These findings underline, that analysts' competitiveness does not only vary with their individual information but also with the information of their environment.

## V. Conclusion

We study whether analysts with superior information selectively share information in their questions during earnings conference calls to maintain their information advantage. On the one hand, analysts have an incentive to reveal information in their questions as informative questions are typically associated with informative management's responses (see Minson et al. 2018), likely increasing the accuracy of their earnings forecasts. On the other hand, especially analysts with superior information are reluctant to share information in their questions as peer analysts may freeride on their information advantage (see Verrecchia 1982; Diamond 1985), potentially reducing superior analysts' information advantages.

Using 9,672 quarterly analyst-manager dialogues in earnings conference calls of the S&P 500 firms in the time-period from 2009 to 2019, we document an inverse U-shaped association between analysts' quality of information (measured as their ranking position in terms of forecast accuracy before the call) and their relative information sharing (measured as the thematic difference between the management's presentation and the analysts' questions). This finding implies that analysts with superior information share relatively less information during conference calls compared to analysts with mediocre information. We show that this behavior results in a

higher likelihood of maintaining or enhancing their ranking positions in terms of relative forecast accuracy. The subsequent mediation analysis suggests that sharing relatively less information is beneficial from the superior analysts' perspective as – in contrast to analysts with inferior information – analysts with superior information cannot learn more from the management's response to their informative questions compared to analysts with mediocre information. More importantly, our findings suggest that peer analysts can even learn from listening to superior analysts' informative questions, reducing the likelihood of superior analysts to maintain or enhance their ranking positions in terms of relative forecast accuracy. Finally, an additional analysis supports the strategic nature of analysts' questioning. In particular, we find that analysts share more information the higher the uncertainty before the call while they share less information, the less information competitors share before the call.

During our analyses, we identified the following limitations. *Firstly*, in our measure for the analyst's information advantage we focus on financial analyst's ex-ante forecast accuracy as one measure of analyst performance. In this context Iselin et al. (2020) find that analysts tend to issue inconsistent output metrics (earnings forecasts, target prices, or stock recommendations), suggesting that financial analysts' performance is a multi-dimensional construct. Nevertheless, we argue that financial analysts' ex-ante forecast accuracy represents a sufficient indicator of financial analysts' information advantage, influencing their questioning behavior during earnings conference calls.

*Secondly*, our measurement of 'new' information content approximates only the lexical and not the semantical difference of each respective analyst's question (management's answer) to the management presentation. Thus, if an analyst (manager) uses different words in her question (his answer) as the management in the presentation section, we would categorize that question (answer) as informative. However, we try to alleviate this concern by including bigrams in the calculation of the cosine modification score. Moreover, we are convinced that this limitation

does not systematically distort the similarity measure as the business language seems to be very standardized and analysts arguably have no incentive to deviate.

*Thirdly*, we mainly focus on the performance outcomes of an analyst based on her personal question, however, analysts might also learn from the questions of others. We try to address this concern by controlling for the information content of other analysts' questions and answers, however, this measure might not be precise enough to measure analysts' full benefits of the questions of their colleagues.

This study introduces the role of strategic questioning induced by the quality of analysts' information as a determinant of conference calls' informativeness. We contribute to the literature on strategic interactions between analysts and managers during earnings conference calls (e.g., Mayew 2008; Mayew et al. 2020) by examining the strategic information exchange among the group of analysts.

## Appendix

### Appendix 1
Variable Definitions.

| Variable name | Variable definitions |
|---|---|
| *RELATIVE INFORMATION SHARING* | |
| Rank_Information_Sharing_in_Question | Analyst *a*'s relative information sharing, as cosine modification score, i.e. inverse of cosine similarity between management presentation and analyst *a*'s question, ranked in deciles within conference call from lowest to highest modification and divided by ten, i.e. information sharing ranges between 0,1 and 1; |
| *INFORMATION ADVANTAGE BEFORE CONFERENCE CALL* | |
| Rank_FA_before_Call | Analyst *a*'s information advantage for firm *i* before the conference call by the percentile rank of analyst *a*'s forecast accuracy for her last forecast before the conference call for firm *i* divided by 100, i.e. [Ranking(abs(forecast - actual)*(-1))]/100 |
| Rank_FA_before_Call² | Squared rank of analyst *a*'s forecast accuracy for firm *i* before the conference call; |
| Industry_Rank_FA_before_Call | Analyst *a*'s industry related information before the conference calls by percentile rank of analyst *a*'s average industry forecast accuracy (defined by SIC classification) for her last forecasts before the conference call divided by 100, i.e. [Ranking(Analyst's Forecast Accuracy for Industry)]/100 |
| Industry_Rank_FA_before_Call² | Squared rank of analyst *a*'s average industry forecast accuracy; |
| Top_25%_Analyst | Indicator variable equal to 1 if analyst's forecast accuracy scored in the upper 75$^{th}$ quantile before the conference call compared to all forecasts for firm *i,* i.e. analysts with a superior information set, 0 otherwise |
| Bottom_25%_Analyst | Indicator variable equal to 1 if analyst's forecast accuracy scored below the 25$^{th}$ quantile before the conference call compared to all forecasts for firm *i,* i.e. analysts with an inferior information set, 0 otherwise |

