KPI Information Acquisition by Analysts: Evidence from Conference Calls

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

As performance measures based on generally accepted accounting principles (GAAP) deteriorate in usefulness, information users are placing more reliance on alternative performance measures. Key performance indicators (KPIs) are a subset of these alternative performance measures illustrating industry-specific firm financial and operational performance. In this study, I investigate analysts' demand for KPI-related information in earnings conference calls and whether managers adjust their decisions about voluntary KPI disclosure in subsequent earnings calls. Using 51 KPIs for six industries, I find that after analysts request KPI-related information, managers increase both the likelihood and the intensity of their KPI disclosure in subsequent earnings conference calls. This effect is more pronounced when the firm's earnings are less relevant, consistent with the supplemental role of KPIs to GAAP financial performance measures. I also find that the proprietary costs faced by the firm and the relationship between analysts and management (as proxied by whether the analysts are invited to ask the first questions during past earnings calls) matter when managers make KPI disclosure decisions following analyst demand. As the findings suggest a well-functioning demand-supply mechanism of KPI disclosure, I further explore whether financial analysts use KPI-related information to improve the quality of their work. I find a significantly positive association between KPI disclosure and the accuracy of analysts' earnings forecasts. This effect is more pronounced when the KPI disclosure is driven by analyst demand. Collectively, my study highlights the role that analysts play in voluntary KPI disclosure when there is an absence of mandatory integrated reporting.

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CHAPTER 1

Introduction

In recent years, along with the declining relevance and usefulness of financial report information (e.g., Brown et al., 1999; Lev, 2018), there has been a rise in the reliance of information users on alternative performance measures (APMs) (Cascino, 2016; E&Y, 2015). While the extant APM literature focuses on non-GAAP financial measures or environmental, social, and governance disclosure (e.g., Hirschey et al., 2001; Marques, 2006), CFA (2018) emphasizes the necessity to go beyond these measures and to "also focus on other alternative performance measures (APMs), including financial and operational key performance indicators (KPIs)." In this dissertation, I investigate analysts' demand for KPI-related information in earnings conference calls and, following analysts' information demand, whether managers increase their voluntary KPI disclosure in subsequent earnings calls.

As a subset of APMs, Key performance indicators (KPIs) are usually contextual and industry-specific, illustrating different aspects of a firm's core business operation. KPIs typically include operational performance measures and financial measures disclosed outside of the primary financial statements.[1] For example, the "same-store sales" for the retail industry describes the sales growth of stores that have been open for a certain time period; and the "load factor" for the airline industry describes the efficiency of the firm's use of passenger-carrying capacity. Prior literature

[1] As described by the SEC's advisory committee on improvements to financial reporting (SEC, 2008), KPIs "capture important aspects of a company's activities that may not be fully reflected in its financial statements or may be nonfinancial measures … by activity and industry."

documents that KPIs are value relevant and indicative for longer-term performance (e.g., Amir and Lev 1996, Lev and Gu 2016).[2]

Anecdotal evidence suggests that KPI disclosure carries strong economic significance. For instance, in 2018, the SEC penalized two high-tech firms, Constant Contact and Endurance, with a fine of $8,000,000 for their material misrepresentation of "subscriber numbers" in their voluntary disclosure (Clarkson and Matelis, 2018).[3] In September 2019, JetBlue's stock price dropped dramatically after disclosing a decreased forecast for "revenue per available seat mile" (Kilgore, 2019). In a survey by Ernst & Young (2015), about 75% of the institutional investors find industry-specific reporting criteria and KPIs beneficial to their investment decisions.

Despite its economic significance, there is no regulatory requirement for KPI disclosure. Thus, the disclosure of KPIs is largely voluntary.[4] To improve the usefulness of financial reporting, researchers, professional associations, and regulators alike have advocated in recent years for integrating and mandating corporate KPI disclosure (e.g., Lev and Gu 2016; CFA, 2018). The SEC (2016) has called for public comments on the benefits and costs of standardizing and mandating KPI disclosure. However, it is challenging to establish mandatory standards for KPI disclosure, since firms' choices and calculation of nonfinancial indicators varies across industries, and, sometimes, even across firms. A potential path is to keep KPI disclosure voluntary and rely on market participants (e.g., analysts) to motivate firms' KPI reporting (Barker and Eccles, 2018). In

[2] Consistent with prior literature, I exclude non-GAAP financial measures (NGFMs) and ESG measures from my definition of KPIs. Section 2.3.2 provides a detailed explanation.
[3] Constant Contact was acquired by Endurance in February 2016.
[4] Authorities and standard setters have proposed various KPI reporting frameworks and guidance (e.g., European Commission, 2017; AcSB, 2018; SEC, 2020); however, due to the context-specific nature of KPIs, the proposed frameworks focus on the disclosure principles but not on specific KPIs. Managers have much discretion in whether to disclose KPI-related information and to what extent in such disclosure.

light of this, it is important to examine whether analysts have influence on managers' disclosure of KPIs in the absence of mandatory integrated reporting.

Motivated by the necessity to understand the role played by financial analysts in KPI disclosure, my dissertation delves into the conversations between managers and analysts during conference calls. It examines whether managers increase their voluntary KPI disclosure following the demand from analysts in the past eight quarters.[5] In practice, venues for KPI disclosure include press releases, the MD&A section of 10-K filings, earnings announcements, and conference calls, among others. In this dissertation, I focus on conference calls as they provide an interactive environment between analysts and firm management and allow researchers to regularly observe analysts' demand for and collection of KPI-related information (Bushee et al., 2004). Moreover, using survey and field data, recent studies demonstrate that managers view conference calls as a vital channel to convey information and maintain good relationships with their investors and other stakeholders (Amel-Zadeh et al., 2019; Brown et al., 2019).

My initial analysis of the sample illustrates a growing interest in KPIs among business information users in recent years. Using multiple sources (i.e., the I/B/E/S KPI database,[6] the KPI literature, and various online articles), I compile a list of 51 industry-specific KPI terms for six industries (i.e., airlines, energy, mining, real estate, retail, and high-tech).[7] I collect 39,302

[5] Following Chapman and Green (2018), I choose a two-year horizon to capture normal business cycles as well as to improve the possibility of observing increased disclosure in case the manager takes some time to collect and prepare the KPI-related information required by analysts.

[6] The I/B/E/S KPI database provides analyst forecasts for industry-specific KPIs and actual values reported by firms in ten industries (i.e., airlines & transportation, banking & investment services, energy, insurance, mining, pharmaceuticals & healthcare, real estate, retail, technology, and telecommunication). I use the list of KPIs followed by analysts in this database to help construct the list of KPIs in my analysis.

[7] Appendix A shows my list of KPIs and their sources. Appendix B reports the construction process of my KPI list. Due to the coverage of I/B/E/S KPI database, the six "industries" may refer to sectors or subsectors with various sizes in Fama French industry classifications.

earnings conference call transcripts of 1,846 firms from the six industries and find that analysts ask about KPI-related information in about one-quarter of earnings calls. Moreover, as shown in Figure 3 Panel A, in the subsample of S&P500 firms, the average number of KPI-related questions posed by analysts increased from 1.26 in 2010 to 1.65 in 2018.[8] I then explore the potential determinants of analysts' interest in KPIs. I find that drivers of such interest tend to be communication-related factors, such as the prior KPI disclosure by the firm, the total number of questions raised in the Q&A section, and the number of words delivered in the managerial presentation. In particular, when the number of analysts following a firm is higher, analysts with connectivity to firm management (identified by whether the analysts are invited to ask the first questions) are less likely to demand KPI disclosure, consistent with the connected analysts being less willing to share KPI-related information with other analysts.

After obtaining an initial understanding about the demand for KPI-related information from analysts, I investigate my research question on the impact of analysts' information demand on managers' voluntary KPI disclosure in subsequent earnings calls. Prior literature suggests that managers have incentives to improve voluntary disclosure when market participants find the information useful in firm evaluation (Dye, 1985; Chapman and Green, 2018). Given the different information specialties of analysts and managers (Hutton et al., 2012) and the importance of industry-specific information in analysts' professional knowledge sets (Brown et al., 2015), I hypothesize that after analysts express their demand for KPI-related information, managers increase voluntary KPI disclosure in their prepared presentations during future earnings calls.

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[8] The number of firms holding earnings conference calls increased significantly from 2006 to 2010 and stayed relatively stable post 2010 (See Table 2. Panel B.) In attempt to illustrate time trend of KPI demand in a relatively consistent sample, I focus on S&P 500 firms from 2010 to 2018.

To test my hypothesis, I map analysts' questions about KPIs in past quarters to managers' subsequent voluntary disclosure of industry-specific KPIs during the presentation sections of conference calls. I employ both the existence of KPI disclosure and the intensity of KPI disclosure (i.e., the number of words covered by KPI-related sentences and the number of KPIs disclosed) in my analysis. I find an increase in managerial voluntary KPI disclosure following analysts' demand for KPI information during the Q&A sections of earnings calls. This finding corroborates the impact of analyst demand on voluntary KPI disclosure.

I further investigate a number of cross-sectional variations of analysts' impact on KPI disclosure. Due to the supplemental role of KPIs to GAAP performance measures, I first conjecture that when a firm exhibits lower earnings relevance, there is stronger demand for alternative information from information users, and thus, it is more beneficial for the firm to satisfy the demand from information users by providing KPI-related information required by financial analysts. Consistent with my hypothesis, I find that the analyst demand effect is more pronounced for firms with lower earnings relevance. Secondly, since KPIs are usually proprietary information used by managers in their internal analysis and decision making, I expect that managers' increase in KPI disclosure following analyst demand is less pronounced when KPI disclosure incurs higher proprietary costs. Using firm-level product market fluidity from Hoberg et al. (2014) as a proxy of proprietary costs, I find a negative association between proprietary costs and the analyst demand effect. Moreover, due to the interpersonal nature of the analyst-management communication, I contend that managers consider their relationship with analysts when making KPI disclosure decisions. Specifically, I predict and find that when the analysts asking about KPIs have connectivity to the management (as proxied by whether the analysts are invited to ask the first questions in prior earnings calls), managers are more likely to increase their KPI disclosure.

These findings suggest a well-functioning demand-supply mechanism of KPI disclosure. To further explore the role played by financial analysts in interpreting and processing KPI-related information, I investigate whether financial analysts use KPI-related information to improve the quality of their work. Specifically, I examine the association between managers' voluntary disclosure about industry-specific KPIs and the accuracy of financial analysts' earnings forecasts.

Prior literature has highlighted the importance of industry-specific information among financial analysts' information sets (e.g., Hutton et al., 2012; Brown et al., 2015). KPIs are an important subset of industry-specific information which are widely used by both managers and other market participants in their business analysis, prediction, and decision-making. However, few studies have empirically examined the impact of KPI disclosure on earnings forecasts. An exception is Simpson (2010), who focuses on the wireless industry from 1997 to 2007 and finds a mixed association between non-financial performance measures and analyst forecast errors. While Simpson (2010) relies on a relatively small sample, this study employs a cross-industry sample covering 51 industry-specific KPIs for six industries from 2006 to 2018.[9] I find a significantly positive association between KPI disclosure and the accuracy of analysts' subsequent earnings forecasts. My finding is robust for most industries (i.e., energy, mining, retail, and high-tech) in the sample except the two industries with the smallest sample size (i.e., airline and real estate).[10]

Moreover, I investigate whether the demand from financial analysts plays a role in the effect of KPI disclosure. I find that the effect of KPI disclosure on analyst forecast accuracy is

[9] The sample of Simpson (2010) covers only six KPIs for 51 firms in wireless industry.
[10] An alternative explanation for the insignificant results for the airline industry and the real estate industry may be that the analysts' earnings forecast accuracy are driven by macro, non-controllable factors in these industries.

more pronounced when the KPI disclosure was motivated by analyst demand. I then reconduct the test for individual industries; the result is only significant for high-tech industry, suggesting that the main finding is driven by the firm-quarters in high-tech industry. This is consistent with the financial analysts being especially important in facilitating the investors' and other stakeholders' understanding the innovative and complicated business models of firms in high-tech industry.

My study contributes to the literature on voluntary KPI disclosure. While prior KPI literature focuses on the value-relevance of KPIs (e.g., Amir and Lev, 1996; Francis et al., 2003) and whether KPIs serve as leading indicators of future financial results (e.g., Behn and Riley, 1999), few have examined the voluntary KPI disclosure decisions of managers. My dissertation contributes by exploring analyst demand as a potential determinant of managers' disclosure of KPIs. In addition, I conduct a comprehensive analysis of KPI disclosure in more than 39,000 conference calls for six industries, significantly extending the literature from single industry analyses (e.g., Amir and Lev, 1996). This dissertation also sheds light on the impact of voluntary KPI disclosure on analysts' earnings forecast accuracy. It extends prior studies about analysts' use of alternative performance measures to a large sample of 31,502 firm-quarters from 2006 until 2018.

My study also contributes to the research on the role of analysts in corporate disclosure. Bradshaw et al. (2017, page 139) call for research on how analysts gather information and benefit firms and capital markets. Due to the difficulty in observing analysts' behaviors, it is challenging to examine financial analysts' information collection and evaluation activities, or even to empirically identify what information analysts use (Gibbons et al., 2020). Thus, studies about the impact of analysts' requests for disclosure are rare. An exception is Chapman and Green (2018), who document that analysts' acquisition of forward-looking GAAP measures during conference

calls influences managers' future disclosures. My study focuses on analysts' information demand and collection for one of their most important inputs, the in-depth industry knowledge (Brown et al., 2015) such as KPIs. This dissertation therefore extends Chapman and Green (2018) by examining whether and how the interaction between managers and analysts plays a role in the voluntary KPI disclosures that are not available from the core financial statements. Moreover, my study highlights the importance of analyst KPI demand in information generation, processing, and dissemination in the high-tech industry. For the high-tech industry, after financial analysts ask for KPI-related information, the effect of voluntary KPI disclosure on analyst forecast accuracy is more significant. This suggests that financial analysts may improve the quality of their earnings forecasts by actively expressing their demand for KPI disclosure and incorporating the KPI-related information into their estimation of firms' future performance.

In addition, my study is of interest to accounting standard setters. Despite the need to integrate nonfinancial information into corporate reporting, it is challenging to establish mandatory standards for KPI disclosure because of the variation of firms' selection and calculation of KPIs. By making an initial exploration of the role played by the analysts without mandatory integrated reporting, my study implies a well-functioning demand-supply mechanism of KPI disclosure suggesting that it may not be necessary to mandate and regulate KPI disclosure.

The remainder of my paper is organized as follows. Chapter 2 presents a review of relevant literature. Chapter 3 examines the association between analysts' information demand and managers' voluntary KPI disclosure in subsequent earnings calls. Chapter 4 examines the association between managerial voluntary KPI disclosure and analysts' earnings forecast accuracy. I conclude my dissertation in Chapter 5.

CHAPTER 2

Literature Review

2.1 Introduction

This chapter reviews four streams of literature relevant to my dissertation: the value relevance of accounting information, the KPI literature, the literature about financial analysts, and studies about earnings conference calls. The first part of the review (Section 2.2) introduces the deterioration of earnings' value relevance in recent decades and the potential reasons for this deterioration. The second part of this review (Section 2.3) begins with anecdotal evidence about the prevalence of alternative performance measures and follows with a detailed description of the definition of KPIs in this dissertation. After introducing the early-stage development in standardizing KPI disclosure, this section concludes with a discussion of the extant research about industry-specific KPIs. The third part (Section 2.4) reviews studies about financial analysts' information acquisition and its impact on analysts' earnings forecast accuracy. My review highlights the challenge in identifying the information requested and collected by analysts. The final part of this review (Section 2.5) introduces the conference call setting, which allows researchers to directly observe the information demand expressed by financial analysts.

2.2 The Declining Usefulness of Financial Report Information

Since the seminal work of Ball and Brown (1968) on the information content of earnings, both standard setters and researchers have made continuous efforts to improve the relevance and usefulness of financial statements. However, in recent decades, because of the rapid development of technology-based industries and the shift of accounting standards from the income statement model to the balance sheet model (Francis and Schipper, 1999), accounting standards and their ability to adequately reflect the economics have come into question. Different groups of market

participants are voicing dissatisfaction with the usefulness of financial reporting. A survey of CFOs argues that financial reporting is more like a compliance exercise than providing the most useful information to the users (Dichev et al., 2013). In a report in 2016, the CFA states that there is an information shortfall caused by the increasing irrelevance of financial reporting and that supplemental information is needed (CFA, 2016).

Empirical studies also suggest the deteriorating usefulness and relevance of the reported accounting numbers (e.g., Lev and Zarowin, 1999; Lev and Gu, 2016, Chapter 3). One stream of the literature measures the usefulness of financial information based on the association between accounting numbers and annual stock returns or share prices. Researchers focus on the usefulness of these accounting measures in stock markets because investors are important accounting information users and the secondary stock market data are publicly available. Lev and Zarowin (1999) regress annual stock returns on earnings (cash flows) and the change of earnings (change of cash flows) and use the R-square to measure the usefulness of reported earnings (cash flows). Similarly, they estimate the usefulness of book value using the R-squares of the stock prices on earnings and book value. Based on the regression of the relevance measures on the time variable, they conclude that the usefulness of earnings, cash flows, and book equity value deteriorated during 1978-1996. Brown et al. (1999) argue that the relevance of earnings across different time periods is not comparable because of the "scale effect". After controlling for the scale effect, the authors find a decline of earnings relevance from 1958 to 1996. Although the length of financial statements has doubled in recent years (Dyer et al., 2017), Lev and Gu (2016, Chapter 3) demonstrate that the adjusted R-square of share price on six key financial measures (i.e., sales, cost of goods sold (COGS), selling, general, and administrative expense (SG&A), earnings, total assets, and total liabilities) has decreased dramatically from the 1950s to the early 2010s. As a

result, executives and investors increasingly rely on alternative non-GAAP and operational data for more relevant and timely information, such as the customer-related KPIs for firms in the telecom, Internet, and media industries (Lev, 2018).

While most studies document the deterioration of earnings' value relevance, researchers find mixed results for the usefulness of other accounting information. Some papers even argue that the increasing relevance of other accounting amounts has offset the declining usefulness of earnings. Collins et al. (1997) put earnings and book value into a single model to estimate stock prices and use the R-square to proxy the combined value relevance. This paper argues that while the usefulness of earnings has been declining from 1953 to 1993, the combined relevance of earnings and equity book value has not decreased. The authors argue that the usefulness of earnings has been replaced by book value because of the occurrence of special items, the prevalence of intangible investment, and the presence of more loss firms. Francis and Schipper (1999) test the relevance of earnings, assets, liabilities, and the book value of equity. The authors estimate a financial measure's value relevance using two proxies: (1) the market-adjusted 15 months returns that could be earned if the financial measure was foreknown, and (2) the explanatory power of financial measures for market values. While the relevance of earnings is decreasing, they find an increasing usefulness of balance sheet and book equity value measures. Barth et al. (2018) examine the usefulness of 14 financial statement measures, from earnings and other common financial measures to the measures related to intangible assets, growth opportunities, and alternative firm performance measures (e.g. operating cash flow, revenue, special items, and other comprehensive income). Similar to prior research, this paper estimates value relevance based on the explanatory power of accounting measures for stock price. Instead of the traditional linear regression model, the authors employ a Classification and Regression Trees (CART) methodology to estimate the

association between measures and stock prices, which allows nonlinearities and interactions. The authors find that while earnings' relevance is decreasing, there is an increase in the usefulness of intangible assets, growth opportunities, and other performance measures, and the trend offsets the increasing irrelevance of earnings in the analysis of integrated relevance. Especially, the performance measures play an important role in the value relevance of accounting information. Up to 2016, alternative performance measures are contributing the third-highest relevance, just below net income and equity book value. Although the definition of alternative performance measure in this paper is not consistent with the industrial KPIs in my study, Barth et al. (2018) shed light on the importance of relaxing the emphasis on earnings as the single performance measure.

Another stream of literature focuses on the short-term stock price volatility or trading volume to examine the informativeness of earnings announcements. Prior papers observe an increase in recent years of the information content of earnings announcements. Landsman and Maydew (2002) test the change of abnormal trading volume and abnormal stock return volatility from 1972 to 1998 and conclude that the information content of earnings announcement was not declining. Beaver et al. (2018) use the three-day cumulative U-Statistic to capture the market reaction to earnings announcements and find a significant increase of market reaction at earnings dates from 2001 to 2011. In their further exploration, Beaver et al. (2020) argue that the dramatic rise in market reaction on earnings announcement dates is driven by three concurrent information releases: management guidance, analyst forecasts, and the voluntary disclosure of items from financial statements.

However, this increasing informativeness does not necessarily conflict with the deterioration of earnings' relevance. As summarized by Butler et al. (2007, p183), the "intraperiod" or short-

term observations are appropriate to indicate the informativeness of public announcements, while the long-horizon timeliness of earnings "captures the extent to which current earnings are explained by, or explain, current economic income." Ball and Shivakumar (2008) explore the relationship between short-window and long-horizon stock returns. The authors use the explanatory power of quarterly earnings announcement window returns for annual returns to measure the importance of earnings announcement relative to annual total information. They find that a quarterly earnings announcement is only associated with about 1% to 2% of annual information incorporated into stock prices. Therefore, although the U-stat around earnings announcements is increasing, its low relative importance is consistent with the irrelevance of earnings. Lev and Gu (2016) employ a similar methodology to estimate the contribution of the three main information sources to the total information that investors use: annual and quarterly financial reports, firms' non-accounting Securities and Exchange Commission (SEC) filings, and analyst forecasts. The authors state that only about 5% of the information used by investors is from annual and quarterly financial reports (Lev and Gu, 2016, Chapter 4), while investors' use of non-accounting information increased from almost zero in 1993 to more than 25% in 2013 (see Figure 1 Panel A). In summary, prior papers have presented the declining relevance of traditional financial statement information along with a rise of information users' reliance on nonfinancial information.

Prior literature has explored the reasons for the deterioration in the usefulness of earnings and proposed three primary explanations: (1) the rise of intangible investments, (2) the development of accounting standards from the traditional income statement (matching) model to a balance sheet (asset valuation) model, and (3) the increase of loss firms. With the development of information technology, intangible investments, such as research and development (R&D), have become more prevalent and brought challenge to accounting standards. Lev and Zarowin (1999) document a

significantly lower earnings relevance for firms with more intangible assets. Core et al. (2003) test the value relevance of seven financial measures (e.g. book value of equity, net income, net income before extraordinary items, R&D expenditures, advertising expenditures, capital expenditures, and the change in sales) and find a decline of combined relevance from the prior period (1975-1995) to the "New Economy" sub-period (1996-1999). Researchers argue that the immediate expensing of intangible investments along with accounting standard setters' abandonment of income statement model results in a mismatch between revenues and expenses. Dichev and Tang (2008) document an increasing mismatch between revenue and expense for the 1,000 largest U.S. firms over the 40 years before 2003. In the regression of revenue on expenses, the authors observe a decreasing coefficient of contemporaneous expense and increasing coefficients of past and future expenses. While it is difficult to link the change in the revenue-expense relation to specific accounting standards, some research suggests that the prevalence of intangible investments is a determinant of the revenue-expense mismatch. Donelson et al. (2011) identify the expensing of special items and their related underlying economic events (e.g. M&A, discontinued operation, revenue decrease, and operating loss) as the source of the increasing revenue-expense mismatch. In addition, Srivastava (2014) states that newly listed firms with higher intangible intensity account for the increasing irrelevance of earnings and the mismatch between revenue and expense among the population. In terms of the explanation of deterioration of earnings' usefulness being due to the increase of loss firms, prior literature shows mixed results. Hayn (1995) and Collins et al. (1999) present a significantly lower earnings-return correlation for loss firms, while Lev and Zarowin (1999) find no significant result in their regression of earnings-return correlation (estimated R-square) on the percentage of loss firms.

