ECONOMICS OF INFORMATION SEARCH AND FINANCIAL MISREPORTING

Jung Min Kim

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Supervisor of Dissertation

Luzi Hail
Stephen J. Heyman Professor
Professor of Accounting

Co-Supervisor of Dissertation

Daniel Taylor
Associate Professor of Accounting

Graduate Group Chairperson

Nancy Zhang, Ge Li and Ning Zhao Professor, Professor of Statistics

Dissertation Committee

Mirko Heinle, Associate Professor of Accounting

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ABSTRACT

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Jung Min Kim

Luzi Hail

Daniel Taylor

I examine how investors' search for different types of information affects managers' reporting decisions. I distinguish investors' search for information about firm fundamentals ("fundamental search") from their search for information about managers' incentives ("incentive search"). Based on a parsimonious model of misreporting, I predict that fundamental search reduces the earnings response coefficient, which reduces a manager's benefits from misreporting, resulting in less misreporting. In contrast, incentive search increases the earnings response coefficient, which increases the benefits from misreporting, resulting in more misreporting. I test these predictions using an empirical technique that classifies EDGAR downloads as fundamental search or incentive search. Consistent with my theoretical predictions, I find that both fundamental and incentive search are positively associated with measures of price efficiency, but that fundamental (incentive) search is negatively (positively) related to the earnings response coefficients and intentional restatements. I also confirm my findings in the XBRL adoption setting where the costs of fundamental search exogenously decreased, and show that the XBRL adoption increased investors' search for fundamental information relative to incentive information, decreased the earnings response coefficient, and decreased misreporting. Collectively, the results show that investors' information demand can shape managers' reporting decisions, and that its effects can vary depending on the type of information investors search for.

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CHAPTER 1: INTRODUCTION

Information search is an important activity central to the functioning of capital markets. Perhaps for this reason, a growing empirical literature examines the relation between investors' information search activity and capital market outcomes related to valuation and liquidity (see Blankespoor et al., 2020 for a review). This prior literature tends to conceptualize "information search" broadly without specifying the type or nature of the information. In this paper, I distinguish between two different types of information––information about firm fundamentals that is associated with true firm value, and information about managers' incentives that is associated with reporting bias. I theoretically and empirically show how investors' search activity related to each type of information influences managers' subsequent misreporting decisions.

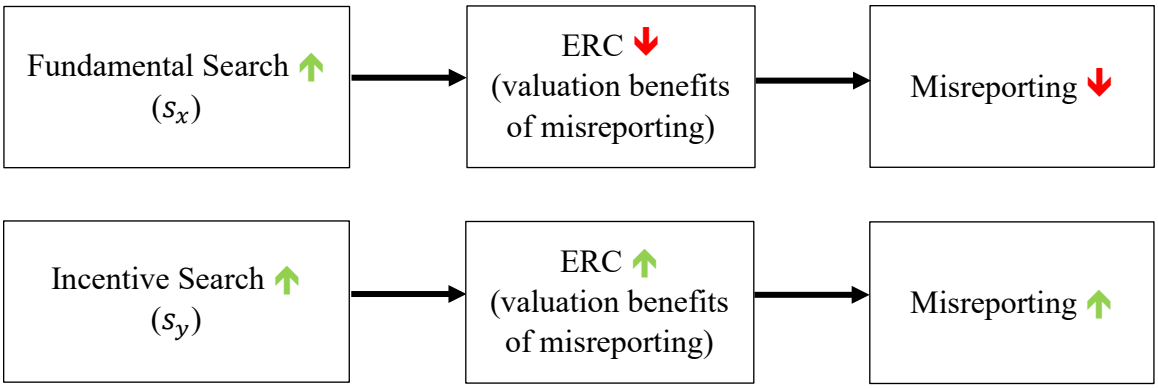
Conceptually, the relation between investors' search activity and managers' misreporting decisions is nuanced. On the one hand, when investors acquire more information about firm fundamentals, they rely less on the reported earnings number and instead put more weight on the additional information they acquired. As a consequence, the earnings response coefficient is lower (i.e., reported earnings has a lower valuation multiple) and the valuation benefits of misreporting are reduced. Thus, in equilibrium, information search activity related to fundamental information reduces the valuation benefits of misreporting and, in turn, reduces the amount of misreporting.

On the other hand, when investors acquire more information about managers' incentives, the information content of the earnings report as captured by the earnings response coefficient increases. The intuition for this result is that when investors have a better understanding of the incentive structure that generated the earnings report, they are able to better anticipate potential bias in the earnings and back it out, which increases the informativeness of the earnings report (e.g., Stein, 1989; Fischer and Verrecchia, 2000). The higher earnings response coefficient then increases the valuation benefits of misreporting which, in turn, increases the amount of misreporting. Thus, in equilibrium, information search activity related to incentives increases the valuation benefits of misreporting, and results in more misreporting. I formalize the intuition that underlies my predictions using a parsimonious model of misreporting based on Fischer and Verrecchia (2000). Figure 1 illustrates the theoretical relation between the two types of information search, the earnings response coefficient, and misreporting.

I empirically test the key predictions of the model using data on EDGAR filing downloads from 2005 to 2016. I classify downloads as fundamental search or incentive search depending on the type of filing forms that investors download. In particular, I use downloads of quarterly and annual financial statements (10-Qs and 10-Ks) to capture investors' search for firm fundamental information ("fundamental search") and I use downloads of proxy statements (DEF 14A) and statements of ownership changes (Form 4) to capture investors' search for information about managerial incentives ("incentive search").

Figure 1
Theoretical Relations

This figure illustrates the theoretical relation between search for different types of information, earnings response coefficient (ERC), and misreporting. Search for information about firm fundamentals represents higher s_x, which decreases ERC, and decreases misreporting. Search for information about managers' incentives represents higher s_y, which increases ERC and increases misreporting.



I begin my empirical analysis validating these two empirical proxies and the existence of the valuation benefits channel. First, I link these empirical proxies to measures of price efficiency to confirm that investors' EDGAR downloads indeed increase investors' informedness and enhance price efficiency (Grossman and Stiglitz, 1980). I employ two common measures of price efficiency, the probability of informed trading and price non-synchronicity (Chen et al., 2007). Consistent with the two empirical proxies capturing investors' information search activity, I find that both types of EDGAR downloads are positively related to price efficiency.

Next, to validate the valuation benefits channel, I link the empirical proxies for fundamental search and incentive search to the earnings response coefficient. To the extent EDGAR downloads of different filings capture investors' search for different types of information, I expect EDGAR downloads of fundamental information to reduce the

earnings response coefficient by providing an alternative signal about true firm value, whereas EDGAR downloads of incentive information increase the earnings response coefficient by allowing investors to better anticipate and filter out the bias in the earnings report. Consistent with the two types of EDGAR downloads having opposite effects on the valuation benefits of misreporting, I find that EDGAR downloads of 10-Ks and 10-Qs are negatively related to the earnings response coefficient, but the downloads of proxy statements and Form 4s are positively related to the earnings response coefficient.

Having documented the presence of the valuation benefits channel, I proceed to examine the relation between the two different types of information search and misreporting. Following prior research that tests empirical predictions based on theoretical models of misreporting, I focus on restatements due to intentional misrepresentation (Fang et al., 2017; Samuels et al., 2021). Specifically, I employ two measures of misreporting, a binary indicator variable for whether there was a restatement due to intentional misrepresentation, and "bias" in reported earnings calculated as the difference between earnings as originally reported and earnings as restated due to intentional misrepresentation. These definitions are in line with the paper's theoretical motivation and the bias measure in particular closely adheres to the theoretical definition of earnings bias. Consistent with the predictions of my model, I find that fundamental search is negatively related to subsequent misreporting, whereas incentive search is positively related to subsequent misreporting.

In additional analyses, I assess the sensitivity of my results to several research design and measurement choices. First, I alter my measures of information search by

narrowing on information search around earnings announcements. I find a negative (positive) relation between my measures of fundamental (incentive) search and misreporting when EDGAR downloads are measured close to the annual earnings announcement, but I find no evidence of a relation between either proxy and misreporting when information search is measured using EDGAR downloads at other times. This finding suggests that EDGAR downloads measured near the earnings announcement capture investors' speculative search activity that translates into their trading decisions more closely. Second, I follow Dyer (2021) and identify information search by professional investors such as asset managers, banks, or brokers using the IP addresses that initiated the EDGAR filing downloads. I find a negative (positive) relation between fundamental (incentive) search and misreporting for both professional and non-professional investors' information search, suggesting that EDGAR downloads effectively capture investors' search activity regardless of who initiates the search. Third, I focus on information search about a leading firm in an industry to which the sample firm belongs and analyze how it relates to the sample firm's misreporting behavior. I find that fundamental search about industry leaders is negatively associated with the sample firm's misreporting, but I do not find any relation between incentive search about industry leaders and the sample firm's misreporting. This finding suggests that fundamental information about product market leaders is informative about the fundamental performance at the sample firm that belongs to the same industry, but that incentive information about individual managers' incentives is more or less heterogeneous across firms. Fourth, I compare the relation between information search and misreporting in the subsamples of firms with more versus fewer alternative information sources other than EDGAR. Using firm size and analyst following

as measures of alternative information sources, I find a negative (positive) relation between fundamental (incentive) search and misreporting in the subsamples of smaller firms and firms with low analyst following where alternative information sources are scarce. However, I find no evidence of a relation between either proxy and misreporting in the subsamples of larger firms and firms with high analyst following where alternative information sources are rich. This finding suggests that my measure of information search based on EDGAR downloads is potentially more effective in the subsample of firms where alternative information sources are lacking and EDGAR is a more important source of information to the investors.

An important distinguishing feature of my analysis is that I predict two different types of information search will have opposite effects on the earnings response coefficient and misreporting. These specific predictions derived from theory should mitigate concerns about alternative explanations (e.g., omitted variables and reverse causality). For example, for an omitted variable to be able to explain my results, it will need to posit an alternative economic theory for why fundamental search is negatively associated with earnings response coefficients and misreporting while incentive search is positively associated with earnings response coefficients and misreporting. Nonetheless, I further mitigate these concerns by examining how an exogenous shock to the costs of fundamental search affects investors' search activity and managerial reporting decisions.

Theoretically, a reduction in costs of fundamental search will cause investors to allocate more time and effort to acquiring fundamental information relative to managerial incentive information, which in turn affects the earnings response coefficient and the

manager's reporting decisions. I exploit the mandatory adoption of eXtensible Business Reporting Language (XBRL) as a setting that exogenously reduced the costs of searching for fundamental information. Using a difference-in-differences research design, I find that the treatment firms subject to the XBRL mandate experience an increase in investors' search for fundamental information relative to managerial incentive information, compared to the non-XBRL control firms. More to the point, I find a decrease in the earnings response coefficient and a decrease in misreporting for the XBRL-adopting treatment firms compared to the non-XBRL control firms. Combined, these results are consistent with the explanation that information search costs affect managers' reporting decisions by altering investors' information search activities.

Overall, my findings contribute to the literature in two regards. First, I theoretically and empirically link investors' information search activity to managers' benefits associated with misreporting. Prior literature on information search tends to focus narrowly on the relation between search and capital market outcomes related to valuation and liquidity (e.g., Da et al., 2011; Brown et al., 2015; Gibbons et al., 2021). My analysis extends this work by showing how search can feed back into the managers' reporting decisions. Thus, the paper integrates economic theory with empirical data to answer the call for a better understanding of the feedback effects of investors' disclosure processing on managerial decision making (Blankespoor et al., 2020).

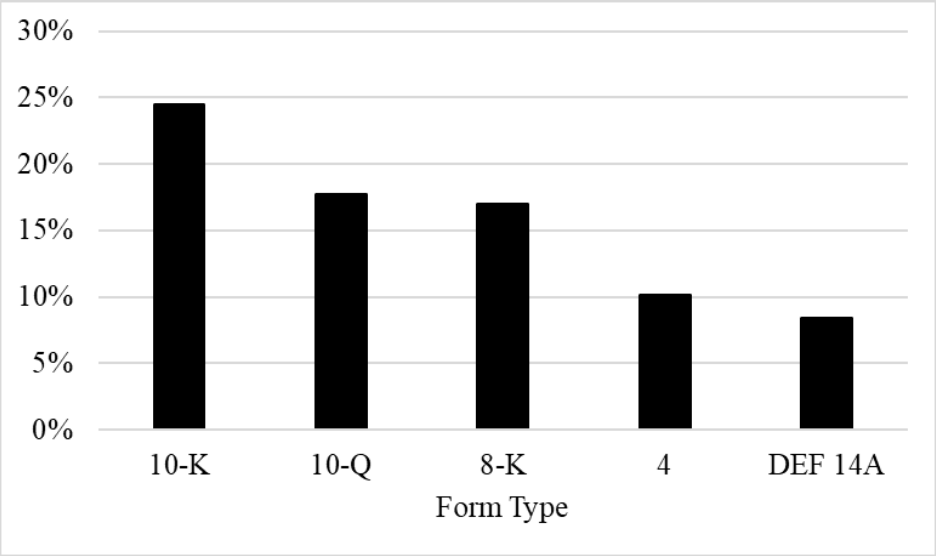
Second, by distinguishing information search about firm fundamentals from information search about incentives, my analysis highlights the limitation of existing intuition in the empirical literature. Prior empirical literature on information search as

surveyed by Blankespoor et al. (2020) tends to conceptualize "information search" broadly without specifying the type or nature of the information. Moreover, it often does not acknowledge the importance of non-fundamental search activities and narrowly focuses on investors' use of 10-Q or 10-K filings (e.g., Asthana et al., 2004; Drake et al., 2016). However, descriptive data on EDGAR filings downloads suggest that a significant portion of investors searches for information about managers' stock ownership positions and about managers' compensation incentives as reported in Form 4s and proxy statements (Figure 2, Panel A). Furthermore, trends in EDGAR search activities over time suggest that not only fundamental search but also incentive search has become more extensive over the years (Figure 2, Panel B). These figures highlight the prevalence of searches for different types of information and the importance of understanding their respective implications. A distinguishing feature of my analysis is that I predict that information search can have opposite effects on misreporting depending on the type of information. These contrasting predictions are difficult to intuit in the absence of formal theory, and suggest that distinguishing different types of information search leads to a richer and more nuanced set of empirical predictions than the standard empirical approach that treats all types of information search as a single construct. Moreover, my findings highlight the importance of empirically distinguishing the type of SEC filings investors are downloading and suggest that downloads of proxy statements and ownership changes have different implications, and measure a different theoretical construct, than downloads of 10-Qs and 10-Ks. In this regard, my findings provide a more nuanced view of how information search affects capital markets and managers' reporting decisions.