**Appendix 1 (continued)**

| | |
|---|---|
| *INFORMATION ADVANTAGE AFTER CONFERENCE CALL* | |
| Keep_Rank_within_1_STDV | Analyst *a*'s relative performance after the conference call of firm *i*, indicator variable that takes value of 1 if analyst *a*'s forecast accuracy rank for firm *i* after the conference call is not more than one standard deviation below her forecast accuracy rank before the conference call for firm *i* RANK_FA(i,j,q+1,c1) ∈ [RANK_FA(i,j,q+1,c0) - STDV(RANK_FA(i,j,q+1,c0) ; 1 ] |
| *CONTROLS* | |
| #Questions_per_Analyst | Natural logarithm of the number of analyst *a*'s questions during the conference call of firm *i* in quarter *t* |
| Timing_Question | Natural logarithm of the position of analyst *a*'s question in the conference call |
| Rank_Information_Sharing_in_Answer | Measures manager's relative information sharing in his answer to analyst *a*'s question, measured as cosine modification score, i.e. inverse of cosine similarity between management presentation and manager's answer, ranked in deciles within conference call from lowest to highest modification and divided by ten, i.e. information sharing ranges between 0,1 and 1; |
| Average_Information_Sharing_in_Question_excl_Analyst_Question | Average information shared in analysts' questions during the conference call, excluding the question of analyst *a*, i.e. average inverse of cosine similarity between management presentation and all analysts' questions during the call, excluding the cosine similarity of analyst *a.* |
| Average_Information_Sharing_in_Answer_excl_Answer_to_Analyst_Question | Average information shared in manager's answers during the conference call, excluding the answer to the question of analyst *a*, i.e. average inverse of cosine similarity between management presentation and all manager's answers during the call, excluding the cosine similarity of analyst *a*'s question. |
| Size | Natural logarithm of total assets in thousands of firm *i* |
| BTM | Book value of equity divided by market value of equity |
| Leverage | Leverage share of equity (long term debt + short term liabilities)/common equity; |

**Appendix 1 (continued)**

| | |
|---|---|
| Coverage | Natural logarithm of the average number of forecasts provided for firm *i* before and after the conference call |
| Beat | Indicator variable equal to 1 if actual earnings exceed consensus analysts' earnings forecast (EPS>Actual), 0 otherwise; |
| Surprise | Difference between quarterly EPS and analyst consensus forecast; |
| ΔROA | Change in return on assets between current and past quarter; |
| Loss | Indicator variable equal to 1 for firms reporting negative earnings, 0 otherwise; |
| Principal_Component_Size | Uncorrelated share of the variable Size, after a principal component analysis with the variables Timing_Question and Coverage |
| Principal_Component_Timing_Question | Uncorrelated share of the variable Timing_Question, after a principal component analysis with the variables Size and Coverage |
| Principal_Component_Coverage | Uncorrelated share of the variable Coverage, after a principal component analysis with the variables Timing_Question and Size |
| *ADDITIONAL ANALYSIS* | |
| Average_FE_before_Call | Average forecast error for firm *i* before the conference call; |
| Average_Information_Sharing_in_Question | Average cosine modification of analysts' questions in conference call of firm *i*; |
| Uncertainty_before_Call | standard deviation in earnings per share forecasts for firm *i* provided before the conference call in *t* |
| ΔInformation_Sharing | Difference between the total number of forecasts provided in *t+1* and the number of forecasts provided in *t-1*, i.e. Coverage*(t+1)* - Coverage*(t-1)*; |

**Notes:** This table lists the variables used in the empirical analysis and their description. Note that all continuous variables are trimmed at 1 and 99 percent level.

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**Table 1:** Sample Selection.

| Sample Selection | #observations |
|---|---|
| Potential dataset 2009-2019 of all analyst-manager dialogues | 190,184 |
| Less questions that cannot be matched by name | 167,537 |
| Less missing controls | 12,975 |
| **Sample Analyst-Manager-Dialogues** | **9,672** |

**Notes:** This table reports the sample selection process and presents the final sample of the analysis. The sample includes S&P 500 firms during the fiscal years 2009 to 2019.

**Table 2:** Descriptive Statistics

| **Variable** | N | Mean | STDV | q25 | q50 | q75 |
|---|---|---|---|---|---|---|
| *DEPENDENT & INDEPENDENT VARIABLES* | | | | | | |
| Rank_Information_Sharing_in_Question | 9,672 | 0.42 | 0.27 | 0.10 | 0.40 | 0.70 |
| Rank_FA_before_Call | 9,672 | 0.57 | 0.29 | 0.34 | 0.58 | 0.83 |
| Industry_Rank_FA_before_Call | 9,672 | 0.00 | 0.23 | -0.15 | 0.01 | 0.17 |
| Keep_Rank_within_1_STDV | 9,672 | 0.75 | 0.43 | 1.00 | 1.00 | 1.00 |
| Top_25%_Analyst | 9,672 | 0.34 | 0.47 | 0.00 | 0.00 | 1.00 |
| Bottom_25%_Analyst | 9,672 | 0.17 | 0.38 | 0.00 | 0.00 | 0.00 |
| *CONTROLS* | | | | | | |
| #Questions_per_Analyst | 9,672 | 0.88 | 0.45 | 0.69 | 0.69 | 1.10 |
| Timing_Question | 9,672 | 3.56 | 0.97 | 3.09 | 3.81 | 4.23 |
| Size | 9,672 | 3.10 | 1.34 | 2.12 | 2.97 | 3.79 |
| BTM | 9,672 | 0.49 | 0.31 | 0.26 | 0.40 | 0.65 |
| Leverage | 9,672 | 1.02 | 1.26 | 0.41 | 0.72 | 1.13 |
| Coverage | 9,672 | 2.69 | 0.39 | 2.44 | 2.74 | 2.94 |
| Beat | 9,672 | 0.68 | 0.47 | 0.00 | 1.00 | 1.00 |
| Surprise | 9,672 | 0.09 | 0.40 | -0.04 | 0.07 | 0.20 |
| ΔROA | 9,672 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| Loss | 9,672 | 0.05 | 0.21 | 0.00 | 0.00 | 0.00 |
| *ADDITIONAL ANALYSIS* | | | | | | |
| Average_FE_before_Call | 4,008 | 0.13 | 0.16 | 0.04 | 0.07 | 0.15 |
| Average_Information_Sharing_in_Question | 4,008 | 0.00 | 0.05 | -0.03 | 0.00 | 0.04 |
| Uncertainty_before_Call | 4,008 | 0.06 | 0.06 | 0.02 | 0.04 | 0.07 |
| ΔInformation_Sharing | 4,008 | -2.43 | 3.17 | -4.00 | -2.00 | 0.00 |

