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Analyst Information Acquisition via EDGAR

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Abstract. We identify analysts' information acquisition patterns by linking EDGAR (Electronic Data Gathering, Analysis, and Retrieval) server activity to analysts' brokerage houses. Analysts rely on EDGAR in 24% of their estimate updates with an average of eight filings viewed. We document that analysts' attention to public information is driven by the demand for information and the analysts' incentives and career concerns. We find that information acquisition via EDGAR is associated with a significant reduction in analysts' forecasting error relative to their peers. This relationship is likewise present when we focus on the intensity of analyst research. Attention to public information further enables analysts to provide forecasts for more time periods and more financial metrics. Informed recommendation updates are associated with substantial and persistent abnormal returns, even when the analyst accesses historical filings. Analysts' use of EDGAR is associated with longer and more informative analysis within recommendation reports.

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1. Introduction

Sell-side equity analysts are specialized information providers who acquire, process, and disseminate financial information to market participants. They are one of the most important information intermediaries between public companies and investment managers, but because of the difficulty in observing analyst information acquisition, little is known about the "black box" (e.g., see Ramnath et al. 2008) in which acquired information becomes informative advice. In this paper, we directly study how analysts acquire company-specific information, examine the incentives behind information acquisition, provide evidence that this acquisition process improves analysts' advice, and show that market participants identify and react more strongly to the higher-quality advice.

Although there is a rich literature on the quality of analysts' advice, a persistent difficulty is directly observing and measuring analysts' attention to specific information. To address this challenge, we link the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database user activity to individual analysts. By systematically identifying the use of EDGAR by analysts, we are able to directly measure an analyst's attention to publicly available information and provide insight on the inner workings of the process through which analysts transform raw financial information into nonredundant advice (Asquith et al. 2005, Liberti and Petersen 2019).

We document that analysts are active users of EDGAR. Analysts access filings on the day before or the day they make an earnings per share (EPS) estimate change in 24% of the cases. Conditional on viewing EDGAR, they access an average of eight filings. The most common filings accessed are annual and quarterly reports filed on Forms 10-K and 10-Q, change in ownership forms filed on Form 4, and current reports filed on Form 8-K. We find that an analyst's activity picks up in the days before making a recommendation change and subsides in the days after the update. We also find that analysts access both new filings and past filings during this period. We use their attention to new filings as a measure of their reaction to current events and attention to past filings as a measure of their reinterpretation of historical information.

We study three central questions. First, we examine the trade-offs analysts make in the decision to acquire information from primary filings. Second, we study whether information acquisition is related to more accurate forecasts and richer information production. Third, we ask whether recommendations that are backed by primary filings are more informative and/or lead to larger market reactions.

We expect that the most important driver of an analyst's attention will be the demand for information coming from her clients. We hypothesize and document that analysts acquire more information for large companies and companies operating in complex information

environments. Furthermore, we find that analysts access EDGAR more frequently for companies with more volatile returns or recent merger and acquisition (M&A) activity.

Our findings highlight the amount of EDGAR research conducted by sell-side analysts, as well as the trade-offs between the costs and benefits of using detailed public information. We propose and find that analysts' private incentives will shape their attention to EDGAR filings. Consistent with the higher demand for information, we document that analysts spend more time viewing EDGAR for large firms and firms with high levels of informational asymmetry. Not only are research patterns related to company characteristics, such as company size and complexity, but they are also determined by analysts' career progression and the competitive environment. We find that experienced analysts gather information via EDGAR more often. Analysts with more experience have a lower expected cost of processing complex information and making a bold forecast based on discovered information (Hong et al. 2000) and thus a stronger incentive to gather information. Analysts are also sensitive to their track records—an analyst is more likely to gather information if her previous year estimate was inaccurate relative to the company's realized earnings or when her estimate was previously excluded from the consensus estimate. Hence, analyst career incentives play an important role in the generation of nonredundant financial analysis.