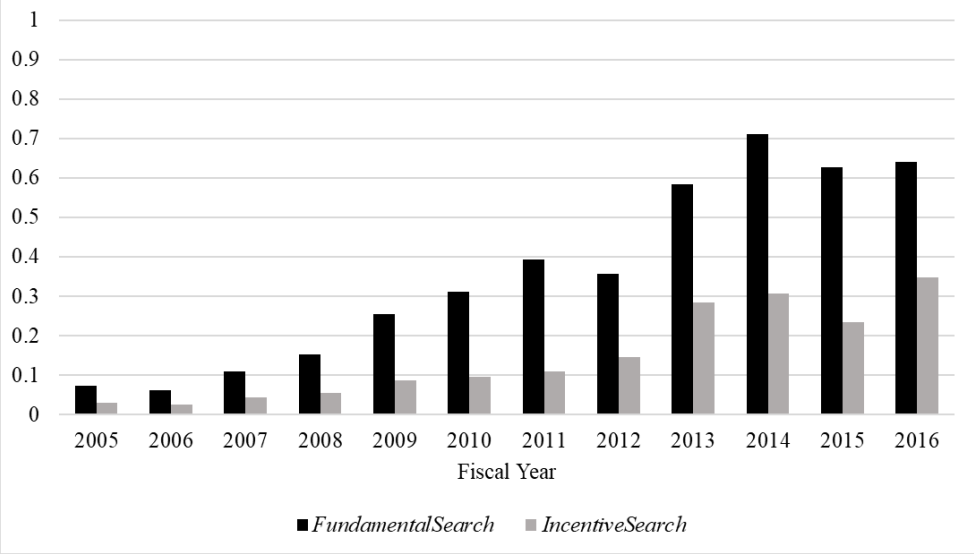
Figure 2
Investors' Information Search Activity

This figure describes investors' information search activities. Panel A plots the percentage of investors' EDGAR downloads for each form type out of total downloads (excluding mass downloads and webcrawlers following Drake et al., 2015). The values are first calculated for each firm-year and then averaged across firm-years. Panel B plots investors' fundamental search activity and incentive search activity over time, deflated by 10,000. The values are first calculated for each firm-year and then averaged across firms each year.

Panel A. Investors' Information Search Activity by Form Type



Panel B. Investors' Information Search Activity by Year



The rest of the paper is organized as follows. Section 2 develops theoretical predictions. Section 3 describes the sample and variable measurement. Section 4 reports the empirical results, and Section 5 concludes.

CHAPTER 2: THEORETICAL PREDICTIONS

2.1 Setup

In this section, I introduce a simple model of information search and misreporting that builds on the framework of Fischer and Verrecchia (2000).[1] The details of the mathematical analysis can be found in Appendix A. There are three players in the model: the manager, the speculator, and the market maker. I assume that the true firm value $\tilde{v}$ is normally distributed with mean zero and precision s_v. The manager privately observes $\tilde{v} = v$ and discloses an earnings report r, but exercises discretion over the extent to which reported earnings (r) diverge from true earnings (v) in order to influence stock prices. I denote the difference between reported earnings and true earnings as "misreporting (bias)". The manager faces cost of misreporting equal to $\frac{(r-v-m)^2}{2}$, where m represents the manager's reporting incentives unknown to the outsiders and privately observed by the manager (see Dye and Sridhar, 2008, for a similar setup). For example, Fischer and

[1] Also related to my study is Fischer and Stocken (2004) who examine how the *presence* of a speculator affects misreporting. Consistent with my intuition, they theoretically show that when the speculator is better informed about the firm's fundamental earnings than about the manager's reporting incentives, the presence of the speculator leads to less misreporting, and that when the speculator is better informed about the manager's reporting incentives than about the firm's fundamental earnings, the presence of the speculator leads to more misreporting.

Verrecchia (2000) explain that "at any point in time, the market does not know the precise nature of the manager's compensation; the manager's time horizon; the manager's rate of time preference and degree of risk aversion; the manager's psychic costs associated with bias, the manager's perceptions of litigation risks and reputation costs associated with bias; or the level of effort or resources the manager must expend to achieve a workable bias scheme". I assume that $\tilde{m}$ is normally distributed with mean $\mu > 0$ and precision s_m.

The speculator obtains additional information about the firm and the manager through his information search.[2] He can obtain information about the firm's fundamental value denoted $\tilde{x} = \tilde{v} + \tilde{e}_x$, where $\tilde{e}_x$ is normally distributed with mean zero and precision s_x. More active search for information about the firm's fundamental value increases s_x. The speculator can also obtain information about the manager's reporting incentives denoted $\tilde{y} = \tilde{m} + \tilde{e}_y$, where $\tilde{e}_y$ is normally distributed with mean zero and precision s_y. More active search for information about the manager's reporting incentives increases s_y. Once the manager issues the earnings report, the risk-neutral speculator submits a utility-maximizing demand order d_s based on the information about fundamentals, information about incentives, and the earnings report. When the speculator submits his demand order, the market maker will price the firm at its expected value conditional on the manager's earnings report (r) and the aggregate demand for the stock (D) ($\widetilde{D} = \tilde{d}_s + \tilde{l}$, where $\tilde{l}$ is the noise traders' demand that is normally distributed with mean zero and precision s_l).

[2] Throughout the paper, I refer to the speculator as a 'he', and I refer to the manager as a 'she'.

2.2 Equilibrium

Based on the setup, one can derive the equilibrium for the earnings report (r), the speculator's demand (d_s), and the stock price (P). The following proposition characterizes the unique equilibrium:

Proposition 1. *There exists a unique equilibrium with the following characteristics:*

- *the manager's earnings report is increasing in the true earnings and increasing in the manager's reporting incentives* ($\frac{dr}{dv} > 0, \frac{dr}{dm} > 0$)*;*
- *the speculator's demand for the firm's share is increasing in the information content about the firm fundamentals and it is decreasing in the information content about the manager's reporting incentives* ($\frac{dd_s}{dx} > 0, \frac{dd_s}{dy} < 0$)*;*
- *the equilibrium stock price is increasing in the earnings report and increasing in the demand for the firm's share* ($\frac{dP}{dr} > 0, \frac{dP}{dD} > 0$).

Overall, the equilibrium characterization is consistent with general intuition.

2.3 Analysis when Information Search is Exogenous

Having established the equilibrium, I next examine the effects of each type of information search on price efficiency (δ), earnings response coefficients (β) and misreporting ($E[b]$), assuming that the intensity of information search is exogenous. The model yields three predictions which I summarize in the following proposition:

Proposition 2. *Search for information about firm fundamentals and about the manager's reporting incentives have the following implications:*

- *search for information about firm fundamentals and about the manager's reporting incentives both increase price efficiency (informativeness)* ($\frac{d\delta}{ds_x} > 0, \frac{d\delta}{ds_y} > 0$)*;*
- *search for information about firm fundamentals decreases earnings response coefficients and search for information about the manager's reporting incentives increases earnings response coefficients* ($\frac{d\beta}{ds_x} < 0, \frac{d\beta}{ds_y} > 0$)*;*

- *search for information about firm fundamentals decreases misreporting and search for information about the manager's reporting incentives increases misreporting* ($\frac{dE[b]}{ds_x} < 0, \frac{dE[b]}{ds_y} > 0$).

The first part of Proposition 2 suggests that the two types of information search both increase price efficiency. This is because both types of information help investors better estimate the true firm value by augmenting the earnings report and reducing residual uncertainty. Regardless of the type of information, the more information investors acquire, the more efficient prices become. More importantly, the last two parts of Proposition 2 suggest that the two types of information search have opposite effects on the earnings response coefficients, which, in turn, leads to their contrasting effects on misreporting.

On the one hand, when the speculator acquires more information about firm fundamentals, he relies less on the reported earnings number and instead puts more weight on the additional information that he has acquired. Indeed, it is not uncommon to observe cases where a firm's stock price drops despite having exhibited strong *earnings* performance because other non-earnings indicators of the firm's fundamental value showed weak performance.[3] As a consequence, information search activity related to fundamental information reduces the earnings response coefficient, which then reduces the valuation benefits of misreporting. This, in turn, reduces the amount of misreporting in equilibrium.

[3] For example, market reaction to Tesla Inc.'s earnings announcement for the second quarter of 2020 was mitigated because a significant portion of its profit was coming from the sale of government emissions credits rather than from its core business activities (Baccardax, 2020). Similarly, Netflix's stock price plunged following the announcement of its second quarter performance in 2019 despite its strong earnings performance because its subscriber growth was weak (Pallotta, 2019; Rodriguez, 2019).

On the other hand, when the speculator acquires more information about the manager's reporting incentives, the information content of the earnings report as captured by the earnings response coefficient increases. The intuition for this result is that when the speculator has a better understanding of the incentive structure that generated the earnings report, he is able to better anticipate potential bias in the earnings and back it out, which increases the informativeness of the earnings report (e.g., Stein, 1989; Fischer and Verrecchia, 2000). Ferri et al. (2018) provide empirical evidence in line with this prediction and show that when investors have a better understanding of the manager's reporting incentives through improved compensation disclosure, the earnings response coefficient increases (see also, Samuels et al., 2021). [4] Thus, in equilibrium, information search activity related to incentives increases the earnings response coefficient, which then increases the valuation benefits of misreporting. This, in turn, results in more misreporting in equilibrium.

2.4 Analysis when Information Search is Exogenous with a Composite Information Signal

In this section, I repeat the analysis from the previous section, now assuming that a composite information signal (z) exists, instead of two independent information signals (x

[4] Relatedly, much anecdotal evidence supports the link between managers' compensation incentives and their reporting decisions. For example, one of the CFOs surveyed by Dichev et al. (2013) and Dichev et al. (2016) reveals that executives will start adjusting accruals depending on their assessment of the firm's likelihood of meeting the compensation targets. Similarly, investment research firms express concerns about compensation targets distorting managerial incentives and accounting reports. For example, New Constructs, an investment research firm, discusses in one of its reports how the use of 'adjusted' compensation targets could lead to misrepresentations, and it highlights the importance of analyzing corporate filings to "strip away" accounting distortions introduced by firms' use of discretionary compensation metrics (McBride, 2015). Collectively, the evidence suggests that having detailed information about managerial incentives allows the investors to better anticipate potential bias in the earnings and back it out, increasing the informativeness of the earnings report.

and y). In other words, $\tilde{z} = \alpha\tilde{v} + (1-\alpha)\tilde{m} + \tilde{e}_z$, where $0 < \alpha < 1$ and $\tilde{e}_z \sim N(0, \frac{1}{s_z})$. Effectively, α captures the extent to which the information signal is relatively more informative about true firm fundamentals (v) than about managerial incentives (m). This analysis allows me to consider a more realistic information structure – the composite information signal is not exclusively informative about one type of information over the other but is informative about the weighted average of firm fundamentals and managerial incentives.

The equilibrium derivation with a composite information signal z is similar to the one with two independent signals x and y. I explain the detailed steps for the equilibrium derivation in Appendix A for parsimony. Based on the equilibrium results, I conduct comparative statics analysis to examine the effects of information search on price efficiency (δ_z), earnings response coefficients (β_z) and misreporting ($E[b_z]$) when the intensity of information search is exogenous and the information signal (z) is a composite signal. The comparative statics analysis yields three predictions which I summarize in the following proposition:

Proposition 3. *Search for composite information has the following implications:*

- *search for composite information increases price efficiency (informativeness)* ($\frac{d\delta_z}{ds_z} > 0$)*;*
- *search for composite information decreases (increases) earnings response coefficients when the information signal is relatively more (less) informative about firm fundamentals than about the managers' reporting incentives* ($\frac{d\beta_z}{ds_z} < 0$ if $\alpha > \frac{1}{2}$, $\frac{d\beta_z}{ds_z} > 0$ if $\alpha < \frac{1}{2}$)*;*
- *search for composite information decreases (increases) misreporting when the information signal is relatively more (less) informative about firm fundamentals*

than about the managers' reporting incentives ($\frac{dE[b_z]}{ds_z} < 0$ if $\alpha > \frac{1}{2}$, $\frac{dE[b_z]}{ds_z} > 0$ if $\alpha < \frac{1}{2}$).

Collectively, the comparative statics results with a composite information signal are in line with the results with two independent information signals about firm fundamentals and managerial incentives. In other words, search for composite information always increases price efficiency, but the effect of information search on the earnings response coefficient and misreporting depends on the information signal's *relative* informativeness about firm fundamentals versus managerial incentives.

2.5 Analysis when Information Search is Endogenous

In the previous sections, I discussed how search for different types of information affects the earnings response coefficient and misreporting, assuming that the intensity of information search is exogenous. In this section, I relax the exogeneity assumption and instead derive the speculator's optimal search activity for each type of information assuming a resource constraint. To do so, I first calculate the speculator's ex-ante expected utility (profit) by substituting in the equilibrium parameters. I then derive the speculator's optimal search activity for each type of information (s_x^*, s_y^*) that maximizes his expected utility subject to a resource constraint $c_x s_x^2 + c_y s_y^2 \leq R$. c_x represents the costs of acquiring fundamental information, c_y represents the costs of acquiring information about the manager's reporting incentives, and R represents available resources. I then solve the speculator's maximization problem using the Lagrange multiplier method. Finally, based on the speculator's optimal search for each type of information derived from these steps, I examine how the exogenous variables in the model, R, c_x, and c_y, affect the speculator's

optimal information search, the earnings response coefficient, and misreporting. The following proposition summarizes the comparative statics results:

Proposition 4. *The speculator's optimal information search, the earnings response coefficient, and misreporting have the following characteristics in equilibrium:*

- *the speculators' optimal search for fundamental (incentive) information is increasing (increasing) in the resources available, decreasing (increasing) in the costs of acquiring information about firm fundamentals, and increasing (decreasing) in the costs of acquiring information about the manager's reporting incentives* ($\frac{ds_x^*}{dR} > 0, \frac{ds_y^*}{dR} > 0, \frac{ds_x^*}{dc_x} < 0, \frac{ds_y^*}{dc_x} > 0, \frac{ds_x^*}{dc_y} > 0, \frac{ds_y^*}{dc_y} < 0$)*;*
- *the earnings response coefficient is either increasing or decreasing in the resources available, increasing in the costs of acquiring information about firm fundamentals, and decreasing in the costs of acquiring information about the manager's reporting incentives* ($\frac{d\beta}{dR} \gtreqless 0, \frac{d\beta}{dc_x} > 0, \frac{d\beta}{dc_y} < 0$)*;*
- *misreporting is either increasing or decreasing in the resources available, increasing in the costs of acquiring information about firm fundamentals, and decreasing in the costs of acquiring information about the manager's reporting incentives* ($\frac{dE[b]}{dR} \gtreqless 0, \frac{dE[b]}{dc_x} > 0, \frac{dE[b]}{dc_y} < 0$).

Comparative statics results on the speculator's optimal information search suggest that more search resources induce the speculator to search for more information of either type, but within a given set of resources, he acquires more of the less costly information type. For this reason, an increase in the search resources and the resulting increase in both types of information search have ambiguous effects on the earnings response coefficient and on misreporting.[5] On the contrary, changes in the costs of searching for each type of information have unambiguous effects on the earnings response coefficient and on misreporting. For example, an increase in the costs of acquiring fundamental information (c_x) induces the speculator to allocate more time and effort to acquiring managerial

[5] In particular, the direction of the effect depends on the relative magnitudes of $c_x s_v$ and $c_y s_m$.

incentive information instead of fundamental information. This increases the earnings response coefficient, and the resulting increase in the valuation benefits of misreporting increases misreporting in equilibrium. The opposite is true for an increase in the costs of acquiring managerial incentive information (c_y).

I conclude this section by noting that the primary purpose of the theory model in this paper is motivational. Without the theory model that offers this simple thought experiment, it would be difficult to intuit why information search about two different types of information might have opposite effects on the earnings response coefficients and misreporting. Perhaps for this reason, prior empirical work on information search tends to conceptualize "information search" broadly without specifying the type or nature of the information. In this regard, my findings use a theory model to motivate a more nuanced view of how information search affects capital markets and managers' reporting decisions.