## Table 2 (continued)

**Notes:** This table lists the variables used in the empirical analysis and the corresponding distribution parameters. Note that all variables are trimmed at the 1 and 99 percent level. ***Rank_Information_Sharing_in_Question*** measures financial analyst a's relative information sharing, as cosine modification score; ***Rank_FA_before_Call*** measures financial analyst a's information advantage for firm i before the conference call by the percentile rank of financial analyst a's forecast accuracy for her last forecast before the conference call for firm i divided by 100; ***Industry_Rank_Forecast_Accuracy*** measures analyst a's industry related information before the conference calls by percentile rank of analyst a's average industry forecast accuracy (defined by SIC classification) for her last forecasts before the conference call divided by 100*;* ***Keep_Rank_within_1_STDV*** measures financial analyst a's relative performance after the conference call of firm i, indicator variable that takes value of 1 if financial analyst a's forecast accuracy rank for firm i after the conference call is not more than one standard deviation below her forecast accuracy rank before the conference call for firm i*;* **#Questions_per_Analyst** is the natural logarithm of the number of questions a financial analyst asks during the conference call of firm i in quarter t; ***Timing_Question*** is the natural logarithm of the position of the question in the conference call; ***Size*** is the natural logarithm of total assets in thousands; ***BTM*** is the book value of equity divided by market value of equity; ***Leverage*** is the leverage share of equity (long term debt + short term liabilities)/common equity; ***Coverage*** is measured as the natural logarithm of the average number of forecasts provided for firm i before and after the conference call; ***Beat*** is an indicator variable equal to 1 if actual earnings exceed consensus analysts' earnings forecast, 0 otherwise; Surprise difference between quarterly EPS and mean forecast of financial analysts; $\Delta$***ROA*** is the change in return on assets between current and past quarter; ***Loss*** indicator variable equal to 1 for firms reporting negative earnings, 0 otherwise; ***Industry_Rank_FA_before_Call*** measures financial analyst a's industry related information before the conference calls by percentile rank of financial analyst a's average industry forecast accuracy (defined by SIC classification) for his last forecasts before the conference call divided by 100; ***Top_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored in the upper 75th quantile before the conference call compared to all forecasts for firm i, 0 otherwise; ***Bottom_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored below the 25th quantile before the conference call compared to all forecasts for firm i, 0 otherwise; ***Average_FE_before_Call*** is the average forecast error for firm i before the conference call; ***Average_Information_Sharing_in_Question*** *is the a*verage cosine modification of analysts' questions in conference call of firm i; ***Uncertainty_before_Call*** standard deviation in earnings per share forecasts for firm i provided before the conference call in t*;* ***Information_Sharing_before_Call*** is the difference between the total number of forecasts provided in t+1 and the number of forecasts provided in t-1, i.e. Coverage(t+1) - Coverage(t-1);

**Table 3:** Pearson correlation matrix.

| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Variable | Rank_Information_Sharing_in_Question | Rank_FA_before_Call | Rank_FA_before_Call² | Keep_Rank_within_1_STDV | #Questions_per_Analyst | Timing_Question | Size | BTM | Leverage | Coverage | Beat | Surprise | ΔROA |
| (1) | Rank_Information_Sharing_in_Question | 1.00 | | | | | | | | | | | | |
| (2) | Rank_FA_before_Call | 0.01 | 1.00 | | | | | | | | | | | |
| (3) | Rank_FA_before_Call² | -0.02* | -0.19*** | 1.00 | | | | | | | | | | |
| (4) | Keep_Rank_within_1_STDV | 0.13*** | -0.30*** | 0.00 | 1.00 | | | | | | | | | |
| (5) | #Questions_per_Analyst | -0.06*** | 0.01 | -0.01 | -0.03*** | 1.00 | | | | | | | | |
| (6) | Timing_Question | 0.10*** | -0.02** | 0.02 | 0.05*** | 0.03*** | 1.00 | | | | | | | |
| (7) | Size | -0.02 | -0.03*** | 0.02* | -0.03*** | -0.05*** | 0.04*** | 1.00 | | | | | | |
| (8) | BTM | 0.00 | -0.02* | 0.02 | -0.01 | 0.07*** | 0.02 | 0.54*** | 1.00 | | | | | |
| (9) | Leverage | -0.02** | 0.00 | 0.00 | -0.04*** | 0.00 | 0.00 | 0.25*** | -0.05*** | 1.00 | | | | |
| (10) | Coverage | 0.10*** | -0.03*** | 0.01 | 0.09*** | -0.18*** | 0.13*** | 0.34*** | 0.16*** | -0.01 | 1.00 | | | |
| (11) | Beat | 0.02** | 0.01 | 0.02** | 0.03*** | -0.03*** | 0.00 | -0.05*** | -0.06*** | -0.02 | 0.04*** | 1.00 | | |
| (12) | Surprise | 0.01 | 0.01 | 0.00 | 0.02** | -0.01 | 0.00 | -0.01 | -0.03*** | 0.05*** | 0.01 | 0.58*** | 1.00 | |
| (13) | ΔROA | 0.01 | 0.00 | 0.01 | -0.02 | 0.02 | -0.01 | -0.03*** | -0.02* | 0.01 | -0.01 | -0.05*** | -0.09*** | 1.00 |
| (14) | Loss | -0.01 | 0.01 | 0.01 | -0.02 | 0.01 | -0.01 | 0.00 | 0.12*** | 0.01 | 0.05*** | 0.04*** | 0.06*** | -0.20*** |