2.3 The Rise of KPIs and Related Literature

2.3.1 The Rise of APMs

Along with the declining usefulness of GAAP financial measures is the rise in the reliance of information users on alternative performance measures (APMs). Anecdotal evidence suggests that executives and investors are increasingly relying on alternative non-GAAP and operational data for more relevant and timely information (Lev, 2018). In a survey conducted by CFA, 84% of the investors indicate that they often use operational metrics to help them make decisions, such as firm valuation and risk estimation (CFA, 2018). A report prepared by the European Financial Reporting Advisory Group (Cascino et al., 2016) documents that professional investors often rely on non-GAAP performance measures because they regard such measures as more informative than net income about managerial performance and operating activities. As shown in Figure 1 Panel B, more than 60% of the information used by professional investors comes from alternative resources outside of financial statements (Cascino et al., 2016, Figure 6). Moreover, as described in Section 2.2, Lev and Gu (2016) demonstrate that investors' use of accounting information decreased from more than 10% in early 1990s to just above 5% in 2013, while their use of non-accounting information increased from almost zero in 1993 to more than 25% in 2013 (see Figure 1 Panel A).

2.3.2 Definition of KPI

This dissertation focuses on a subset of APMs, the industry-specific key performance indicators (KPIs), including the financial measures disclosed outside of the primary financial statements and the operational performance measures, such as "proven reserve" in the energy industry and "available seat kilometers" in the transportation industry. As shown in Figure 2 Panel A and B, both the CFA and the Accounting Standards Board (AcSB) classify performance measures into four categories: (1) GAAP financial measures — for example, net income; (2) non-

GAAP financial measures (NGFMs) — for example, earnings before interest, taxes, and amortization (EBITA); (3) other financial measures — for example, same store sales in the retail industry; and (4) operational measures — for example, available seat kilometers in the airline industry. "KPIs" in this dissertation refer to the last two types of measures and differs from NGFMs. For NGFMs, I follow the CFA (2016) definition: NGFMs are "financial measures derived from adjusted GAAP/IFRS measures". Figure 2 Panel C presents some examples from the CFA report (2016) to distinguish NGFM and other metrics, which is consistent with the scope of KPIs in this dissertation.

I exclude NGFMs from my study for two reasons. Firstly, although the definitions of key performance indicators (KPIs) are not unified in the literature, prior papers generally treat NGFMs and KPIs as two different concepts and study them separately (e.g. Lev, 2018; CFA U., 2015). In addition, while NGFMs are calculated based on accounting numbers and generally report a firm's performance at the integrated level, financial and operational KPIs are usually contextual and industry-specific, thus illustrating in detail different aspects of firm performance. For example, "customer acquisition cost," the average cost to acquire a new customer, is widely used by Internet technology firms as a KPI. While many start-up Internet firms focus on increasing their market share, it is important for both the shareholders and the outside investors to understand how costly it is for the firm to acquire each new customer. Secondly, I focus on managers' voluntary disclosure of information in response to requests from information users. Since some NGFMs can be calculated by information users themselves from the financial statements, managers' disclosure of NGFMs sometimes overlaps with a re-emphasis on the mandatory disclosure of information. Thus, I exclude NGFMs from the scope of this study.

Moreover, my definition of KPI is consistent with the CFA (2018) survey of KPIs, which emphasizes the necessity "to go beyond focusing on non-GAAP financial measures (NGFMs) and environmental, social, and governance (ESG) information and to also focus on other alternative performance measures (APMs), including financial and operational key performance indicators (KPIs)." KPIs in this dissertation differ from ESG information. While KPIs illustrate different aspects of a firm's business and provide insight into the sources of firm value (SEC, 2008), ESG information focuses on the firm's responsibility to the overall society beyond that of generating profits for shareholders (Carroll and Shabana, 2010; Flower, 2015). Thus, although prior research reveals that ESG disclosures are value-relevant (Orlitzky et al., 2003; Al-Tuwaijri et al., 2004), I exclude ESG disclosures from my study since they are not likely to be used as supplemental performance indicators to GAAP financial measures.

2.3.3 Calls to Standardize KPI Reporting

While the disclosure of KPIs is largely voluntary, regulators and standard setters have realized the importance of KPIs and called for discussion about integrating KPI disclosure. In 2018, Richard Howitt, the CEO of the International Integrated Reporting Council (IIRC), emphasized the importance of standardizing KPI reporting (CFA, 2018). The Canadian Accounting Standard Board (AcSB) states that information users consider performance measures not reported in the financial statements and the users ask for transparent disclosures of these performance indicators (AcSB, 2018). The SEC advisory committee on improvements to financial reporting (2008) also emphasizes that firms' disclosure of "all key variables and other factors that management uses to manage the business would be material to investors," especially the industry-specific measures and value drivers. Although there is no common standard to regulate KPI reporting, SEC (2008) emphasizes that firms should explain their calculation method of KPIs and be comparable with

their industry peers. In 2018, the SEC penalized two high-tech firms, Constant Contact and Endurance, with a fine of $8,000,000 for their material misrepresentation of "subscriber number" in their voluntary disclosure (Clarkson and Matelis, 2018).

Some organizations have already started the regulation-setting process. In May 2018, the Governor of the Bank of Canada established an APM working group with other organizations.[11] The objective of the APM group is to develop sub-sector reporting standards for APMs in order to improve the quality of corporate disclosure. As stated by the group, "APMs are different from GAAP information because they are typically very sector-specific and, therefore, require the standard setters to know the subject industry in detail."[12] Most of the proposed KPI disclosure frameworks have been focused on disclosure principles but not on specific KPIs. In October 2018, AcSB proposed a framework for selecting and reporting performance measures after considering the feedback from managers, auditors, information users, and academics (AcSB, 2018). AcSB (2018) issued voluntary guidance for firms to enhance their KPI disclosure but did not delve into the specific KPI selection at the industry or firm level. While the SEC released guidance about the broad principle of KPI disclosure in 2020 (SEC, 2020), the Financial Accounting Standards Advisory Council (FASAC) of Financial Accounting Standards Board (FASB) have not reached a conclusion about whether to extend their role from financial statements to the reporting of specific KPIs (FASAC, 2016). Meanwhile, standard setters and regulators across the world are suggesting or requiring the disclosure of KPIs. For example, in 2010, the International Accounting

[11] The APM working group is comprised of the eight largest pension funds in Canada, the Sustainability Accounting Standards Board (SASB), the Canadian Coalition for Good Governance (CCGG), the CFA, and an observer from the Bank of Canada.

[12] Quoted, with permission, from an internal reporting slide of CFA Societies Canada, provided by Richard E. Talbot and Thomas J. Trainor.

Standards Board (IASB) proposed a practice statement for management commentary and required firms following International Financial Reporting Standards (IFRS) to disclose "performance measures and indicators (both financial and nonfinancial) that are used by management to assess progress against its stated objectives" (IASB, 2010: 15). Another example is that, in 2017, the European Commission issued a guidance on non-financial reporting but did not require disclosure of specific KPIs (European Commission, 2017).

Despite the need to integrate nonfinancial information into corporate reporting, it is challenging to establish mandatory standards for KPI disclosures, because firms' choices and calculation of nonfinancial indicators varies across industries, sometimes even across firms. Givoly et al. (2019) argue that the definition of each industrial KPI should be uniform and consistent among firms. However, even if the KPI definitions are regulated, it remains an open question whether KPI reporting should be mandatory or voluntary. SEC (2016) has called for public comments on the benefits and costs of standardizing and mandating KPI disclosure.

A potential path is to keep KPI disclosure voluntary and rely on market participants (e.g. financial analysts) to motivate firms' KPI reporting (Barker and Eccles, 2018). In light of this, it is important to examine whether analysts have influence on managers' disclosure of KPIs in the absence of mandatory integrated reporting. An answer to this question would be helpful, allowing regulators to understand the potential substituting relationship between mandatory integrated reporting and the requests for voluntary reporting from information users.

2.3.4 KPI Related Literature

There are mainly two streams of literature on KPIs: the value relevance of industry-specific KPIs and whether KPIs serve as leading indicators of future financial results. For the former, Amir

and Lev (1996) investigate the wireless communication industry and find that nonfinancial performance measures (e.g. population coverage and penetration rate) are highly value-relevant, while the traditional financial measures are largely irrelevant. In addition, considering the combined value relevance, the authors argue a complementary relationship between financial information and the nonfinancial KPIs. Francis et al. (2003) conduct industry-by-industry analyses to test the superiority of industrial KPIs relative to earnings. Specifically, the authors focus on three industries whose "preferred" performance indicators are nonfinancial industry-specific measures (i.e. the airline industry with revenue per passenger mile, cost per available seat mile, and load factor measures; the homebuilding industry with value of new orders and value of order backlog measures; and retail restaurants with same-store sales measure); they, however, find no domination of the preferred KPIs over earnings in terms of value relevance. Trueman et al. (2000) focus on 63 Internet firms and find that KPIs specific to the industry (i.e., unique users and pageviews) provide incremental explanatory power for stock prices.

Some studies show that industry-specific KPIs are leading indicators of future financial results. Rajgopal et al. (2003) investigate the relevance of an industrial nonfinancial measure (specifically, the order backlog in durable manufacturing and computers industry) to future earnings. They find that after controlling past earnings, the order backlog is still informative about future earnings. Behn and Riley (1999) find that in the airline industry, nonfinancial metrics, such as available ton-miles and ticket over-sales, are leading indicators of financial performance. Simpson (2010) focuses on nonfinancial KPIs in the wireless industry (e.g., customer acquisition cost, number of subscribers, etc.) and finds that some KPIs can predict the firms' future financial performance, but analysts underact to the release of KPI information. Collectively, both streams of literature have highlighted the usefulness of KPIs as performance indicators and value drivers.

Despite the importance of alternative information, the extant literature provides limited insight into the determinants and consequences of corporate KPI disclosures. Related studies are generally conducted using European data with a relatively small sample size and short sample period, and the results are mixed. In addition, the measurement of KPI disclosure usually relies on the judgment of researchers without a specific list of KPIs. The insights provided by these studies are difficult to be generalized to a large US sample that I examine. Boesso (2004) documents that the firm size and industry are potential determinants of voluntary KPI disclosure based on the analysis of 72 firms listed in Italy and the US. Elzahar (2013) focuses on 103 UK firms and investigates the firm characteristics' impact on voluntary KPI reporting; the author demonstrates a positive association between firm size and KPI disclosure but finds no results for other firm characteristics. Dainelli et al. (2013) analyze Italian data and argue that the number of KPIs disclosed in annual reports is positively associated with the firms' profitability. Coram et al. (2011) explore the analysts' use of nonfinancial KPIs through a verbal protocol study on eight financial analysts in Austria; the authors find that, on average, the analysts pay 28.3% of their attention to nonfinancial KPI information when they evaluate a medium-sized private retail company, and they rely more on KPIs when the financial indicators show positive trends. Elzahar et al. (2015) test the economic consequences of KPI disclosure issued by 102 UK firms from 2006 to 2010; the authors develop a measure of KPI disclosure quality based on the guideline of UK Accounting Standard Board (ASB) by manually checking the annual reports of the firms. Elzahar et al. (2015) do not find evidence for the economic impact of nonfinancial KPI disclosure and conclude that only the disclosure of financial KPIs matters.

Givoly et al. (2019) extend the KPI literature to analysts' forecasts of KPIs. Using the I/B/E/S KPI database, they investigate analysts' forecast of 28 KPIs for firms in four industries

(i.e. the airline, pharmaceutical, retail, and oil and gas industries). After documenting the incremental informativeness of firms' disclosure of KPIs to earnings and revenue surprises, the authors demonstrate that the KPI forecasts made by analysts are more accurate than their EPS forecasts, consistent with analysts possessing superior industry-level knowledge (Brown et al., 2015). Moreover, after investigating the calculation details of same-store sales growth rate for the retail industry, Givoly et al. (2019) argue that the informativeness of KPI disclosure depends heavily on the consistency of the KPI's definition; therefore, the definition of each industrial KPI should be uniform and consistent across firms. My study complements Givoly et al. (2019) by investigating analysts' efforts in extracting KPI-related information and managers' decisions about voluntary KPI disclosure. Specifically, by observing the communication between managers and financial analysts during conference calls, I examine whether analysts' requests are associated with increased managerial KPI disclosures. Furthermore, I extend my study by testing whether the managers' voluntary disclosure of KPIs is associated with improved earnings forecast accuracy provided by financial analysts.

2.4 Analysts' Information Acquisition

Analysts are important intermediaries between firms and investors. They collect, analyze, and disseminate firm-related information to market participants and enhance the efficiency of capital markets (O'Brien and Bhushan, 1990). Furthermore, sell-side analysts evaluate the firm's current performance, predict its prospects, and make recommendations to their clients to buy, hold, or sell the firm's stock (Healy and Palepu, 2001). The literature of analysts started as a by-product of research on accounting earnings and stock prices when researchers used analysts' forecasts of earnings to proxy expected earnings and to calculate unexpected earnings (Bradshaw, 2011). Subsequently, researchers focused on one type of the outputs of analysts, their earnings forecasts

(e.g. Fried and Givoly, 1982; O'Brien, 1988). Since Fried and Givoly (1982) concluded that analyst forecasts predict earnings more accurately than time-series models, researchers have turned to investigating analysts and their behavior such as the analysts' incentives, the conflict of interest, and the mediating role of analysts in the capital markets. Bradshaw (2011) emphasizes that it is important to study analysts because of their important role as market information intermediaries, let alone their representation of general investors in capital markets. Thus, studying analysts' information acquisition, processing, and outputs helps us understand how the capital markets function. Bradshaw, Ertimur and O'Brien (2017, page 139) call for research on how analysts gather information and benefit firms and capital markets.

Despite the importance of understanding analysts' information acquisition, the extant literature provides limited insight into this issue because of the difficulty in observing analysts' behavior directly. As a result, it is challenging to examine the information collection and evaluation activities of analysts, or even to empirically identify what information analysts use (Gibbons et al., 2020). Therefore, the literature on analyst information acquisition has focused mainly on modeling their behavior and qualitative analysis using surveys or interviews.

In the analytical literature of analysts' information acquisition and communication with clients, Benabou and Laroque's (1992) model indicates that analysts' concerns for their reputation encourage them to provide faithful information to their clients. Morris (2001) challenges the conventional conclusion (e.g. Benabou and Laroque, 1992) by showing that when analysts have strong reputational concerns, they have incentives to distinguish themselves from analysts whose interest is not aligned with their clients' interest. Thus, the aligned analysts tend to avoid sending information similar to the not aligned analysts. As a result, the aligned analysts may fail to provide the most fair and accurate information in their communication with investors. In contrast, Meng

(2015) builds an analytical model in a two-period setting, where analysts make a decision on information acquisition efforts, which leads to a difference in the accuracy of the outputs of various analysts. Meng (2015) argues that analysts can build their reputation by providing accurate information; thus, they do not necessarily avoid reporting specific information to signal themselves as aligned analysts. Therefore, all analysts have the incentive to acquire more (firm-specific, industry-specific, or macro-economic) information, and the analysts whose interest is aligned with investors are motivated to collect more information and provide more precise reports. These analytical studies highlight the importance of information acquisition in analysts' processing of information.

Some survey and interview studies explore the "black box" of sell-side analysts and shed light on the importance of industry-level information. Brown et al. (2015) survey 365 analysts and conduct 18 interviews to investigate the inputs and incentives of analysts. They find that the industry-level knowledge is the single most valuable information in the analysts' earnings forecasts and stock recommendations and determines the analysts' compensation. Brown et al. (2016) conduct surveys and interviews for buy-side analysts and conclude that, from the perspective of buy-side analysts, the most valuable functions of sell-side analysts are to provide industry knowledge and access to firm management.

In recent years, some papers have investigated the impact of nonfinancial information on analysts' outputs. Simpson (2010) examines how firms' nonfinancial disclosure affects analysts' forecast accuracy for wireless industry. The authors employ a relatively small sample of 556 firm-quarters for 51 firms in wireless industry and focus on six KPIs (i.e., number of subscribers, customer acquisition cost, average revenue per user, churn rate, market share, and minutes of use per subscriber). The author finds that while some KPIs (i.e., number of subscribers, customer

acquisition cost, and average revenue per user) are leading indicators for the firms' future performance, financial analysts tend to underact to the release of KPI information. Simpson (2010) also concludes that when the firms provide more persistent disclosure of nonfinancial information, analysts provide more precise earnings forecasts. Dhaliwal et al. (2012) employ an international setting to investigate the association between voluntary corporate social responsibility (CSR) disclosure and analyst forecast accuracy. The authors find that voluntary CSR disclosure is negatively associated with analysts' forecast errors, and the effect is stronger for firms and countries with lower disclosure transparency. Moreover, Huang and Mamo (2016) document that analysts' earnings forecast revisions are significantly affected by the tone of firm-specific content in media news and that the effect is stronger for firms with higher information asymmetry. My study extends this literature by comprehensively investigating analysts' demand for KPI-related information, managers' voluntary disclosure of KPIs, and the consequences of KPI disclosure. Specifically, in Chapter 4, I explore the association between information disclosure and the outputs of analysts after controlling for the potential endogeneity between analysts' information request activities and managers' disclosure decisions.

Review papers have called for direct analysis of analysts' information acquisition activities (Bradshaw, 2011 and Brown et al., 2015). Some researchers have accepted the challenge of identifying and investigating analysts' information acquisition from public and private sources. Gibbons et al. (2020) empirically test analysts' collection of public information from EDGAR. The authors link EDGAR server records with the brokers to identify and link analysts' assessments to firms' filings. They find that both company characteristics (e.g. firm size, market-to-book ratio) and analyst characteristics (e.g. length of analysts' career, the accuracy of analysts' past forecasts, and so on) are positively related to the analysts' information acquisition on EDGAR. Moreover,

accessing formal filings on EDGAR leads to positive consequences for the analysts, such as more accurate predictions and stronger market reactions. Soltes (2014) conducts a field study on analysts' acquisition of private information through private interactions with a firm's management. Following a large-cap NYSE-traded firm for one year, the author examines which sell-side analysts pursue private interactions with managers, when they do so, and why. He finds that the analysts engaged in private interaction have similar characteristics to those who engage in public interaction with management during conference calls (Mayew, 2008), such as following fewer firms, making forecasts more frequently, and having shorter past careers as analysts. Cheng et al. (2016) focus on analysts' site visits to some Chinese public firms during 2009 and 2012. They find an increase in forecast accuracy following site visits and argue that site visits help mitigate the information disadvantage of non-local analysts. Klein et al. (2016) document analysts' requests for non-public information in the healthcare industry by examining their access to information available under the Freedom of Information Act. Under the Freedom of Information Act, in response to analysts' requests, the Food and Drug Administration (FDA) may disclose some of the non-public information of healthcare firms to the analyst. The authors test the pattern of the analysts' requests for information and find that star analysts and analysts who make more effort (proxied by the frequency of forecasts and number of stocks covered by the analyst) are more likely to request firm-specific information from the FDA. In addition, they demonstrate that the market has stronger reaction to the recommendations made by the analysts in possession of FDA disclosure. However, as mentioned by Klein et al. (2016), a limitation of this paper is that it does not capture the specific contents of disclosure acquired by analysts and, thus, cannot unambiguously identify the information collected, analyzed, and disseminated in analysts' outputs.

Although the above papers use different settings to identify analysts' information acquisition activities, due to data or technology limits, few of them have clearly identified the contents of the information collected. Thus, what specific information is requested and acquired by the analysts remains an open question. My paper sheds light on this question using the conference call setting.

My study focuses on analysts' information demand and collection for one of their most important intelligent assets, the in-depth industry knowledge. As illustrated by the survey-based studies, industry-level information is one of the most important determinants of an analyst's compensation (e.g. Brown et al., 2015; Brown et al., 2016). My study adds to the literature by observing and examining analysts' demand for a specific type of industrial information, the industry-specific KPIs.

2.5 The Conference Call Setting

In recent decades, conference calls have been widely used as a voluntary disclosure channel (Jung et al., 2018). Firms regularly hold conference calls shortly after their quarterly earnings announcements. Since the implementation of Regulation Fair Disclosure (Reg. FD) in 2000, all conference calls are publicly accessible. Typically, an earnings call contains two sections, the prepared presentation by management and the Q&A section in which analysts communicate with managers publicly.

To investigate the demand from financial analysts for KPI disclosure, I employ the setting of quarterly earnings calls for two reasons. First, conference calls provide an opportunity to observe the requests for, and the collection of, information by analysts (Bushee et al., 2004). The public disclosure channels of KPI-related information include press releases, the MD&A section of 10-K filings, earnings announcements, and conference calls, amongst other disclosure channels.

Conference calls are a public channel providing a regular interactive environment (i.e., the Q&A sections) between analysts and firm management. Therefore, adding to prior papers about private manager-analyst interaction (Soltes, 2014; Cheng et al., 2016), I conduct a large sample analysis based on the public conference call setting.[13]

Moreover, recent studies have highlighted that conference calls are an important channel for firm management to disclose information and maintain good relationships with investors and other stakeholders. Brown et al. (2019) survey 610 investor relations officers (IROs) and find that, from IROs' perspective, earnings conference calls are the most important communication channel to convey messages to institutional investors. Using field data, the study of Amel-Zadeh et al. (2019) demonstrates that managers make significant efforts to prepare their quarterly conference calls.

A number of papers have examined analysts' participation during conference calls and demonstrated that the dialogues between management and analysts generate and disseminate new information into the market. Mayew and Venkatachalam (2012) document that analysts' participation in conference calls is significantly associated with the accuracy and timeliness of their earnings forecasts. Matsumoto et al. (2011) examine the intra-day stock return during the managers' presentation and the Q&A section. The authors find that the Q&A section is significantly more informative than the presentation section, and the difference is higher when the firm has poor financial performance. Jung et al. (2018) state that when a firm has lower sell-side

[13] This paper focuses on KPI disclosure in conference call setting but does not exclude the possibility of KPI disclosure in other channels (e.g., press releases, the MD&A section of 10-K filings, and earnings announcements). The managers may simultaneously improve their KPI disclosure in other disclosure channels.

analyst coverage and higher forecast uncertainty, buy-side analysts are more likely to attend the firm's conference calls. Moreover, Cen et al. (2018) distinguish sell-side analysts and buy-side analysts and find that buy-side analysts' questions trigger higher stock price volatility and higher trading volumes, and that the effect is even stronger when the buy-side analyst is affiliated with hedge funds.

Some research suggests that the participation of analysts during conference calls may indicate their superior private information or good relationships with the management. Mayew (2008) documents that the likelihood of an analyst being allowed to ask a question during a firm's earnings call is positively associated with the favorableness of that analyst's past stock recommendation related to the firm. Mayew et al. (2013) further argue that analysts participating in conference calls potentially possess superior private information since these analysts provide more accurate and timelier earnings forecasts after a conference call relative to their peer analysts. Cen et al. (2020) use analysts' early participation in calls as a proxy of their special access to management. Using the quasi-experiment of brokerage closures, the authors find that the connectivity to management is very valuable for an analyst's career.

Only a limited number of studies, however, have delved into the information content of the dialogue between managers and analysts. A few researchers have explored management's failure to directly answer analysts' questions. Hollander et al. (2010) find that managers avoid answering questions when their disclosure cost is high, and their silence triggers negative market reactions. Gow et al. (2019) extend Hollender et al. (2010) by constructing a measure of "non-answers" based on linguistic analysis. They find that managers are more willing to answer questions when competition is low or when the firm needs to raise capital. Barth et al. (2020) further develop a dictionary to identify rejection, avoidance, and dodging under broad Q&A situations.