CHAPTER 3: SAMPLE AND VARIABLE MEASUREMENT

Having discussed the economic theory that motivates my predictions, I next examine whether the theoretical intuition is empirically descriptive. I construct my sample using data from Compustat, CRSP, Audit Analytics, IBES, Thomson Reuters, and EDGAR access log file. My sample begins in 2005 because firms were required to file 4.02 non-reliance disclosures for restatements beginning in August 2004. My sample ends in 2016 because EDGAR access log data ends in June 2017. The sample consists of all firm-years with non-missing control variables, with stock price of no less than $5, and with at least 5

years of data throughout the sample period.[6] The final sample consists of 27,989 firm-years from 2005 to 2016.

Following prior research that tests empirical predictions based on theoretical models of misreporting, I focus on restatements due to intentional misrepresentation and employ two different measures of misreporting (Fang et al., 2017; Samuels et al., 2021).[7] My first measure of misreporting is *Restate* defined as an indicator variable that equals one if the respective firm-year is eventually restated due to intentional misreporting and zero otherwise. My second measure of misreporting is *Bias* defined as the amount of restated earnings due to intentional misreporting, scaled by beginning total assets and expressed in basis points. An advantage of this measure is that it captures the difference between earnings as originally reported and earnings as restated, closely adhering to the theoretical definition of earnings bias. Panel A of Table 1 presents the number of observations each year from 2005 to 2016 along with the probability of restatement due to intentional misreporting (average *Restate*), and the average values of *Bias*. The probability of restatement due to intentional misreporting is approximately 0.012 across years, and average bias is approximately 0.371 basis points of assets.

In order to measure investors' information search activities, I use data on EDGAR filing downloads and develop a novel empirical technique for classifying downloads as search for information about firm fundamentals or search for information about managers'

[6] Focusing on observations with stock prices greater than $5 ensures that my results are not driven by extreme observations of illiquid stocks. My inferences remain unchanged when I include these observations.
[7] Consistent with prior literature, I consider restatements classified by Audit Analytics as resulting from fraud or an SEC investigation to be intentional misreporting (e.g., Hennes et al., 2008; Armstrong et al., 2013).

reporting incentives.[8] In particular, I use downloads of quarterly and annual financial statements (10-Qs and 10-Ks) to capture investors' search for fundamental information (*FundamentalSearch*) and I use downloads of proxy statements (DEF 14A) and statements of ownership changes (Form 4) to capture investors' search for information about managerial incentives (*IncentiveSearch*). Quarterly and annual financial statements are comprehensive reports of a firm's financial performance. These filings include financial statements and notes to financial statements that allow investors to acquire several alternative signals about fundamental firm value. For example, the literature on fundamental analysis shows that fundamental signals like labor productivity and growth, order backlogs, and gross margin are correlated with and indicative of firm value (e.g., Lev and Thiagarajan, 1993). Thus, I employ search for quarterly and annual financial statements to capture fundamental search. In comparison, proxy statements and statements of ownership changes contain information about the firm's managers and directors and the details of their compensation and stock ownership positions in the firm. For example, large sections of the proxy statements are devoted to the discussion of executive compensation practices and philosophy including the executive's background, different components of executive compensation, vesting schedules, and performance targets. Similarly, statements of changes in beneficial ownership provide information about changes in the holdings of the firm's managers and directors. Managers' compensation incentives play a significant

[8] I obtain data on EDGAR downloads from James Ryan's website (http://www.jamesryans.com/). Consistent with prior literature, the data eliminates EDGAR download requests from IP addresses accessing more than five filings in a given minute or more than 1,000 filings during the day to filter out webcrawlers (Drake et al., 2015). My inferences remain unchanged when I instead use data that eliminates EDGAR download requests from IP addresses accessing more than 25 filings in a given minute, more than 3 different companies' filings in a given minute, or more than 500 filings in a given day, as suggested by Ryans (2017). I also obtain the raw data of EDGAR log file from https://www.sec.gov/dera/data/edgar-log-file-data-set.html.

role in their reporting decisions as documented in a number of prior studies (Murphy, 2013; Dichev et al., 2013; Dichev et al., 2016). Thus, I employ search for proxy statements and statements of ownership changes to capture incentive search.

Relatedly, Panel A of Figure 2 shows that investors' downloads of 10-K, 10-Q, 8-K, Form 4, and DEF 14A filings together account for approximately three quarters of the total downloads. These values are in line with the findings from prior literature, which document that 10-K, 10-Q, 8-K, Form 4, and DEF 14A are the five most frequently downloaded forms on EDGAR (see, e.g., Table 2 of Drake et al., 2015). This suggests that focusing on the searches for annual and quarterly financial statements, the proxy statements, and the statements of ownership changes yields a fairly comprehensive picture of the investors' information search activities. Panel B of Table 1 presents descriptive statistics of the variables used in my analysis. Statistics on information search variables suggest that investors search for fundamental information approximately 3,550 (1,790) times and they search for information about managers' incentives approximately 1,450 (700) times for an average (median) firm-year in my sample.

Table 1
Descriptive Statistics

This table presents descriptive statistics of the variables used in the analysis. Panel A presents average values of misreporting by year. Column (1) presents the total number of firm-years in the sample, and columns (2) and (3) present average values of the measures of misreporting. Panel B presents summary statistics for the variables used in the analysis. Variable definitions can be found in Appendix B.

Panel A. Average Misreporting by Year

Year	Sample Observations	Average $Restate_{t+1}$	Average $Bias_{t+1}$
2005	2,177	0.016	0.894
2006	2,345	0.011	0.426
2007	2,448	0.011	0.423
2008	2,316	0.013	0.350
2009	2,291	0.013	0.308
2010	2,467	0.013	0.381
2011	2,473	0.014	0.421
2012	2,306	0.014	0.466
2013	2,435	0.015	0.370
2014	2,417	0.010	0.240
2015	2,244	0.006	0.122
2016	2,070	0.005	0.036
Total	27,989	0.012	0.371

Panel B. Summary Statistics

Variables	N	Mean	SD	Q1	Median	Q3
FundamentalSearch	27,989	0.355	0.576	0.060	0.179	0.410
IncentiveSearch	27,989	0.145	0.217	0.025	0.070	0.174
AbnRet	27,989	0.005	0.078	−0.031	0.003	0.040
Acquisition	27,989	0.028	0.166	0.000	0.000	0.000
Beta	27,989	0.939	0.439	0.689	0.949	1.211
BM	27,989	0.592	0.395	0.302	0.509	0.787
Capital	27,989	0.229	0.245	0.033	0.133	0.349
Financing	27,989	0.185	0.175	0.033	0.139	0.292
Intangibles	27,989	0.053	0.172	0.000	0.010	0.044
InstOwnership	27,989	0.488	0.383	0.013	0.557	0.856
InterestCov	27,989	1.479	17.643	1.772	2.000	2.000
Leverage	27,989	0.202	0.181	0.041	0.168	0.317
Nonsynchronicity	27,989	0.662	0.201	0.515	0.671	0.817
NumAnalyst	27,989	7.696	7.156	2.000	6.000	11.000
PIN	20,521	0.163	0.100	0.100	0.138	0.207
Return	27,989	0.138	0.429	−0.110	0.094	0.315
Retvol	27,989	0.097	0.050	0.061	0.086	0.120
Roa	27,989	0.041	0.081	0.009	0.038	0.077
SaleGrowth	27,989	0.106	0.262	−0.015	0.068	0.175
ShortInterest	27,989	0.047	0.058	0.010	0.027	0.061
Size	27,989	7.218	1.832	5.922	7.137	8.414
Surprise	27,989	−0.012	0.320	−0.018	0.003	0.018

CHAPTER 4: EMPIRICAL RESULTS

4.1 Search for Different Types of Information and Misreporting

I begin my empirical analysis by validating that the measures of information search based on EDGAR downloads indeed proxy for investors' information search activity, which enhances investors' informedness and reduces residual uncertainty about firm value. To show this, I estimate the relation between the two measures of information search and price efficiency (informativeness). To the extent EDGAR downloads increase investors' informedness and allow investors to estimate firm value more accurately, I expect a positive relation between my measures of information search and price efficiency regardless of the information's type. I test this conventional intuition by estimating the following regression specification.

$$PriceEfficiency = \beta_1 FundamentalSearch + \beta_2 IncentiveSearch + \Gamma Controls + \varepsilon \quad (1)$$

I follow prior literature and measure price efficiency as one of the two variables, the probability of informed trading (*PIN*) and price non-synchronicity (*Nonsynchronicity*) (e.g., Chen et al., 2007). The first measure, the probability of informed trading (*PIN*), was developed in Easley et al. (1996) and utilizes information from the trading process to directly capture the probability of informed trading in a stock.[9] The second measure, price non-synchronicity (*Nonsynchronicity*) was first proposed by Roll (1988) and is computed as one minus R-squared from the regression of a firm's daily stock return on the market and industry returns, estimated for each firm-year. The idea underlying this measure is that

[9] PIN estimation steps are implemented following Noah Stoffman (https://host.kelley.iu.edu/nstoffma/ekop.html).

if a firm's return is strongly correlated with the market and industry returns, then it is less likely that the firm's stock price is capturing firm-specific information, suggesting low stock price efficiency. *FundamentalSearch* and *IncentiveSearch* are measures of information search activities as previously defined, and *Controls* is a vector of control variables consisting of firm size (*Size*), book-to-market ratio (*BM*), leverage (*Leverage*), number of analysts (*NumAnalyst*), percentage of institutional ownership (*InstOwnership*), and outstanding short-sell interests (*ShortInterest*). I include firm and year fixed effects to control for unobservable firm characteristics and year effects, and present standard errors clustered by firm.[10]

Table 2 presents results from estimating equation (1). Column (1) presents results that use the probability of informed trading (*PIN*) as a measure of price efficiency, and column (2) presents results that use price non-synchronicity (*Nonsynchronicity*) as a measure of price efficiency.[11] Consistent with my theoretical predictions, I find positive and significant coefficient estimates on both measures of information search activities across the two specifications. In particular, *t*-statistics on *FundamentalSearch* and *IncentiveSearch* are 1.97 and 2.08 when probability of informed trading is used as the dependent variable, and they are 2.35 and 1.82 when price non-synchronicity is used as the

[10] Throughout the analysis, including firm and year fixed effects effectively allows me to estimate the effect of 'abnormal' search volume that exceeds the expected base level of search volume, which differs across firms and years.

[11] When probability of informed trading (*PIN*) is used as the dependent variable in column (1), the number of observations are smaller than in column (2) because the probability of informed trading could not be estimated for some observations.

dependent variable. Combined, the results in Table 2 confirm that information downloads on EDGAR, regardless of its type, proxy for investors' information search activity.

Table 2
Information Search and Price Efficiency

This table presents regression analysis on the relation between different types of information search and price efficiency. Firm and year fixed effects are included and standard errors are clustered by firm. *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Depvar =	*PriceEfficiency*	
	PIN	*Nonsynchronicity*
	(1)	(2)
FundamentalSearch	0.007**	0.009**
	(1.97)	(2.35)
IncentiveSearch	0.013**	0.015*
	(2.08)	(1.82)
Size	−0.015***	−0.030***
	(−7.72)	(−11.16)
BM	−0.005	0.005
	(−1.47)	(1.00)
Leverage	−0.009	0.010
	(−1.15)	(1.00)
NumAnalyst	−0.001**	−0.001**
	(−2.25)	(−2.36)
InstOwnership	−0.025***	−0.044***
	(−4.26)	(−6.11)
ShortInterest	−0.080***	−0.025
	(−4.97)	(−1.18)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Adjusted R^2	0.40	0.74
N	20,521	27,989

Next, I validate the existence of the valuation benefits channel underlying my predictions. My model explicitly predicts that fundamental search and incentive search have opposite effects on the earnings response coefficients. Accordingly, I validate my measures of different types of information search by estimating their relations to the earnings response coefficients. If I do not find opposite relations for EDGAR downloads

of different filings, this would suggest that my empirical measures do not adequately capture the theoretical constructs of interest. To examine this relation, I estimate the earnings response coefficient as a function of the two types of information search using the following regression specification.

$$AbnRet = \beta_1 Surprise \times FundamentalSearch + \beta_2 Surprise \times IncentiveSearch + \beta_3 Surprise + \Gamma Controls + \delta_1 FundamentalSearch + \delta_2 IncentiveSearch + \varepsilon \quad (2)$$

AbnRet is daily abnormal return cumulated over the three trading days surrounding the annual earnings announcement date.[12] *Surprise* is earnings surprise defined as current year's earnings per share minus prior year's earnings per share, deflated by stock price on a trading day prior to the annual earnings announcement date. *FundamentalSearch* and *IncentiveSearch* are measures of information search activities as previously defined, and *Controls* is a vector of control variables. Consistent with asset pricing literature, I include market beta (*Beta*), firm size (*Size*), and book-to-market ratio (*BM*) as controls. I include firm and year fixed effects to control for unobservable firm characteristics and year effects, and present standard errors clustered by firm.

Table 3 presents results from estimating equation (2). In particular, I estimate the earnings response coefficient by regressing abnormal return on earnings surprise, and further examine how the earnings response coefficients differ for the two types of information search by interacting *Surprise* with *FundamentalSearch* and with *IncentiveSearch*. Column (1) controls for market beta, firm size, and book-to-market ratio

[12] The annual earnings announcement occurs after the year-end and releases earnings for the year during which the information search variables are measured. Therefore, the information search precedes the annual earnings announcement.

to account for any systematic factors that may affect my inferences. Column (2) includes additional controls for market beta, firm size, and book-to-market ratio, interacted with the earnings surprise variable. In both specifications, I find negative and significant coefficient estimates on the interaction term *Surprise*×*FundamentalSearch* (*t*-stats −4.67 and −2.77), and positive and significant coefficient estimates on the interaction term *Surprise*×*IncentiveSearch* (*t*-stats 3.85 and 2.27).

I further validate that measures of fundamental search and incentive search have opposite effects on the valuation benefits of misreporting using multiple research design choices, and report the results in Appendix C. In column (1) of Appendix C, I re-estimate equation (2) using firm-quarter observations and quarterly earnings announcements. In column (2) of Appendix C, I re-estimate the relation controlling for the interaction terms between the earnings surprise variable and firm and year fixed effects. The additional interaction terms allow me to account for the predictable variation in the earnings response coefficients across firms and across years. Lastly, in column (3) of Appendix C, I re-estimate equation (2) with an alternative earnings surprise variable measured relative to the analysts' most recent earnings consensus. Across three distinct research design choices, I continue to find a robust negative (positive) relation between fundamental (incentive) search and the earnings response coefficients.

Collectively, these findings are consistent with the theoretical prediction that information search about firm fundamentals decreases earnings response coefficient, while information search about managers' reporting incentives increases earnings response coefficient. Therefore, I conclude that my empirical measures adequately capture searches

for different types of information that have different effects on the earnings response coefficients. Since higher (lower) earnings response coefficient represents higher (lower) valuation benefits of misreporting, this result segues into my main prediction that search for information about firm fundamentals and about managers' incentives have contrasting effects on misreporting.