**Table 3 (continued)**

| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Variable | Rank_In-for-mation_Sha ring_in_Qu estion | Rank_FA_ before_Call | Rank_FA_ be-fore_Call² | Keep_Rank _within_1_ STDV | #Ques-tions_per_ Analyst | Tim-ing_Ques-tion | Size | BTM | Leverage | Coverage | Beat | Surprise | ΔROA |
| (15) | Indus-try_Rank _FA_be-fore_Call | 0.01 | 0.80*** | -0.15*** | -0.24*** | 0.02** | -0.01 | -0.03*** | -0.02 | 0.00 | -0.03*** | 0.01 | 0.01 | 0.00 |
| (16) | Top_25% _Analyst | 0.00 | 0.81*** | 0.24*** | -0.27*** | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 | -0.01 | 0.02** | 0.01 | 0.00 |
| (17) | Bot-tom_25% _Analyst | -0.01 | -0.68*** | 0.67*** | 0.17*** | -0.01 | 0.03*** | 0.04*** | 0.03*** | 0.00 | 0.03*** | 0.00 | 0.00 | 0.00 |

**Table 3 (continued)**

| | | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|
| | Variable | Loss | Industry_Rank_FA_before_Call | Top_25%_Analyst | Bottom_25%_Analyst |
| (14) | Loss | 1.00 | | | |
| (15) | Industry_Rank_FA_before_Call | 0.00 | 1.00 | | |
| (16) | Top_25%_Analyst | 0.01 | 0.64*** | 1.00 | |
| (17) | Bottom_25%_Analyst | 0.00 | -0.55*** | -0.32*** | 1.00 |

**Notes:** This table reports the Pearson correlations among the variables. ***Rank_Information_Sharing_in_Question*** measures financial analyst a's relative information sharing, as cosine modification score; ***Rank_FA_before_Call*** measures financial analyst a's information advantage for firm i before the conference call by the percentile rank of financial analyst a's forecast accuracy for her last forecast before the conference call for firm i divided by 100; ***Rank_FA_before_Call²*** is the squared rank of financial analyst a's forecast accuracy for firm i before the conference call; ***Keep_Rank_within_1_STDV*** measures financial analyst a's relative performance after the conference call of firm i, indicator variable that takes value of 1 if financial analyst a's forecast accuracy rank for firm i after the conference call is not more than one standard deviation below her forecast accuracy rank before the conference call for firm i; ***#Questions_per_Analyst*** is the natural logarithm of the number of questions a financial analyst asks during the conference call of firm i in quarter t; ***Timing_Question*** is the natural logarithm of the position of the question in the conference call; **Size** is the natural logarithm of total assets in thousands; ***BTM*** is the book value of equity divided by market value of equity; ***Leverage*** is the leverage share of equity (long term debt + short term liabilities)/common equity; ***Coverage*** is measured as the natural logarithm of the average number of forecasts provided for firm i before and after the conference call; ***Beat*** is an indicator variable equal to 1 if actual earnings exceed consensus analysts' earnings forecast, 0 otherwise; ***Surprise*** difference between quarterly EPS and mean forecast of financial analysts; ***ΔROA*** is the change in return on assets between current and past quarter; ***Loss*** indicator variable equal to 1 for firms reporting negative earnings, 0 otherwise; ***Industry_Rank_FA_before_Call*** measures financial analyst a's industry related information before the conference calls by percentile rank of financial analyst a's average industry forecast accuracy (defined by SIC classification) for his last forecasts before the conference call divided by 100; ***Top_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored in the upper 75th quantile before the conference call compared to all forecasts for firm i, 0 otherwise; ***Bottom_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored below the 25th quantile before the conference call compared to all forecasts for firm i, 0 otherwise. *, **, *** indicate the two-tailed statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. For an overview on the variables please see Appendix 1.