My study is closer to the work by Chapman and Green (2018) and Feldman et al. (2020). Chapman and Green (2018) examine analysts' demand for forward-looking information about six common financial indicators in the Q&A sections and demonstrate that managers are more likely to disclose these measures in response to analysts' questions in past earnings calls. Feldman et al. (2020) focus on the disclosure or discussion about order backlog during conference calls and find an incremental market reaction to earnings calls with order backlog-related contents, but their analysis does not distinguish the information demand expressed by analysts and the information disclosure of managers. My study extends prior literature by exploring the interaction between conference participants (i.e., managers and analysts) over time and examining a relatively comprehensive list of industry-specific KPIs.

2.5 Conclusion

In summary, this chapter reviews research on KPIs, financial analysts, and conference calls. Since there is no unified definition of KPIs in the literature, I follow CFA and the Accounting Standards Board (AcSB) and define industry-specific KPIs as the operational performance measures and financial measures that cannot be derived from the primary financial statements. This chapter also reviews the literature on financial analysts' information acquisition activities. Distinguished from prior studies about analysts' collection of general information, my dissertation employs the conference call setting to identify analysts' demand for a specific type of industry-specific information, namely KPIs. This dissertation comprehensively examines the analysts' demand for KPI-related information, the managers' KPI disclosure decisions, and the effect of KPI disclosure on analysts' forecast accuracy.

CHAPTER 3

Analysts' Demand and Managers' KPI Disclosure during Earnings Calls

3.1 Hypotheses Development (Hypotheses 1-2)

3.1.1 Introduction

In Section 3.1, I develop the first two sets of hypotheses based on the themes reviewed in the last chapter. In Section 3.1.2, I discuss whether managers adjust their voluntary KPI disclosure decisions following the information demand from analysts during earnings calls. I argue that the different information specialties between managers and financial analysts provides the opportunity for managers to learn from analysts' information demand during conference calls and that managers consider both benefits and costs in their disclosure decisions. I develop hypothesis H1 based on this discussion. Section 3.1.3 presents hypotheses H2a, H2b, and H2c to test whether the increase of voluntary KPI disclosure following analyst demand is conditional on the firm's earnings relevance level, the firm's concerns about their proprietary information leakage, and the relationship between analysts and management.

3.1.2 Analyst Demand and KPI Disclosure in Conference Calls

In this section, I investigate whether the interactions between managers and analysts play a role in firms' decisions to make voluntary KPI disclosures. Prior studies demonstrate that analysts and managers have different information specialties, which provides an opportunity for managers to learn from analysts about what information is important and should be disclosed. Hutton et al. (2012) compare the accuracy of earnings forecasts of the two parties and find that analysts have the information advantage at the macroeconomic level and managers have the advantage at the firm level. My study extends the work of Hutton et al. (2012) to analysts' potential

information advantage at the industry level: analysts may have better knowledge about the types of KPIs that are most useful for a given industry, and their demand for these KPIs may help managers make better voluntary disclosure choices.

Moreover, managers have incentives to initiate voluntary disclosure when market participants find the information useful in assessing firm value (Dye, 1985). Good voluntary disclosure brings benefits to firms, such as higher firm value (Verrecchia, 2001), higher liquidity of the firm's securities (Botosan and Plumlee, 2000), reduced information asymmetry (Narayanan et al., 2000; Shroff et al., 2013), lower cost of capital (Diamond and Verrecchia, 1991; Hughes et al., 2007), and lower litigation risk (Field et al., 2005). Especially, managers may benefit from satisfying the needs of analysts, since analysts in good relationships with management usually provide optimistic forecasts and stock recommendations for the firm (Libby et al., 2008).

On the other hand, managers may not respond to the requests from analysts since reporting KPI-related information can be costly. One cost is that of preparing and revising the new disclosure (Beyer et al., 2010). In addition, since KPIs are generally highly proprietary and informative, managers' KPI disclosure to their competitors may negatively affect the firms' competitive position in product markets (Baloria et al., 2019; De Franco et al., 2016). Managers' KPI disclosure to regulators additionally may lead to litigation costs since regulators can better understand the firm's actual performance and verify the reported earnings (Skinner, 1994). Finally, managers' current KPI disclosure to market participants may lead to future costs when the firm has to disclose negative KPI news due to the ex-ante disclosure commitment (Verrecchia, 2001).

Additionally, I note two other reasons to expect no change or even a decrease in KPI disclosure during subsequent earnings calls. First, while conference calls are an important channel through which analysts express their information demand, managers may provide related

disclosure through other venues, such as earnings announcements, 10-K filing, and press releases. Therefore, it is possible that managers learn from past Q&A sections that some KPI-related information is needed by market participants but improve their future KPI disclosure in other channels rather than earnings calls. Second, due to the context-specific nature of KPIs, it is possible that analysts' interest in KPIs does not represent persistent demand from the market, thus managers may not see the necessity to increase KPI disclosure. For example, analysts tend to ask firms in the airline industry about their cost per available seat mile (CASM) when the oil price is high, but the demand for CASM disclosure may dissipate in subsequent quarters along with the decline of oil price.

Taken together, I expect that, on average, managers will actively respond to the demand from analysts for KPI-related information during conference calls and thus increase their future disclosure. My H1, therefore, is as follows:

H1: Following the demand by analysts for industry-specific KPI information, managers increase their KPI-related disclosure in subsequent conference calls.

3.1.3 Cross-sectional Variation in Analysts' Effects on KPI Disclosure

Next, I examine whether the increase in voluntary KPI disclosure following analyst demand is conditional on the firms' consideration of the related costs and benefits; and whether the effects depend on the relationship between analysts and management.

I contend that when a firm's accounting information is less useful, there is a higher benefit to be derived from improving KPI disclosure in response to analyst requests. Prior literature suggests that when earnings are less relevant, information users tend to rely on other disclosures to supplement financial reporting information (Chen et al., 2002). An important part of analysts' work is to understand a firm's current performance and make forecasts. As mentioned above, KPIs

provide incremental informativeness and help to predict longer-term performance (e.g., Amir and Lev, 1996; Rajgopal et al., 2003). Thus, I conjecture that when the firm's financial statements fail to provide enough useful information, additional information like KPI-related disclosure is especially valuable for analysts and other information users who consume analysts' products. Since the benefit of voluntary disclosure is realized through stakeholders' consumption of the information (e.g., Dye, 1985; Shroff et al., 2013), I expect that, for firms, the benefit of KPI disclosure is also more significant when their earnings are less relevant. Consistent with my conjecture, prior studies document that the prevalence of KPI disclosure has paralleled the growth of financial statement users' concerns about the usefulness of earnings numbers (e.g., Givoly et al., 2019; Lev and Gu, 2016). Therefore, my H2a is as follows:

H2a: Managers' increase in KPI-related disclosure following analyst demand is higher for firms with lower earnings relevance.

I further examine whether the increase in managerial KPI disclosure is lower when the firm faces higher proprietary costs. I focus on proprietary costs since industry-specific KPIs are usually inside information used by managers in their business analysis, prediction, and decision-making. Managers tend to hoard information about their daily operations to prevent competition from their current and potential rivals (Dye, 1986; Graham et al., 2005).[14] For example, "pre-opening expense" in the retail industry reflects the average cost incurred before a new store can open its doors for business. While managers need "pre-opening expense" to decide how many new stores to open

[14] As stated by Graham et al. (2005), CFOs avoid explicitly revealing their sensitive proprietary information even if that information can be partially derived from other sources. In the case of industry-specific KPIs, although some KPIs (e.g., the market share of high-tech industry) can be calculated by information users themselves, the managers still have incentives to avoid disclosing explicit values.

and the budget needed, they have incentives to hide this information to avoid their expansion strategy being copied by competitors. Thus, I expect the increase in KPI disclosure following analyst demand to be less pronounced when the firm is concerned about proprietary information leakage.

H2b: Managers' increase in KPI-related disclosure following analyst demand is lower when the firms' KPI disclosure faces higher proprietary costs.

Furthermore, I test whether the effect of analyst demand depends on the relationship between analysts who raise KPI-related questions and the management. Unlike prior studies focusing on analysts' relationship-building efforts, I examine the impact of the analyst-management relationship on managers' KPI disclosure decisions. Therefore, following Cen et al. (2020), I focus on a manager's recognition of her relationship with an analyst based on whether the analyst is invited to ask the first question in the Q&A section. Specifically, I consider a financial analyst to be connected to firm management if the manager invites that analyst to ask the first question in an earnings call. I conjecture that the effect of analyst demand is more pronounced when the KPI-related questions are raised by analysts with connectivity to management for two reasons. First, relative to other analysts, the connected analysts tend to have better knowledge about the firm since these analysts have more private information about the firm (Cen et al., 2020).[15] As a result, their questions about KPIs could be more relevant and more insightful in terms of the managers' future KPI disclosure. In addition, since connected analysts usually provide more optimistic stock recommendations (Michaely and Womack, 1999; Kadan et al., 2009),

[15] As demonstrated by Cen et al. (2020), analysts with access to management make more accurate forecasts relative to other analysts.

managers have incentives to maintain their good relationships with these analysts by satisfying their disclosure requests. My H2c, therefore, is as follows:

H2c: Managers' increase in KPI-related disclosure following analyst demand is higher when the analysts posing the KPI-related questions have connectivity to management.

3.1.4 Conclusion

In Section 3.1, I posit two sets of hypotheses to be tested in my empirical analyses. I present my first hypothesis in support of a positive association between analysts' demand for KPI-related information and the managers' voluntary KPI disclosure in subsequent earnings calls. I present the next three hypotheses to test the cross-sectional factors that may affect the effect of analyst demand during earnings calls.

3.2 Data and Research Design

3.2.1 Introduction

Section 3.2 describes my data and the research design for the hypotheses developed in the previous section. The section begins by introducing my KPI term list in Section 3.2.2 and follows with my sample construction process in Section 3.2.3. Section 3.2.4 presents the measures of managers' voluntary KPI disclosure in their prepared presentation sections during earnings conference calls and Section 3.2.5 describes the measure of analysts' demand for KPI-related information during the Q&A sections. I introduce my regression model to test hypotheses H1, H2a, H2b, and H2c in Section 3.2.6 and conclude with a summary in Section 3.2.7.

3.2.2 List of KPI Terms

I develop a unique list of 51 KPI measures for six industries based on the industry-specific KPIs covered by the I/B/E/S KPI database, the related literature, and various online articles.[16] I start with the full list of industry-specific performance measures in the I/B/E/S KPI database and exclude the KPIs of the banking industry.[17] As mentioned in Section 2.3.2, the industry-specific KPIs in this study include the financial measures disclosed outside of the primary financial statements and some operational performance measures. According to my definition of KPIs, I exclude the performance measures that are available in financial statements (GAAP measures). I then refer to the literature and some online articles and add to my list the KPIs documented as value relevant. The resulting list contains 131 KPIs for seven industries.

I then conduct key word searching across all the conference call transcripts held by firms in the seven industries covered by my sample and exclude the KPIs that have been discussed by managers (analysts) in less than ten (five) conference calls from my list.[18] My final list of KPIs contains 51 KPIs for six industries (i.e., airlines, energy, mining, real estate, retail, and high-tech). Appendix A presents my list of KPIs and their resources.

3.2.3 Sample Construction

I construct my sample by first identifying the firms operating in the six industries covered by my KPI list (i.e., airlines, energy, mining, real estate, retail, and high-tech industry). Specifically, I determine the SIC codes of airline, energy, and real estate industries based on Fama-French 48 industry classifications; and the retail and mining industries based on Fama-French 17 industry

[16] See Appendix B for details about the construction of my KPI list.
[17] I follow prior literature and exclude the banking industry from my sample since the financial firms usually have different disclosure practices and are generally excluded in studies about corporate disclosure (e.g., Chen et al., 2015; Kim and Shi, 2012).
[18] Appendix B presents my industry classification approach in detail.

classifications (Fama and French, 1997).[19] I then follow Kile and Phillips (2009)'s optimal three-digit SIC code combination to identify high-tech firms.[20] Appendix B presents my industry classification approach in detail.

Table 1 summarizes my sample selection process. I start with all conference call transcripts between January 2006 and December 2018 available in the S&P Global Market Intelligence database. I restrict my sample to the conference calls identified as 'earnings calls' by the database, which are usually held shortly after firms' earnings announcements. I then exclude the earnings conference calls held by non-US firms and those without Q&A sections. The resulting sample contains 120,180 earnings calls.

I match the earnings calls with financial reporting and stock market related variables from Compustat and CRSP.[21] After merging with Compustat and CRSP, there remain 115,982 earnings calls held by 5,200 firms. I further restrict my sample to the firms in the six industries whose KPIs are covered in my KPI list. Finally, I require non-missing values of variables used in my models. My sample has 39,302 firm-quarters of 1,846 unique firms during 2006-2018. Of the sample, the high-tech industry has the most observations (i.e., 24,555 firm-quarters for firms for 1,184 unique firms), while the airline industry is the smallest group (i.e., 714 firm-quarters for 25 unique firms).

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[19] I refer to both 17 and 48 industry portfolios since the scope where the KPIs are applicable varies across different industries. For example, the KPIs of airline industry may not be applied to other industries covered by the transportation industry in Fama French 17 industry portfolios.

[20] Kile and Phillips (2009) examine the type I error and type II error of misclassification and demonstrate the optimal SIC codes combination to classify high-tech sector into hardware, software, medical technology, communications, electronic manufacturing, and Internet subgroups. I exclude the medical technology subgroup from my sample since this subgroup is likely to be related to pharmacy industry, which is not covered by my KPI list.

[21] Earnings calls are usually held within two days after the earnings announcements. Since earnings announcements are generally made at least several weeks after the end of the fiscal quarter, I match each earnings call with the closest fiscal quarter of the firm before the holding date of the call.

To further validate my selection of KPIs and industry classification, I check whether the KPIs are well-matched with their corresponding industries. For KPIs of a specific industry, I conduct key word searches across the earnings calls of all industries; and then, I compare the frequency of KPI mentions by the KPIs' corresponding industry and that by other industries. Figure 3 Panel B displays the frequency of KPIs mentioned in managerial presentations of their corresponding industry and in those of other industries. For example, the airline industry's KPIs are mentioned in 62% of managerial presentations during the earnings calls of airline firms, while they are mentioned in only 4% of the calls held by firms from other industries. Meanwhile, the KPIs of the high-tech industry are mentioned in 45% of high-tech firms' managerial presentations and 22% of other industries' calls suggesting that these KPIs may be less industry-specific. Similarly, Figure 3 Panel C presents the frequency of KPIs mentioned by analysts in the calls held by the corresponding industry and other industries.[22] In summary, both graphs show that the KPIs selected in my term list are much more frequently mentioned in the earnings calls of their corresponding industries, suggesting a proper matching between my KPIs and the industries.[23]

3.2.4 Measures of Managers' Disclosure of KPI Information

I measure the level of managers' voluntary KPI disclosure using three different variables at the conference call level: (1) *M_KPI*, an indicator variable, which equals one if the management

[22] In Figure 3 Panel B, for high-tech and real estate industries' KPIs, the analyst mentioning during their corresponding industries and other industries are relatively close. A potential reason is that following the I/B/E/S KPI database, my KPI term list includes "market share" ("backlog") as an industry-specific KPI for high-tech (real estate) industry. Although the two KPIs are more frequently mentioned in their corresponding industry, they can also be used as common metrics for firms in all industries. Therefore, in untabulated tests, I reconduct my analysis for the high-tech (real estate) industry while excluding "market share" ("backlog") from its industry-specific KPI list.

[23] I conduct *z*-tests (untabulated) to compare the likelihood of KPI mentions in the corresponding industry and that in other industries. The results are significant at 1% level, supporting my argument that KPIs are significantly more likely to be mentioned during the conference calls of their corresponding industries.

makes voluntary KPI disclosure during the presentation section of a given conference call, and zero otherwise; (2) *M_KPI_Words*, the logarithm of one plus the number of words covered by the sentences related to KPIs in the managerial presentation; and (3) *M_KPI_Mentions*, the logarithm of one plus the number of unique industry-specific KPIs mentioned in the managerial presentation.[24] In summary, I use three measures to proxy the likelihood (*M_KPI*) and intensity (*M_KPI_Words* and *M_KPI_Mentions*) of managers' voluntary KPI disclosure.

3.2.5 Measures of Analysts' Demand for KPI Disclosure

Similarly, I measure analysts' demand for KPI-related information at the conference call level. *A_KPI* is an indicator variable, which equals one if the analysts ask about any KPI of the firm's industry during the Q&A section of the conference call, and zero otherwise.[25] To capture the demand for KPI information expressed by analysts before a manager's presentation, for each earnings call, I calculate the logarithm of one plus the sum of *A_KPI* for the firm's calls held in the past eight quarters (*A_KPI_PastQtrs*).

3.2.6 Regression Model for Testing Hypotheses 1-2

The objective of this section is to examine whether firms improve their KPI disclosure following analyst demand expressed during earnings conference calls and whether there are cross-

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[24] I do not require the KPI disclosed by managers to be the same one that was requested by analysts. Since KPIs are closely related to firms' operations, when analysts ask about a KPI, it may indicate information users' interest in a specific aspect of the firm's business. And managers' efforts to better illustrate their operations may lead to the disclosure of other industry-specific KPIs. In robustness tests in Section 3.4.4, I reconduct my analyses focusing on the most frequently used KPI for each industry, including the "load factor" for airline industry, the "realized price" for energy industry, the "market share" for high-tech industry, the "production cost" for mining industry, the "backlog" for real estate industry, and the "same-store sales" for retail industry, and find that the results are generally consistent.

[25] In supplemental analyses, I use the number of questions related to KPIs to measure analysts' demand for (or interest in) KPI disclosure.

sectional variations in firms' disclosure decisions. To test the association between analyst demand and future KPI disclosure, I model a manager's voluntary KPI disclosure in the current quarter as a function of the demand from analysts in the past periods. The regression model is as follows:

$$\begin{aligned} KPIDisclosure_{it} = {} & \beta_0 + \beta_1\ A\_KPI\_PastQtrs_{i(t-8,\ldots,t-1)} + \beta_2\ M\_KPI\_PastQtrs\_Dummy_{it} \\ & + \beta_3 Answer\_KPI\_PastQtrs\_Dummy_{it} + \beta_4\ M\_PresentationWords_{it} \\ & + \beta_5 A\_All\_Questions_{it} + \beta_6 Size_{it} + \beta_7 Loss_{it} + \beta_8 Accruals_{it} \\ & + \beta_9 ROA_{it} + \beta_{10} SUE + \beta_{11} RetVol_{it} + \beta_{12}\ Leverage_{it} + \beta_{13}\ MB_{it} \\ & + \beta_{14}\ IO_{it} + \beta_{15}\ FollowingAnalysts_{it} \\ & + Quarter\ FE + \ Industry\ FE + \ \varepsilon \end{aligned} \qquad \text{(Eq. 1)}$$

In this regression, the subscript i denotes firm and the subscript t denotes fiscal quarter of the firm-quarter observation. The dependent variable for managerial voluntary KPI disclosure is proxied by M_KPI, *M_KPI_Words*, or *M_KPI_Mentions*. The model is a probit regression when the dependent variable is M_KPI, otherwise it is an OLS regression. The variable of interest $A\_KPI\_PastQtrs$ measures the analysts' total demand for KPIs from quarter t-8 to quarter t-1.[26] I correct for outliers by winsorizing the continuous variables at 1 and 99 percentiles. To support H1, I expect a positive coefficient on *A_KPI_PastQtrs*.

To address inter-industry differences, this model controls for industry fixed effects and clusters the standard error at the firm level. To control for potential time trends in the prevalence of KPI disclosure, I include quarter fixed effects. Considering the potential impact of the firm's past KPI disclosure patterns, I include indicator variables about whether the manager disclosed

[26] In the supplemental analysis in Section 3.4.3, I replace *A_KPI_PastQtrs* with analyst demand variables for individual quarters and reconduct my analysis. (The results are similar to those using *A_KPI_PastQtrs*.)

about KPI-related information in their presentations (*M_KPI_PastQtrs_Dummy*) or the Q&A sections (*Answer_KPI_PastQtrs_Dummy*) during the past eight quarters. I further control for the total number of words in the prepared presentation of the earnings call (*M_PresentationWords*) to capture the total information volume delivered in the managerial presentation. I also add the average number of questions raised by analysts in the past eight quarters (*A_All_Questions_PastQtrs*) as a proxy for the overall disclosure demand from analysts before the current earnings call.

I also include other factors documented to be associated with the use of alternative measures. Cohen et al. (2012) find that larger firms provide more voluntary disclosure about nonfinancial leading indicators (e.g., customer satisfaction).[27] As KPIs cover industry-specific operational measures and their proprietary nature may alter the association between firm size and managers' disclosure decisions, I control for firm size (*Size*) but do not make a prediction about its association with managerial KPI disclosure. Following Givoly et al. (2019), I also include an indicator to control for loss firms (*Loss*) and the firm's absolute accruals (*Accruals*).

In addition, I include factors from the general voluntary disclosure (e.g., Lang and Lundholm 1993; Frankel et al. 1999; Kim and Shi, 2012). I control for firm profitability (*ROA*), measured as the net income before extraordinary items scaled by total assets; earnings surprise (*SUE*), measured as the difference between the firm's actual earnings per share and the expectation of financial analysts, scaled by stock price; stock return volatility (*RetVol*), measured as the standard deviation of the firm's monthly stock returns over the past two years; leverage (*Leverage*),

[27] While Cohen et al. (2012) do not distinguish nonfinancial measures by industry, they find that firms' disclosure of nonfinancial leading indicators varies across industries. This is consistent with my argument that KPIs are industry-specific.

measured as the ratio of total liabilities to total assets; growth opportunities (*MB*), measured as the ratio of the firm's market value of total equity to the book value of total equity; institutional ownership (*IO*), measured as the percentage ownership of institutional investors; and analyst coverage (*FollowingAnalysts*), measured as the natural logarithm of one plus the number of analysts following the firm.

To examine the cross-sectional variation in the effects of analyst demand, I respectively add the following variables and their interactions with analyst demand to Equation (1): proxies for low earnings relevance (*LowRelev, Loss,* and *Accruals*), a measure of proprietary costs (*Fluidity*), and an indicator of the KPI information demanders' connectivity to the management (*A_Access_PastQtrs*).[28]

My H2a examines whether a firm's earnings relevance affects its KPI disclosure decisions following analyst demand. Following Banker et al. (2009), I measure firm-specific earnings relevance using the explanatory power from a regression of a firm's stock price on earnings per share and equity book value per share.[29] To ensure that accounting information has been released and disseminated, I measure the stock price three months after the fiscal-quarter ends. Using adjusted R-squared of the regression as my measure of earnings relevance, I identify an indicator variable (*LowRelev*) which equals one for firms with earnings relevance below the median by industry-quarter. To support my H2a, I expect a positive coefficient on the interaction term

[28] *Fluidity* measure how much the firm's competitors modify their product portfolios in response to the firm's disclosure which reflects the firm's concerns about its proprietary information leakage.