Table 3
Information Search and Earnings Response Coefficient

This table presents regression analysis on the relation between different types of information search and earnings response coefficients. Firm and year fixed effects are included and standard errors are clustered by firm. *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Depvar =	*Returns*	
	AbnRet	*AbnRet*
	(1)	(2)
Surprise×*FundamentalSearch*	−0.032***	−0.034***
	(−4.67)	(−2.77)
Surprise×*IncentiveSearch*	0.087***	0.093**
	(3.85)	(2.27)
Surprise	0.021***	0.038***
	(4.64)	(2.96)
Beta	0.001	0.001
	(0.44)	(0.40)
Size	−0.015***	−0.015***
	(−8.67)	(−8.62)
BM	−0.003	−0.003
	(−1.02)	(−0.98)
FundamentalSearch	−0.001	−0.001
	(−0.28)	(−0.28)
IncentiveSearch	−0.003	−0.003
	(−0.79)	(−0.79)
Surprise×*Beta*		−0.009*
		(−1.66)
Surprise×*Size*		−0.001
		(−0.90)
Surprise×*BM*		0.001
		(0.20)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Adjusted R^2	0.03	0.03
N	27,989	27,989

In my main analysis, I estimate the relation between the two types of information search and misreporting. Specifically, I estimate the following regression specification.

$$Misreporting_{t+1} = \beta_1 FundamentalSearch + \beta_2 IncentiveSearch + \Gamma Controls + \varepsilon_{t+1} \quad (3)$$

Misreporting is one of the two measures of misreporting (*Restate*, *Bias*), *FundamentalSearch* and *IncentiveSearch* are measures of information search activities as previously defined, and *Controls* is a vector of control variables. Consistent with prior research, the misreporting variables are measured one year after the independent variables are measured (e.g., Armstrong et al., 2013). Following Armstrong et al. (2013), I include controls for the known determinants of misreporting as follows: firm size (*Size*), growth opportunities (*BM*), leverage (*Leverage*), past accounting and stock performances (*Roa*, *Return*), return volatility (*Retvol*), capital intensity (*Capital*), research and development and advertising expense (*Intangibles*), external financing during the year (*Financing*), size of acquisitions made during the year (*Acquisition*), interest coverage (*InterestCov*), and sales growth (*SaleGrowth*). In addition, to assess the effect of EDGAR downloads incremental to the presence of sophisticated market participants, I control for the number of analysts (*NumAnalyst*), institutional ownership (*InstOwnership*), and outstanding short-sell interests (*ShortInterest*). I include firm and year fixed effects to control for unobservable firm characteristics and year effects, and present standard errors clustered by firm.

Table 4 presents results from estimating equation (3). Column (1) and column (2) present results using *Restate* as the measure of misreporting, with and without control

variables. Column (3) and column (4) present results using *Bias* as the measure of misreporting, with and without control variables.[13] Across all specifications, I find negative and significant coefficient estimates on *FundamentalSearch* (*t*-stats range from −2.56 to −1.89) and positive and significant coefficient estimates on *IncentiveSearch* (*t*-stats range from 2.19 to 2.94). This result is consistent with the explanation that search for information about firm fundamentals decreases misreporting, while search for information about managers' reporting incentives increases misreporting. Combined with the previous analysis that documents contrasting effects of each type of information search on the earnings response coefficient, these results suggest that the earnings response coefficient channel is crucial in understanding misreporting decisions.

[13] In an untabulated analysis, I find that the results are robust to using discretionary accruals as an alternative measure of misreporting. I estimate discretionary accruals following the modified-Jones approach (Dechow et al., 1995), as the residuals from the following regressions for each industry and year, where industries are defined based on two-digit SIC codes: $\frac{Accruals}{AvgAssets} = \alpha_1 \left(\frac{1}{AvgAssets}\right) + \alpha_2 \left(\frac{\Delta Revenue - \Delta Receivables}{AvgAssets}\right) + \alpha_3 (\frac{PPE}{AvgAssets})$.

Table 4
Information Search and Misreporting

This table presents regression analysis on the relation between different types of information search and subsequent misreporting. Firm and year fixed effects are included and standard errors are clustered by firm. *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Depvar =	*Misreporting*$_{t+1}$			
	Restate$_{t+1}$	*Restate*$_{t+1}$	*Bias*$_{t+1}$	*Bias*$_{t+1}$
	(1)	(2)	(3)	(4)
FundamentalSearch	−0.005*	−0.006**	−0.200**	−0.223**
	(−1.89)	(−2.42)	(−2.51)	(−2.56)
IncentiveSearch	0.016**	0.015**	0.667***	0.608***
	(2.33)	(2.19)	(2.94)	(2.72)
Size		0.006*		0.199
		(1.95)		(1.11)
BM		−0.001		−0.205
		(−0.35)		(−0.89)
Leverage		0.023		−0.073
		(1.29)		(−0.12)
Roa		−0.005		−0.296
		(−0.36)		(−0.43)
Return		−0.002		0.083
		(−0.90)		(0.92)
Retvol		0.021		1.527*
		(1.39)		(1.82)
Capital		−0.037***		−0.457
		(−2.71)		(−0.66)
Intangibles		−0.005		−0.076
		(−1.31)		(−0.58)
Financing		−0.016		−0.470
		(−1.17)		(−0.82)
Acquisition		−0.003		−0.119
		(−0.54)		(−0.47)
InterestCov		0.000		0.001
		(0.50)		(0.70)
SaleGrowth		0.002		0.171
		(0.62)		(0.77)
NumAnalyst		0.001**		0.023
		(2.54)		(1.47)
InstOwnership		−0.003		−0.029
		(−0.33)		(−0.12)
ShortInterest		0.040		2.418*
		(1.56)		(1.85)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.34	0.34	0.32	0.32
N	27,989	27,989	27,989	27,989

Next, I conduct a series of additional analysis to assess the sensitivity of my results to several research design and measurement choices. First, I alter my measures of information search by narrowing on information search around earnings announcements. Tightening the variable measurement window in this manner allows me to focus on information search that is more likely to have been motivated by the upcoming earnings announcement. To measure information search close to the earnings announcement, I define *FundamentalSearchEA* as the downloads of quarterly and annual financial statements, and *IncentiveSearchEA* as the downloads of proxy statements and statements of ownership changes, measured between 60 trading days and 1 trading day prior to the annual earnings announcement date (i.e., $[\tau-60,\tau-1)$ where τ denotes annual earnings announcement date).[14] The mean (median) value of *FundamentalSearchEA* is 0.075 (0.037) and the mean (median) value of *IncentiveSearchEA* is 0.033 (0.015).[15] Next, to measure information search further away from the earnings announcement, I define *FundamentalSearchNEA* as the downloads of quarterly and annual financial statements, and *IncentiveSearchNEA* as the downloads of proxy statements and statements of ownership changes, measured between 120 trading days and 60 trading days prior to the annual earnings announcement date (i.e., $[\tau-120,\tau-60)$). The mean (median) value of *FundamentalSearchNEA* is 0.084 (0.043) and the mean (median) value of *IncentiveSearchNEA* is 0.033 (0.015).

[14] The 60 trading day cutoff follows Drake et al. (2015) who capture the extent of pre-announcement information acquisition using the 60 trading day cutoff.
[15] Note that these values are deflated by 10,000.

I re-estimate regression equation (3) replacing *FundamentalSearch* and *IncentiveSearch* variables with *FundamentalSearchEA* (*FundamentalSearchNEA*) and *IncentiveSearchEA* (*IncentiveSearchNEA*), respectively. The estimation results are reported in Panel A of Table 5. When information search is measured close to the earnings announcement, I find a negative relation between fundamental search and misreporting (*t*-stats −2.26 and −2.73), and a positive relation between incentive search and misreporting (*t*-stats 2.30 and 2.50). In contrast, when information search is measured further away from the earnings announcement, neither type of information search has a significant effect on misreporting (*t*-stats range from −1.02 to 1.37). Combined, these results suggest that EDGAR downloads measured near the earnings announcement capture investors' speculative search activity that translates into their trading decisions more closely.

Second, I follow Dyer (2021) and identify information search by professional investors such as asset managers, banks, or brokers using the IP addresses that initiated the EDGAR filing downloads. It is unclear ex-ante whether the relation between information search and misreporting should vary depending on who initiates the search. On the one hand, since all investors who appear on the EDGAR log are actively acquiring information, they are all acting as speculators and their search activities should have implications on managerial reporting decisions regardless of who initiates the search. On the other hand, professional investors may be able to impound their information into prices to a greater extent, which suggests a stronger relation between professional investors' search and misreporting. Alternatively, EDGAR downloads may capture non-professional investors'

search activity more closely given their lack of alternative information sources, which suggests a stronger relation between non-professional investors' search and misreporting.

To identify who initiates the search, I match the entities associated with each IP address block using the American Registry for Internet Numbers (ARIN) Whois reports.[16] I define EDGAR filing downloads initiated from IP addresses that are associated with professional investors such as asset managers, banks, or brokers to be professional investors' information search (*FundamentalSearchProf*, *IncentiveSearchProf*).[17] The mean (median) value of *FundamentalSearchProf* is 0.111 (0.067) and the mean (median) value of *IncentiveSearchProf* is 0.022 (0.014).[18] Downloads initiated from IP addresses that are not identified as professional investors are considered to be non-professional investors' information search (*FundamentalSearchNProf*, *IncentiveSearchNProf*). The mean (median) value of *FundamentalSearchNProf* is 0.244 (0.106) and the mean (median) value of *IncentiveSearchNProf* is 0.124 (0.054).

I re-estimate equation (3) using professional and non-professional investors' search for fundamental information and incentive information as the explanatory variables. The results are reported in Panel B of Table 5. I find a negative relation between fundamental

[16] Because EDGAR log file masks the last digits of the IP address, I match on IP address 'blocks' as opposed to the full IP address. If any of the entities associated with the IP address 'block' is identified as a professional investor, then the search initiated from that IP address block is considered to be professional investors' search.
[17] I identify professional investors by manually categorizing the entity names associated with the 1,000 most used IP address blocks. For the remaining IP address blocks, I classify them as professional investors' searches if the associated entity's name includes one of the following keywords and their variants: Advisor, Analyst, Asset Management, Bank, Broker, Business, Capital, Casualty, Commerce, Credit, Equity, Fiduciary, Financial, Fund, Holdings, Leasing, Ledger, Lender, Insurance, Invest, Merchant, Mortgage, Mutual, Pension, Profit, Research, REIT, Saving, Securities, Trade, Trust, Underwriter, Wall Street, and Wealth.
[18] Note that these values are deflated by 10,000.

search and misreporting (*t*-stats range from −2.77 to −2.01) and a positive relation between incentive search and misreporting (*t*-stats range from 1.75 to 2.56) regardless of who initiates the search. This result suggests that not only professional investors but also non-professional investors who access EDGAR are actively acquiring information, and that EDGAR downloads effectively capture investors' search activity regardless of who initiates the search.[19]

Third, I focus on information search about a leading firm in an industry to which the sample firm belongs and analyze how it relates to the sample firm's misreporting behavior. To the extent fundamental (incentive) information about a leading firm is also informative about the firm fundamentals (managerial incentives) at the sample firm that belongs to the same industry, and to the extent the sample firm's investors rely on this information, I would expect fundamental (incentive) search about the leader firm to have a negative (positive) effect on the sample firm's misreporting. However, if the firm fundamentals (managerial incentives) are heterogeneous across firms that belong to the same industry, or if the investors of the sample firm disregard this information, information search about the leader firm would not have any effect on the sample firm's misreporting behavior.

[19] In an untabulated additional analysis, I standardize these variables (*FundamentalSearchProf*, *IncentiveSearchProf*, *FundamentalSearchNProf*, and *IncentiveSearchNProf*) to have mean values of zero and standard deviations of one to compare the magnitude of the coefficient estimates. The results show bigger estimated effects from the standardized professional investors' search compared to the standardized non-professional investors' search. This result suggests that one unit of professional investors' search activity has bigger effects than one unit of non-professional investors' search activity.

I identify a firm with the highest average revenue across the sample periods for each of the two-digit SIC industry groups as an industry leader. I then correlate information search about industry leaders (*FundamentalSearchLeader*, *IncentiveSearchLeader*) to misreporting at sample firms that belong to the same industry group.[20] I exclude the leader firm observations themselves from this analysis. The mean (median) value of *FundamentalSearchLeader* is 3.343 (1.732) and the mean (median) value of *IncentiveSearchLeader* is 0.915 (0.454).[21]

In Panel C of Table 5, I re-estimate equation (3) replacing *FundamentalSearch* and *IncentiveSearch* with *FundamentalSearchLeader* and *IncentiveSearchLeader*, respectively. The results show that fundamental search about industry leaders is negatively associated with the sample firm's misreporting (*t*-stats −2.18, −2.14), but incentive search about industry leaders is not significantly associated with the sample firm's misreporting (*t*-stats −0.60, 0.37). This result suggests that fundamental information about product market leaders is informative about the fundamental performance at the sample firm that belongs to the same industry. On the contrary, incentive information about individual managers' incentives appears to be more or less heterogeneous across firms, suggesting that product market leaders are not necessarily leaders of the misreporting incentives.

Fourth, I compare the relation between information search and misreporting in the subsamples of firms with more versus fewer alternative information sources other than

[20] For example, I identify McDonald's Corp. as the leading firm in the retail-eating industry (two-digit SIC: 58) during my sample period. Thus, I examine how investors' downloads of McDonald's Corp.'s fundamental and incentive information relate to misreporting at other firms that belong to the same industry group, such as Wendy's Co. and Papa John's International Inc.

[21] Note that these values are deflated by 10,000.

EDGAR. I measure the amount of alternative information sources using firm size and analyst following, where large firm size and high analyst following imply more alternative information sources and small firm size and low analyst following imply fewer alternative information sources (Collins and Kothari, 1989; Frankel and Li, 2004). In Panel D of Table 5, I re-estimate equation (3) in the subsamples of firms with below- and above- median values of firm size (*Size*). I find a negative relation between fundamental search and misreporting (*t*-stats −2.18 and −2.61) and a positive relation between incentive search and misreporting (*t*-stats 2.40 and 2.57) in the subsample of smaller firms where alternative information sources are scarce. In contrast, I find no evidence of a relation between either proxy and misreporting in the subsample of larger firms with rich alternative information sources (*t*-stats range from −1.57 to 0.79). Similarly, in Panel E of Table 5, I re-estimate equation (3) in the subsamples of firms with below- and above- median number of analyst following (*NumAnalyst*). I find a negative relation between fundamental search and misreporting (*t*-stats −2.44 and −2.18) and a positive relation between incentive search and misreporting (*t*-stats 2.03 and 2.37) in the subsample of firms with low analyst following where alternative information sources are scarce. In contrast, I find no evidence of such relations in the subsample of firms with high analyst following where alternative information sources are rich (*t*-stats range from −1.10 to 1.07). Collectively, these results suggest that my measure of information search based on EDGAR downloads is potentially more effective in the subsample of firms where alternative information sources are lacking and EDGAR is a more important source of information to the investors.