**Table 4:** Selective information sharing of financial analysts with superior information.

| VARIABLES | **H1** | | | | |
|---|---|---|---|---|---|
| | (1a) | (1b) | (1c) | (1d) | (1e) |
| | Rank_Information_Sharing_in_Question (mono- and bigram, count) | Rank_Information_Sharing_in_Question (mono- and bigram, tfidf) | Rank_Information_Sharing_in_Question (monogram, tf) | Rank_Information_Sharing_in_Question (monogram, tf-idf) | Rank_Information_Sharing_in_Question (mono- and bigram, tf) |
| Rank_FA_before_Call | 0.013 | 0.013 | 0.011 | 0.012 | |
| | (0.010) | (0.010) | (0.010) | (0.010) | |
| Rank_FA_before_Call² | **-0.120*** ** | **-0.095** ** | **-0.089** ** | **-0.115*** ** | |
| | **(0.038)** | **(0.038)** | **(0.037)** | **(0.038)** | |
| Industry_Rank_FA_before_Call | | | | | 0.018 |
| | | | | | (0.013) |
| Industry_Rank_FA_before_Call² | | | | | **-0.078*** |
| | | | | | **(0.045)** |
| #Questions_per_Analyst | -0.025*** | -0.032*** | -0.032*** | -0.026*** | -0.025*** |
| | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| Timing_Question | 0.026*** | 0.028*** | 0.027*** | 0.026*** | 0.026*** |
| | (0.004) | (0.003) | (0.003) | (0.003) | (0.004) |
| Size | -0.009* | -0.006 | -0.008 | -0.009* | -0.009* |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| BTM | 0.020 | 0.018 | 0.029 | 0.023 | 0.020 |
| | (0.020) | (0.020) | (0.019) | (0.020) | (0.019) |
| Leverage | -0.002 | -0.002 | -0.002 | -0.001 | -0.002 |
| | (0.003) | (0.004) | (0.003) | (0.003) | (0.003) |
| Coverage | 0.062*** | 0.066*** | 0.071*** | 0.070*** | 0.063*** |
| | (0.016) | (0.016) | (0.016) | (0.015) | (0.016) |
| Beat | 0.004 | 0.002 | 0.003 | 0.006 | 0.004 |
| | (0.008) | (0.007) | (0.007) | (0.008) | (0.008) |
| Surprise | -0.002 | 0.000 | 0.003 | -0.002 | -0.002 |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
| ΔROA | 0.107 | 0.185 | 0.179 | 0.172 | 0.106 |
| | (0.295) | (0.293) | (0.285) | (0.299) | (0.296) |
| Loss | -0.020 | -0.019 | -0.025* | -0.021 | -0.021 |
| | (0.015) | (0.015) | (0.015) | (0.015) | (0.015) |
| Constant | 0.011 | 0.001 | -0.014 | -0.010 | 0.005 |
| | (0.045) | (0.046) | (0.046) | (0.043) | (0.045) |

**Table 4 (continued)**

| | | | | | |
|---|---|---|---|---|---|
| Analyst fixed effects | YES | YES | YES | YES | YES |
| Quarter fixed effects | YES | YES | YES | YES | YES |
| Year fixed effects | YES | YES | YES | YES | YES |
| Observations | 9,672 | 9,672 | 9,672 | 9,672 | 9,672 |
| R-squared | 0.157 | 0.154 | 0.154 | 0.157 | 0.156 |
| Adjusted R-squared | 0.104 | 0.100 | 0.101 | 0.104 | 0.103 |
| F-Test | 11.84*** | 10.52*** | 10.83*** | 9.94*** | 8.85*** |
| Robust standard errors | YES | YES | YES | YES | YES |
| Clustered standard errors | analyst-level | analyst-level | analyst-level | analyst-level | analyst-level |

**Notes:** Table 4 reports the relation between financial analysts' information and relative information sharing in earnings conference calls, estimated with OLS regressions with robust standard errors clustered at the analyst-level. Model (1a-d) reports the relation between financial analysts' firm specific forecast error and information sharing, where n-gram specification as well as term-weighting schemes are varied. Model (1e) reports the relation between financial analysts' industry specific forecast error and information sharing (mono- and bigram with term-frequency-weighting). ***Rank_Information_Sharing_in_Question*** measures financial analyst a's relative information sharing, as cosine modification score; ***Rank_FA_before_Call*** measures financial analyst a's information advantage for firm i before the conference call by the percentile rank of financial analyst a's forecast accuracy for her last forecast before the conference call for firm i divided by 100, the variable is zero-centered; ***Rank_FA_before_Call²*** is the squared rank of financial analyst a's forecast accuracy for firm i before the conference call, the variable is zero-centered; ***Industry_Rank_FA_before_Call*** measures financial analyst a's industry related information before the conference calls by percentile rank of financial analyst a's average industry forecast accuracy (defined by SIC classification) for his last forecasts before the conference call divided by 100, the variable is zero-centered; ***#Questions_per_Analyst*** is the natural logarithm of the number of questions a financial analyst asks during the conference call of firm i in quarter t; ***Timing_Question*** is the natural logarithm of the position of the question in the conference call; ***Size*** is the natural logarithm of total assets in thousands; ***BTM*** is the book value of equity divided by market value of equity; ***Leverage*** is the leverage share of equity (long term debt + short term liabilities)/common equity; ***Coverage*** is measured as the natural logarithm of the average number of forecasts provided for firm i before and after the conference call; ***Beat*** is an indicator variable equal to 1 if actual earnings exceed consensus analysts' earnings forecast, 0 otherwise; Surprise difference between quarterly EPS and mean forecast of financial analysts; $\Delta$***ROA*** is the change in return on assets between current and past quarter; ***Loss*** indicator variable equal to 1 for firms reporting negative earnings, 0 otherwise. Furthermore, we control for year, quarter and analyst fixed effects. *, **, *** indicate two-tailed significance at the 10 percent, 5 percent, and 1 percent levels. Standard errors are reported in parentheses. For an overview on the variables see Appendix 1.