[29] In their firm-year-specific estimation for value relevance, Banker et al. (2009) uses a ten-year rolling window and requires data available for each firm in at least eight years since 1980. Similar to their approach, I require available data for at least eight firm-quarter observations in the ten-quarter rolling window in my estimation for earnings relevance. In untabulated analyses, I estimate the regression for each subindustry-quarter to calculate the value of earnings relevance for each two-digit SIC code in each quarter. (The results are similar to those reported in Table 6.)

between *LowRelev* and *A_KPI_PastQtrs*, indicating that when a firm's earnings are less useful, managers increase the likelihood and intensity of their KPI disclosure after receiving the demand from financial analysts.

Moreover, due to the potential noise of the firm-level measure of earnings relevance, I employ two other proxies to identify firms with lower earnings relevance. Prior studies find that earnings numbers tend to be less useful when the firm reports a loss or a large discrepancy between earnings and operating cash flows (e.g., Lev and Gu, 2016; Givoly et al., 2019). I thus use an indicator variable to capture whether the firm reports a loss in the current period (*Loss*) and the absolute value of total accruals scaled by absolute net operating cash flow (*Accruals*) to identify potentially lower earnings relevance.

To measure firm-level proprietary costs, I use the measure of product market fluidity (*Fluidity*) calculated by Hoberg et al. (2014). *Fluidity* measures the competitive threat faced by a firm and reflects how the firm's competitors modify their product portfolios in response to the firm's disclosure. Some studies have demonstrated the association between competition and proprietary costs (e.g., Ali et al., 2014; Bernard, 2016; Huang et al., 2017), but most competition measures focus on industry-level variation (e.g., Karuna, 2007; Li, 2010), such as the proxies of the Herfindahl–Hirschman Index and the four-firm concentration ratio. Following Imhof et al. (2018) and Dedman and Lennox (2009), I use the measure of product competition to proxy for the firm's proprietary costs of disclosure. Calculated using textual analysis technology, *Fluidity* captures the similarity between a firm's word usage in its product description in 10-K filings and the average change of the word usage by its competitors. A higher *Fluidity* value indicates that the firm's competition space in the product market reduces due to the moves made by its competitors, and thus, higher proprietary costs faced by the firm. To support my H2b, I predict the coefficients

for the interaction term between *Fluidity* and *A_KPI_PastQtrs* to be negative, suggesting that higher proprietary cost discourages the increase of managerial KPI disclosure.

My H2c examines whether the connectivity between analysts and firm management affects the effect of analyst KPI demand. Following prior literature, I use analysts' early participation in conference calls as a proxy for their special access to management, since managers usually invite well-connected analysts to ask the first questions, and those invitations are highly valued by analysts and their employers (e.g., Mayew, 2008; Cen et al., 2020). For each earnings call, I first identify the connected analysts based on whether the analyst was invited to ask the first question during any earnings call held by the firm in the past four quarters. I then generate an indicator variable for the current quarter, *A_Access*, which equals one if any KPI-related question is posed by the connected analysts, and zero otherwise. To capture the impact of connectivity on future managerial disclosure, I further construct an indicator variable (*A_Access_PastQtrs*) which equals one if connected analysts requested KPIs in any of the past eight quarters, and zero otherwise. Consistent with other cross-sectional tests, I add this variable and its interaction term with *A_KPI_PastQtrs* to Equation (1). To support my H2c, I predict the coefficients for the interaction term to be significantly positive.

3.2.7 Conclusion

Section 3.2 reviews the construction of my KPI term list, the sample selection methods, the measures of managerial KPI disclosure and analysts' demand for KPI-related information, and the design of my regression models. Equation (1) is used to test hypothesis H1, and the results will be reported in Section 3.3.4. I add interaction terms to Equation (1) to test hypotheses H2a, H2b, and H2c, and will report the results in Section 3.3.5.

3.3 Empirical Analysis

3.3.1 Introduction

In Section 3.3, I test the hypotheses on the effect of analyst demand on managerial voluntary KPI disclosure and the cross-sectional variation in this effect. Section 3.3.2 presents the descriptive statistics relevant to my Equations (1). Section 3.3.3 describes my initial exploration of the determinants of analysts' interest in industry-specific KPIs. Sections 3.3.4 and 3.3.5 report the results of the hypotheses separately. I conclude the empirical analysis in Section 3.3.6.

3.3.2 Descriptive Statistics for Testing Hypotheses 1-2

Table 2 presents the sample distribution of my KPI key word search results by industry and earnings call holding year. While the industry-specific KPIs are voluntarily disclosed by managers in about half of the earnings calls, the frequency of analysts' questions about KPIs varies across industries. Analysts ask about KPIs in about 56.1% (12.4%) of the conference calls held by firms in airline industry (energy industry). There are several potential reasons for this variation. First, the industry-specific KPIs themselves may have various degrees of usefulness for different industries. As a result, managers and analysts may discuss KPIs to different extents during the earnings calls. Furthermore, the coverage of my KPI list may vary across industries. In other words, the KPI list may include almost all KPIs for one industry while missing some important KPIs for another industry.

Table 3 provides the summary statistics.[30] On average, managers voluntarily disclose KPIs during their presentations in about half of the earnings calls (i.e., the mean of *M_KPI*), while

[30] In all the tables, the continuous variables are winsorized at the 1st and 99th percentiles.

analysts ask about KPI-related information in the Q&A sections in 23.3% of calls (i.e., the mean of *A_KPI*). In addition, 62.2% of observations show that analysts demanded KPI information in the past two years, suggesting the analysts' high interest in KPI-related information (i.e., the mean of *A_KPI_PastQtrs_Dummy*). In terms of the control variables, the average leverage ratio is 0.50; and, on average, each firm in my sample is covered by 9.7 financial analysts.

3.3.3 Determinants of Analysts' Demand for KPI Disclosure

While my hypotheses H1, H2a, H2b, and H2c focus on the association between analysts' demand and managers' voluntary disclosure of KPIs, little is known about analysts' decisions to pose their requests for KPI-related information during conference calls. Therefore, before testing the hypotheses, I conduct some descriptive analysis to explore the potential determinants of analysts' requests for KPI-related information. I model analysts' requests for KPI disclosure (*A_KPI*) as a function of the factors that may trigger their interest in KPIs. I include variables related to the communication between firm management and the analysts, including the manager's mentioning of industry-specific KPIs in the presentation section (*M_KPI*), the total number of words delivered in a managerial presentation (*M_PresentationWords*), the manager's mentioning of KPIs in past earnings call presentations (*M_KPI_PastQtrs_Dummy*) and Q&A sections (*Answer_KPI_PastQtrs_Dummy*), the number of questions asked by analysts in the Q&A section (*A_All_Questions*), and the analysts' persistent interest in KPIs in past periods (*A_KPI_PastQtrs_Dummy*).

I then consider how firm characteristics are related to information users' needs for KPI disclosure. I control for variables such as firm size (*Size*), profitability (*ROA*), and analyst following (*FollowingAnalysts*). Moreover, Givoly et al. (2019) find that analysts tend to provide KPI forecasts when firms report losses or high absolute accruals. I thus add an indicator of loss

firms (*Loss*), the absolute accrual variable (*Accruals*), and other variables affecting corporate KPI disclosure as demonstrated in my cross-sectional tests (*LowRelev* and *Fluidity*).

Table 4 presents the results of the potential determinants of analyst KPI demand. Column 1 shows that analysts express more interest in KPI information when the manager talks about KPIs at the beginning of the earnings call, when the analysts get more opportunities to pose questions, and when there was more KPI disclosure in the past eight quarters. And the significantly positive coefficient of *A_KPI_PastQtrs_Dummy* indicates the persistence of analysts' interest.[31] The coefficient of *Fluidity* is positive and significant, suggesting that analysts are interested in the operational performance of firms with value-relevant proprietary information.

Due to the potential difference between analysts with access to management and other financial analysts, I replace the dependent variable with an indicator capturing whether KPI-related questions are raised by analysts with connectivity to the management (*A_Access*). Column 2 shows that most results are similar to those in Column 1. Moreover, the coefficient on *FollowingAnalysts* is negative and significant, consistent with the connected analysts being less willing to share KPI-related information with others when the number of analysts following the firm is high.

3.3.4 Results for Hypothesis H1

Table 5 presents the results of my empirical analysis for H1. In Column 1, I examine whether analysts' demand for KPI information in the past eight quarters is associated with an increase in managers' likelihood of voluntary KPI disclosure during the current quarter's conference calls. The coefficient on analysts' past demand (*A_KPI_PastQtrs*) is 0.294 and is

[31] The persistence of analysts' interest in KPIs supports my choice to integrate analysts' KPI demand in the past eight quarters to capture their requests for KPI disclosure in my main analysis.

significant at the 1% level, supporting my prediction that managers are more likely to disclose about KPIs following analysts' requests. The improvement is economically significant, representing a 29.4% increase of managerial KPI disclosure probability. In Column 2, I regress the number of words covered by sentences about industry-specific KPIs in managers' presentations on past analyst KPI demand. I find that after analysts ask for KPI information, the managers increase the KPI-related content in their presentations. Similarly, Column 3 suggests that past analyst demand is positively associated with the number of industry-specific KPIs mentioned by managers.

The signs of control variables are largely consistent with expectations. The coefficients on *M_PresentationWords* across the three columns are significantly positive, consistent with the perception that managers have a higher capacity to include KPI-related contents when they provide longer presentations. The coefficients on *M_KPI_PastQtrs_Dummy* and *Answer_KPI_PastQtrs_Dummy* are significantly positive, suggesting that managers' KPI disclosure is highly persistent. Further, *A_All_Questions_PastQtrs* has negative coefficients, consistent with managers paying less attention to KPI-related questions when analysts ask many other unrelated questions. Firms with higher profitability make more voluntary KPI disclosure. While prior literature finds that larger firms tend to make more and better corporate disclosure (e.g., Lev and Penman, 1990; Frankel et al., 1997), my analysis shows a significantly negative coefficient for firm size, suggesting that KPI disclosure is more prevalent among small firms who provide relatively less other disclosure.

In summary, the analyses support my H1 that managers increase their KPI disclosure in future conference calls following analyst demand even after controlling for the firm's prior disclosure.

3.3.5 Results for Hypotheses H2a, H2b, and H2c

In this section, I examine under which conditions the increase of managerial KPI disclosure is more pronounced. Since managers make their voluntary disclosure based on the potential costs and benefits, I identify two important considerations in managerial decision making: the benefits of providing value-relevant performance measures to supplement the less useful earnings information; and the proprietary costs related to the revealing of private operational information.

Table 6 presents the results of my empirical analysis for H2a. Column 1, 2, and 3 use *LowRelev* as an indicator variable identifying the firms whose earnings numbers are less relevant. In Column 1, the interaction term of *LowRelev* and *A_KPI_PastQtrs* has a significantly positive coefficient, suggesting that firms with lower earnings relevance are more likely to provide KPI disclosure in the post periods of analysts' demand. In Column 2, the coefficient of the interaction term is positive, yet not significant. In Column 3, the coefficient of the interaction term is significantly positive, consistent with managers increasing the number of KPIs to present at the beginning of conference calls. Column 4, 5, and 6 report H2a results using *Loss* as an indicator of low earnings relevance. Column 4 and 5 show a significantly more pronounced effect of analyst demand on loss firms. However, the coefficient of interaction in Column 6 is negative and not significant. The insignificance could be explained by the loss firms trying to avoid mentioning some KPIs that report bad performance. In Column 7, 8, and 9, I use absolute accruals (*Accruals*) as a proxy for the irrelevance of firms' reported earnings. The significantly positive coefficients for the interaction terms are consistent with my H2a prediction. Taken together, my analyses largely support the argument that when firms cannot provide useful earnings numbers, managers tend to increase their KPI disclosure to a greater extent.

Table 7 shows the results of my H2b. Higher *Fluidity* represents higher competition faced by the firm in the product market and thus higher proprietary costs related to the firm's KPI information release. In Column 1, the interaction term of *Fluidity* and *A_KPI_PastQtrs* has significantly negative coefficient, suggesting that firms with more concerns about their proprietary information are less likely to provide KPI disclosure following analysts' demand. In Column 2 and 3, the coefficients of the interaction term are also significantly negative, consistent with managers reducing the intensity of their KPI disclosure when they are more concerned about their proprietary information leakage. Collectively, the results support my conjecture that firms faced with higher proprietary costs are unwilling to improve KPI disclosure even when analysts ask for that information.

I then examine whether the connectivity between analysts and the management affects the effect of analyst KPI demand. In Table 8, I add *A_Access_PastQtrs* and its interaction with *A_KPI_PastQtrs* to Equation (1). *A_Access_PastQtrs* indicates the KPI demand from connected analysts during the past eight quarters. In Column 1, the estimated coefficient on the interaction term is positive and significant, suggesting that managers are more likely to provide KPI disclosure when the demand is posted by connected analysts. In Column 2 and 3, the marginal effects of the interactions are also significantly positive, consistent with my hypotheses that managers increase the length of their KPI-related disclosure and the number of KPIs covered to a higher extent when the demand comes from well-connected analysts. These findings imply that managers react more

strongly when the KPI-related questions are raised by analysts enjoying special access to the management.[32]

3.3.6 Conclusion

In summary, the evidence reported in Section 3.3 is generally consistent with my prediction that after analysts pose questions about KPI-related information, managers tend to increase both the likelihood and the intensity of their KPI disclosure in their presentations during future earnings calls. The effect of analyst demand is more pronounced when the firm's earnings relevance is lower, when the firm faces less concerns about proprietary information leakage, and when the KPI demand is expressed by connected analysts.

3.4 Additional analyses

3.4.1 Introduction

In Section 3.4, I conduct additional tests to assess the robustness of my findings in Section 3.3. I begin with efforts to mitigate the concern that the findings may not exist in all the six industries. Specifically, in Section 3.4.2, I conduct analyses to test hypothesis H1 for each individual industry; I then reconduct the analyses for the cross-sectional tests with the largest industry (i.e., high-tech industry) omitted. In Section 3.4.3, to mitigate the concerns on the persistency of KPI disclosure, I first examine the effect of analyst requests that happened in the past eight individual quarters and then investigate the effect on managers' initial KPI disclosure

[32] In untabulated analyses, I replicate the analysis for H1 with *A_KPI_PastQtrs* replaced by *A_Access_PastQtrs*. The coefficients for *A_Access_PastQtrs* are significantly positive and higher than those for *A_KPI_PastQtrs* in Table 4. This is consistent with my prediction that managers have higher incentives to improve their KPI disclosure when the KPI-related questions are raised by analysts connected to management.

decisions. I construct new measures for KPI disclosure and analyst demand and reconduct my analyses in Section 3.4.4 and 3.4.5. Section 3.4.6 concludes this section with a summary.

3.4.2 Subgroup Analyses

One potential concern of my findings is that the results may be dominated by high-tech firms as the high-tech industry covers more than half of the observations. To mitigate this concern, I reconduct my analyses for each individual industry. Table 9 presents the effect of analyst demand on the probability of managerial KPI disclosure for each industry. I find that managers in all industries are more likely to make KPI disclosure following the requests from analysts. Additionally, the coefficient of *A_KPI_PastQtrs* is especially high for the airline industry subgroup. This is consistent with the prevalence of KPIs in the airline industry as shown in Figure 3 Panel 2 and 3, suggesting that the KPIs selected in my list are very important performance measures for the airline industry. The untabulated analyses for the intensity of managerial KPI disclosure (*M_KPI_Words, M_KPI_Mentions*) has similar results.

Table 10 reports the cross-sectional analyses with the high-tech industry omitted. The signs and significance levels of the coefficients on the interaction terms remain similar to those from the full sample analyses. Collectively, the results in Table 9 and 10 indicate that my results are not driven by the high-tech industry, and the effects exist across all six industries in my sample.

3.4.3 The Persistency of KPI Disclosure

In Table 11, I reconduct the Equation (1) analysis with *A_KPI_PastQtrs* replaced by the analyst demand variables (*A_KPI*) for individual quarters, from t-1 to t-8, respectively. While the effect of analysts' KPI demand remains significant, with the increasing interval between requests

and disclosure, it appears that near-term KPI demand has a distinct impact.[33] To further investigate this possibility, I separate out analysts' initial KPI demand from those that are more "stale."

Specifically, to mitigate concerns that my main findings are driven by the persistency of managerial disclosure, I examine the effect of analysts' KPI demand in quarter t-1 for two subgroups. My first test focuses on the firm-quarters with no KPI disclosure in managerial presentation in quarter t-1 and examines whether analysts' demand in the last quarter is associated with managers' initiation of KPI disclosure in the current quarter. Table 12, Column 1, 2, and 3 present the results of this test. In Column 1, the significantly positive coefficient on *A_KPI* in quarter t-1 suggests that managers tend to initiate KPI disclosure when they receive KPI demand from analysts in the last quarter. Moreover, the results reported in Column 2 and 3 suggest that for firms without any KPI disclosure in the last quarter's earnings calls, analyst demand is associated with higher intensity of KPI disclosure in the current quarter.

Another alternative explanation of my findings is that the requests from analysts are persistent and managers only react to the needs of information users when they see cumulative demand, which undermines the effectiveness of the supply-demand mechanism of KPI disclosure. Therefore, I further investigate whether the initiation of analyst demand is associated with the initiation of managerial KPI disclosure. In Column 4 to 6 of Table 12, I focus on the firm-quarters with no KPI disclosure in managerial presentation in quarter t-1 and no questions from analysts

[33] Since using nonstationary variables in regressions may lead to spurious results (Granger and Newbold, 1974), I examine whether the variables in my sample are stationary. The untabulated results reject the null hypothesis that none of the panels is stationary. In case some panels are nonstationary, I further test for the cointegration of the panel data, since the issue of spurious results would not exist when the non-stationary variables are cointegrated (Phillips, 1986). My untabulated results significantly reject the null of no cointegration, suggesting that the lack of stationary would not lead to spurious regression issue in my analyses.

about KPIs in quarter t-2. The results in Column 4 indicate that when analysts initiate a request for KPI-related information in quarter t-1, managers are more likely to start to disclose about KPIs in the current quarter. The results in Column 5 and 6 also support a significant effect of initial analyst demand. Collectively, the findings in Table 12 suggest that my analysis is not dominated by the persistency of KPI disclosure/demand.

3.4.4 Alternative Selection of KPIs

My KPI list contains 51 KPI measures for six industries. A potential concern is that the number of KPIs and the coverage of the KPI list may vary across industries. In an attempt to address this issue, I select one KPI that is mentioned the most by managers and analysts in each industry and get a new list of six KPIs, including the "load factor" for the airline industry, the "realized price" for the energy industry, the "market share" for the high-tech industry, the "production cost" for the mining industry, the "backlog" for the real estate industry, and the "same store sales" for the retail industry. Using this new KPI list, I reconstruct my main variables about the mentioning of KPIs, such as *M_KPI, A_KPI,* and *A_KPI_PastQtrs.* In Table 13 I reconduct my main analysis using the new measures generated. The results suggest that the variation of KPI coverage across industries is not a severe problem in my study.

3.4.5 Alternative Measure of Analysts' Demand for KPI Disclosure

In my main analysis, I use an indicator variable (*A_KPI*) to measure whether analysts ask about KPIs during an earnings conference call. Analysts' demand for KPI disclosure can also be measured using the number of questions asked about KPIs. I test my main hypotheses using the number of KPI-related questions. In Table 14, the variable of interest is the logarithm of one plus the total number of KPI-related questions asked during the past eight quarters

(*A_KPI_Questions_PastQtrs*). In Column 1, the coefficients on *A_KPI_Questions_PastQtrs* remain significantly positive, supporting my argument that analysts' demand for KPI-related information during Q&A sections motivates managers to provide voluntary KPI disclosure in their presentations. In Columns 2 to 4, the coefficients on the interaction terms are consistent with my cross-sectional hypotheses. I also explore the determinants of analysts' interest in KPIs using the natural logarithm of one plus the number of KPI-related questions (*A_KPI_Questions*) and the untabulated results are consistent with those reported in Table 4.

3.4.6 Conclusion

In summary, Section 3.4 demonstrates that my primary findings are robust to the subgroup analyses for individual industries; that the analysts' demand for KPI information has relatively long-term effects but the impact declines over time; and that my results are not dominated by the persistence of KPI disclosure/demand. The evidence reported in this section also strengthens my findings in Section 3.3 by using alternative measures for managers' voluntary KPI disclosure and analysts' KPI demand.

CHAPTER 4

The Effect of KPI Disclosure in Conference Calls on Analyst Earnings Forecast Accuracy

4.1 Hypotheses Development (Hypotheses H3-H4)

4.1.1 Introduction

The findings in Chapter 3 suggest a well-functioning demand-supply mechanism of KPI disclosure. In this chapter, I explore the consequences of KPI disclosure, namely, whether financial analysts use KPI-related information to improve the quality of their work. In Section 4.1.2, I discuss the association between managers' voluntary disclosure about industry-specific KPIs and the accuracy of financial analysts' earnings forecasts. I posit hypothesis H3 for this research question. Section 4.1.3 presents my hypothesis H4 to test whether the demand from financial analysts plays a role in the effect of KPI disclosure. Section 4.1.4 concludes this section with a summary.

4.1.2 KPI Disclosure and the Accuracy of Analyst Earnings Forecasts

As reviewed in Chapter 2, prior literature has shown the importance of industry-specific information among financial analysts' knowledge about the firms they follow. For example, Brown et al. (2015) survey 365 analysts and conduct 18 interviews to investigate the inputs and incentives of financial analysts. They find that industry-level knowledge is the single most valuable type of information for analysts' earnings forecasts and stock recommendations. Brown et al. (2016) conduct surveys and interviews for buy-side analysts and conclude that, from the perspective of buy-side analysts, the most valuable functions of sell-side analysts are to provide industry knowledge and access to firm management. The importance of industry-specific

knowledge suggests the necessity to further test what information is acquired by analysts and how they collect the information.

Moreover, prior studies have documented that some industry-specific KPIs are leading indicators for future performance which may be especially important for financial analysts in the task of making forecasts. Rajgopal et al. (2003) investigate the relevance of an industrial nonfinancial measure (specifically, the order backlog in durable manufacturing and computers industry) to future earnings. They find that after controlling for past earnings, the order backlog is still informative about future earnings. Behn and Riley (1999) find that in the airline industry, nonfinancial metrics, such as available ton-miles and ticket over-sales, are leading indicators of financial performance. Simpson (2010) focuses on nonfinancial KPIs in the wireless industry (e.g., customer acquisition cost, number of subscribers, etc.) and finds that the KPIs predict the firms' future financial performance, but that analysts underreact to the release of KPI information. Collectively, the KPI literature has highlighted the usefulness of KPIs as performance indicators and value drivers.