Table 5
Information Search and Misreporting: Additional Analysis

This table presents additional analysis on the relation between different types of information search and misreporting. Panel A presents regression analysis that examines the relation between different types of information search and misreporting for searches initiated close to the annual earnings announcement date (*FundamentalSearchEA*, *IncentiveSearchEA*) versus those initiated further away from the annual earnings announcement date (*FundamentalSearchNEA*, *IncentiveSearchNEA*). Information searches close to the earnings announcement are measured between 60 trading days and 1 trading day prior to the annual earnings announcement date (i.e., $[\tau-60,\tau-1)$ where τ denotes annual earnings announcement date). Information searches further away from the earnings announcement are measured between 120 trading days and 60 trading days prior to the annual earnings announcement date (i.e., $[\tau-120,\tau-60)$). Panel B presents regression analysis that examines the relation between different types of information search and misreporting for searches initiated by professional investors (*FundamentalSearchProf, IncentiveSearchProf*) versus those initiated by non-professional investors (*FundamentalSearchNProf, IncentiveSearchNProf*). Panel C presents regression analysis that examines the relation between information search about a leading firm in an industry to which the sample firm belongs (*FundamentalSearchLeader, IncentiveSearchLeader*) and misreporting. Panel D presents regression analysis that examines how the relation between different types of information search and misreporting differs by firm size. Panel E presents regression analysis that examines how the relation between different types of information search and misreporting differs by analyst following. Firm and year fixed effects are included and standard errors are clustered by firm. *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Panel A. Information Search Close to Earnings Announcement and Misreporting

Depvar =	*Misreporting*$_{t+1}$			
	Restate$_{t+1}$	*Bias*$_{t+1}$	*Restate*$_{t+1}$	*Bias*$_{t+1}$
	(1)	(2)	(3)	(4)
FundamentalSearchEA	−0.026**	−0.890***		
	(−2.26)	(−2.73)		
IncentiveSearchEA	0.060**	2.338**		
	(2.30)	(2.50)		
FundamentalSearchNEA			−0.011	−0.334
			(−1.01)	(−1.02)
IncentiveSearchNEA			0.014	0.919
			(0.90)	(1.37)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.34	0.32	0.34	0.32
N	27,989	27,989	27,989	27,989

Table 5

Information Search and Misreporting: Additional Analysis (continued)

Panel B. Information Search by Professional Investors and Misreporting

Depvar =	$Misreporting_{t+1}$			
	$Restate_{t+1}$	$Bias_{t+1}$	$Restate_{t+1}$	$Bias_{t+1}$
	(1)	(2)	(3)	(4)
FundamentalSearchProf	−0.046***	−1.495**		
	(−2.77)	(−2.14)		
IncentiveSearchProf	0.210*	6.599*		
	(1.93)	(1.75)		
FundamentalSearchNProf			−0.006**	−0.202**
			(−2.01)	(−2.42)
IncentiveSearchNProf			0.013*	0.541**
			(1.95)	(2.56)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.34	0.32	0.34	0.32
N	27,989	27,989	27,989	27,989

Panel C. Information Search about Industry Leaders and Misreporting

Depvar =	$Misreporting_{t+1}$	
	$Restate_{t+1}$	$Bias_{t+1}$
	(1)	(2)
FundamentalSearchLeader	−0.001**	−0.046**
	(−2.18)	(−2.14)
IncentiveSearchLeader	−0.001	0.018
	(−0.60)	(0.37)
Controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Adjusted R^2	0.35	0.35
N	24,781	24,781

Table 5
Information Search and Misreporting: Additional Analysis (continued)

Panel D. Information Search and Misreporting by Firm Size

Depvar =	*Misreporting*$_{t+1}$			
	Small Firm		*Large Firm*	
	Restate$_{t+1}$	*Bias*$_{t+1}$	*Restate*$_{t+1}$	*Bias*$_{t+1}$
	(1)	(2)	(3)	(4)
FundamentalSearch	−0.041**	−2.130***	−0.004	0.008
	(−2.18)	(−2.61)	(−1.57)	(0.17)
IncentiveSearch	0.044**	2.041**	0.006	0.079
	(2.40)	(2.57)	(0.79)	(0.44)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.38	0.34	0.38	0.38
N	13,995	13,995	13,994	13,994

Panel E. Information Search and Misreporting by Analyst Following

Depvar =	*Misreporting*$_{t+1}$			
	Low Analyst Following		*High Analyst Following*	
	Restate$_{t+1}$	*Bias*$_{t+1}$	*Restate*$_{t+1}$	*Bias*$_{t+1}$
	(1)	(2)	(3)	(4)
FundamentalSearch	−0.030**	−1.192**	−0.003	−0.040
	(−2.44)	(−2.18)	(−1.10)	(−0.66)
IncentiveSearch	0.031**	1.490**	0.005	0.261
	(2.03)	(2.37)	(0.64)	(1.07)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.35	0.31	0.39	0.41
N	13,814	13,814	14,175	14,175

4.2 Mandatory XBRL Adoption and Changes in Fundamental Information Search Costs

In this section, I examine how an exogenous shock to the costs of fundamental search affects investors' search activity and managerial reporting decisions. This analysis allows me to consider investors' endogenous decisions to search for different types of information. Comparative statics results from the model described in section 2.5 suggest

that a reduction in the costs of fundamental search induces investors to allocate more time and effort to acquiring fundamental information relative to managerial incentive information. This, in turn, decreases the earnings response coefficient and decreases misreporting in equilibrium. To test this conjecture empirically, I exploit the mandatory XBRL adoption as a setting that exogenously reduced the costs of searching for fundamental information.

4.2.1 Background

In April 2009, the SEC enacted the *Interactive Data to Improve Financial Reporting Rule*, which mandated firms to report their financial statement data using eXtensible Business Reporting Language (XBRL). The XBRL mandate requires firms to tag financial statement elements so that it is easier for the financial statement users to extract, process, and analyze financial data. For example, the SEC highlights the advantages of interactive data in its Final Rule release (SEC, 2009) by stating that "(…) users of financial information will be able to download it directly into spreadsheets, analyze it using commercial off-the-shelf software, or use it within investment models in other software formats. Through interactive data, what is currently static, text-based information can be dynamically searched and analyzed (…)".

Particularly relevant to my study, the mandate requires firms to submit XBRL-formatted 10-Q and 10-K filings by tagging the financial statement items according to the U.S. GAAP taxonomy, but its scope does not cover proxy statements or statements of ownership changes. Consequently, the XBRL mandate decreased the costs of searching for fundamental information but not the costs of searching for information about managers'

reporting incentives. Therefore, I exploit the XBRL adoption setting to study how an exogenous decrease in the costs of fundamental search affects investors' equilibrium search activity, the earnings response coefficient, and misreporting.

One feature of the XBRL mandate rule is that it instituted a phase-in period. Large accelerated filers with an equity float of $5 billion or greater were the first to be subject to the mandate, and they had to comply with the mandate for fiscal periods ending on or after June 15, 2009. All the other large accelerated filers with an equity float of $700 million or greater were the next to be subject to the mandate, and they had to comply with the mandate for fiscal periods ending on or after June 15, 2010. Lastly, all the remaining filers had to comply with the mandate for fiscal periods ending on or after June 15, 2011. I exploit this variation in the timing of the XBRL adoption to conduct a difference-in-differences analysis.

4.2.2 Difference-in-differences Analysis

I exploit the phased-in mandatory XBRL adoption setting and conduct a difference-in-differences analysis to study the effects of a decrease in the costs of searching for fundamental information. I focus on the first phase-in period because this provides the cleanest and arguably the most powerful setting to examine the effects of the XBRL adoption (Blankespoor et al., 2014). In particular, focusing on the first adoption year minimizes any concerns about potential anticipation effects, and maximizes the set of non-treatment firms which can be used to construct a control sample that exhibits the closest match to the treatment sample.

The treatment sample consists of first phase mandatory XBRL adopters with an equity float above $5 billion. To ensure that the sample is comprised solely of mandatory XBRL adopters, I retain firms whose first XBRL filing was filed for the first fiscal period ending on or after June 15, 2009, and whose investors had access to the XBRL-tagged financial statements for the first time in fiscal year 2009. This yields the treatment sample of 246 firms, which I match with the control sample based on industry and size. The control sample is chosen from the set of firms that do not adopt XBRL until the fiscal period ending on or after June 15, 2010. I follow Blankespoor et al. (2014) and count the number of firms from the treatment sample for each industry (defined using two-digit SIC classification). I then match them to the equivalent number of control sample firms in the same industry, using the largest market value of equity as the selection criteria. In the end, the final sample consists of 1,825 firm-years from 246 mandatory XBRL treatment firms and 246 non-XBRL control firms from fiscal years 2006 to 2009. Table 6 describes the XBRL adoption sample. Panel A of Table 6 provides an industry breakdown of the sample XBRL firms by one-digit SIC industry classification. The results show that sample observations are distributed across several industry groups. Panel B of Table 6 compares firm characteristics across the XBRL treatment sample and the non-XBRL control sample in the XBRL adoption year (i.e., FY 2009). Given that the size of the market float determines the mandatory XBRL requirement, it is not surprising that the treatment sample consists of firms that are larger than the control sample. The difference-in-differences analysis allows me to estimate the effect of the XBRL mandate while controlling for any pre-existing differences between the treatment and control samples.

Table 6
XBRL Adoption: Industry Breakdown and Sample Descriptives

This table describes the sample for the XBRL adoption analysis. Panel A provides an industry breakdown of mandatory XBRL firms by one-digit SIC industry classification. Panel B compares descriptive statistics of mandatory XBRL treatment sample and non-XBRL control sample in the XBRL adoption year (i.e., FY 2009). *Market Float* is the aggregate market value of equity held by non-affiliates as reported in firms' annual financial statements, *Market Value* is the year-end total value of equity, and *Assets* is the year-end total assets, all expressed in millions.

Panel A. Sample Industry Breakdown

one-digit SIC	Industry Name	Number of XBRL firms	Percent of Total
1	Mining and construction	24	9.8%
2	Light manufacturing and chemicals	43	17.5%
3	Heavy manufacturing	63	25.6%
4	Transportation and public utilities	39	15.9%
5	Wholesale and retail trade	19	7.7%
6	Finance, insurance, and real estate	35	14.2%
7	Services	17	6.9%
8	Health services	5	2.0%
9	Public administration and others	1	0.4%
	Total	246	100.0%

Panel B. Sample Descriptives

		XBRL (*Treat*=1)	Non-XBRL (*Treat*=0)
Number of Firms		246	246
Market Float (in millions)	(Mean)	16,659	1,739
	(Median)	9,212	1,482
Market Value (in millions)	(Mean)	19,167	2,638
	(Median)	12,087	2,258
Assets (in millions)	(Mean)	32,040	4,829
	(Median)	14,401	2,368

I first examine how a decrease in the costs of fundamental search affects investors' search activity. The optimal information search equilibrium derived in section 2.5 suggests that a decrease in the costs of fundamental information search induces investors to allocate more time and effort to acquiring fundamental information instead of managerial incentive information. Realistically speaking, one commonsense interpretation of this result is that

investors increase their search for fundamental information relative to managerial incentive information. To test this prediction, I estimate the following regression equation.

$$FundamentalSearchRatio = \beta_1 Treat \times Post + \Gamma Controls + \varepsilon \quad (4)$$

FundamentalSearchRatio is a measure of investors' relative search activity, defined as *FundamentalSearch* divided by the sum of *FundamentalSearch* and *IncentiveSearch* during the year.[22] The mean (median) value of *FundamentalSearchRatio* is 0.72 (0.74). *Treat* is an indicator variable that equals one if the firm is the mandatory XBRL adopter and zero otherwise, and *Post* is an indicator variable that equals one in the XBRL adoption year (i.e., FY 2009) and zero otherwise. I also control for variables that could affect investors' search activity, including firm size (*Size*), book-to-market ratio (*BM*), accounting and stock performances (*Roa, Return*), return volatility (*Retvol*), number of analysts (*NumAnalyst*), institutional ownership (*InstOwnership*), and short-sell interests (*ShortInterest*). Firm and year fixed effects are included to control for unobservable firm characteristics and year effects, and standard errors are clustered by firm.[23]

Panel A of Table 7 presents results from estimating equation (4). In column (1), I present results from estimating the average treatment effect. I find that the treatment firms experience an increase in investors' search for fundamental information relative to managerial incentive information, compared to the control firms, following the XBRL adoption (*t*-stat 3.64). In column (2), I additionally test for parallel trends by replacing the

[22] Note that *IncentiveSearchRatio*, defined as *IncentiveSearch* divided by the sum of *FundamentalSearch* and *IncentiveSearch* during the year, will have coefficient estimates exactly opposite to *FundamentalSearchRatio* when used as the dependent variable.

[23] Throughout the analysis, the main effects on variables *Treat* and *Post* are subsumed by the inclusion of firm and year fixed effects.

Post indicator variable with separate indicators for each fiscal year, using the year immediately preceding the treatment (i.e., FY 2008) as the omitted benchmark year. I find that investors' search for fundamental information relative to managerial incentive information stays more-or-less parallel between the treatment and control firms in the years leading up to the XBRL adoption, followed by an increase in the treatment firms compared to the control firms in the adoption year (*t*-stat 2.42).

Next, I examine if the exogenous decrease in the costs of searching for fundamental information and the resulting change in investors' search activity affect the earnings response coefficient. I predict that as investors increase their search for fundamental information relative to managerial incentive information, they rely less on the reported earnings number and instead put more weight on the additional fundamental information, which results in lower earnings response coefficients. I test this prediction by estimating the following regression equation.

$$AbnRet = \beta_1 Surprise \times Treat \times Post + \beta_2 Surprise + \beta_3 Surprise \times Treat + \beta_4 Surprise \times Post + \beta_5 Treat \times Post + \Gamma Controls + \varepsilon \quad (5)$$

AbnRet is daily abnormal return cumulated over the three trading days surrounding the annual earnings announcement date. *Surprise* is earnings surprise defined as current year's earnings per share minus prior year's earnings per share, deflated by stock price on a trading day prior to the annual earnings announcement date. Variables *Treat* and *Post* are as previously defined. I also control for the known risk factors, namely market beta (*Beta*), firm size (*Size*), and book-to-market ratio (*BM*), and their interactions with the earnings

surprise variable. Firm and year fixed effects are included to control for unobservable firm characteristics and year effects, and standard errors are clustered by firm.

Panel B of Table 7 presents results from estimating equation (5). In column (1), I present results from estimating the average treatment effect. I find that the treatment firms experience a decrease in the earnings response coefficients compared to the control firms following the XBRL adoption (*t*-stat −3.18). In column (2), I additionally test for parallel trends by replacing the *Post* indicator variable with separate indicators for each fiscal year, using the year immediately preceding the treatment (i.e., FY 2008) as the omitted benchmark year. I find a more-or-less parallel trend in the earnings response coefficients between the treatment and control firms in the years leading up to the XBRL adoption, followed by a decrease in the treatment firms compared to the control firms in the adoption year (*t*-stat −3.13). This finding suggests that the decrease in the costs of fundamental information search reduces the earnings response coefficient and thus reduces the valuation benefits of misreporting. This leads to my final analysis that examines how a decrease in the costs of fundamental information search affects misreporting.

In my final analysis, I study how an exogenous decrease in the costs of fundamental search affects misreporting by estimating the following regression equation.

$$Misreporting_{t+1} = \beta_1 Treat \times Post + \Gamma Controls + \varepsilon_{t+1} \quad (6)$$

Misreporting is defined as one of two variables, *Restate* and *Bias*, measured a year after the independent variables are measured. Variables *Treat* and *Post* are as previously defined. I also include the control variables from regression equation (3) to account for the known

determinants of misreporting, firm and year fixed effects to account for unobservable firm characteristics and year effects, and present standard errors clustered by firm.