The size of the brokerage where an analyst is employed is also strongly associated with the amount of research via EDGAR that an analyst performs. A larger brokerage has a broader base of clients, and the analysts employed by these brokerages have strong career incentives to provide a superior service for these clients. We find that increases in the size of the brokerage increase EDGAR views before a forecast update.

Second, we examine whether primary financial information acquisition is associated with more accurate forecasts. This relation cannot be taken for granted, because in choosing which information source to use, analysts likely prioritize the best information sources first. An analyst might rely on public information from EDGAR in cases where she has not developed sufficient industry knowledge or important relationships with management (Brown et al. 2015), and thus reliance on EDGAR could be associated with reduced accuracy. We find that after controlling for factors previously shown to affect analyst accuracy, an analyst who views EDGAR before making a forecast update has a 3.7% lower relative peer-adjusted EPS forecast error relative to updates when she does not view EDGAR. This improvement suggests that the costly acquisition of information is associated with higher-quality estimates. We also document that analysts relying on EDGAR provide estimates for more EPS frequencies (e.g., quarterly or multiyear horizons) and provide additional estimates for more financial metrics (e.g., book value or dividends per share). Importantly, because some analysts may specialize in providing different types of advice (such as highly accurate forecasts, industry expertise, or access to management), we use analyst-level fixed effects to identify the effect of EDGAR information acquisition over time and within an analyst. We document that more attention to EDGAR is associated with more accurate forecasts, even within the time series of an analyst's forecast history.

Moreover, we find that the increase in forecast accuracy is present even when we only examine views of past filings, suggesting that analysts can transform publicly available, noncurrent information into superior advice relative to their peers. The increase in accuracy is related to the views of the most important company filings—the annual and quarterly reports, as well as current reports on Form 8-K, which communicate timely material information. The observable link between inputs and outputs provided by the data represents a direct look into the "black box" of the analyst information intermediation process.

If analyst advice backed by information gathered via EDGAR is indeed more informative, we would expect a stronger market reaction to recommendations that are backed by primary filings. Our third and final question examines this proposition. We find that the absolute value of the cumulative abnormal returns (CARs) is 122 basis points larger than other recommendation updates by the analyst when the recommendation is made after using EDGAR. This association between information gathering via EDGAR and abnormal returns is robust to different measures of attention. The relationship is present when we classify attention as the number of filings viewed, the amount of time spent viewing those filings, or the number of exhibits viewed. These results suggest that the market relies on analysts to synthesize and communicate fundamental information. The relationship holds whether the primary filings accessed are current or historical, suggesting that analysts provide a nonredundant evaluation of the content, regardless of when the filing was posted.

There are multiple channels that could lead investors to react more strongly to recommendations that are backed by information gathered via EDGAR. For example, analysts that rely on EDGAR may have stronger reputations or, perhaps, provide higher-quality advice in their recommendations. Our analysis supports the latter channel. Analyst reports produced when the analyst views EDGAR are longer and feature more-detailed company and industry information. Moreover, we document that analysts' attention to EDGAR produces research that influences and informs subsequent recommendations from other analysts.

One limitation of our study is that analysts likely use a variety of sources of information to produce their advice. Whereas we observe their usage of EDGAR, we cannot directly measure an analyst's acquisition of company-related information through financial news outlets, social media, company websites, discussions with company insiders and clients, or financial data providers. To address this concern, in supplemental fieldwork, we found that all analysts we surveyed claimed to use EDGAR to access company information.[1] Analysts also use the company's investor relations website or a data aggregator such as Thomson Reuters Eikon or Capital IQ for similar purposes. There were complaints about these aggregators, such as being "clunky" and "slow" or having "data reliability issues." A common theme was that analysts develop their own style and the frequency with which they use EDGAR. This style depends on the analyst's preferences and the total resources and time pressures at her brokerage. EDGAR was deemed most helpful when analysts needed a consistent source for all current and historical 10-K and 10-Q reports, when analysts faced a specific situation (e.g., an initial public offering (IPO) or insider trading), or when filings were not promptly uploaded to data aggregators (e.g., FactSet) or the company website. Similar to the findings of Brown et al. (2015), many analysts also mentioned the importance of discussions with management in shaping their EPS and recommendation updates. The primary company filings on EDGAR are rich in quantitative and qualitative detail, such as extensive footnotes, that are difficult to standardize and are backed by the scrutiny of the U.S. Securities and Exchange Commission (SEC). Our ability to identify the analysts' attention to EDGAR provides a valuable insight into the analysts' reliance on the information contained in primary company filings.[2]