Therefore, I expect that managers' disclosure of industry-specific KPIs would add especially valuable information to financial analysts' knowledge about the firm and would enable analysts to make better predictions about the firm's future performance. Despite the importance of industry-specific KPIs, prior analyst literature has been focused on the impact of general voluntary disclosure (e.g., Lang and Lundholm, 1996; Aerts et al., 2007; Dhaliwal et al., 2012) or the knowledge of analysts related to their work and study experience (e.g., Clement, 1999; Rubin et al., 2017). An exception is Givoly et al. (2019), who examine analysts' forecasts of KPIs. Using the I/B/E/S KPI database, the authors investigate analysts' forecast of 28 KPIs for firms in four industries (i.e., the airline, pharmaceutical, retail, and oil and gas industries). The authors

demonstrate that the KPI forecasts made by analysts are more accurate than their earnings forecasts, consistent with analysts possessing superior industry-level knowledge (Brown et al., 2015). My study extends Givoly et al. (2019) by investigating the spillover effect of KPI-related information to analysts' earnings forecasts which is generally believed one of the most important outputs of financial analysts (e.g., Fried and Givoly, 1982; Bradshaw et al., 2017). I state my hypothesis as follow:

H3: **Following managers' voluntary disclosure of KPI-related information during conference calls, there is an increase in the accuracy of analysts' earnings forecasts.**

This hypothesis is not without tension. As documented in the literature, the rise of KPIs paralleled the deterioration of earnings relevance (e.g., Lev and Gu, 2016). Despite the usefulness of KPI-related information, one of the most important inputs for financial analysts is earnings numbers (Das et al., 1998). Therefore, analysts' earnings forecast accuracy may not improve or may even decrease when the increase of KPI disclosure accompanies declining usefulness of earnings numbers or other corporate disclosure. Moreover, prior literature about non-GAAP earnings suggests that while adjusted earnings are informative (e.g., Bradshaw and Sloan, 2002; Brown and Sivakumar, 2003), they may also be used opportunistically to mislead investors (e.g., Bradshaw and Sloan, 2002; Frankel et al., 2011). I argue that, compared with non-GAAP earnings, the disclosure of KPIs allows even more space for opportunistic reporting. Since KPIs are not audited, and there is no unified list of KPIs for each industry, managers have the discretion to decide which KPI to disclose as well as the calculation method used to generate the KPI. Therefore, although some KPIs can serve as leading indicators for future financial performance (e.g., Rajgopal et al., 2003; Simpson, 2010), the quality of KPI disclosure can be highly variable; thus, managers may select and use KPIs to provide misleading information. Furthermore, a recent study

by Basu and Xiang (2020) has questioned the value of conference calls from analysts' perspectives. The authors find that the financial analysts' earnings forecasts do not become more accurate around earnings conference calls. They argue that analysts may ignore the information in conference calls when they have private access to the management. Overall, the disclosure of KPIs during conference calls may not improve and may even decrease analysts' earnings forecast accuracy.

4.1.3 The Role of Analysts in KPI Disclosure and the Accuracy of Analyst Earnings Forecasts

I further examine whether the increase of analysts' earnings forecast accuracy (if any) is especially salient when the KPI-related disclosure is motivated by the requests from financial analysts. I expect the H3 effect would be more pronounced under this condition for two reasons. First, analysts' questions about industry-specific KPIs reflect the usefulness of KPIs for their evaluation, prediction, and recommendation about the firm. Gibbons et al. (2020) investigate financial analysts' information acquisition via EDGAR and find that analysts collect more information for large and complex firms, consistent with the information about these firms being especially useful for financial analysts. Additionally, analysts' interest in KPIs may indicate their efforts and ability to use the KPI-related information disclosed by managers. Cen et al. (2020) investigate analysts' interest in supply-chain-related information and argue that interest can lead to increased attention to a specific area (e.g., Ainley et al., 2002) and superior inference about the information (Estes and Vaughan, 1973). Therefore, I predict that when analysts are more interested in KPI-related information, they tend to interpret the information more comprehensively and improve their forecasts about the firm to a greater extent. I state my last hypothesis as follows:

H4: The association between managers' voluntary KPI disclosure and the accuracy of analysts' earnings forecasts (if any) is more salient when the KPI disclosure is motivated by the demand from financial analysts.

4.1.4 Conclusion

In Section 4.1, I posit two hypotheses to be tested in empirical analyses. I present my hypothesis H3 in support of a positive association between managers' voluntary KPI disclosure in earnings calls and the accuracy of analysts' future earnings forecasts. I present hypothesis H4 to test whether this association is more evident when the KPI-related information is disclosed following analysts' demand.

4.2 Research Design

4.2.1 Introduction

Section 4.2 describes aspects related to my data and research design for the hypotheses developed in the previous section. The section begins by introducing my measure of analysts' earnings forecasts accuracy in Section 4.2.2. I then present the regressions models to test hypotheses H3 and H4 in Section 4.2.3. Considering the potential endogeneity between managers' disclosure decisions and the usefulness of the KPI-related information released, I employ Heckman (1979)'s two-step approach with a choice model using Equation (1) in Section 3.2.6. I conclude with a summary in Section 4.2.4.

4.2.2 The Measure of Analysts' Earnings Forecasts Accuracy

I measure the accuracy of financial analysts' earnings forecasts for each firm-quarter. Following prior literature (e.g., Cheng et al., 2016), I define the error of analysts' forecast as the negative value of the absolute difference between actual earnings per share and the consensus of earnings per share forecast, scaled by the actual stock price. The forecast consensus is the average value of financial analysts' estimation for the quarterly earnings per share reported in the quarter before the publication of the quarterly report. Due to the small magnitude of the forecast error, my

measure of forecast accuracy (*Accuracy*) equals the forecast error variable multiplied by -100. Higher values for *Accuracy* represent higher accuracy (i.e. lower error) of analysts' earnings forecasts.

4.2.3 Regression model for Testing Hypotheses 3-4

The objective of this section is to examine whether there is an increase in analysts' earnings forecast accuracy after managers make voluntary disclosure of KPIs during their presentations in conference calls; and further, whether the increase of analyst forecast accuracy, if any, is more evident when financial analysts expressed their demand for KPI-related information in past earnings calls.

The disclosure of industry-specific KPIs is a discretionary decision made by firm management. Since managers consider both the benefits and costs of KPI disclosure, there is a potential endogeneity issue between managers' disclosure decisions and the usefulness of the KPI-related information released. To address the potential self-selection problem, I follow Simpson (2010) and employ the Heckman (1979) two-step approach. Specifically, I use Equation (1) in Section 3.2.6 as a choice model of voluntary KPI disclosure, in which managers' voluntary KPI disclosure is regressed on analysts' demand for KPI-related information and a set of firm characteristics that may influence voluntary disclosure decisions.[34] In this probit regression, the dependent variable is an indicator variable, *M_KPI*, which equals one if the management makes

[34] Simpson (2010) uses the financial analysts' forecast error to capture the information usefulness or the potential benefits of managers' disclosure decisions. My study captures the usefulness of KPI-related information for financial analysts using a more direct measure, which is the information demand expressed by analysts during the Q&A sections in previous earnings calls (*A_KPI_PastQtrs*).

voluntary KPI disclosure during the presentation section of a given conference call, and zero otherwise.

As introduced in Section 3.2.6, I control for the firm's past disclosure patterns, including the firm's past disclosure of KPIs in previous presentations (*M_KPI_PastQtrs_Dummy*) and the Q&A sections (*Answer_KPI_PastQtrs_Dummy*). I control for characteristics of the firm's conference calls, including the length of the prepared presentation (*M_PresentationWords*) and the average number of questions raised by analysts in the past eight quarters (*A_All_Questions_PastQtrs*). I also include a set of firm characteristics related to the use of alternative performance measures: firm size (*Size*), total accruals (*Accruals*), firm profitability (*ROA*), growth opportunity (*MB*), earnings surprise (*SUE*), stock return volatility (*RetVol*), leverage level (*Leverage*), institutional ownership (*IO*), analyst coverage (*FollowingAnalysts*), and an indicator of loss firms (*Loss*). The detailed variable definitions are provided in Appendix D.

To address inter-industry differences, this model controls for industry fixed effects and clusters the standard error at the firm level. To control for potential time trends in the prevalence of KPI disclosure, I include quarter fixed effects. Based on the coefficients estimated in this regression, I calculate the Inverse Mills Ratio (*IMR*) and include it as an additional explanatory variable in the second equation.

In the second equation, to test the association between KPI disclosure and analysts' earnings forecast accuracy, I model the accuracy of analysts' forecasts for the firm's earnings in the next quarter as a function of the manager's voluntary KPI disclosure in this quarter's earnings call. The system of equations using Heckman (1979) two-step approach is as follows:

$$M\_KPI_{it} = \beta_0 + \beta_1\, A\_KPI\_PastQtrs_{i(t-8,\ldots,t-1)} + \beta_2\, M\_KPI\_PastQtrs\_Dummy_{it} + \beta_3 Answer\_KPI\_PastQtrs\_Dummy_{it} + \beta_4\, M\_PresentationWords_{it}$$

$$+\beta_5 A\_All\_Questions_{it} + \beta_6 Size_{it} + \beta_7 Loss_{it} + \beta_8 Accruals_{it}$$
$$+\beta_9 ROA_{it} + \beta_{10} SUE + \beta_{11} RetVol_{it} + \beta_{12} Leverage_{it} + \beta_{13} MB_{it}$$
$$+\beta_{14} IO_{it} + \beta_{15} FollowingAnalysts_{it}$$
$$+Quarter\ FE + Industry\ FE + \varepsilon \quad \text{(Eq. 1)}$$

$$Accuracy_{it+1} = \beta_0 + \beta_1 M\_KPI_{it} + \beta_2 Accuracy_{it} + \beta_3 M\_KPI\_PastQtrs\_Dummy_{it}$$
$$+\beta_4 PastRet_{it} + \beta_5 BVPS_{it} + \beta_6 SalesGrowth_{it} + \beta_7 Size_{it} + \beta_8 Loss_{it}$$
$$+\beta_9 Accruals_{it} + \beta_{10} SUE + \beta_{11} RetVol_{it} + \beta_{12} Leverage_{it}$$
$$+\beta_{13} FollowingAnalysts_{it} + \beta_{14} IMR_{it}$$
$$+Quarter\ FE + Industry\ FE + \varepsilon \quad \text{(Eq. 2)}$$

In this regression, the subscript i denotes the firm, and the subscript t denotes the fiscal quarter of the firm-quarter observation. The dependent variable *Accuracy* measures the accuracy of financial analysts' estimation about quarterly earnings per share. The variable of interest, *M_KPI*, is an indicator variable which equals one if the manager provides any voluntary KPI disclosure in quarterly earnings call, and zero otherwise. In addition to some firm characteristics controlled in Equation (1), Equation (2) controls for the financial analysts' forecast accuracy for this quarter ($Accuracy_{it}$) and three variables documented to be related to analysts' forecast accuracy (e.g., Simpson, 2010; Abarbanell, 1991; and Frankel and Lee, 1998): the firm's past stock return (*PastRet*), which is the stock return from two month before to one month after the quarter end; the book value per share scaled by stock price (*BVPS*), and the sales growth (*SalesGrowth*). *IMR* is the Inverse Mills Ratio calculated based on the coefficients estimated in Equation (1). I control for quarter fixed effects and industry fixed effects in this model. To support H3, I expect a positive coefficient on *M_KPI*.

To examine whether the association between voluntary KPI disclosure and analyst forecast accuracy is more pronounced for KPI disclosure motivated by analyst demand, I add an indicator variable (*M_KPI_Motivated*) which equals one only if managers provide KPI disclosure after analysts request the information in the past quarter, and zero otherwise. Specifically, $M\_KPI\_Motivated_{it} = M\_KPI_{it} \times A\_KPI_{it-1}$, where *A_KPI* is an indicator variable, which equals one if the analysts ask about any KPI of the firm's industry during the Q&A section of the conference call, and zero otherwise. Furthermore, to examine whether the H3 effect is more significant when KPI-related disclosure was requested by financial analysts, I control for *M_KPI* in the second equation. To support H4, I expect the coefficient of *M_KPI_Motivated* to be significantly positive after controlling for *M_KPI*.[35]

4.2.4 Conclusion

Section 4.2 describes my measure of analysts' earnings forecast accuracy and the use of Heckman (1979) two-step approach to address the potential self-section issue in my empirical analyses. I use Equation (1) as a choice model to capture managers' discretionary decisions about KPI disclosure. I then include the Inverse Mills Ratio (*IMR*) calculated from the choice model in Equation (2) to test hypotheses H3 and H4. The empirical results are reported in Section 4.3.

4.3 Empirical Results

4.3.1 Introduction

In this section, I test the hypotheses on the effect of managerial voluntary KPI disclosure on analysts' earnings forecast accuracy. Section 4.3.2 presents the sample selection and descriptive

[35] I expect the coefficient on *M_KPI* to be less significant or become insignificant after including *M_KPI_Motivated* in the model.

statistics relevant to my Heckman (1979) two-step equation system. Section 4.3.3 and 4.3.4 reports the results of hypotheses H3 and H4, respectively. Section 4.3.5 presents the results of my subgroup analyses and follows with a summary of my empirical results in Section 4.3.6.

4.3.2 Sample Selection & Summary Statistics

Similar to the sample selection process in Section 3.3.2, I start with all quarterly earnings conference call transcripts between January 2006 and December 2018 available in the S&P Global Market Intelligence database. After restricting to the US firms with Q&A sections, I match the sample with Compustat, CRSP, and I/B/E/S databases. Finally, I require non-missing values of variables used in my regression models and get a final sample of 31,502 firm-quarters for 1,720 unique firms.

Table 15 presents the summary statistics for the sample. Similar to the findings in Section 3.3.2, managers voluntarily disclose KPIs during their presentations in more than half of the earnings calls (52.4%). In about 16% of conference calls, financial analysts requested KPI-related information in the past quarter, and managers conduct voluntary KPI disclosure in the current quarter. Further, the average value of *Accuracy* is -0.981 which is comparable with the value observed in prior literature.[36] In terms of the control variables, the average leverage ratio is 0.508; and, on average, each firm in my sample is covered by 6.83 financial analysts.

4.3.3 Results for Hypothesis H3

[36] For example, the absolute value of the average analyst forecast accuracy in Cheng et al. (2016) is 1.241 and 1.077, respectively, for two samples.

Table 16 reports the results of voluntary KPI disclosure effect on analyst forecast accuracy. Column 1 and 2 presents the results of Heckman regressions. In Column 1, I use *M_KPI* as the dependent variable and use the estimated coefficients to calculate the Inverse Mills Ratio (*IMR*). In Column 2, I use future *Accuracy* as the dependent variable, use this quarter's *M_KPI* as the variable of interest, and include *IMR* in the model. As shown in Column 2, the coefficient on managers' KPI disclosure (*M_KPI*) is significantly positive, supporting my prediction that analysts' earnings forecast accuracy improves following managers' voluntary KPI disclosure. The result also indicates economic significance of managerial KPI disclosure, representing a 4.2% increase of analysts' earnings forecast accuracy following KPI disclosure in conference calls. The significant coefficient on the Inverse Mills Ratio (*IMR*) suggests that the endogeneity issue is significant in the models. The signs of control variables are largely consistent with expectations. The coefficient on the forecast accuracy for current quarter's earnings is positive and significant, suggesting that financial analysts have a relatively persistent ability to estimate a firm's future performance. The coefficient on *A_KPI_PastQtrs* is significantly negative, consistent with the argument that when analysts have difficulty forecasting a firm's earnings, they are more likely to ask about KPIs and collect supplemental information during conference calls. The coefficients on *Accruals* and *RetVol* are significantly negative, suggesting that it is more difficult to make accurate forecasts when the firm has higher total accruals or stock return volatility. And *FollowingAnalysts* has significantly positive coefficients, consistent with the consensus forecast becoming more accurate when there are more financial analysts producing earnings forecasts for the firm.

While my main test is conducted using Heckman two-stage models, I also report the coefficients estimated using OLS regression in Column 3, since OLS regression is more robust than Heckman's approach (Lennox et al. 2012). I find that after controlling for *A_KPI_PastQtrs*

and other firm characteristics, the coefficient on *M_KPI* is significantly positive and has similar magnitude to that in Column 2. In summary, the analyses support my H3 that the analysts' earnings forecast accuracy is higher when managers voluntarily disclose KPI-related information in the past quarter.

4.3.4 Results for Hypothesis H4

In this section, I examine whether the effect of voluntary KPI disclosure is more pronounced when the KPI disclosure is motivated by the demand from financial analysts. Table 17 presents the results of my H4. Column 1 and 2 report the results of Heckman two-stage regressions. In Column 1, I use *M_KPI_Motivated* as the dependent variable and use the estimated coefficients to calculate the Inverse Mills Ratio (*IMR*). In Column 2, I use *M_KPI_Motivated* as the variable of interest and include *IMR* in the model. I find that after controlling for *M_KPI*, the coefficient on *M_KPI_Motivated* is significantly positive, consistent with my prediction that the H3 effect is more pronounced when the KPI disclosure was motivated by analyst demand. The coefficient on the Inverse Mills Ratio (*IMR*) is significant, suggesting that the endogeneity issue is not trivial in the models. Moreover, I report the results of OLS regression in Column 3. The significantly positive coefficient of *M_KPI_Motivated* also supports my H4 that the effect of KPI disclosure is more significant when financial analysts expressed their demand for the disclosure in prior earnings calls.[37]

4.3.5 Additional Analyses

[37] The coefficient on *M_KPI* is positive but only significant in the OLS regression results. This is consistent with my prediction that the results for *M_KPI* become less significant after including *M_KPI_Motivated* in the model.

In Table 18, I reconduct my H3 analysis for each individual industry. I find that in most industries (i.e., energy, mining, retail, and high-tech industries), financial analysts tend to make more accurate earnings forecasts when they receive KPI-related information from managers' presentations in earnings calls. While the coefficients on *M_KPI* are significantly positive for these industries, the magnitude of the coefficient varies across subgroups. For example, the coefficient on *M_KPI* for the mining industry is 0.429. While the high-tech industry has the smallest coefficient on *M_KPI*, its result is the most significant (0.077, t=3.255). The exceptions are the airline industry and real estate industry. For these two industries, the coefficients on *M_KPI* are not significant. A potential reason might be the relatively small sample size of the two subgroups.

I further examine whether the demand from financial analysts plays an important role in the impact of KPI disclosure in all industries. Table 19 documents the impact of analyst demand on the effect of voluntary KPI disclosure. Interestingly, while the coefficients on *M_KPI_Motivated* are positive in most industries (i.e., mining, real estate, retail, and high-tech industries), the effect is significant only for the subgroup of high-tech industry. This is consistent with the especially important role of financial analysts in facilitating market participants' understanding of high-tech firms which usually have innovative and complicated business models and rely on often unrecognized intangible assets (Lev and Zarowin, 1999; Srivastava, 2014; Barth et al., 2001).

In Table 20, I use alternative measures of managerial KPI disclosure to test hypotheses H3 and H4. In the main analysis, I use an indicator variable (*M_KPI*) to measure whether managers voluntarily disclose KPIs in their presentations. As introduced in Section 3.2.4, the intensity of managers' voluntary KPI disclosure can be captured using two continuous variables, the logarithm of one plus the number of words covered by the sentences related to KPIs in the managerial

presentation (*M_KPI_Words*) and the logarithm of one plus the number of KPIs mentioned in the managerial presentation (*M_KPI_Mentions*). Moreover, Simpson (2010) emphasizes the importance of persistent disclosure of nonfinancial information in the wireless industry. I thus construct an indicator variable for persistent disclosure (*M_KPI_Persist*), which equals one if management persistently makes KPI-related disclosures in the presentation sections of calls held in the past four quarters, and zero otherwise. Since the Heckman two-stage approach requires the dependent variable in the choice model to be an indicator variable, I only conduct OLS regressions for the alternative measures of KPI disclosure. Columns 1 to 3 report the results for H3. The coefficients on my variables of interest (i.e., *M_KPI_Words*, *M_KPI_Mentions*, and *M_KPI_Persist*) remain significantly positive, supporting my argument that managers' voluntary KPI disclosure leads to an improvement in the accuracy of analysts' earnings forecasts. Columns 4 to 6 report the results for H4. The significantly positive coefficients on *M_KPI_Motivated* are consistent with my H4 that the effect of KPI disclosure is more significant when financial analysts expressed their demand for the disclosure in prior earnings calls.

A caveat in my interpretation of the results is the difficulty of controlling for all other disclosure channels. Although I follow prior studies and control for some variables related to analysts' earnings forecast accuracy, the increase in analysts' earnings forecast accuracy may be driven by managers' improvement in other disclosure channels. For example, the manager's voluntary disclosure of KPIs during conference calls may happen simultaneously with the firm improving the quality of its financial reporting which facilitates analysts' estimation about the firm's future performance.

4.3.6 Conclusion

In summary, the evidence reported in Section 4.3 is generally consistent with my prediction that managers' voluntary KPI disclosure is associated with an increase in analysts' earnings forecast accuracy in future quarters. Except the two industries with small sample size (i.e., airline and real estate), my finding holds for most industries covered by my KPI term list (i.e., energy, mining, retail, and high-tech). I further find that this effect is more pronounced when the KPI disclosure was motivated by analyst demand. The results for hypothesis H4 seem to be driven by the high-tech industry which is consistent with the especially important role played by financial analysts where there is a high degree of asset intangibility.

CHAPTER 5

Conclusion

Using 39,302 earnings conference calls from 2006 to 2018, I find that managers' KPI disclosure in earnings call presentations is significantly associated with the demand from financial analysts in past quarters. Specifically, I find that following analysts' questions about industry-specific KPIs in the Q&A sections of conference calls, managers are more likely to disclose KPI-related information in future presentations, they tend to spend more words in the sentences talking about KPIs, and they cover more industry-specific KPIs in their future presentations. I also find that the effects are more evident when earnings relevance is low, when the firm faces fewer concerns about proprietary information leakage, and when the KPI demand is expressed by connected analysts.

I then examine whether and how managers' voluntary KPI disclosure during conference calls improves the accuracy of financial analysts' earnings forecasts. I find a significantly positive association between KPI disclosure and analyst forecast accuracy. This result is robust using both OLS regressions and the Heckman two-stage approach. I further investigate whether the demand from financial analysts plays a role in the effect of KPI disclosure. While the effect is more pronounced when the KPI disclosure was motivated by analyst demand, the result seems to be driven by the high-tech industry. This is consistent with financial analysts being especially important in facilitating the investors' and other stakeholders' understanding of the innovative and complicated business of firms in high-tech industries.

This dissertation sheds light on the roles played by analysts in the absence of mandatory KPI disclosure standards, suggesting that the demand from market participants (i.e., financial analysts) at least to some extent can motivate corporate KPI disclosure. My study is of interest to

standard setters and regulators considering the debate about integrating and mandating KPI disclosure. My findings imply the existence of a well-functioning demand-supply mechanism of KPI disclosure, suggesting that the regulation of KPI disclosure may not be necessary.

This dissertation also adds to research about the impact of voluntary KPI disclosure on analyst earnings forecast accuracy. While Givoly et al. (2019) document that analysts' forecasts of KPIs are more accurate than their estimates of earnings numbers, my study extends their findings by investigating the usefulness of KPI-related information in improving earnings forecasts, a potential spillover effect of voluntary KPI disclosure. My study contributes to the KPI literature and the analyst literature by showing that analysts integrate industry-specific KPIs, which are usually leading indicators for future financial performance, to generate one of their most important outputs, earnings forecasts.

This dissertation opens the potential for future research about KPIs. I plan to survey firm managers and financial analysts to further understand how they choose and interpret different KPIs. My study can also be extended by investigating the real effect of KPI disclosure on different stakeholders' decisions, such as the investors' investment decisions and the potential creditors' lending decisions.

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Appendix A

List of KPIs

If not specified, the source of the KPIs is I/B/E/S KPI database.