**Table 5:** The relation between financial analysts' selective information sharing and their performance after the conference call.

| VARIABLES | H2 | | | |
|---|---|---|---|---|
| | (2a) | (2b) | (2c) | (2d) |
| | Keep_Rank_ within_1_ STDV | Keep_Rank_ within_1_ STDV | Keep_Rank_ within_0.5_ STDV | Keep_Rank_ within_0.5_ STDV |
| Rank_Information_ Sharing_in_ Question | 0.694*** | 0.652*** | 0.503*** | 0.432*** |
| | (0.094) | (0.090) | (0.082) | (0.077) |
| Rank_ Information_ Sharing_in_ Question x Top_25%_Analyst | **-0.490*** ** | | **-0.192** | |
| | **(0.137)** | | **(0.120)** | |
| Rank_Infor-mation_Sharing_in_ Question x Bottom_25%_ Analyst | **0.675**** | | **0.968*** ** | |
| | **(0.272)** | | **(0.241)** | |
| Rank_Infor-mation_Sharing _in_Question x Top_50%_Analyst | | **-0.555*** ** | | **-0.311**** |
| | | **(0.151)** | | **(0.129)** |
| Top_25%_Analyst | -0.744*** | | -0.888*** | |
| | (0.036) | | (0.034) | |
| Bottom_25%_ Analyst | 0.672*** | | 0.942*** | |
| | (0.073) | | (0.065) | |
| Top_50%_Analyst | | -0.913*** | | -1.070*** |
| | | (0.043) | | (0.038) |
| Rank_Infor-mation_Shar-ing_in_Answer | 0.358*** | 0.335*** | 0.252*** | 0.225*** |
| | (0.081) | (0.080) | (0.067) | (0.066) |
| Average_ Information_ Sharing_in_Ques-tion_excl_Analyst_ Question | 0.456 | 0.518 | 0.225 | 0.304 |
| | (0.642) | (0.633) | (0.638) | (0.626) |
| Average_ Information_ Sharing_in_An-swer_excl_An-swer_to_ Analyst_Question | 0.606 | 0.623 | 0.346 | 0.365 |
| | (0.493) | (0.482) | (0.460) | (0.452) |
| #Questions_per _Analyst | -0.013 | -0.004 | -0.026 | -0.012 |
| | (0.044) | (0.042) | (0.041) | (0.039) |

**Table 5 (continued)**

| | | | | |
|---|---|---|---|---|
| Principal_ Component_Size | 0.014<br>(0.020) | 0.020<br>(0.020) | -0.010<br>(0.019) | -0.003<br>(0.018) |
| Principal_ Component_ Timing_Question | 0.106***<br>(0.025) | 0.097***<br>(0.025) | 0.088***<br>(0.026) | 0.078***<br>(0.026) |
| Principal_ Component_ Coverage | -0.137***<br>(0.034) | -0.146***<br>(0.034) | -0.067**<br>(0.033) | -0.074**<br>(0.032) |
| BTM | 0.016<br>(0.099) | 0.033<br>(0.092) | -0.152<br>(0.095) | -0.141<br>(0.088) |
| Leverage | -0.047***<br>(0.018) | -0.048***<br>(0.017) | -0.039**<br>(0.016) | -0.043***<br>(0.016) |
| Beat | 0.051<br>(0.044) | 0.050<br>(0.043) | 0.021<br>(0.043) | 0.018<br>(0.041) |
| Surprise | 0.045<br>(0.055) | 0.028<br>(0.054) | 0.015<br>(0.049) | 0.001<br>(0.046) |
| ΔROA | -3.594*<br>(1.897) | -3.853**<br>(1.888) | -1.477<br>(1.661) | -1.948<br>(1.649) |
| Loss | -0.078<br>(0.085) | -0.098<br>(0.086) | 0.002<br>(0.077) | -0.035<br>(0.074) |
| Constant | 0.477***<br>(0.133) | 0.516***<br>(0.126) | 0.415***<br>(0.144) | 0.518***<br>(0.141) |
| Analyst fixed effects | YES | YES | YES | YES |
| Quarter fixed effects | YES | YES | YES | YES |
| Year fixed effects | YES | YES | YES | YES |
| Observations | 9,672 | 9,672 | 10,049 | 10,049 |
| Pseudo R-squared | 0.175 | 0.157 | 0.189 | 0.159 |
| Chi² | 809.60*** | 651.16*** | 1240.51*** | 982.39*** |
| Robust standard errors | YES | YES | YES | YES |
| Clustered standard errors | analyst-level | analyst-level | analyst-level | analyst-level |