The black box of analyst information acquisition and processing underlies the extensive literature on analyst behavior. Our direct examination of the inner workings of the black box allows us to contribute to the likewise broad literature on analyst information acquisition (e.g., Abarbanell 1991, Trueman 1994, Epstein and Palepu 1999, Fischer and Stocken 2010), analyst recommendations (e.g., Bradshaw 2004, Conrad et al. 2006), their value to market efficiency (e.g., Womack 1996, Asquith et al. 2005, Loh and Mian 2006, Beyer et al. 2010, Chen et al. 2010), earnings estimates accuracy (e.g., Trueman 1994, Mikhail et al. 1997, Clement 1999, Easterwood and Nutt 1999, Hong and Kubik 2003), and estimate informativeness when forecasts are preceded by important corporate disclosures (Kross et al. 1990, Lys and Sohn 1990). In the context of our results, additional research via EDGAR is correlated with reduced forecast error and more informative analyst recommendation changes.

We also contribute to the nascent but rapidly growing literature that describes the channels through which market participants acquire information. Recent advances in this literature include studies on the informational advantages of personal meetings (Solomon and Soltes 2015, Cheng et al. 2016, Han et al. 2018), social networks (Cohen et al. 2010), mass media (Blankespoor et al. 2019), and the acquisition of information through Bloomberg terminals (Ben-Rephael et al. 2017). This study explores a fundamental channel to acquire value-relevant information—the full set of up-to-date company filings hosted on EDGAR.

Our research also sheds light on the limits to analysts' attention. Because attention is a limited resource, analysts cannot always pay attention to all companies and must be selective with regard to where they allocate their attention. This literature has largely argued that inattention will be related to negative capital market effects (Hirshleifer and Teoh 2003, Corwin and Coughenour 2008, Hirshleifer et al. 2009, Chakrabarty and Moulton 2012) and that attention is driven by company characteristics (Drake et al. 2015, Gargano and Rossi 2018). We extend this debate to analysts' attention to primary filings from EDGAR and document the incentives that shape how an analyst allocates her attention.

Finally, this study contributes to a fast-growing body of literature that examines investors' use of company information from the EDGAR database. Neilson (2016) demonstrates that investors' aggregate use of EDGAR is related to the informational uncertainty following an earnings announcement. Drake et al. (2015) show that the average EDGAR user only accesses the database a few times per quarter, EDGAR access is negatively related to a company's share price performance, and EDGAR access has a positive benefit to market efficiency. Drake et al. (2017) use EDGAR searches to measure the comovement of investor attention, and Drake et al. (2019) document that firm-specific searches on EDGAR predict positive future performance for that firm. Bauguess et al. (2018) document that EDGAR search traffic increases significantly during IPO episodes. Lee et al. (2016) demonstrate that EDGAR users tend to search for filings for economically related peer companies after viewing a filing for a particular company.

In this literature, a limited number of current papers have started to identify specific institutional users of EDGAR. EDGAR use by institutional investors (Chen et al. 2018) and hedge funds (Crane et al. 2019) has been examined using a similar approach to ours in the context of the investment decision-making process. Additionally, Iliev et al. (2019) examine research on corporate governance using EDGAR by mutual fund families around annual meetings. Finally, Bozanic et al. (2017) single out the use of EDGAR by the IRS. This new approach has the promise of testing detailed

hypotheses about the distinct goals of different consumers of information.