KPI	Description
	Airline
Available Seat Miles (Available Seat Kilometers)	ASM. The passenger-carrying capacity during the period, which equals the number of miles traveled multiplied by the number of seats available.
Revenue per Available Seat Miles (Revenue per Available Seat Kilometers)	RASM. The average passenger revenue generated per available seat mile.
Cost per Available Seat Miles (Cost per Available Seat Kilometers)	CASM. The average operating cost per available seat mile.
Load Factor	The number of miles traveled by passengers divided by total available seat miles.
	Energy
Realized Price	The average price received per unit during the period.
Maintenance Capex	The investments required to maintain existing physical assets for operating.
Lease Operating Expense	The costs incurred to maintain and operate an active well and its associated equipment producing oil and gas.
Production Tax	A valued based tax applied to the production of oil and gas.
Production Expense	Production expense.
Proven Reserve	The quantity of energy sources reserved estimated using geologic and engineering data.
Total Production	Total production.
	High-tech
Traffic Acquisition Cost	TAC. The payments made that direct consumer and business traffic to websites.
Burn Rate	The amount of cash consumed by the firm during the period. [Source: Internet (a)][38]
Retention Rate	(The number of customers-The number of new customers acquired)/The number of customers at the start of the period*100. [Source: Internet (a)]
Life Time Value	LTV. The estimated average revenue that a customer brings throughout the lifespan as a customer. [Source: Internet (a)]

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Appendix A. (*Continued*)

KPI	Description
Recurring Revenue	The percentage of a firm's revenue expected to continue in the future. [Source: Internet (b)][39]
Net Promoter Score	An index ranging from -100 to 100 that measures the willingness of customers to recommend a firm's products or services to others. [Source: Internet (a)]
Average Revenue per Unit	The amount of money a firm expects to receive from selling one unit of product.
Churn Rate	Customer turnover.
Customer Acquisition Cost (Subscriber Acquisition Cost)	The average cost incurred to acquire a new customer.
Daily Active User (Daily User)	DAU. The number of users per day who take an action in a website or app. [Source: Internet (c)][40]
Web Traffic	The amount of data sent and received by visitors in a website. [Source: Literature] (Trueman et al., 2001)
Penetration Rate	The number of subscribers scaled by the population size of the target market. [Source: Literature] (Amir and Lev (1996)
Market Share	Market share. [Source: Literature] (Simpson, 2010)
Average Revenue per User	The amount of money that a firm expects to generate from an individual customer. [Source: Literature] (Simpson, 2010)
Network Traffic	The amount of data moving across a network at a given point of time.
	Mining
Production Cost	The costs incurred to manufacture a product or provide a service.
Average Price	The average price of the products during the period.
Realized Price (Realized Gold/Copper/Silver Price)	The final price the product or service is sold, calculated by excluding all applicable discounts, rebates, shopper rewards, coupon discounts from list price.
Total Production	Total production.
Silver Equivalent Production	The value of production converted to equivalent silver amount.
Copper Production	Total production of cooper.
Silver Production	Total production of silver.
Zinc Production	Total production of zinc.
Molybdenum Production	Total production of molybdenum.

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Appendix A. (*Continued*)

KPI	Description
	Real Estate
Backlog	The quantity or value of products ordered by a customer but not shipped yet.
Development Cost	Development expense.
Home Sale	Sale of home.
Land Sale	Sale of land.
Lot Sale	Sale of lots.
Occupancy Rate	The ratio of rented or used space to the total amount of available space.
Vacancy Rate	The vacancy rate is the percentage of all available units in a rental property, such as a hotel or apartment, that are vacant or unoccupied.
	Retail
Same-Store Sale	Same-Store Sales. A percentage sales growth for retail stores that have been open for more than one year (or over another time period defined by the reporting firm).
Number of Store	Total number of open stores.
Floor Space	Total floor space of stores.
Number of Stores Opened	Number of stores opened during the period.
Retail Sale	Revenue from retail sales (i.e., the number excludes wholesale sales).
Stores Closed	Total number of stores closed or relocated during the period.
Franchise Fee	Franchise expense.
Licensing Fee	Licensing expense.
Pre-Opening Expense	Costs incurred before the firm can open its doors for business.

Appendix B

The Construction of KPI List & Industry Classification

This appendix summarizes the process to construct my list of industry-specific KPIs. I start with the full list of industry-specific performance measures in the I/B/E/S KPI database, which covers 147 measures across ten industries.[41] I then exclude the KPIs of banking industry and combine the technology and telecommunications industries into the high-tech industry. Then, according to my definition of KPIs, I exclude the performance measures that are available in financial statements (GAAP measures), such as the net operating income for real estate industry and the rent expense for retail industry. Next, I refer to the literature and add to my list the KPIs documented as value relevant. Then, due to the importance of the high-tech industry in recent decades and the small number of high-tech related KPIs (eight KPIs in I/B/E/S), I collect some KPIs for the high-tech industry from the internet. The resulting list contains 131 KPIs for seven industries.

Next, I link the earnings call transcripts with the firm-quarters belonging to the seven industries identified by my KPI list based on their SIC industry code. Specifically, I determine the SIC codes of airline, energy, pharmacy, and real estate industries based on Fama-French 48 industry classifications; and the retail and mining industries based on Fama-French 17 industry classifications (Fama and French, 1997).[42] I then follow Kile and Phillips (2009)'s three digit SIC code combination to identify high-tech firms.[43]

Furthermore, I conduct key word searching using Python for all the 131 KPI terms across the earnings call transcripts held by their corresponding industries.[44] I then exclude the KPIs that have been discussed by managers (analysts) in less than ten (five) conference calls from my list. My final list of KPIs contains

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[41] I/B/E/S KPI database classifies analysts' KPI forecasts into ten industries: airlines, banking & investment services, energy, insurance, mining, pharmaceuticals & healthcare, real estate, retail, technology, and telecommunications.

[42] I refer to both 17 and 48 industry portfolios since the scope where the KPIs are applicable varies across different industries. For example, the KPIs of airline industry may not be applied to other industries in the transportation industry covered by Fama French 17 industry portfolios.

[43] Kile and Phillips (2009) classify high-tech sector into hardware, software, medical technology, communications, electronic manufacturing, and Internet subgroups. I exclude the medical technology subgroup from my sample since this subgroup is likely to be related to pharmacy industry, which is not covered by my KPI list.

[44] I explain the key word searching process in detail in Appendix C.

51 KPIs for six industries (i.e., airlines, energy, mining, real estate, retail, and high-tech). Appendix A shows my list of KPIs and their resources. 41 (80.4%) of the KPIs are covered by I/B/E/S KPI database; four KPIs are collected from the literature; and finally, six KPIs for the high-tech industry are collected from the internet. The following table summarizes my industry classification in detail:

Industry	SIC codes
Airline	4500 - 4599
Energy (Oil and gas equipment and services in I/B/E/S KPI)	1200 – 1399, 2900 - 2999
Mining	1000 – 1099, 1200 – 1299, 1400 – 1499, 5050-5052
Pharmacy	2830 – 2831, 2833 – 2836
Real Estate	6500, 6510, 6512 – 6515, 6517-6519, 6520-6532, 6540-6541, 6550-6553, 6590-6599, 6610-6611
Retail	5200 – 5959, 5970 – 5999
High-tech (three-digit SIC)	366, 481, 482, 484, 489 (Communications); 355, 357 (Hardware); 737 (Software); 596, 641, 731, 733, 736, 737, 738, 870, 874 (Internet); 362, 364, 367, 369 (Electronic equipment)

Appendix C

Examples of Conference Call Transcript Text Coding

As mentioned in Appendix B, I conduct key word searching using Python for all the 131 KPI terms across the earnings call transcripts held by their corresponding industries. The contents of each conference call transcript are divided into multiple pieces in order. Each piece of text comprises the sentences of one speaker until another speaker starts to talk. The transcripts covered by my sample have 3,609,414 pieces of texts in total. For each piece of text, the key word searching process determines whether a specific KPI is mentioned by the speaker. Using the flag variable of speaker types, I identify the pieces of text belonging to the presentation provided by executives at the beginning of the call and those from the Q&A section which contains conversations between managers and analysts.

Before searching for the key words across the texts, I conduct text preprocessing to improve the efficiency and accuracy of the matching between KPIs and the mentions by conference call participates. For example, I tokenize each text to break it into separate words to prepare to other preprocessing treatments; I then convert all the characters into their lower case; and finally, I stem the words to reduce inflection to their root forms. To better clarify this process and the following key word searching results, I provide several examples of the original and preprocessed texts during earnings conference calls.

Example 1. A manager's discussion about KPIs in his/her presentation.

Continental Airlines' Second Quarter 2007 Earnings Conference Call held on July 19, 2007.

[Original text] The KPI mentioned is *costs per available seat mile* for airline industry.

"Thanks, Jeff, and again thanks to all of you for joining us this morning. Well despite all of our weather and ATC operational challenges, we're pretty pleased with our second quarter results. Revenue came in a bit stronger than we initially expected, and we continue to work the cost side of the ledger. … So on the cost side, on a year-over-year basis, the increase in same quarter costs was primarily attributable to increased flying, higher maintenance costs and increase in profit-sharing and other variable compensation. Our second quarter mainline *costs per available seat mile*, is CASM, on a GAAP basis, increased $0.09 on 1% year-over-year. Excluding special items and holding fuel rate constant, mainline CASM was up 1.5% year-over-year, which was a little better than our guidance. Looking ahead to the third quarter, we

expect our mainline CASM, again including special items and holding fuel rate constant, to be up about 3% year-over-year. As I mentioned last quarter, throughout 2007, we'll continue to see pressure on the maintenance line as our fleet ages and a larger number of heavy checks are needed. We also have some program escalations in our aircraft maintenance contracts but we are working on a couple of initiatives to offset some of these increases and hope to have some of those initiatives in place by year end. We'll also see some increase in the wage and benefit line due to increased volume variable pay and our 2% compensation increase for all work groups that agreed to reductions in 2005 which went into effect earlier this month. Our cost pressures will be partially offset by improvements in our regional jet economics as we complete the transition of part of our regional flying to Chautauqua. Larry mentioned our current plan to scale back mainline growth a bit next year. That of course will put some additional pressure on CASM but we think it's the right thing to do in the current environment."

[Preprocessed text] The KPI mentioned is converted to cost per avail seat mile for airline industry.

"thank , jeff , and again thank to all of you for join us thi morn . well despit all of our weather and atc oper challeng , we 're pretti pleas with our second quarter result . revenu came in a bit stronger than we initi expect , and we continu to work the cost side of the ledger . … so on the cost side , on a year-over-year basi , the increas in same quarter cost wa primarili attribut to increas fli , higher mainten cost and increas in profit-shar and other variabl compens . our second quarter mainlin *cost per avail seat mile* , is casm , on a gaap basi , increas $ 0.09 on 1 % year-over-year . exclud special item and hold fuel rate constant , mainlin casm wa up 1.5 % year-over-year , which wa a littl better than our guidanc . look ahead to the third quarter , we expect our mainlin casm , again includ special item and hold fuel rate constant , to be up about 3 % year-over-year . as i mention last quarter , throughout 2007 , we 'll continu to see pressur on the mainten line as our fleet age and a larger number of heavi check are need . we also have some program escal in our aircraft mainten contract but we are work on a coupl of initi to offset some of these increas and hope to have some of those initi in place by year end . we 'll also see some increas in the wage and benefit line due to increas volum variabl pay and our 2 % compens increas for all work group that agre to reduct in 2005 which went into effect earlier thi month . our cost pressur will be partial offset by improv in our region jet econom as we complet the transit of part of our region fli to chautauqua . larri mention our current plan to scale back mainlin growth a bit next year . that of cours will put some addit pressur on casm but we think it 's the right thing to do in the current environ ."

Example 2. The discussion between an analyst and a manager during the Q&A section.

Marchex's Fourth Quarter 2005 Earnings Conference Call held on February 23, 2006.

[Original text] The KPI mentioned is *traffic acquisition cost* for high-tech industry.

The analyst's question is "Sure, a final question, your gross margin seems to have increased, improved dramatically, we also heard that on Yahoo's call that *traffic acquisition costs* for them was going up. Could you comment of there was a change in revenue splits of payouts or any other trends that you saw there?"

The manager's answer is "The trends have been pretty consistent with us in terms of kind of what we saw through the year, and we see happening in 2006, John touched on it. Highly quality third-party distribution, it's always competitive and; you do a better job, you are going to keep your partners and I think we've been doing that. And on the other side of it we clearly benefit as a large and increasingly growing traffic owner, because we know that, the more traffic you have the more control you have of your own destiny. So overall trend feel pretty consistent with what they were and, for us we think that creates a pretty right environment for this year."

[Preprocessed text] The KPI mentioned is converted to *traffic acquisit cost* for high-tech industry.

The analyst's question is "sure , a final question , your gross margin seem to have increas , improv dramat , we also heard that on yahoo ' s call that *traffic acquisit cost* for them wa go up . could you comment of there wa a chang in revenu split of payout or ani other trend that you saw there ?"

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Appendix D

Variable Definitions

Variable	Definition
M_KPI	Indicator variable, which equals one if the firm's executives make any voluntary KPI disclosure during the presentation section in its earnings call.
M_KPI_Mentions	The natural log one plus the number of KPIs mentioned by managers during the presentation.
M_KPI_Words	The natural log of one plus the number of words covered by the sentences related to KPIs in managerial presentation.
M_KPI_PastQtrs_Dummy	Indicator variable, which equals one if the firm's executives have made any voluntary KPI disclosure during the presentation sections of earnings calls in quarter t-8 to t-1.
M_KPI_Motivated	Indicator variable, which equals one only if managers provide KPI disclosure after analysts request the information in the past quarter.
M_PresentationWords	The natural log of one plus the total number of words in the prepared presentation of the earnings call.
Answer_KPI	Indicator variable, which equals one if the firm's executives make any KPI disclosure during the Q&A section in its earnings call.
Answer_KPI_PastQtrs_Dummy	Indicator variable, which equals one if the firm's executives have made any KPI disclosure during the Q&A sections of earnings calls in quarter t-8 to t-1.
A_KPI	Indicator variable, which equals one if analysts ask at least one question about KPIs during the Q&A section of the earnings call.
A_KPI_PastQtrs	The natural log of one plus the sum of A_KPI for quarter t-8 to quarter t-1.
A_KPI_Questions	The natural log of one plus the number of KPI-related questions during the Q&A section of the earnings call.
A_KPI_Questions_PastQtrs	The natural log of one plus the total number of KPI-related questions from quarter t-8 to quarter t-1.
A_All_Questions	The natural log of one plus the number of questions raised by analysts during the Q&A section of the earnings call.
A_All_Questions_PastQtrs	The natural log of one plus the average number of questions asked from quarter t-8 to quarter t-1.
A_KPI_PastQtrs_Dummy	Indicator variable, which equals one if analysts have asked about KPIs during the Q&A sections of the firm's earnings calls in quarter t-8 to t-1.

Appendix D. (*Continued*)

Variable	Definition
LowRelev	Indicator variable, which equals one if the firm has earnings relevance below the median by industry and quarter.
Fluidity	The measure of proprietary cost based on textual analysis of 10-K filings (Hoberg, et al., 2014).
A_Access	Indicator variable, which equals one if at least one of the analysts asking about KPI-related information was invited to ask the first question in any of the earnings calls held in the past four quarters.
A_Access_PastQtrs	Indicator variable, which equals one if at least one of the analysts asking about KPI-related information in quarter t-8 to quarter t-1has connectivity to firm management.
Accuracy	The negative value of the absolute difference between actual earnings per share and the consensus of earnings per share forecast, scaled by the actual stock price.
Size	The natural log of one plus total asset.
Loss	Indicator variable for loss firms.
Accruals	The absolute accrual value scaled by the absolute net operating cash flow.
ROA	Return on assets.
SUE	Standardized earnings surprise calculated using the analyst forecasts and actuals reported by I/B/E/S (actual earnings per share minus expected earnings per share, scaled by adjusted stock price).
RetVol	The standard deviation of monthly stock returns in the past 12 months.
Leverage	The ratio of total liabilities to total assets.
MB	Market-to-book ratio.
IO	The percentage of shares owned by institutional investors.
FollowingAnalysts	The natural log of one plus the number of analysts following the firm.
PastRet	The firm's past stock return (PastRet), which is the stock return from two month before to one month after the quarter end.
BVPS	The book value per share scaled by stock price (BVPS).
SalesGrowth	The sales growth rate.

Figure 1. Investors' Use of Information

Panel A. Percentage of Information Used by Investors (Lev and Gu, 2016, Chapter 4, Figure 4.1)

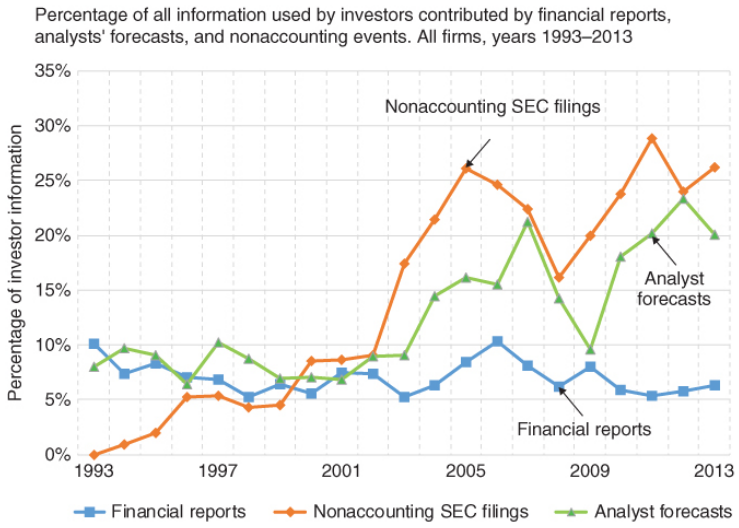


Figure 4.1 The Unique Contribution to Investors' Information: Financial Reports, Analysts' Forecasts, and Nonaccounting SEC Filings

Panel B. (2) Professional Investors' Use of Information (European Financial Reporting Advisory Group, 2016)

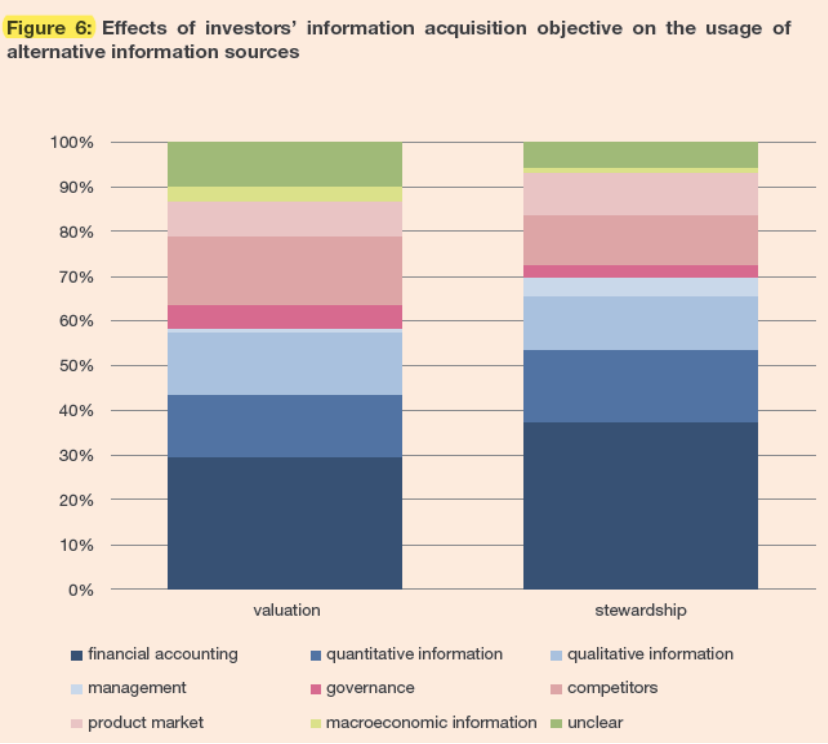
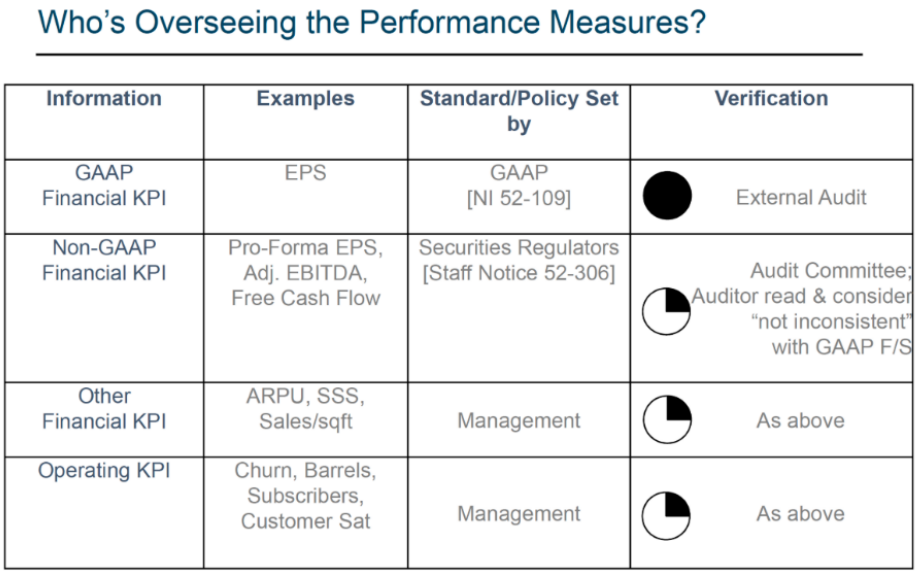


Figure 2. The Scope of KPIs

Panel A. CFA's schematic for performance measures



Panel B. AcSB's (2018) Classification of Performance Measures

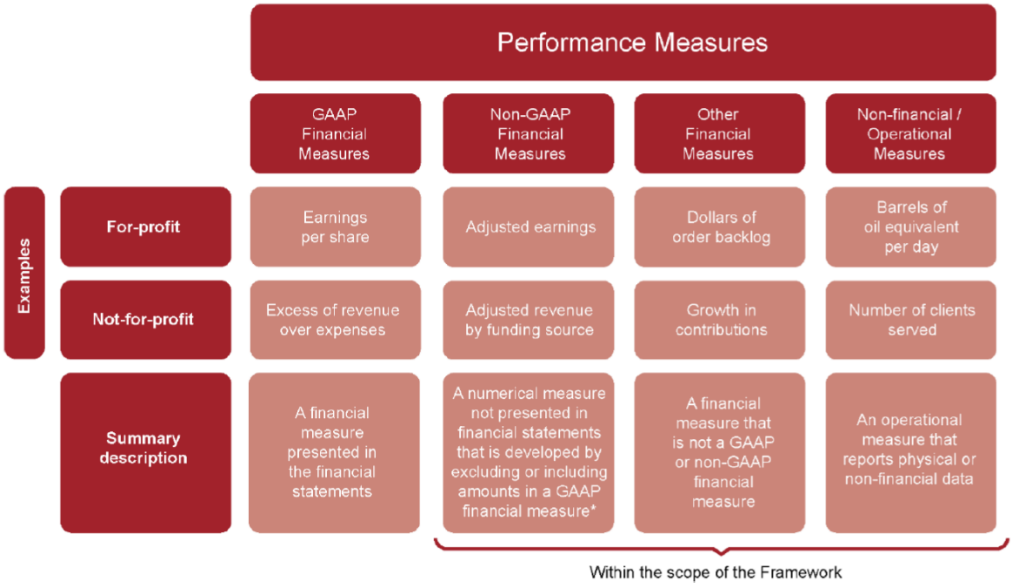


Figure 2. (*Continued*)