Panel C of Table 7 presents results from estimating equation (6). In columns (1) and (3), I present results from estimating the average treatment effect. I find that the likelihood of restatements and the amount of earnings restated due to intentional misreporting decrease for the treatment firms compared to the control firms following the XBRL adoption (*t*-stats −1.98 and −1.78). In columns (2) and (4), I additionally test for parallel trends by replacing the *Post* indicator variable with separate indicators for each fiscal year, using the year immediately preceding the treatment (i.e., FY 2008) as the omitted benchmark year. The results show a more-or-less parallel trend in misreporting between the treatment and control firms in the years leading up to the XBRL adoption, followed by a decrease in the treatment firms compared to the control firms in the adoption year (*t*-stats −2.03 and −1.83).[24] Combined, the series of analysis provides evidence consistent with the explanation that a change in the costs of information search affects investors' search activity and managerial reporting decisions.

[24] Relatedly, Kim et al. (2019) also document a negative relation between XBRL adoption and misreporting, where misreporting is measured using absolute discretionary accruals. They argue that the XBRL adoption makes it easier for the investors to monitor the firm, which decreases misreporting. I add to their findings and posit that the change in investors' information search activity and its effect on the valuation benefits of misreporting could have also contributed to the documented decrease in misreporting.

Table 7
XBRL Adoption:
Information Search, Earnings Response Coefficient, and Misreporting

This table presents regression analysis that examines the effect of the XBRL adoption. The sample consists of 1,825 firm-years from 246 mandatory XBRL treatment firms and 246 non-XBRL control firms from fiscal years 2006 to 2009. Panel A estimates the relation between XBRL adoption and investors' search for fundamental information relative to managerial incentive information. *FundamentalSearchRatio* is defined as *FundamentalSearch* divided by the sum of *FundamentalSearch* and *IncentiveSearch* during the year. *Treat* is an indicator variable that equals one if the firm is the mandatory XBRL treatment firm and zero otherwise. *Post* is an indicator variable that equals one in the XBRL adoption year (i.e., FY 2009) and zero otherwise. *I(Year=t)* is an indicator variable that equals one for observations in fiscal year *t* and zero otherwise. Panel B estimates the relation between XBRL adoption and the earnings response coefficient. Panel C estimates the relation between XBRL adoption and misreporting. Firm and year fixed effects are included and standard errors are clustered by firm. *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Panel A. XBRL Adoption and Information Search

Depvar =	*Relative Information Search*	
	FundamentalSearchRatio	*FundamentalSearchRatio*
	(1)	(2)
Treat×Post	0.018***	
	(3.64)	
Treat×I(Year=2009)		0.013**
		(2.42)
Treat×I(Year=2007)		−0.009
		(−1.49)
Treat×I(Year=2006)		−0.006
		(−0.78)
Controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Adjusted R^2	0.84	0.84
N	1,825	1,825

Table 7
XBRL Adoption:
Information Search, Earnings Response Coefficient, and Misreporting (continued)

Panel B. XBRL Adoption and Earnings Response Coefficient

Depvar =	*Returns*	
	AbnRet	*AbnRet*
	(1)	(2)
Surprise×Treat×Post	−0.141***	
	(−3.18)	
Surprise×Treat×I(Year=2009)		−0.140***
		(−3.13)
Surprise×Treat×I(Year=2007)		0.066
		(0.59)
Surprise×Treat×I(Year=2006)		−0.121
		(−1.09)
Controls	Yes	Yes
Main Effects	Yes	Yes
Interaction Effects	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Adjusted R^2	0.04	0.04
N	1,825	1,825

Panel C. XBRL Adoption and Misreporting

Depvar =	*Misreporting*$_{t+1}$			
	Restate$_{t+1}$	*Restate*$_{t+1}$	*Bias*$_{t+1}$	*Bias*$_{t+1}$
	(1)	(2)	(3)	(4)
Treat×Post	−0.016**		−0.153*	
	(−1.98)		(−1.78)	
Treat×I(Year=2009)		−0.016**		−0.159*
		(−2.03)		(−1.83)
Treat×I(Year=2007)		−0.000		−0.006
		(−0.23)		(−0.23)
Treat×I(Year=2006)		−0.000		−0.013
		(−0.19)		(−0.46)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.47	0.11	0.47	0.10
N	1,825	1,825	1,825	1,825

CHAPTER 5: CONCLUSION

In this paper, I study how investors' search for different types of information affects managers' equilibrium financial reporting choices. I distinguish investors' search for information about firm fundamentals from their search for information about managerial incentives, and study their effects on the managers' reporting decisions using a parsimonious model of misreporting. The model predicts that fundamental search decreases valuation benefits of misreporting and results in less misreporting, whereas incentive search increases valuation benefits of misreporting and results in more misreporting.

I test my predictions using a novel empirical technique for classifying EDGAR downloads as fundamental search or incentive search based on the type of filings investors download. In particular, I use EDGAR downloads of quarterly and annual financial statements to capture fundamental search activity, and EDGAR downloads of proxy statements and statements of ownership changes to capture incentive search activity. Consistent with the predictions of my model, I find that both fundamental and incentive search are positively associated with price efficiency, but that fundamental (incentive) search is negatively (positively) related to the earnings response coefficient and intentional restatements.

I also consider investors' endogenous decisions to search for different types of information by examining how an exogenous shock to the costs of fundamental search affects their search activity and managerial reporting decisions. I exploit the mandatory XBRL adoption as a setting that exogenously reduced the costs of searching for

fundamental information. Using a difference-in-differences research design, I predict and find that the treatment firms subject to the XBRL mandate experience an increase in investors' search for fundamental information relative to managerial incentive information, a decrease in the earnings response coefficient, and a decrease in misreporting, compared to the non-XBRL control firms.

Collectively, my findings theoretically and empirically link investors' information search activity to the valuation benefits associated with misreporting, and show that information search activity has broad implications beyond capital market outcomes and can also affect reporting decisions. Moreover, I predict and find that the relation between information search and misreporting depends on the type of information investors' are searching for. This finding suggests that distinguishing search for different types of information leads to a richer and more nuanced set of empirical predictions than the standard empirical approach that treats all types of information search as a single construct. In this regard, my findings provide a more nuanced view of how information search affects capital markets and managers' reporting decisions.

Appendix A
A Model of Information Search and Misreporting

A.1 Setup

In this section, I introduce a simple model of information search and misreporting that builds on Fischer and Verrecchia (2000) and Fischer and Stocken (2004). There are three players in the model: the manager, the speculator, and the market maker. I assume that the true firm value $\tilde{v}$ is normally distributed with mean 0 and precision s_v ($\tilde{v} \sim N(0, \frac{1}{s_v})$). The manager privately observes $\tilde{v} = v$ and discloses an earnings report r, subject to manipulation. The manager exercises discretion over the extent to which reported earnings (r) diverge from true earnings (v) in order to influence short-term stock prices. The difference represents misreporting or the amount of bias the manager introduces into the earnings report. The manager's cost of misreporting equals $\frac{(r-v-m)^2}{2}$, where $\tilde{m}$ represents the manager's reporting incentives unknown to the outsiders and privately observed by the manager (see Dye and Sridhar, 2008, for a similar setup).[25] For example, Fischer and Verrecchia (2000) explain that "*at any point in time, the market does not know the precise nature of the manager's compensation; the manager's time horizon; the manager's rate of time preference and degree of risk-aversion; the manager's psychic costs associated with bias, the manager's perceptions of litigation risks and reputation costs associated with bias; or the level of effort or resources the manager must expend to achieve a workable bias scheme*". I assume that $\tilde{m}$ is normally distributed with mean $\mu > 0$ and precision s_m ($\tilde{m} \sim N(\mu, \frac{1}{s_m})$).

The speculator obtains additional information about the firm and about the manager through his information search. The speculator can obtain information about the firm's fundamental value, $\tilde{x} = \tilde{v} + \tilde{e}_x$, where $\tilde{e}_x \sim N(0, \frac{1}{s_x})$. Higher values of s_x imply more active search for information about the firm's fundamental value. The speculator can also obtain information about the manager's reporting incentives, $\tilde{y} = \tilde{m} + \tilde{e}_y$, where $\tilde{e}_y \sim N(0, \frac{1}{s_y})$. Higher values of s_y imply more active search for information about the manager's reporting incentives. Once the manager issues the earnings report, the risk-neutral speculator submits a utility-maximizing demand order of d_s based on his additional information and the earnings report.

When the speculator submits his demand order, the market maker prices the firm at the expected value, conditional on the aggregate demand ($D = d_s + l$, where $\tilde{l} \sim N(0, \frac{1}{s_l})$ represents noise trade) and the earnings report (r). Thus, $P = E[\tilde{v}|D, r]$.

[25] The underlying assumption is that $r - v - m > 0$, which is satisfied in equilibrium.

A.2 Conjectured Equilibrium

Based on the setup, one can express the conjectured equilibrium for the earnings (r), the speculator's demand (d_s) and the stock price (P) as follows:

$$r = r_0 + r_v v + r_m m, \tag{A.1}$$
$$d_s = d_0 + d_x x + d_y y + d_r r, \tag{A.2}$$
$$P = E[\tilde{v}|D, r] = p^o + p^D D + p^r r. \tag{A.3}$$

I use the conjectured equilibrium to derive parameters that characterize the unique equilibrium.

A.3 The Manager

The manager observes v and m and chooses r that maximizes her objective function based on her conjectures about D and P. Her maximization problem can be expressed as follows:

$$\max_{\{r\}} P - \frac{(r-v-m)^2}{2}. \tag{A.4}$$

Solving for r, the equilibrium earnings report is $r = r_0 + r_v v + r_m m$, where $r_0 = p^D d_r + p^r$, $r_v = 1$, and $r_m = 1$ (i.e., $r = p^D d_r + p^r + v + m$).

A.4 The Speculator

The speculator chooses d_s that maximizes his objective function based on the earnings report (r), the additional information signals (x, y), and the conjectured pricing function. His maximization problem can be expressed as follows:

$$\max_{\{d_s\}} E[d_s(v - P)|r, x, y; P]. \tag{A.5}$$

Substituting in the conjectures for the pricing functions (P), the speculator's maximization problem now becomes:

$$\max_{\{d_s\}} d_s(E[v|r, x, y] - p^o - p^r r) - d_s^2 p^D, \tag{A.6}$$

where

$$E[v|r, x, y] = \frac{s_m + s_y}{s_m + s_v + s_x + s_y}\left(r - (p^D d_r + p^r + \mu)\right)$$

$$+\frac{s_x}{s_m+s_v+s_x+s_y}x-\frac{s_y}{s_m+s_v+s_x+s_y}(y-\mu). \tag{A.7}$$

Assuming that $p^D > 0$ (I later show that this assumption is satisfied in equilibrium), I can solve for d_s to get $d_s = d_0 + d_x x + d_y y + d_r r$, where

$$d_0 = (-p^o - \frac{s_m+s_y}{s_m+s_v+s_x+s_y}(p^D d_r + p^r + \mu) + \frac{s_y}{s_m+s_v+s_x+s_y}\mu)\frac{1}{2p^D}, \tag{A.8}$$

$$d_x = \frac{s_x}{s_m+s_v+s_x+s_y}\frac{1}{2p^D}, \tag{A.9}$$

$$d_y = -\frac{s_y}{s_m+s_v+s_x+s_y}\frac{1}{2p^D}, \tag{A.10}$$

$$d_r = (\frac{s_m+s_y}{s_m+s_v+s_x+s_y} - p^r)\frac{1}{2p^D}. \tag{A.11}$$

A.5 The Market Maker

The market maker prices the firm conditional on the information conveyed through the aggregate demand (D) and the earnings report (r) as follows:

$$P = E[\tilde{v}|D, r] = p^o + p^D D + p^r r, \tag{A.12}$$

where

$$p^o = -p^D(d_0 + d_y\mu + d_r(p^D d_r + p^r + \mu)) - p^r(p^D d_r + p^r + \mu), \tag{A.13}$$

$$p^D = \frac{s_l s_x s_y (d_x - d_y)}{t}, \tag{A.14}$$

$$p^r = \frac{s_m s_x s_y + s_l s_m (d_x^2 s_y + d_y^2 s_x) + (d_y + d_r)(d_y - d_x) s_l s_x s_y}{t}, \tag{A.15}$$

$$t = (s_m + s_v)s_x s_y + s_l s_y s_x((d_x - d_y)^2 + \left(\frac{s_m+s_v}{s_x}\right)d_x^2 + \left(\frac{s_m+s_v}{s_y}\right)d_y^2) > 0. \tag{A.16}$$

A.6 Unique Equilibrium

In this section, I characterize the unique equilibrium which I describe in Proposition 1. Substituting in the expression for t, and re-expressing d_x,d_y, d_r, p^D, p^r,d_0, and p^o, the unique equilibrium is characterized by the following parameters:

$$d_x = \sqrt{\frac{1}{s_l}s_x^2\frac{s_m+s_v}{(s_x+s_y)(s_m+s_v+s_x+s_y)}} = \frac{1}{s_l}\frac{s_x}{s_x+s_y}\frac{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}{s_m+s_v+s_x+s_y}, \tag{A.17}$$

$$d_y = -\sqrt{\frac{1}{s_l}s_y^2\frac{s_m+s_v}{(s_x+s_y)(s_m+s_v+s_x+s_y)}} = -\frac{1}{s_l}\frac{s_y}{s_x+s_y}\frac{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}{s_m+s_v+s_x+s_y}, \tag{A.18}$$

$$d_r = \frac{-s_m s_x + s_v s_y}{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}, \tag{A.19}$$

$$p^D = \frac{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}{2(s_m+s_v)(s_m+s_v+s_x+s_y)}, \tag{A.20}$$

$$p^r = \frac{s_m}{s_m+s_v}, \tag{A.21}$$

$$d_0 = \frac{2s_m(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)\mu+(s_m s_x-s_v s_y)(2s_m^2+2s_m s_v+2s_m s_y+s_m s_x+s_v s_y)}{2(s_m+s_v)\sqrt{(s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y))(s_m+s_v+s_x+s_y)}}, \tag{A.22}$$

$$p^o = -\frac{2s_m(s_m+s_v)(s_m+s_v+s_x+s_y)\mu+s_m(2s_m s_v+2s_m s_y+2s_m^2+s_m s_x+s_v s_y)}{2(s_m+s_v)^2(s_m+s_v+s_x+s_y)}. \tag{A.23}$$

A.7 Analysis when Information Search is Exogenous

In this section, I study the effects of each type of information search on the earnings response coefficient (ERC; β) and on misreporting ($E[b]$), assuming that the intensity of information search is exogenous. The analysis that follows is summarized in Proposition 2.[26] I begin my analysis by verifying that both types of information search indeed enhance the investors' informedness and reduce the residual uncertainty about firm value. To do so, I study how the two types of information search affect price efficiency (informativeness; δ). I define price efficiency as the inverse of the posterior variance of the market maker's beliefs about firm value. This definition of price efficiency is tied to the residual uncertainty about the firm's value, where lower residual uncertainty implies greater price efficiency. Substituting in the equilibrium parameters, price efficiency (δ) can be expressed as follows:

$$\delta = \frac{1}{Var[v|r,D]} = \frac{2(s_m+s_v)(s_m+s_v+s_x+s_y)}{2s_m+2s_v+s_x+s_y}. \tag{A.24}$$

Differentiating the expression (A.24) with respect to information search about firm fundamentals (s_x) and with respect to information search about the manager's incentives (s_y), I get the following comparative statics results:

$$\frac{d\delta}{ds_x} = \frac{2(s_m+s_v)^2}{(2s_m+2s_v+s_x+s_y)^2} > 0, \tag{A.25}$$

$$\frac{d\delta}{ds_y} = \frac{2(s_m+s_v)^2}{(2s_m+2s_v+s_x+s_y)^2} > 0. \tag{A.26}$$

This result suggests that both search for information about fundamental firm value and search for information about the manager's incentives help investors better estimate the true firm value by augmenting the earnings report and reducing residual uncertainty.