2. Empirical Predictions

Our first objective is to examine the usefulness of EDGAR information for analysts' forecasts and recommendations. We argue that the use of in-depth public information will be in response to the benefits that an analyst can achieve by utilizing such information. An analyst's time is limited, and allocating too much time to examining information for a given a company will reduce the time available to allocate to other companies and tasks. Consequently, given the high opportunity costs of attention, an analyst must choose the scope and depth of the information she acquires. Therefore, we use an equilibrium approach as our main identification strategy and devise hypotheses that test for the optimal analyst behavior. We expect that analysts will pay attention to information on EDGAR only in cases where the expected benefits are high enough to exceed the costs.

2.1. The Determinants of Analyst Attention to EDGAR

Analysts aggregate and produce information in response to the demands of their clients. We expect the relative importance of in-depth research on a company will be largely determined by investor demand for information on that company. Hence, our first hypothesis is about the determinants of analysts' use of EDGAR.

Hypothesis 1. *Analyst reliance on EDGAR is increasing with investor demand for information about a company.*

Investor demand will be driven by the size of investors' positions and the need for in-depth analysis. Therefore, we expect analysts' acquisition of information will increase with company market capitalization because investors have larger dollar investments in larger companies. This hypothesis is motivated by the findings in Harford et al. (2019), who document that companies in an analyst's portfolio with higher market capitalization and higher institutional ownership receive more attention, as measured by the frequency and accuracy of forecasts and recommendation changes. This set of tests is also motivated by the conflicting pressures on sell-side analysts from institutional investors and large firms documented by Ljungqvist et al. (2007). Additionally, the trading volumes of large companies with high institutional ownership are a substantial source of commission for the analyst's brokerage (Frankel et al. 2006). By generating informative recommendations for such companies, analysts could drive trading activity for their brokerage, which in turn, could favorably impact their compensation.

Furthermore, we expect the analyst's marginal benefit of producing informed analysis for an investor to be higher in complex information environments. Investors will demand more analysis in uncertain information environments, and analysts, as specialists in acquiring and interpreting financial information, should supply more sophisticated, in-depth research in response. Therefore, we expect that companies with a higher level of uncertainty, as measured by return volatility, will be researched more heavily by analysts. We view M&A activity as another proxy for heightened uncertainty and expect that this type of activity will be positively related to analyst research. M&A activity creates a more complex information environment for investors, as the operations of the two companies are integrated. Analysts specialize in both company-level and industry-level information. Therefore, an analyst's industry expertise allows her to evaluate the M&A activity in the context of an evolving industry structure and produce high-quality information to meet increased investor demand.

In our next hypothesis, we anticipate that the acquisition of information also will be sensitive to the analyst's skill and career concerns. We define this conjecture with two specific hypotheses.

Hypothesis 2. *An analyst's research on a given company will be inversely related to that analyst's record of accuracy for that company.*

An analyst's reputation as an accurate forecaster is a highly visible signal of her skill and ability to make valuable recommendations. Therefore, an analyst will be sensitive to her track record and will avoid consistent bad advice for any company in her portfolio. Thus, we expect an analyst will focus her attention on companies for which her previous forecasts were particularly inaccurate relative to realized earnings or for which she was previously excluded from the Institutional Brokers' Estimate System (I/B/E/S) consensus. This will allow an analyst to maintain credibility across all the companies that she covers.

The alternative to this hypothesis is that analysts may concentrate efforts on important companies in their portfolio and ignore others. If an analyst does not have expertise in analyzing a company's information or is not incentivized to provide accurate forecasts across her entire portfolio, she may decide to ignore some of her companies. In this case, we may observe that previous accuracy is positively related to current EDGAR attention.

Hypothesis 3. *Analyst usage of EDGAR will be increasing in analyst experience.*

We expect that a more experienced analyst will have a lower cost of processing information and thus will be more likely to acquire such information. The

relationship between the cost of processing information and experience could arise from "learning by doing," with analysts becoming more efficient over time. Moreover, analysts that are more experienced are, on average, higher skilled than those with less experience, simply because lower-skilled analysts are more likely to be terminated. Additionally, as Hong et al. (2000) document, inexperienced analysts are more likely to be terminated for incorrect estimates that deviate from consensus, and as a result, the expected benefit of acquiring EDGAR information should be lower for an inexperienced analyst—if the analyst comes to a diverging opinion based on that information, she is less likely to use that information. Hence, we expect that analysts with longer tenures will use EDGAR more.