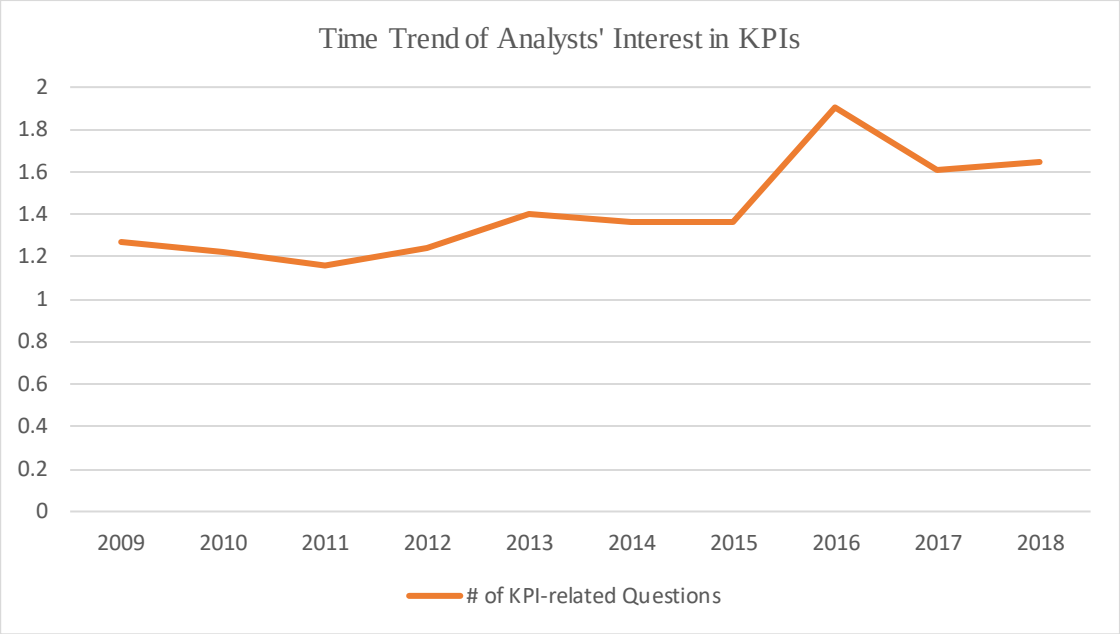
Panel C. CFA's (2016) examples of non-GAAP measures and KPIs

Table 1.1. Examples of NGFM versus Other Metrics

NGFMs/APMs	Other Metrics, Key Performance Indicators
• Adjusted revenue	• Same store sales
• Adjusted net income	• Average revenue per customer or user
• EBITDA	• Revenue per available room
• Adjusted EBITDA	• Sales per square foot
• EBITDAR	• Customer retention
• EBIT	
• Adjusted EPS	
• Free cash flow	
• Funds from operation	
• Net debt	
• Unbilled deferred revenue	
• Book-to-bill ratio	
• Orders and order backlog	
• Return on capital employed (adjusted)	

Figure 3. Prevalence of KPIs in Conference Calls

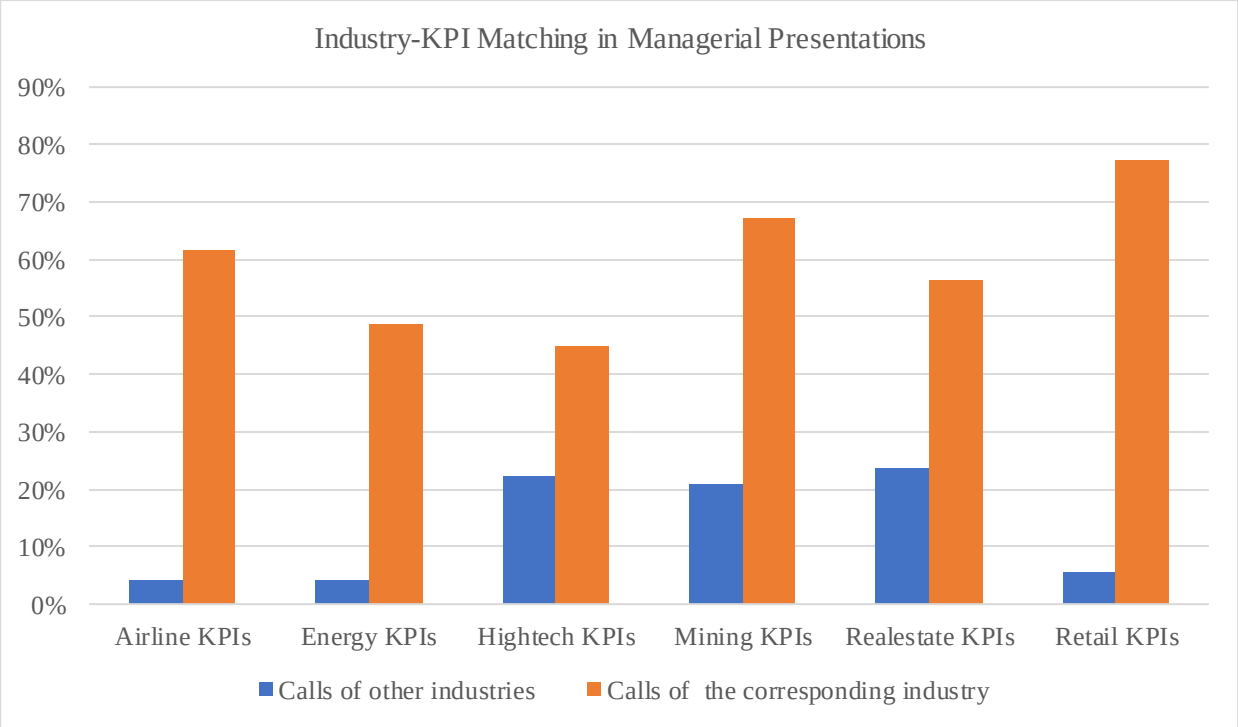
Panel A. Time Trend of Analysts' interest in KPIs during S&P 500 firms' earnings calls.



This graph shows the time trend of analysts' interest in KPI-related information. In attempt to address the changing sample over time, I focus on the earnings calls held by S&P500 firms in the six industries identified in this paper; this subsample includes about 200 conference calls during each year between 2009 and 2018.

Figure 3. (*Continued*)

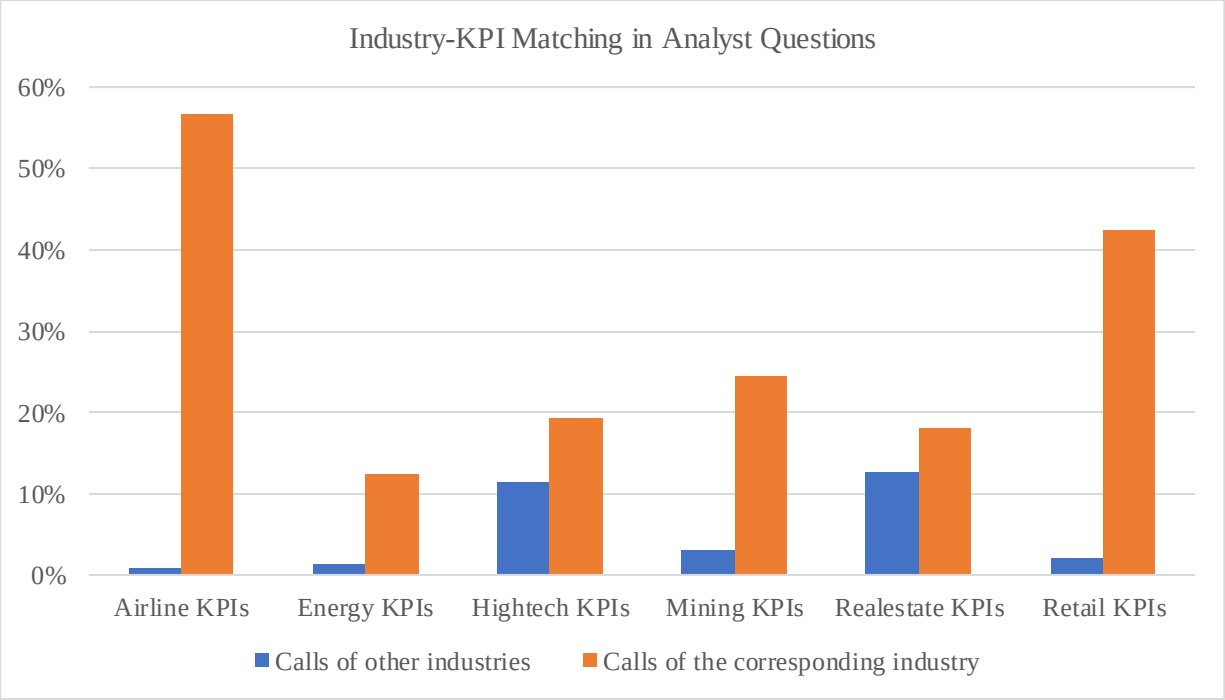
Panel B. Percent of Observations with Managerial Mentioning of the KPIs.



This graph shows displays the frequency of KPIs mentioned in managerial presentations of their corresponding industry and in those of other industries.

Figure 3. (*Continued*)

Panel C. Percent of Observations with Analyst Mentioning of the KPIs.



This graph shows displays the frequency of KPIs mentioned by analysts during the conference calls held by their corresponding industry and in those of other industries.

Table 1. Initial Sample Selection Process

Panel A. Sample Selection

Sample Selection Criteria	Sample Size
All conference call transcripts in S&P Global Market database during 2006-2018	229,374 transcripts
Restrict to earnings conference calls with Q&A sections	179,758 transcripts
Restrict to earnings conference calls held by US firms	120,180 firm-quarters for 5,460 unique firms
Merge with Compustat and CRSP	115,982 firm-quarters for 5,200 unique firms
Restrict to the six industries examined in this dissertation	43,421 firm-quarters for 1,999 unique firms
Require non-missing value of regression variables in Equation (1)	39,302 firm-quarters for 1,846 unique firms

Panel B. Distribution of Sample by Industry

Industry	Firm-quarters	Unique Firms
Airline	714	25
Energy	5,029	246
High-tech	24,555	1,184
Mining	1,265	66
Real Estate	410	30
Retail	7,329	295

Table 2. Distribution of transcripts with KPI mentioning by managers and analysts

Panel A. Distribution of KPI Mentioning by Industry

Industry	# of transcripts	# of Managers	# of Analysts
Airline	714	438	401
Energy	5,029	2,453	623
High-tech	24,555	11,106	4,780
Mining	1,265	848	318
Real Estate	410	223	78
Retail	7,329	5,430	2,962
Total	39,302	20,498	9,162

Panel B. Distribution of KPI Mentioning by Year

Year	# of transcripts	# of Managers	# of Analysts
2006	332	195	96
2007	675	381	206
2008	2,434	1,363	617
2009	3,209	1,797	818
2010	3,463	1,904	828
2011	3,780	1,962	887
2012	3,852	2,026	875
2013	3,829	1,992	869
2014	3,816	1,925	850
2015	3,751	1,920	879
2016	3,451	1,730	727
2017	3,422	1,671	779
2018	3,288	1,632	731
Total	39,302	20,498	9,162

This table reports the distribution of earnings calls, the distribution of earnings calls during which the managers voluntarily disclosed KPI-related information during the presentation sections, and the distribution of earnings calls during which analysts asked about KPIs during the Q&A sections.

Table 3. Summary Statistics

Variable	# of obs.	Mean	25P	Median	75P	Min	Max	Std.
M_KPI	39,302	0.522	0.000	0.000	1.000	0.000	1.000	0.500
M_KPI_Words	39,302	1.851	0.000	0.000	3.892	0.000	6.977	2.120
M_KPI_Mentions	39,302	0.697	0.000	0.000	1.386	0.000	4.533	0.849
A_KPI	39,302	0.233	0.000	0.000	0.000	0.000	1.000	0.428
A_KPI_PastQtrs	39,302	0.729	0.000	0.693	1.099	0.000	2.398	0.676
A_KPI_Questions	39,302	0.200	0.000	0.000	0.000	0.000	2.565	0.392
A_KPI_Questions_PastQtrs	39,302	0.643	0.000	0.527	1.125	0.000	2.835	0.612
Answer_KPI	39,302	0.286	0.000	0.000	1.000	0.000	1.000	0.452
Answer_KPI_PastQtrs_Dummy	39,302	0.706	0.000	1.000	1.000	0.000	1.000	0.456
Fluidity	35,886	6.487	4.359	5.918	7.808	0.510	23.905	3.159
LowRelev	39,128	0.496	0.000	0.000	1.000	0.000	1.000	0.500
A_Access	39,302	0.056	0.000	0.000	0.000	0.000	1.000	0.230
A_Access_PastQtrs	39,302	0.372	0.000	0.000	0.000	0.000	8.000	0.828
M_KPI_PastQtrs_Dummy	39,302	0.752	1.000	1.000	1.000	0.000	1.000	0.432
A_KPI_PastQtrs_Dummy	39,302	0.622	0.000	1.000	1.000	0.000	1.000	0.485
M_PresentationWords	39,302	7.917	7.685	7.953	8.193	1.609	10.088	0.422
A_All_Questions_PastQtrs	39,302	3.041	2.708	3.091	3.434	0.693	4.956	0.584
Size	39,302	7.101	5.835	7.081	8.265	3.003	11.591	1.788
Loss	39,302	0.309	0.000	0.000	1.000	0.000	1.000	0.462
Accruals	39,302	1.569	0.358	0.619	1.142	0.022	29.455	3.755
ROA	39,302	0.002	-0.005	0.009	0.021	-0.234	0.087	0.043
SUE	39,302	-0.001	-0.001	0.001	0.003	-3.693	9.605	0.079
RetVol	39,302	0.122	0.076	0.106	0.149	0.036	0.389	0.065
Leverage	39,302	0.496	0.321	0.485	0.638	0.075	1.273	0.239
MB	39,302	3.061	1.257	2.117	3.697	-17.350	30.134	4.888
IO	39,302	0.681	0.503	0.762	0.903	0.001	1.	0.299
FollowingAnalysts	39,302	2.002	1.386	2.079	2.708	0.000	3.555	0.927

Table 4. Determinants of Analyst KPI Demand

	(1)	(2)
Dependent Variable =	**A_KPI**	**A_Access**
M_KPI	0.264***	0.201***
	(11.690)	(6.043)
M_PresentationWords	-0.039	-0.072*
	(-1.460)	(-1.851)
M_KPI_PastQtrs_Dummy	0.123***	0.121***
	(4.009)	(2.614)
Answer_KPI_PastQtrs_Dummy	0.071***	0.037
	(2.706)	(0.947)
A_All_Questions	0.443***	0.204***
	(20.741)	(6.790)
A_KPI_PastQtrs_Dummy	0.472***	0.433***
	(21.524)	(14.431)
Loss	0.012	0.041
	(0.496)	(1.115)
Accruals	-0.059	-0.244
	(-0.506)	(-1.383)
Size	-0.010	-0.019
	(-0.990)	(-1.360)
FollowingAnalysts	0.033	-0.118***
	(1.623)	(-4.184)
Fluidity	0.008**	0.015**
	(2.073)	(2.562)
LowRelev	-0.037*	-0.034
	(-1.708)	(-1.138)
ROA	0.378	1.069**
	(1.296)	(2.240)
SUE	-0.030	-0.217
	(-0.403)	(-1.315)
MB	0.003*	0.003
	(1.952)	(1.412)
Leverage	0.075	-0.010
	(1.542)	(-0.154)
IO	-0.033	-0.035
	(-0.793)	(-0.566)
Quarter & Industry FE	Yes	Yes
Constant	-2.546***	-1.870***
	(-10.407)	(-5.461)
Observations	35,787	35,787
Pseudo R-squared	0.138	0.117

This table reports the determinants of analysts' interest in KPIs. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 5. The Effects of Analyst Demand on Managerial Voluntary KPI Disclosure

Dependent Variable =	(1) **M_KPI**	(2) **M_KPI_Words**	(3) **M_KPI_Mentions**
A_KPI_PastQtrs	**0.299*** **	**0.310*** **	**0.245*** **
	(10.221)	**(9.305)**	**(11.052)**
M_KPI_PastQtrs_Dummy	1.213***	0.930***	0.498***
	(33.304)	(29.374)	(25.881)
Answer_KPI_PastQtrs_Dummy	0.309***	0.335***	0.184***
	(9.438)	(10.104)	(8.807)
M_PresentationWords	0.641***	0.718***	0.359***
	(13.832)	(16.132)	(12.858)
A_All_Questions_PastQtrs	-0.051**	-0.079***	-0.010
	(-1.973)	(-2.902)	(-0.591)
Size	-0.065***	-0.078***	-0.055***
	(-3.935)	(-4.445)	(-4.811)
Loss	0.015	0.038	0.010
	(0.463)	(1.153)	(0.541)
Accruals	0.083	0.022	-0.076
	(0.614)	(0.158)	(-0.917)
ROA	0.831**	0.699**	0.557***
	(2.470)	(2.252)	(2.940)
SUE	0.205	0.170***	0.135***
	(1.444)	(2.588)	(4.097)
RetVol	0.382	0.528**	0.034
	(1.592)	(2.003)	(0.213)
Leverage	0.094	0.104	0.187***
	(1.219)	(1.227)	(3.264)
MB	0.004	0.004	0.002
	(1.524)	(1.436)	(1.126)
IO	-0.017	0.000	0.008
	(-0.261)	(0.002)	(0.177)
FollowingAnalysts	0.001	0.005	-0.016
	(0.0312)	(0.150)	(-0.710)
Quarter & Industry FE	Yes	Yes	Yes
Constant	-6.239***	-3.306***	-2.521***
	(-16.493)	(-8.012)	(-10.070)
Observations	39,302	39,302	39,302
Pseudo/Adjusted R-squared	0.201	0.244	0.349

This table reports regressions of analyst demand in the past eight quarters on managerial KPI disclosure. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 6. The Impact of Earnings Relevance on Analyst Demand Effects

Independent Variable (IV) =	LowRelev			Loss			Accruals		
Dependent Variable =	**M_KPI**	**M_KPI_ Words**	**M_KPI_ Mentions**	**M_KPI**	**M_KPI_ Words**	**M_KPI_ Mentions**	**M_KPI**	**M_KPI_ Words**	**M_KPI_ Mentions**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A_KPI_PastQtrs	0.318***	0.322***	0.260***	0.279***	0.283***	0.250***	0.245***	0.273***	0.222***
	(17.463)	(20.222)	(29.713)	(17.478)	(20.086)	(32.273)	(13.489)	(16.981)	(25.127)
IV	-0.079***	-0.046**	-0.048***	-0.021	-0.031	0.022	-0.094***	-0.076***	-0.029**
	(-3.374)	(-2.244)	(-4.227)	(-0.735)	(-1.229)	(1.582)	(-3.918)	(-3.604)	(-2.537)
A_KPI_PastQtrs * IV	**0.049****	**0.024**	**0.031*****	**0.049***	**0.094*****	**-0.016**	**0.097*****	**0.074*****	**0.047*****
	(2.081)	**(1.154)**	**(2.708)**	**(1.864)**	**(4.070)**	**(-1.255)**	**(4.099)**	**(3.630)**	**(4.150)**
M_KPI_PastQtrs_Dummy	1.215***	0.929***	0.499***	1.212***	0.929***	0.498***	1.209***	0.926***	0.496***
	(52.207)	(50.302)	(48.994)	(52.382)	(50.470)	(49.157)	(52.239)	(50.244)	(48.911)
Answer_KPI_PastQtrs_Dummy	0.314***	0.339***	0.186***	0.308***	0.334***	0.184***	0.306***	0.333***	0.182***
	(16.565)	(20.319)	(20.304)	(16.293)	(20.088)	(20.144)	(16.173)	(20.019)	(19.954)
M_PresentationWords	0.644***	0.719***	0.359***	0.641***	0.718***	0.359***	0.642***	0.720***	0.360***
	(30.965)	(42.490)	(38.602)	(30.919)	(42.507)	(38.648)	(30.983)	(42.600)	(38.745)
A_All_Questions_PastQtrs	-0.052***	-0.081***	-0.011	-0.051***	-0.080***	-0.010	-0.051***	-0.078***	-0.009
	(-3.197)	(-5.658)	(-1.359)	(-3.124)	(-5.576)	(-1.263)	(-3.112)	(-5.484)	(-1.192)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-6.309***	-3.342***	-2.549***	-6.224***	-3.288***	-2.523***	-6.185***	-3.279***	-2.515***
	(-34.306)	(-20.286)	(-28.124)	(-34.071)	(-20.070)	(-27.996)	(-33.878)	(-20.027)	(-27.936)
Observations	39,128	39,128	39,128	39,302	39,302	39,302	39,302	39,302	39,302
Pseudo/Adjusted R-squared	0.192	0.244	0.349	0.192	0.244	0.349	0.201	0.244	0.349

This table reports the impact analyst demand on managerial KPI disclosure conditional on the firm's earnings relevance. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 7. The Impact of Proprietary Cost on Analyst Demand Effects

	(1)	(2)	(3)
Dependent Variable =	**M_KPI**	**M_KPI_Words**	**M_KPI_Mentions**
A_KPI_PastQtrs	0.506***	0.437***	0.390***
	(8.331)	(6.636)	(8.237)
Fluidity	0.034***	0.023***	0.014***
	(4.380)	(2.932)	(3.135)
A_KPI_PastQtrs * Fluidity	**-0.025*** **	**-0.014* **	**-0.014** **
	(-3.226)	**(-1.721)**	**(-2.354)**
M_KPI_PastQtrs_Dummy	1.255***	0.965***	0.548***
	(33.353)	(28.252)	(26.500)
Answer_KPI_PastQtrs_Dummy	0.222***	0.286***	0.112***
	(6.494)	(8.240)	(5.086)
M_PresentationWords	0.639***	0.725***	0.373***
	(12.945)	(15.414)	(12.152)
A_All_Questions_PastQtrs	-0.092***	-0.104***	-0.048***
	(-3.356)	(-3.627)	(-2.621)
Controls Included	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes
Constant	-6.091***	-3.056***	-2.246***
	(-14.630)	(-7.729)	(-8.684)
Observations	35,886	35,886	35,886
Pseudo/Adjusted R-squared	0.185	0.236	0.306

This table reports the impact analyst demand on managerial KPI disclosure conditional on the firm's proprietary cost. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 8. The Impact of Analysts' Connectivity to Management on Analyst Demand Effects

	(1)	(2)	(3)
Dependent Variable =	**M_KPI**	**M_KPI_Words**	**M_KPI_Mentions**
A_KPI_PastQtrs	0.286***	0.292***	0.210***
	(9.884)	(9.793)	(11.245)
A_Access_PastQtrs	-0.222**	-0.240*	-0.356***
	(-1.983)	(-1.841)	(-4.126)
A_KPI_PastQtrs* A_Access_PastQtrs	**0.228*** **	**0.221** **	**0.333*** **
	(2.871)	**(2.374)**	**(5.292)**
M_KPI_PastQtrs_Dummy	1.260***	0.965***	0.549***
	(34.822)	(29.633)	(28.147)
Answer_KPI_PastQtrs_Dummy	0.226***	0.288***	0.125***
	(6.794)	(8.600)	(5.826)
M_PresentationWords	0.650***	0.726***	0.369***
	(13.380)	(15.792)	(12.103)
A_All_Questions_PastQtrs	-0.092***	-0.106***	-0.053***
	(-3.448)	(-3.729)	(-2.941)
Controls Included	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes
Constant	-6.171***	-3.671***	-2.616***
	(-15.429)	(-9.878)	(-10.577)
Observations	39,302	39, 302	39, 302
Pseudo/Adjusted R-squared	0.186	0.239	0.313

This table reports the impact analyst demand on managerial KPI disclosure conditional on whether the analysts raising KPI-related questions have private access to the management. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 9. Subgroup Analysis