## Table 5 (continued)

**Notes:** Table 5 reports the relation between financial analysts' relative information sharing and their relative performance after the earnings conference calls, estimated with a Probit-Model with robust standard errors clustered at the analyst level. For Model (2a) and Model (2b) reports the results for a variation in the cross-section analysis of financial analysts' information advantages, i.e. best 25% and best 50% of analysts. Model (2c) and Model (2d) report the results for a variation in the performance, i.e. loose less than one standard deviation or loose less than 0.5 standard deviations in the rank of forecast accuracy. ***Rank_Information_Sharing_in_Question*** measures financial analyst a's relative information sharing, as cosine modification score, the variable is mean-centered; ***Keep_Rank_within_1_STDV*** measures financial analyst a's relative performance after the conference call of firm i, indicator variable that takes value of 1 if financial analyst a's forecast accuracy rank for firm i after the conference call is not more than one standard deviation below her forecast accuracy rank before the conference call for firm i; ***Keep_Rank_within_0.5_STDV*** measures financial analyst a's relative performance after the conference call of firm i, indicator variable that takes value of 1 if financial analyst a's forecast accuracy rank for firm i after the conference call is not more than 0.5 standard deviations below her forecast accuracy rank before the conference call for firm i; ***Rank_Information_Sharing_in_Answer*** measures manager's relative information sharing in his answer to analyst a's question, as cosine modification score, i.e. inverse of cosine similarity between management presentation and manager's answer, ranked in deciles within conference call from lowest to highest modification and divided by ten, i.e. information sharing ranges between 0,1 and 1; ***Average_Information_Sharing_in_Question_excl_Analyst_Question*** measures the average information shared in financial analysts' questions during the conference call, excluding the question of analyst a; ***Average_Information_Sharing_in_Answer_excl_Answer_to_Analyst_Question*** measures the average information shared in manager's answers during the conference call, excluding the answer to the question of analyst a; ***#Questions_per_Analyst*** is the natural logarithm of the number of questions a financial analyst asks during the conference call of firm i in quarter t; ***Principal_Component_Timing_Question*** uncorrelated share of the variable Timing_Question, after a principal component analysis with the variables Size and Coverage; ***Principal_Component_Coverage*** uncorrelated share of the variable Coverage, after a principal component analysis with the variables Timing_Question and Size; ***Principal_Component_Size*** is the uncorrelated share of the variable Size, after a principal component analysis with the variables Timing_Question and Coverage; ***BTM*** is the book value of equity divided by market value of equity; ***Leverage*** is the leverage share of equity (long term debt + short term liabilities)/common equity; ***Coverage*** is measured as the natural logarithm of the average number of forecasts provided for firm i before and after the conference call; ***Beat*** is an indicator variable equal to 1 if actual earnings exceed consensus analysts' earnings forecast, 0 otherwise; ***Surprise*** difference between quarterly EPS and mean forecast of financial analysts; $\Delta$***ROA*** is the change in return on assets between current and past quarter; ***Loss*** indicator variable equal to 1 for firms reporting negative earnings, 0 otherwise; ***Industry_Rank_FA_before_Call*** measures financial analyst a's industry related information before the conference calls by percentile rank of financial analyst a's average industry forecast accuracy (defined by SIC classification) for his last forecasts before the conference call divided by 100; ***Best_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored in the upper 75th quantile before the conference call compared to all forecasts for firm i, 0 otherwise; ***Bottom_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored below the 25th quantile before the conference call compared to all forecasts for firm i, 0 otherwise. Furthermore, we control for year, quarter and analyst fixed effects. *, **, *** indicate two-tailed significance at the 10 percent, 5 percent, and 1 percent levels. Standard errors are reported in parentheses. For an overview on the variables see Appendix 1.

**Table 6:** Additional Analysis - The Role of Question and Answer.

| VARIABLES | Mediator Model | |
|---|---|---|
| | (1a) | (1b) |
| | Rank_Information_Sharing_in_Answer | Keep_Rank_within_1_STDV |
| Rank_Information_Sharing_in_Question | 0.344*** | 0.632*** |
| | (0.009) | (0.064) |
| Top_25%_Analyst | | -0.684*** |
| | | (0.031) |
| Bottom_25%_Analyst | | 0.658*** |
| | | (0.065) |
| Rank_Information_Sharing_in_Question x Top_25%_Analyst | **0.033** | **-0.462*** ** |
| | **(0.021)** | **(0.122)** |
| Rank_Information_Sharing_in_Question x Bottom_25%_Analyst | **0.017** | **0.334** |
| | **(0.026)** | **(0.224)** |
| Rank_Information_Sharing_in_Answer x Top_25%_Analyst | | -0.114 |
| | | (0.123) |
| Rank_Information_Sharing_in_Answer x Bottom_25%_Analyst | | 0.754*** |
| | | (0.214) |
| Rank_Information_Sharing_in_Answer | | 0.446*** |
| | | (0.062) |
| Average_Information_Sharing_in_Question_ excl_Analyst_Question | | 0.804 |
| | | (0.585) |
| Average_Information_Sharing_in_Answer_ excl_Answer_to_Analyst_ Question | | 0.118 |
| | | (0.408) |
| #Questions_per_Analyst | -0.028*** | -0.008 |
| | (0.006) | (0.034) |
| Principal_Component_Timing_Question | 0.013*** | 0.032** |
| | (0.003) | (0.016) |
| Principal_Component_Size | 0.036*** | 0.041** |
| | (0.003) | (0.016) |
| BTM | 0.008 | 0.034 |
| | (0.012) | (0.067) |
| Leverage | 0.001 | -0.026** |
| | (0.002) | (0.012) |
| Principal_Component_ Coverage | -0.011*** | -0.134*** |
| | (0.004) | (0.024) |

**Table 6 (continued)**

| | | |
|---|---|---|
| Beat | 0.006<br>(0.007) | 0.071*<br>(0.039) |
| Surprise | -0.001<br>(0.008) | 0.041<br>(0.045) |
| ΔROA | 0.191<br>(0.265) | -2.954*<br>(1.559) |
| Loss | -0.005<br>(0.013) | -0.125*<br>(0.072) |
| Analyst fixed effects | NO | NO |
| Industry fixed effects | YES | YES |
| Quarter fixed effects | YES | YES |
| Year fixed effects | YES | YES |
| Constant | -0.101**<br>(0.040) | 0.015<br>(0.244) |
| Observations | 9,672 | 9,672 |
| R-squared | 0.162 | |
| Pseudo R-squared | | 0.115 |
| Adjusted R-squared | 0.159 | |
| F-Test/Chi² | 59.47*** | 981.11*** |
| Robust standard errors | YES | YES |