Having verified that information search enhances investors' informedness, I next examine how each type of information search affects the earnings response coefficient. The earnings response coefficient captures the stock price sensitivity to the earnings report r.

[26] The comparative statics results presented in Proposition 2 continue to hold when I instead model the manager's utility function as: $\tilde{m}P - \frac{(r-v)^2}{2}$. The derivations are available upon request.

The expression for the equilibrium stock price shows that the reported earnings affect stock price in two ways, first indirectly through the speculators' demand ($p^D d_r$), and next directly through the market maker's pricing (p^r). Combined, the earnings response coefficient (β) can be expressed as follows:

$$\beta = p^D d_r + p^r = \frac{(2s_m^2+2s_m s_v+s_m s_x+2s_m s_y+s_v s_y)}{2(s_m+s_v)(s_m+s_v+s_x+s_y)}. \quad \text{(A.27)}$$

Differentiating the expression (A.27) with respect to information search about firm fundamentals (s_x) and with respect to information search about the manager's incentives (s_y), I get the following comparative statics results:

$$\frac{d\beta}{ds_x} = -\frac{1}{2}\frac{(s_m+s_y)}{(s_m+s_v+s_x+s_y)^2} < 0, \quad \text{(A.28)}$$

$$\frac{d\beta}{ds_y} = \frac{1}{2}\frac{(s_v+s_x)}{(s_m+s_v+s_x+s_y)^2} > 0. \quad \text{(A.29)}$$

The comparative statics results suggest that ERC decreases as s_x increases and that ERC increases as s_y increases.

As a final step, I repeat the analysis for misreporting. The expected magnitude of misreporting in equilibrium equals $E[r-v]$, which can be expressed as follows:

$$E[b] = p^D d_r + p^r + \mu = \frac{(2s_m^2+2s_m s_v+s_m s_x+2s_m s_y+s_v s_y)}{2(s_m+s_v)(s_m+s_v+s_x+s_y)} + \mu. \quad \text{(A.30)}$$

Differentiating the expression (A.30) with respect to information search about firm fundamentals (s_x) and with respect to information search about the manager's incentives (s_y), I get the following comparative statics results:

$$\frac{dE[b]}{ds_x} = -\frac{1}{2}\frac{(s_m+s_y)}{(s_m+s_v+s_x+s_y)^2} < 0, \quad \text{(A.31)}$$

$$\frac{dE[b]}{ds_y} = \frac{1}{2}\frac{(s_v+s_x)}{(s_m+s_v+s_x+s_y)^2} > 0. \quad \text{(A.32)}$$

The comparative statics results suggest that misreporting decreases as s_x increases and that it increases as s_y increases. The two types of information search have contrasting effects on misreporting due to the opposite effects they have on the earnings response coefficients. On the one hand, when the speculator acquires more information about firm fundamentals, he relies less on the reported earnings number and instead puts more weight on the additional information that he has acquired. As a consequence, information search activity related to firm fundamentals reduces the earnings response coefficient, which then reduces the valuation benefits of misreporting. This, in turn, reduces the amount of misreporting in equilibrium. On the other hand, when the speculator acquires more information about the manager's incentives, the information content of the earnings report as captured by the

earnings response coefficient increases. The intuition for this result is that when the speculator has a better understanding of the incentive structure that generated the earnings report, he is able to better anticipate potential bias in the earnings and back it out, which increases the informativeness of the earnings report (e.g., Stein, 1989; Fischer and Verrecchia, 2000). The higher earnings response coefficient then increases the valuation benefits of misreporting which, in turn, increases the amount of misreporting in equilibrium. Thus, information search activity related to incentives increases the valuation benefits of misreporting, and results in more misreporting.

A.8 Analysis when Information Search is Exogenous with a Composite Information Signal

In this section, I repeat the analysis from the previous sections, now assuming that a composite information signal (z) exists, instead of two independent information signals (x and y). In other words, $\tilde{z} = \alpha\tilde{v} + (1-\alpha)\tilde{m} + \tilde{e}_z$, where $0 < \alpha < 1$ and $\tilde{e}_z \sim N(0, \frac{1}{s_z})$. To focus on the relative informativeness of the signal z, I only consider cases where $\alpha \neq \frac{1}{2}$. Effectively, α captures the extent to which the information signal is relatively more informative about true firm fundamentals (v) than about managerial incentives (m).

A.8.1 Setup with a Composite Information Signal

The setup with a composite information signal is the same as in previous sections unless otherwise specified. With the composite information signal z, the conjectured linear equilibrium for the earnings report (r_z), the speculator's demand (d_s^z), and the stock price (P_z) can be expressed as follows.

$$r_z = r_0^z + r_v^z v + r_m^z m, \quad \text{(A.33)}$$
$$d_s^z = d_0^z + d_z z + d_r^z r_z, \quad \text{(A.34)}$$
$$P_z = p_z^o + p_z^D D_z + p_z^r r_z. \quad \text{(A.35)}$$

Variables v and m are as previously defined, and D_z represents the aggregate demand with a composite information signal z (i.e., $D_z = d_s^z + l$, where $\tilde{l} \sim N(0, \frac{1}{s_l})$ represents noise trade).

Following similar steps as in previous sections, the manager's maximization problem can be described as:

$$\max_{\{r_z\}} P_z - \frac{(r_z - v - m)^2}{2}. \quad \text{(A.36)}$$

Solving for the manager's maximization problem, the equilibrium earnings report can be expressed as $r_z = p_z^D d_r^z + p_z^r + v + m$, meaning $r_0^z = p_z^D d_r^z + p_z^r$, $r_v^z = 1$, and $r_m^z = 1$.

The speculator on the other hand solves for the following maximization problem:

$$\max_{\{d_s^z\}} E[d_s^z(v - P_z)|r_z, z; P_z], \tag{A.37}$$

or

$$\max_{\{d_s^z\}} d_s^z(E[v|r_z, z] - p_z^o - p_z^r r) - p_z^D(d_s^z)^2, \tag{A.38}$$

where $E[v|r_z, z] = \frac{1}{4s_z\alpha^2 - 4s_z\alpha + s_m + s_v + s_z}((2s_z\alpha^2 - 3s_z\alpha + s_m + s_z)(r_z - \mu - p_z^D d_r^z - p_z^r) + s_z(2\alpha - 1)(z - (1 - \alpha)\mu))$.

Assuming that $p_z^D > 0$ (later I show that this is true in equilibrium), I can express d_s^z as $d_s^z = d_0^z + d_z z + d_r^z r$, where

$$d_0^z = \frac{1}{2p_z^D}\left(-p_z^o - \frac{(s_z(\alpha-1)(2\alpha-1)+s_m)(\mu + p_z^D d_r^z + p_z^r) + s_z(2\alpha-1)(1-\alpha)\mu}{s_z(2\alpha-1)^2 + s_m + s_v}\right), \tag{A.39}$$

$$d_z = \frac{1}{2p_z^D}\frac{s_z(2\alpha-1)}{s_z(2\alpha-1)^2 + s_m + s_v}, \tag{A.40}$$

$$d_r^z = \frac{1}{2p_z^D}\left(\frac{s_z(\alpha-1)(2\alpha-1)+s_m}{s_z(2\alpha-1)^2 + s_m + s_v} - p_z^r\right). \tag{A.41}$$

Finally, the market maker sets the stock price at:

$$P_z = E[v|D_z, r_z] = p_z^o + p_z^D D_z + p_z^r r_z, \tag{A.42}$$

where

$$p_z^o = -p_z^D\left(d_0^z + d_z(1-\alpha)\mu + d_r(\mu + p_z^D d_r^z + p_z^r)\right) - p_z^r(\mu + p_z^D d_r^z + p_z^r), \tag{A.43}$$

$$p_z^D = \frac{d_z s_l s_z(2\alpha-1)}{t_z}, \tag{A.44}$$

$$p_z^r = \frac{s_m s_z + d_z^2 s_l\left(s_m + s_z(\alpha-1)(2\alpha-1)\right) + d_r^z d_z s_l s_z(1-2\alpha)}{t_z}, \tag{A.45}$$

$$t_z = (d_z^2 s_l(2\alpha-1)^2 + s_m + s_v)s_z + d_z^2 s_l(s_m + s_v) > 0. \tag{A.46}$$

A.8.2 Equilibrium with a Composite Information Signal

Based on the setup I solve for the equilibrium, which yields the following equilibrium parameters.

$$\begin{aligned} d_z &= \frac{s_z(s_m+s_v)}{\sqrt{s_l s_z(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)}}, \text{ when } \alpha > \tfrac{1}{2}, \\ &= \frac{-s_z(s_m+s_v)}{\sqrt{s_l s_z(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)}}, \text{ when } \alpha < \tfrac{1}{2}, \end{aligned} \tag{A.47}$$

$$\begin{aligned} d_r^z &= \frac{-s_z(s_v(1-\alpha)+\alpha s_m)}{\sqrt{s_l s_z(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)}}, \text{ when } \alpha > \tfrac{1}{2}, \\ &= \frac{s_z(s_v(1-\alpha)+\alpha s_m)}{\sqrt{s_l s_z(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)}}, \text{ when } \alpha < \tfrac{1}{2}, \end{aligned} \tag{A.48}$$

$$p_z^D = \left|\frac{(2\alpha-1)\sqrt{s_l s_z(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)}}{2(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)}\right|, \quad \text{(A.49)}$$

$$p_z^r = \frac{s_m}{s_m+s_v}. \quad \text{(A.50)}$$

Note that $p_z^D > 0$ in equilibrium as assumed earlier.

A.8.3 Comparative Statics with a Composite Information Signal

As a final step, I conduct comparative statics analyses to examine the effect of information search on price efficiency (δ_z), earnings response coefficient (β_z), and misreporting ($E[b_z]$). These results are summarized in Proposition 3.

First, price efficiency (δ_z) can be expressed as:

$$\delta_z = \frac{1}{Var[v|D_z, r_z]} = \frac{8\alpha^2 s_z s_m+8\alpha^2 s_z s_v-8\alpha s_z s_m-8\alpha s_z s_v+2s_m^2+4s_m s_v+2s_z s_m+2s_v^2+2s_z s_v}{4s_z\alpha^2-4s_z\alpha+2s_m+2s_v+s_z}. \quad \text{(A.51)}$$

Differentiating price efficiency (δ_z) with respect to information search (s_z) yields the following comparative statics results:

$$\frac{d\delta_z}{ds_z} = \frac{2(2\alpha-1)^2(s_m+s_v)^2}{(4s_z\alpha^2-4s_z\alpha+2s_m+2s_v+s_z)^2} > 0. \quad \text{(A.52)}$$

Thus, information search always improves price efficiency when the information signal is a composite signal.

Next, earnings response coefficient (β_z) can be expressed as:

$$\beta_z = p_z^D d_r^z + p_r^z = \frac{(2s_m^2+2s_m s_v+2s_m s_z+s_v s_z+6\alpha^2 s_m s_z+2\alpha^2 s_v s_z-7\alpha s_m s_z-3\alpha s_v s_z}{2(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)}. \quad \text{(A.53)}$$

Differentiating earnings response coefficients (β_z) with respect to information search (s_z) yields the following comparative statics results:

$$\frac{d\beta_z}{ds_z} = -\frac{1}{2}(2\alpha-1)\frac{(1-\alpha)s_v+\alpha s_m}{(s_z(2\alpha-1)^2+s_m+s_v)^2}. \quad \text{(A.54)}$$

Thus, the effect of information search on the earnings response coefficient when the information signal is a composite signal depends on the value of α. In particular, if $\alpha > \frac{1}{2}$ and z is relatively more informative about fundamental firm value (v) than about managerial incentives (m), then the earnings response coefficient decreases as the speculator acquires a more precise information signal z through his search activity. On the other hand, if $\alpha < \frac{1}{2}$ and z is relatively more informative about managerial incentives (m) than about fundamental firm value (v), then the earnings response coefficient increases as the speculator acquires a more precise information signal z through his search activity.

Similarly, average misreporting ($E[b_z]$) can be expressed as:

$$E[b_z] = p_z^D d_r^z + p_z^r + \mu$$
$$= \frac{(2s_m^2+2s_m s_v+2s_m s_z+s_v s_z+6\alpha^2 s_m s_z+2\alpha^2 s_v s_z-7\alpha s_m s_z-3\alpha s_v s_z}{2(s_m+s_v)(s_z(2\alpha-1)^2+s_m+s_v)} + \mu. \quad \text{(A.55)}$$

Comparative statics analysis on expected misreporting ($E[b_z]$) with respect to information search (s_z) shows that

$$\frac{dE[b_z]}{ds_z} = -\frac{1}{2}(2\alpha-1)\frac{(1-\alpha)s_v+\alpha s_m}{(s_z(2\alpha-1)^2+s_m+s_v)^2}. \quad \text{(A.56)}$$

Thus, if z is relatively more informative about fundamental firm value (v) than about managerial incentives (m) (i.e., $\alpha > \frac{1}{2}$), then misreporting decreases as the speculator acquires a more precise information signal z through his search activity. On the other hand, if z is relatively more informative about managerial incentives (m) than about fundamental firm value (v) (i.e., $\alpha > \frac{1}{2}$), then misreporting increases as the speculator acquires a more precise information signal z through his search activity. Collectively, the comparative statics results with a composite information signal are in line with the results with two independent information signals about firm fundamentals and managerial incentives. In other words, the effect of information search on the earnings response coefficient and misreporting depends on the composite information signal's *relative* informativeness about firm fundamentals versus managerial incentives.

A.9 Analysis when Information Search is Endogenous

In this section, I repeat the analysis from section *A.7*, now assuming that the intensity of information search is endogenous. I perform this analysis in three steps. First, I derive the speculator's ex-ante expected utility (profit). Second, I derive the speculator's optimal choice of s_x and s_y that maximizes his expected utility subject to a resource constraint. Lastly, I conduct comparative statics analysis to study how exogenous variables in the model affect the earnings response coefficient and misreporting through their effects on optimal s_x and s_y.