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent = M_KPI	**Airline**	**Energy**	**Mining**	**Real Estate**	**Retail**	**High-Tech**
A_KPI_PastQtrs	**2.380*** **	**0.249*** **	**0.373*** **	**0.443***	**0.267*** **	**0.281*** **
	(7.062)	**(3.551)**	**(2.655)**	**(1.801)**	**(3.190)**	**(8.737)**
M_KPI_PastQtrs_Dummy	1.547***	1.771***	0.827***	1.792***	1.832***	0.943***
	(2.744)	(19.744)	(3.847)	(3.793)	(17.101)	(24.578)
Answer_KPI_PastQtrs_Dummy	1.523***	0.054	0.372**	0.943***	0.399***	0.319***
	(2.768)	(0.813)	(2.342)	(4.675)	(4.607)	(8.393)
M_PresentationWords	3.505***	0.813***	0.754***	2.203***	0.439***	0.687***
	(7.364)	(8.303)	(3.569)	(5.133)	(3.057)	(13.554)
A_All_Questions_PastQtrs	0.322	-0.144**	-0.057	0.489*	0.023	-0.105***
	(1.120)	(-2.179)	(-0.413)	(1.799)	(0.293)	(-3.530)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-31.057***	-7.460***	-6.951***	-17.947***	-4.966***	-6.143***
	(-11.218)	(-9.007)	(-4.468)	(-5.143)	(-4.428)	(-14.600)
Observations	712	5,029	1,255	403	7,328	25,180
Pseudo R-squared	0.876	0.292	0.243	0.444	0.224	0.131

This table reports subgroup analysis for each individual industry. The model regresses analyst demand in the past eight quarters on managerial KPI disclosure. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 10. Subgroup Analysis with High-tech Industry Omitted

Dependent Variable =	M_KPI			M_KPI_Words			M_KPI_Mentions		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A_KPI_PastQtrs	0.379***	0.477***	0.208***	0.346***	0.326***	0.175***	0.358***	0.413***	0.173***
	(12.448)	(9.930)	(6.833)	(13.244)	(8.052)	(6.517)	(23.310)	(5.404)	(11.010)
LowRelev	-0.153***			-0.086**			-0.096***		
	(-3.622)			(-2.330)			(-4.397)		
A_KPI_PastQtrs * LowRelev	**0.076****			**0.058***			**0.073*****		
	(1.968)			**(1.761)**			**(3.810)**		
Fluidity		0.058***			0.036***			0.024***	
		(9.132)			(6.593)			(7.382)	
A_KPI_PastQtrs * Fluidity		**-0.024*****			**-0.010****			**-0.012*****	
		(-4.218)			**(-2.145)**			**(-4.193)**	
A_Access_PastQtrs			-0.076			-0.029			-0.231***
			(-0.910)			(-0.402)			(-5.484)
A_KPI_PastQtrs * A_Access_PastQtrs			**0.143****			**0.096***			**0.264*****
			(2.402)			**(1.894)**			**(8.922)**
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-6.152***	-6.368***	-6.195***	-2.728***	-0.464	-3.646***	-2.588***	-1.917**	-3.209***
	(-22.155)	(-20.071)	(-21.256)	(-11.114)	(-0.361)	(-14.703)	(-18.052)	(-2.498)	(-22.100)
Observations	14,056	12,848	14,121	14,057	12,849	14,122	14,057	12,849	14,122
Pseudo/Adjusted R-squared	0.291	0.309	0.295	0.270	0.286	0.280	0.387	0.406	0.399

This table reports the cross-sectional analysis with high-tech firms omitted. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 11. The Effect of Analysts' KPI Demand in the Past Quarters

Dependent Variable = M_KPI Independent Variable = A_KPI in Quarter	**t-1**	**t-2**	**t-3**	**t-4**	**t-5**	**t-6**	**t-7**	**t-8**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A_KPI (in prior quarter)	**0.292*** **	**0.262*** **	**0.240*** **	**0.251*** **	**0.248*** **	**0.215*** **	**0.216*** **	**0.207*** **
	(10.941)	**(9.794)**	**(8.972)**	**(9.220)**	**(8.674)**	**(7.267)**	**(7.473)**	**(6.897)**
M_KPI_PastQtrs_Dummy	1.270***	1.295***	1.323***	1.328***	1.337***	1.344***	1.361***	1.353***
	(34.194)	(33.450)	(32.441)	(31.281)	(30.259)	(29.901)	(29.542)	(29.003)
Answer_KPI_PastQtrs_Dummy	0.386***	0.417***	0.449***	0.454***	0.446***	0.455***	0.453***	0.457***
	(11.972)	(12.362)	(12.638)	(12.416)	(11.731)	(11.630)	(11.242)	(11.088)
M_PresentationWords	0.625***	0.628***	0.625***	0.640***	0.638***	0.625***	0.638***	0.627***
	(13.220)	(12.977)	(12.614)	(12.670)	(12.514)	(12.000)	(12.005)	(11.621)
A_All_Questions_PastQtrs	-0.037	-0.040	-0.035	-0.036	-0.025	-0.019	-0.021	-0.019
	(-1.355)	(-1.436)	(-1.232)	(-1.208)	(-0.820)	(-0.611)	(-0.673)	(-0.577)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-6.195***	-6.276***	-6.319***	-6.487***	-6.524***	-6.437***	-6.551***	-6.465***
	(-15.973)	(-15.793)	(-15.531)	(-15.542)	(-15.439)	(-15.030)	(-14.959)	(-14.589)
Observations	39,291	39,118	35,875	35,875	35,875	35,875	35,875	35,875
Pseudo/Adjusted R-squared	0.196	0.196	0.196	0.195	0.194	0.191	0.191	0.191

This table reports the probit regressions using the analysts' demand for KPI disclosure (*A_KPI*) in the past eight quarters, respectively, as independent variables. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 12. The Tests for Initial KPI Demand and Initial KPI Disclosure

Test for	Initial KPI disclosure (subgroup with no KPI disclosure in quarter t-1)			Initial analyst demand and Initial KPI disclosure (subgroup with no KPI demand in quarter t-2 and no KPI disclosure in quarter t-1)		
Dependent Variable =	**M_KPI**	**M_KPI_Words**	**M_KPI_Mentions**	**M_KPI**	**M_KPI_Words**	**M_KPI_Mentions**
	(1)	(2)	(3)	(4)	(5)	(6)
A_KPI (in quarter t-1)	**0.171*** **	**0.099*** **	**0.057*** **	**0.171*** **	**0.096*** **	**0.059*** **
	(5.142)	**(4.382)**	**(5.311)**	**(4.662)**	**(3.822)**	**(5.005)**
M_KPI_PastQtrs_Dummy	0.565***	0.291***	0.143***	0.558***	0.281***	0.135***
	(17.410)	(14.997)	(18.097)	(16.210)	(14.102)	(16.752)
Answer_KPI_PastQtrs_Dummy	0.257***	0.142***	0.069***	0.240***	0.130***	0.062***
	(8.347)	(7.645)	(8.964)	(7.444)	(6.863)	(7.890)
M_PresentationWords	0.502***	0.426***	0.130***	0.510***	0.421***	0.127***
	(12.946)	(19.637)	(14.744)	(12.276)	(19.059)	(14.116)
A_All_Questions_PastQtrs	-0.004	-0.006	0.001	-0.028	-0.018	-0.005
	(-0.140)	(-0.300)	(0.076)	(-0.891)	(-0.912)	(-0.634)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-5.261***	-1.662***	-1.043***	-5.172***	-1.524***	-0.940***
	(-15.422)	(-7.994)	(-11.711)	(-14.249)	(-6.854)	(-9.843)
Observations	15,032	15,032	15,032	12,642	12,642	12,642
Pseudo/Adjusted R-squared	0.089	0.107	0.092	0.091	0.107	0.091

This table reports the subgroup regressions using the analysts' demand for KPI disclosure (*A_KPI*) in quarter t-1 as independent variables. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 13. Alternative Selection of KPIs

Dependent Variable =	(1) **M_KPI**	(2) **M_KPI_Words**	(3) **M_KPI_Mentions**
A_KPI_PastQtrs	**0.250*** **	**0.116*** **	**0.161*** **
	(7.528)	**(3.352)**	**(6.878)**
M_KPI_PastQtrs_Dummy	1.168***	0.688***	0.359***
	(34.058)	(26.874)	(23.360)
Answer_KPI_PastQtrs_Dummy	0.240***	0.208***	0.110***
	(7.317)	(7.991)	(6.880)
M_PresentationWords	0.435***	0.397***	0.162***
	(9.129)	(10.789)	(6.864)
A_All_Questions_PastQtrs	-0.037	-0.083***	-0.013
	(-1.344)	(-3.336)	(-0.913)
Size	-0.045***	-0.034**	-0.034***
	(-2.710)	(-2.381)	(-3.566)
Loss	0.029	0.021	0.008
	(0.893)	(0.795)	(0.594)
Accruals	-0.396***	-0.303**	-0.253***
	(-2.718)	(-2.539)	(-3.745)
ROA	1.137***	0.599**	0.530***
	(3.249)	(2.221)	(3.375)
SUE	-0.020	-0.016	-0.019
	(-0.244)	(-0.305)	(-0.694)
RetVol	0.889***	0.980***	0.287**
	(3.558)	(4.107)	(2.187)
Leverage	0.125*	-0.045	0.135***
	(1.651)	(-0.620)	(2.734)
MB	-0.001	-0.001	-0.001
	(-0.453)	(-0.276)	(-0.512)
IO	0.043	0.056	0.031
	(0.655)	(0.993)	(0.971)
FollowingAnalysts	0.030	0.058**	0.012
	(0.912)	(1.981)	(0.705)
Quarter & Industry FE	Yes	Yes	Yes
Constant	-5.219***	-0.910***	-1.103***
	(-13.303)	(-2.809)	(-5.544)
Observations	39,302	39,302	39,302
Pseudo/Adjusted R-squared	0.247	0.227	0.363

This table reports regressions of analyst demand in the past eight quarters on managerial KPI disclosure with measures generated using alternative KPI list. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 14. Alternative Measurement of Analysts' KPI Demand

	(1)	(2)	(3)	(4)
Dependent Variable =	**M_KPI**	**M_KPI**	**M_KPI**	**M_KPI**
A_KPI_Questions_PastQtrs	0.337***	0.315***	0.565***	-0.226**
	(10.194)	(34.412)	(8.276)	(-2.073)
LowRelev		-0.048***		
		(-4.421)		
A_KPI_PastQtrs * LowRelev		**0.035*** **		
		(3.022)		
Fluidity			0.033***	
			(4.277)	
A_KPI_PastQtrs * Fluidity			**-0.027*** **	
			(-3.069)	
A_Access_PastQtrs				0.562***
				(4.494)
A_KPI_PastQtrs * A_Access_PastQtrs				**0.112*** **
				(2.901)
Controls Included	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes
Constant	-6.249***	-6.318***	-6.106***	-6.216***
	(-16.429)	(-34.310)	(-14.609)	(-15.353)
Observations	39,291	39,118	35,875	39,286
Pseudo/Adjusted R-squared	0.203	0.203	0.187	0.189

This table replicates the probit regressions in Table 5 to Table 8 using the number of KPI-related questions as an alternative measurement of analyst demand for KPI disclosure. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 15. Summary Statistics

Variable	# of	Mean	25P	Median	75P	Min	Max	Std.
M_KPI	31,502	0.524	0.000	1.000	1.000	0.000	1.000	0.499
M_KPI_Motivated	29,090	0.160	0.000	0.000	0.000	0.000	1.000	0.367
M_KPI_Words	31,502	0.692	0.000	0.693	1.099	0.000	4.533	0.813
M_KPI_Mentions	31,502	2.954	1.792	2.197	4.143	0.693	7.030	1.391
M_KPI_Persist	31,502	0.228	0.000	0.000	0.000	0.000	1.000	0.420
Accuracy	31,502	-0.981	-0.784	-0.246	-0.080	-16.759	0.000	2.332
A_KPI_PastQtrs	31,502	0.724	0.000	0.693	1.099	0.000	2.197	0.642
M_KPI_PastQtrs_Dumm	31,502	0.801	1.000	1.000	1.000	0.000	1.000	0.399
Answer_KPI_PastQtrs_D	31,502	0.706	0.000	1.000	1.000	0.000	1.000	0.456
M_PresentationWords	31,502	8.058	7.841	8.094	8.321	2.197	9.806	0.407
A_All_Questions_PastQtr	31,502	3.019	2.708	3.091	3.434	0.693	4.956	0.593
Size	31,502	6.881	5.619	6.797	8.031	2.917	11.547	1.818
Accruals	31,502	-0.084	-0.113	-0.066	-0.030	-0.624	0.150	0.106
Loss	31,502	0.346	0.000	0.000	1.000	0.000	1.000	0.476
ROA	31,502	-0.001	-0.008	0.008	0.020	-0.248	0.088	0.046
MB	31,502	3.206	1.285	2.228	3.947	-21.672	33.849	5.722
IO	31,502	0.676	0.485	0.762	0.904	0.001	1.192	0.303
RetVol	31,502	0.125	0.078	0.109	0.153	0.036	0.397	0.067
SUE	31,502	-0.001	-0.001	0.001	0.003	-3.693	9.605	0.079
FollowingAnalysts	31,502	2.059	1.609	2.197	2.708	0.000	3.555	0.887
Leverage	31,502	0.508	0.318	0.486	0.657	0.074	1.409	0.260
PastRet	31,502	0.033	-0.130	0.021	0.175	-0.618	1.000	0.274
BVPS	31,502	0.503	0.220	0.407	0.695	-0.884	2.568	0.481
SalesGrowth	31,502	0.035	-0.045	0.023	0.094	-0.529	1.009	0.204

This table presents the number of observations (N), mean value (Mean), 25th percentile, median value (Median), 75th percentile, minimum (Min), maximum (Max), and standard deviation (Std.) for the variables used in the regressions. I winsorize all continuous variables at 1% and 99% percentiles.

Table 16. The Effect of Voluntary KPI Disclosure on Analyst Earnings Forecast Accuracy

	Heckman		OLS
	Step 1	Step 2	
	(1)	(2)	(3)
Dependent Variable =	**M_KPI**	**Accuracy(t+1)**	**Accuracy(t+1)**
M_KPI		**0.042****	**0.060*****
		(1.983)	**(3.229)**
Accuracy		0.456***	0.462***
		(114.637)	(117.801)
A_KPI_PastQtrs	0.269***	-0.050***	-0.041***
	(9.037)	(-3.115)	(-2.632)
M_KPI_PastQtrs_Dummy	3.032***		
	(35.812)		
Answer_KPI_PastQtrs_Dummy	0.267***		
	(7.152)		
M_PresentationWords	0.461***		
	(9.718)		
A_All_Questions_PastQtrs	-0.049*		
	(-1.676)		
PastRet		0.566***	0.562***
		(15.358)	(15.209)
BVPS		-0.177***	-0.203***
		(-7.291)	(-8.480)
SalesGrowth		-0.096**	-0.091**
		(-2.124)	(-2.017)
Size	-0.068***	-0.042***	-0.036***
	(-3.924)	(-5.021)	(-4.334)
Loss	-0.019	-0.307***	-0.291***
	(-0.554)	(-14.191)	(-13.472)
Accruals	-0.139	-0.826***	-0.845***
	(-0.957)	(-7.622)	(-7.794)
SUE	0.202	1.798***	1.656***
	(1.491)	(15.528)	(14.831)
RetVol	0.539**	-3.145***	-3.175***
	(2.004)	(-17.662)	(-17.804)
Leverage	0.138*	-0.606***	-0.647***
	(1.687)	(-13.891)	(-14.775)
FollowingAnalysts	0.012	0.257***	0.253***
	(0.348)	(14.025)	(13.795)
ROA	0.567		
	(1.556)		
MB	0.004*		
	(1.646)		

Table 16. (Continued)

	Heckman		OLS
	Step 1	Step 2	
	(1)	(2)	(3)
Dependent Variable =	**M_KPI**	**Accuracy**	**Accuracy**
IO	-0.004		
	(-0.051)		
IMR		-0.023**	
		(-2.222)	
Quarter & Industry FE	Yes	Yes	Yes
Constant	-6.544***	0.344***	0.629***
	(-16.249)	(3.181)	(5.163)
Observations	32,457	31,502	31,502
Pseudo R-squared	0.296	0.449	0.456

This table reports the association between voluntary KPI disclosure and analyst earnings forecast accuracy. *t*-statistics are in parentheses. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 17. The Effect of Voluntary KPI Disclosure Motivated by Analyst Demand on Forecast Accuracy

	Heckman		OLS
	Step 1	Step 2	
	(1)	(2)	(3)
Dependent Variable =	**M_KPI_Motivated**	**Accuracy(t+1)**	**Accuracy(t+1)**
M_KPI_Motivated		**0.055****	**0.048***
		(1.971)	**(1.719)**
M_KPI		0.013	0.043**
		(0.614)	(2.192)
Accuracy		0.388***	0.388***
		(76.644)	(76.662)
A_KPI_PastQtrs	1.400***	-0.115***	-0.055***
	(48.211)	(-4.480)	(-3.327)
M_KPI_PastQtrs_Dummy	1.923***		
	(12.795)		
Answer_KPI_PastQtrs_Dummy	0.169***		
	(4.316)		
M_PresentationWords	0.205***		
	(5.255)		
A_All_Questions_PastQtrs	0.054**		
	(2.060)		
PastRet		0.425***	0.425***
		(11.380)	(11.380)
BVPS		-0.102***	-0.102***
		(-4.135)	(-4.122)
SalesGrowth		-0.075*	-0.075
		(-1.655)	(-1.644)
Size	-0.048***	-0.057***	-0.059***
	(-3.941)	(-6.823)	(-6.983)
Loss	0.028	-0.011	-0.008
	(0.880)	(-0.426)	(-0.331)
Accruals	-0.321**	-0.416***	-0.410***
	(-2.115)	(-3.789)	(-3.737)
SUE	-0.034	4.169***	4.166***
	(-0.220)	(24.345)	(24.322)
RetVol	0.560**	-2.499***	-2.477***
	(2.508)	(-13.754)	(-13.640)
Leverage	0.091	-0.491***	-0.488***
	(1.629)	(-11.226)	(-11.169)
FollowingAnalysts	-0.030	0.221***	0.224***
	(-1.167)	(11.761)	(11.885)
ROA	0.212	4.137***	4.128***
	(0.546)	(13.974)	(13.946)

Table 17. (Continued)

	Heckman		OLS
	Step 1	Step 2	
	(1)	(2)	(3)
Dependent Variable =	**M_KPI_Motivated**	**Accuracy**	**Accuracy**
MB	0.004*	0.003**	0.003**
	(1.900)	(1.976)	(2.036)
IO	-0.088*	0.432***	0.430***
	(-1.907)	(12.647)	(12.598)
IMR		-0.045***	
		(-3.053)	
Quarter & Industry FE	Yes	Yes	Yes
Constant	-6.082***	0.263**	0.110
	(-16.510)	(1.985)	(0.892)
Observations	29,922	29,090	29,090
Pseudo R-squared	0.332	0.472	0.472

This table reports the effect of the voluntary KPI disclosure which happens in the aftermath of analyst demand. *t*-statistics are in parentheses. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively

Table 18. Subgroup Analysis for H3 (Eq.2 in Heckman specification)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent = **Accuracy(t+1)**	**Airline**	**Energy**	**Mining**	**Real Estate**	**Retail**	**High-Tech**
M_KPI	**-0.117**	**0.224*** **	**0.429*** **	**-0.116**	**0.122*** **	**0.077*** **
	(-0.361)	**(2.846)**	**(2.724)**	**(-1.211)**	**(2.626)**	**(3.255)**
Accuracy	0.080***	0.001***	0.003***	0.004***	0.258***	0.071***
	(3.380)	(5.613)	(14.044)	(5.840)	(6.118)	(23.191)
A_KPI_PastQtrs	0.058	-0.098	0.541***	-0.561***	-0.180	0.004
	(0.198)	(-0.259)	(3.019)	(-2.908)	(-1.330)	(0.025)
IMR	-0.016	-1.013	-1.782***	-0.516**	0.691	2.174***
	(-0.091)	(-0.555)	(-2.762)	(-2.044)	(1.246)	(3.368)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.284	-1.008	-0.197	0.040	-0.697	-2.743***
	(1.001)	(-0.448)	(-0.250)	(0.100)	(-1.255)	(-4.351)
Observations	654	4,382	967	282	6,255	19,466
Pseudo R-squared	0.359	0.289	0.387	0.407	0.343	0.244

This table reports subgroup analysis of the second equation in Heckman two-stage approach for each individual industry. The model regresses analyst forecast accuracy on managerial KPI disclosure. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 19. Subgroup Analysis for H4 (Eq.2 in Heckman specification)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent = **Accuracy(t+1)**	**Airline**	**Energy**	**Mining**	**Real Estate**	**Retail**	**High-Tech**
M_KPI_Motivated	**-0.118**	**-0.027**	**0.128**	**0.013**	**0.064**	**0.124*** **
	(-0.290)	**(-0.189)**	**(0.864)**	**(0.090)**	**(1.455)**	**(3.582)**
M_KPI	0.249	0.130	0.237*	0.038	-0.072	0.001
	(0.543)	(1.507)	(1.666)	(0.349)	(-1.439)	(0.054)
Accuracy	0.172***	0.370***	0.314***	0.247***	0.386***	0.392***
	(3.315)	(26.757)	(12.605)	(6.809)	(34.094)	(59.884)
A_KPI_PastQtrs	0.463	0.094	0.203	0.331*	-0.171***	-0.090***
	(1.201)	(0.990)	(0.369)	(1.970)	(-3.148)	(-2.945)
MRI	0.260*	-0.021	0.153	0.165**	-0.024	-0.034*
	(1.697)	(-0.452)	(0.355)	(2.085)	(-0.721)	(-1.851)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.087	-0.646*	-2.164	-1.200**	0.439**	0.159
	(0.625)	(-1.690)	(-1.620)	(-2.441)	(2.076)	(1.232)
Observations	618	3,986	890	188	5,798	17,964
Pseudo R-squared	0.375	0.337	0.399	0.577	0.375	0.237

This table reports subgroup analysis of the second equation in Heckman two-stage approach for each individual industry. The model regresses analyst forecast accuracy on managerial KPI disclosure. *t*-statistics are in parentheses. Standard errors are clustered at firm level. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 20. Alternative Measures of Voluntary KPI Disclosure

Test for	**H3**			**H4**		
Dependent Variable =	**Accuracy(t+1)**			**Accuracy(t+1)**		
	(1)	(2)	(3)	(4)	(5)	(6)
M_KPI_Words	**0.035*** **			0.029**		
	(2.967)			(2.284)		
M_KPI_Mentions		**0.018*** **			0.013*	
		(2.768)			(1.934)	
M_KPI_Persist			**0.057*** **			0.035
			(2.637)			(1.642)
M_KPI_Motivated				**0.047***	**0.053***	**0.060** **
				(1.699)	**(1.919)**	**(2.225)**
Accuracy	0.389***	0.389***	0.382***	0.388***	0.388***	0.388***
	(79.219)	(79.243)	(79.129)	(76.647)	(76.659)	(76.629)
A_KPI_PastQtrs	-0.058***	-0.055***	-0.054***	-0.058***	-0.056***	-0.057***
	(-3.719)	(-3.550)	(-3.491)	(-3.481)	(-3.361)	(-3.407)
Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.306***	-0.319***	0.180	-0.342***	-0.349***	0.119
	(-2.828)	(-2.921)	(1.494)	(-3.158)	(-3.198)	(0.973)
Observations	31,502	31,502	31,502	29,090	29,090	29,090
Pseudo R-squared	0.464	0.464	0.460	0.472	0.472	0.472

This table reports the effect of the voluntary KPI disclosure on analysts' earnings forecast accuracy using alternative measures of KPI disclosure. *t*-statistics are in parentheses. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.