## Table 6 (continued)

**Notes:** Table 6 reports a mediator analysis, with the analysts' question as the treatment variable and the manager's answer as the mediating variable. Model (1a) reports the relation between an informative question and an informative answer, Model (1b) reports the mediating effect of manager's informative answer to financial analyst's question on the likelihood to maintain once ranking position. ***Rank_Information_Sharing_in_Question*** measures financial analyst a's relative information sharing, as cosine modification score; ***Rank_Information_Sharing_in_Answer*** measures manager's relative information sharing in his answer to analyst a's question, as cosine modification score, i.e. inverse of cosine similarity between management presentation and manager's answer, ranked in deciles within conference call from lowest to highest modification and divided by ten, i.e. information sharing ranges between 0,1 and 1; ***Keep_Rank_within_1_STDV*** measures financial analyst a's relative performance after the conference call of firm i, indicator variable that takes value of 1 if financial analyst a's forecast accuracy rank for firm i after the conference call is not more than one standard deviation below her forecast accuracy rank before the conference call for firm i; ***Average_Information_Sharing_in_Question_excl_Analyst_Question*** measures the average information shared in financial analysts' questions during the conference call, excluding the question of analyst a; ***Average_Information_Sharing_in_Answer_excl_Answer_to_Analyst_Question*** measures the average information shared in manager's answers during the conference call, excluding the answer to the question of analyst a; ***#Questions_per_Analyst*** is the natural logarithm of the number of questions a financial analyst asks during the conference call of firm i in quarter t; ***Principal_Component_Timing_Question*** uncorrelated share of the variable Timing_Question, after a principal component analysis with the variables Size and Coverage; ***Principal_Component_Coverage*** uncorrelated share of the variable Coverage, after a principal component analysis with the variables Timing_Question and Size; ***Principal_Component_Size*** is the uncorrelated share of the variable Size, after a principal component analysis with the variables Timing_Question and Coverage*;* ***BTM*** is the book value of equity divided by market value of equity; ***Leverage*** is the leverage share of equity (long term debt + short term liabilities)/common equity; ***Coverage*** is measured as the natural logarithm of the average number of forecasts provided for firm i before and after the conference call; ***Beat*** is an indicator variable equal to 1 if actual earnings exceed consensus analysts' earnings forecast, 0 otherwise; ***Surprise*** difference between quarterly EPS and mean forecast of financial analysts; $\Delta$***ROA*** is the change in return on assets between current and past quarter; Loss indicator variable equal to 1 for firms reporting negative earnings, 0 otherwise*;* ***Industry_Rank_FA_before_Call*** measures financial analyst a's industry related information before the conference calls by percentile rank of financial analyst a's average industry forecast accuracy (defined by SIC classification) for his last forecasts before the conference call divided by 100;
***Top_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored in the upper 75th quantile before the conference call compared to all forecasts for firm i, 0 otherwise; ***Bottom_25%_Analyst*** indicator variable equal to 1 if financial analyst's forecast accuracy scored below the 25th quantile before the conference call compared to all forecasts for firm i, 0 otherwise. Furthermore, we control for year, quarter and analyst fixed effects. *, **, *** indicate two-tailed significance at the 10 percent, 5 percent, and 1 percent levels. Standard errors are reported in parentheses. For an overview on the variables see Appendix 1.

**Table 7:** Additional Analysis - Determinants of Information in Questioning.

| VARIABLES | (1)<br>Average_Information_Sharing_in_Question |
|---|---|
| Average_FE_before_Call | 0.003 |
| | (0.012) |
| Average_FE_before_Call² | -0.004 |
| | (0.009) |
| Uncertainty_before_Call | 0.065*** |
| | (0.020) |
| ΔInformation_Sharing | -0.001** |
| | (0.000) |
| #Questions_per_Analyst | -0.007*** |
| | (0.002) |
| Size | 0.004** |
| | (0.002) |
| BTM | -0.008 |
| | (0.006) |
| Leverage | -0.001 |
| | (0.001) |
| Beat | 0.002 |
| | (0.002) |
| Surprise | -0.002 |
| | (0.002) |
| ΔROA | -0.004 |
| | (0.083) |
| Loss | 0.003 |
| | (0.004) |
| Industry fixed effects | YES |
| Quarter fixed effects | YES |
| Year fixed effects | YES |
| Constant | -0.001 |
| | (0.009) |
| Observations | 4,008 |
| R-squared | 0.062 |
| Adjusted R-squared | 0.0546 |
| F-Test | 4.90*** |
| Robust standard errors | YES |
| Clustered standard errors | firm-level |

**Table 7 (continued)**

**Notes:** Table 7 reports the relation between the competitiveness of financial analysts' environment and their overall information sharing in earnings conference calls, estimated with a OLS with robust standard errors clustered at the firm level. ***Average_Information_Sharing_in_Question*** average cosine modification of financial analysts' questions in conference call of firm i; ***Average_FE_before_Call*** average forecast error for firm i before the conference call; ***Uncertainty_before_Call*** standard deviation in earnings per share forecasts for firm i provided before the conference call in t; ***Information_Sharing_before_Call*** difference between the total number of forecasts provided in t+1 and the number of forecasts provided in t-1, i.e. Coverage(t+1) - Coverage(t-1); ***#Questions_per_Analyst*** is the natural logarithm of the number of questions a financial analyst asks during the conference call of firm i in quarter t*;* ***Size*** is the natural logarithm of total assets in thousands*;* ***BTM*** is the book value of equity divided by market value of equity; ***Leverage*** is the leverage share of equity (long term debt + short term liabilities)/common equity; ***Beat*** is an indicator variable equal to 1 if actual earnings exceed consensus analysts' earnings forecast, 0 otherwise; ***Surprise*** difference between quarterly EPS and mean forecast of financial analysts; $\Delta$***ROA*** is the change in return on assets between current and past quarter; ***Loss*** indicator variable equal to 1 for firms reporting negative earnings, 0 otherwise. Furthermore, we control for year, quarter and analyst fixed effects. *, **, *** indicate two-tailed significance at the 10 percent, 5 percent, and 1 percent levels. Standard errors are reported in parentheses. For an overview on the variables see Appendix 1.

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