A.9.1 Speculator's Expected Utility (Expected Profit)

I begin by calculating the risk-neutral speculator's ex-ante expected utility (profit; $E[U]$) as follows:

$$E[U]$$
$$= E[d_s(v-P)]$$
$$= E\left[\left(d^0 + d_x x + d_y y + d_r r\right)\left(v - p^o - p^D\left(\left(d^0 + d_x x + d_y y + d_r r\right) + l\right) - p^r r\right)\right]$$

$$
\begin{aligned}
&= d^0\left(-p^o - p^D\left(d^0 + d_y\mu + d_r(p^D d_r + p^r + \mu)\right) - p^r(p^D d_r + p^r + \mu)\right) \\
&\quad + d_x\left(\frac{1}{s_v} - p^D d_x\left(\frac{1}{s_v} + \frac{1}{s_x}\right) - p^D d_r \frac{1}{s_v} - p^r \frac{1}{s_v}\right) \\
&\quad + d_y(-p^o\mu - p^D d^0\mu - p^D d_y\left(\frac{1}{s_m} + \frac{1}{s_y} + \mu^2\right) - p^D d_r\left(\frac{1}{s_m} + \mu(p^D d_r + p^r + \mu)\right) \\
&\quad - p^r\left(\frac{1}{s_m} + \mu(p^D d_r + p^r + \mu)\right)) \\
&\quad + d_r(\frac{1}{s_v} - p^o(p^D d_r + p^r + \mu) - p^D d_0(p^D d_r + p^r + \mu) - p^D d_x \frac{1}{s_v} \\
&\quad - p^D d_y(\frac{1}{s_m} + \mu(p^D d_r + p^r + \mu)) - p^D d_r(\frac{1}{s_v} + \frac{1}{s_m} + (p^D d_r + p^r + \mu)^2) \\
&\quad - p^r(\frac{1}{s_v} + \frac{1}{s_m} + (p^D d_r + p^r + \mu)^2)) \\
&= \frac{1}{2}\frac{s_x + s_y}{\sqrt{s_l(s_m + s_v)(s_x + s_y)(s_m + s_v + s_x + s_y)}}.
\end{aligned} \tag{A.57}
$$

Note that the speculator's expected utility is increasing in the precision of his private information (s_x, s_y), decreasing in the ex-ante precision of fundamental firm value (s_v), and decreasing in the ex-ante precision of the manager's reporting incentives (s_m). This is because more precise private information gives an informational advantage to the speculator, while higher ex-ante precision about firm fundamentals or about the manager's incentives erodes his informational advantage. Also note that the speculator's expected utility is decreasing in the precision of the noise trade (s_l). This is because higher precision of noise trades makes it more difficult for the speculator to trade without revealing his private information. The formal comparative statics results on the speculator's expected utility are presented below:

$$
\frac{dE[U]}{ds_x} = \frac{1}{4s_l(s_x + s_y)}\frac{\sqrt{s_l(s_m + s_v)(s_x + s_y)(s_m + s_v + s_x + s_y)}}{(s_m + s_v + s_x + s_y)^2} > 0, \tag{A.58}
$$

$$
\frac{dE[U]}{ds_y} = \frac{1}{4s_l(s_x + s_y)}\frac{\sqrt{s_l(s_m + s_v)(s_x + s_y)(s_m + s_v + s_x + s_y)}}{(s_m + s_v + s_x + s_y)^2} > 0, \tag{A.59}
$$

$$
\frac{dE[U]}{ds_v} = -\frac{1}{4}s_l(s_x + s_y)^2\frac{2s_m + 2s_v + s_x + s_y}{\left(s_l(s_m + s_v)(s_x + s_y)(s_m + s_v + s_x + s_y)\right)^{\frac{3}{2}}} < 0, \tag{A.60}
$$

$$
\frac{dE[U]}{ds_m} = -\frac{1}{4}s_l(s_x + s_y)^2\frac{2s_m + 2s_v + s_x + s_y}{\left(s_l(s_m + s_v)(s_x + s_y)(s_m + s_v + s_x + s_y)\right)^{\frac{3}{2}}} < 0, \tag{A.61}
$$

$$
\frac{dE[U]}{ds_l} = -\frac{1}{4}(s_m + s_v)\frac{(s_x + s_y)^2(s_m + s_v + s_x + s_y)}{\left(s_l(s_m + s_v)(s_x + s_y)(s_m + s_v + s_x + s_y)\right)^{\frac{3}{2}}} < 0. \tag{A.62}
$$

A.9.2 The Optimal Choice of s_x and s_y

Next, I derive the speculator's optimal choice of s_x and s_y. From the earlier analysis, I know that the speculator's ex-ante expected utility can be expressed as $\frac{1}{2}\frac{s_x+s_y}{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}$. I assume that the speculator chooses s_x and s_y that maximizes his expected utility subject to a resource constraint $c_x s_x^2 + c_y s_y^2 \leq R$. c_x represents the costs of acquiring fundamental information, c_y represents the costs of acquiring information about the manager's reporting incentives, and R represents available resources ($c_x, c_y, R > 0$). In equilibrium, the resource constraint will be binding (i.e., $c_x {s_x}^2 + c_y {s_y}^2 = R$) because the speculator's expected utility is increasing in s_x and in s_y. Using the Lagrange multiplier method, I solve the maximization problem as follows[27]:

$$L = \frac{1}{2}\frac{s_x+s_y}{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}} + \lambda\left(R - c_x s_x^2 - c_y s_y^2\right). \tag{A.63}$$

$$\frac{dL}{ds_x} = \frac{1}{4s_l(s_x+s_y)}\frac{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}{(s_m+s_v+s_x+s_y)^2} - 2c_x s_x \lambda = 0, \tag{A.64}$$

$$\frac{dL}{ds_y} = \frac{1}{4s_l(s_x+s_y)}\frac{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}{(s_m+s_v+s_x+s_y)^2} - 2c_y s_y \lambda = 0, \tag{A.65}$$

$$\frac{dL}{d\lambda} = R - c_x s_x^2 - c_y s_y^2 = 0. \tag{A.66}$$

From equation (A.64) and (A.65), one can show that $\lambda = \frac{K}{2c_x s_x} = \frac{K}{2c_y s_y}$, where $K = \frac{1}{4s_l(s_x+s_y)}\frac{\sqrt{s_l(s_m+s_v)(s_x+s_y)(s_m+s_v+s_x+s_y)}}{(s_m+s_v+s_x+s_y)^2}$. Thus it can be inferred that $s_y = \frac{c_x}{c_y}s_x$ in equilibrium. Substituting this into equation (A.66), the optimal s_x (s_x^*) can be expressed as follows:

$$s_x^* = \sqrt{\frac{c_y R}{c_x(c_x+c_y)}}, \tag{A.67}$$

and the optimal s_y (s_y^*) can be expressed as follows:

[27] It is worthwhile to note that while I use the Lagrange multiplier method, one can also approach this maximization problem graphically, in a two-dimensional plot with s_x as the horizontal axis and s_y as the vertical axis. From equation (A.57), one can see that s_x and s_y are perfect substitutes when it comes to the speculator's expected utility. Thus, the speculator's "indifference curve" can be expressed as a straight line with a slope of -1, and the constraint can be expressed as an ellipse whose shape depends on c_x, c_y, and R. The optimal solution that maximizes the speculator's expected utility will be determined at the tangent point in the upper-right quadrant where the ellipse and the straight line meets. This suggests that the functional form of the constraint is important in deriving the optimal solution, and a change in its functional form could lead to a different solution.

$$s_y^* = \sqrt{\frac{c_x R}{c_y(c_x+c_y)}}. \tag{A.68}$$

A.9.3 Comparative Statics when Information Search is Endogenous

Having derived the speculator's optimal choice of s_x and s_y, I next examine how changes in R, c_x, and c_y affect the speculator's optimal information search (s_x^*, s_y^*), the earnings response coefficient (β), and misreporting ($E[b]$). Proposition 4 summarizes the analysis that follows.

I first differentiate equation (A.67) with respect to R, c_x, and c_y to show that the speculator's optimal search for fundamental information (s_x^*) is increasing in the resources available (R), decreasing in the costs of acquiring information about firm fundamentals (c_x), and increasing in the costs of acquiring information about the manager's reporting incentives (c_y).

$$\frac{ds_x^*}{dR} = \frac{1}{2c_x}\frac{c_y}{(c_x+c_y)\sqrt{\frac{R}{c_x}\left(\frac{c_y}{c_x+c_y}\right)}} > 0, \tag{A.69}$$

$$\frac{ds_x^*}{dc_x} = -\frac{1}{2}\frac{R}{c_x^2}c_y\frac{2c_x+c_y}{(c_x+c_y)^2\sqrt{\frac{R}{c_x}\left(\frac{c_y}{c_x+c_y}\right)}} < 0, \tag{A.70}$$

$$\frac{ds_x^*}{dc_y} = \frac{1}{2}\frac{R}{(c_x+c_y)^2\sqrt{\frac{R}{c_x}\left(\frac{c_y}{c_x+c_y}\right)}} > 0. \tag{A.71}$$

Similarly, differentiating equation (A.68) with respect to R, c_x, and c_y show that the speculator's optimal search for incentive information (s_y^*) is increasing the resources available (R), increasing in the costs of acquiring information about firm fundamentals (c_x), and decreasing in the costs of acquiring information about the manager's reporting incentives (c_y). (i.e., $\frac{ds_y^*}{dR} > 0, \frac{ds_y^*}{dc_x} > 0, \frac{ds_y^*}{dc_y} < 0$). This suggests that more search resources induce the speculator to search for more information of either type, but within a given set of resources, he acquires more of the less costly information type.

Next, I substitute equations (A.67) and (A.68) into equation (A.27) to express the earnings response coefficient as a function of the exogenous variables. I then derive the following comparative statics:

$$\frac{d\beta}{dR} = \frac{c_x(c_x s_v - c_y s_m)K}{4R(c_x s_m + c_x s_v + c_x K + c_y K)^2} \gtreqless 0, \tag{A.72}$$

$$\frac{d\beta}{dc_x} = \frac{2Rc_x + c_y^2 s_m K + 2c_x c_y s_m K + c_x c_y s_v K}{4(c_x+c_y)(c_x s_m + c_x s_v + c_x K + c_y K)^2} > 0, \tag{A.73}$$

$$\frac{d\beta}{dc_y} = -\frac{2Rc_x^2+c_x^2c_ys_mK+c_x^3s_vK+2c_x^2c_ys_vK}{4c_y(c_x+c_y)(c_xs_m+c_xs_v+c_xK+c_yK)^2} < 0, \quad \text{(A.74)}$$

$$\text{where } K = \sqrt{R\left(\frac{c_x}{c_y(c_x+c_y)}\right)}. \quad \text{(A.75)}$$

Three observations can be made. First, when the resource for information search (R) increases, it has an ambiguous effect on the earnings response coefficient.[28] This is because an increase in the resources increases both types of information search, which have countervailing effects on the earnings response coefficient.

Second, when the cost of acquiring fundamental information (c_x) increases, earnings response coefficient increases. This is because an increase in c_x induces the speculator to allocate more time and effort to acquiring managerial incentive information instead of fundamental information. As a result, the earnings response coefficient increases.

Third, when the cost of acquiring incentive information (c_y) increases, earnings response coefficient decreases. This is because an increase in c_y induces the speculator to allocate more time and effort to acquiring fundamental information instead of managerial incentive information. As a result, the earnings response coefficient decreases.

The effects of the exogenous variables on misreporting ($E[b]$) follow from their effects on the earnings response coefficient. This is because an increase (a decrease) in the earnings response coefficient represents higher (lower) valuation benefits of misreporting. Thus, expected misreporting in equilibrium will either be increasing or decreasing in the amount of available resources (R), increasing in the costs of fundamental information search (c_x), and decreasing in the costs of incentive information search (c_y). These relations can be summarized as follows.

$$\frac{dE[b]}{dR} \gtreqless 0, \quad \text{(A.76)}$$

$$\frac{dE[b]}{dc_x} > 0, \quad \text{(A.77)}$$

$$\frac{dE[b]}{dc_y} < 0. \quad \text{(A.78)}$$

[28] In particular, the direction of the effect depends on the relative magnitudes of c_xs_v and c_ys_m.

Appendix B
Variable Definitions

This appendix provides variable definitions.

Variables	Definitions
Restate	An indicator variable that equals one if the respective year is eventually restated due to intentional misreporting and zero otherwise, where restatements classified by Audit Analytics as resulting from fraud or an SEC investigation are considered to be intentional misreporting
Bias	The amount of restated earnings due to intentional misreporting, scaled by beginning total assets and expressed in basis points
FundamentalSearch	The number of EDGAR downloads of quarterly and annual financial statements (10-Qs and 10-Ks) for a firm in a given year, scaled by 10,000; EDGAR search log data is provided through the SEC website, and is compiled by Ryans (2017) following the method in Drake et al. (2015)
IncentiveSearch	The number of EDGAR downloads of proxy statements (DEF 14A) and the statements of ownership changes (Form 4) for a firm in a given year, scaled by 10,000; EDGAR search log data is provided through the SEC website, and is compiled by Ryans (2017) following the method in Drake et al. (2015)
AbnRet	Daily abnormal return (individual firm return minus the return on the S&P 500 index), cumulated over the three trading days surrounding the annual earnings announcement date
Acquisition	An indicator variable that equals one if an acquisition accounts for 20% or more of total sales, and zero otherwise
Beta	Market beta estimated from the Fama-French 3 factor market model using daily returns over the past 252 trading days
BM	Book value of equity divided by market value of equity
Capital	Net plant, property, and equipment, scaled by total assets
Financing	Amount raised from stock and debt issuances, divided by total assets
Intangibles	Ratio of research and development and advertising expense to sales
InstOwnership	Percentage of shares owned by institutions from Thomson Reuters dataset as of the end of the year
InterestCov	Ratio of net income to interest expense; if net income is negative the value is set to 0, if interest expense is zero or if net income is more than twice the interest expense, the value is set to 2
Leverage	Ratio of current and long-term debt to total assets
Nonsynchronicity	One minus R-squared from the regression of a firm's daily stock return on the daily market return and the return of the two-digit SIC industry portfolio, estimated for each firm-year

NumAnalyst	Number of analysts following the firm with one-year-ahead earnings forecasts
PIN	Probability of informed trading estimated as in Easley et al. (1996), implemented following Noah Stoffman's method (https://host.kelley.iu.edu/nstoffma/ekop.html)
Return	Cumulative monthly buy-and-hold returns over the year
Retvol	Standard deviation of monthly returns over the year
Roa	Income before extraordinary items, divided by total assets
SaleGrowth	Change in sales divided by prior-year sales
ShortInterest	The ratio of outstanding shares held in short interest to total shares outstanding as of the end of the year
Size	Natural logarithm of one plus market value of equity in millions
Surprise	Current earnings per share minus prior year's earnings per share, deflated by stock price on a trading day prior to the annual earnings announcement date

Appendix C
Information Search and Earnings Response Coefficient: Additional Analysis

This table presents regression analysis on the relation between different types of information search and earnings response coefficients using multiple research design choices. Column (1) presents results using firm-quarter observations and quarterly earnings announcements. In column (1), variables *Surprise*, *FundamentalSearch*, *IncentiveSearch* as well as all the control variables are measured at a quarterly level. Column (2) presents results where firm and year fixed effects are interacted with the earnings surprise and are included as additional control variables. Column (3) presents results where earnings surprise (*Surprise*) is measured relative to the analysts' most recent earnings consensus. Firm and year fixed effects are included and standard errors are clustered by firm. *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Depvar =	*Returns*		
	AbnRet	*AbnRet*	*AbnRet*
	(1)	(2)	(3)
	Quarterly Analysis	*Surprise* × *Fixed Effects*	*Surprise Consensus*
Surprise×*FundamentalSearch*	−0.181*	−0.084**	−0.062***
	(−1.75)	(−2.45)	(−2.79)
Surprise×*IncentiveSearch*	0.856***	0.201**	0.175***
	(3.29)	(2.16)	(2.65)
Surprise	0.365***	.	0.055*
	(8.54)	.	(1.70)
FundamentalSearch	−0.005	−0.000	−0.002
	(−1.61)	(−0.19)	(−1.14)
IncentiveSearch	−0.008	−0.004	−0.001
	(−1.13)	(−0.81)	(−0.29)
Controls	Yes	Yes	Yes
Surprise×Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Surprise×FirmFE	No	Yes	No
Surprise×YearFE	No	Yes	No
Adjusted R^2	0.02	0.10	0.03
N	108,402	27,989	25,050

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