Furthermore, part of the analyst's career incentives will be driven by the characteristics of their brokerage company. A large brokerage company has the resources to employ larger analyst teams and distributes analysts' estimates to a broad set of clients. Additionally, analysts of higher skill are more likely to match with larger brokerages (Hong et al. 2000). We expect that information acquisition will be more intense for analysts at larger brokerages, as the career incentives and resources present at large brokerages indicate that analysts should exert more effort to provide accurate estimates.

A positive association between analyst experience and EDGAR could be tempered (or even reversed) by analyst experience being positively related to access to industry insiders and company management (Green et al. 2014, Soltes 2014). Therefore, relative to an experienced analyst, an inexperienced analyst may have to rely more heavily on gleaning information from public filings on EDGAR. Hence, a credible alternative is that experienced analysts may rely less on EDGAR information and more on soft information or industry contacts.

2.2. Analyst EDGAR Views, Earnings Estimate Accuracy, and Analyst Recommendations

Analysts' attention is limited, and processing complex information is costly (e.g., Hirshleifer and Teoh 2003, Sims 2003). Therefore, we expect analysts will acquire information on a company in their portfolio when it is expected to enhance the value of their estimates and recommendations, and analysts will acquire less information or no information in cases where the public information on EDGAR is not expected to be helpful.

Hypothesis 4. *Analyst use of EDGAR will correlate with more accurate EPS estimates.*

This hypothesis directly tests the ability of analysts to transform publicly available information into precise forecasts of a company's future performance. This hypothesis cannot be taken for granted. As previously discussed, an analyst may be more reliant on EDGAR if the analyst does not have strong links to industry insiders or company management. In fact, survey evidence provided by Brown et al. (2015) documents that analysts find industry knowledge and private communication with management to be the most useful information, and recent 10-K and 10-Q reports are the seventh most useful response. If compensating for the lack of industry knowledge or other private sources of information is the dominant driver of EDGAR use by analysts, then an analyst's use of EDGAR may not be correlated, or even negatively correlated, with EPS forecasting accuracy relative to her peers. Conversely, Brown et al. (2015, p. 19) also document that some analysts describe using these private communications for "double-checking our own thought processes and that our models are solid" and use them for clarification to "help you digest the [earnings] information a little bit better." Therefore, private communications with management may be a complement to the detailed public information contained in annual and quarterly reports filed via EDGAR, rather than a substitute.

Finally, more accurate forecasts may not be the end goal of analysts because some analysts specialize in providing industry knowledge (Brown et al. 2015), and thus their use of EDGAR could be for developing generalized industry knowledge and not specifically to increase forecast accuracy. Thus, ultimately it is an empirical question as to whether the public information available on EDGAR can be used to improve accuracy relative to their peers.

In sum, finding evidence in favor of improved forecast accuracy when analysts rely on EDGAR would support the notion that analysts rely on public information in order to provide accurate forecasts for their clients.

In testing this hypothesis, we are able to characterize, with great detail, the ways in which analysts use EDGAR. For example, an analyst could use EDGAR to quickly check a recent filing; verify historical risk disclosures; or perform time-consuming, in-depth financial analysis. Because of the multitude of different ways an analyst could use EDGAR, we also empirically investigate five related measures that capture different aspects of an analyst's use of EDGAR. These measures include the total number of filings viewed on EDGAR, the total number of historical filings viewed, an indicator equal to 1 if any filings are examined, the amount of time spent researching on EDGAR, and the number of exhibits viewed. These related measures all seek to capture analyst information acquisition prior to an update, but some are tilted more toward measuring analyst attention (e.g., if an analyst examines any filings), whereas others are tilted toward measuring the depth of analyst research (e.g., the

amount of time spent viewing and analyzing). These detailed tests are only possible with the highly granular data that identify the analyst and her behavior over time.

A related prediction is that analysts will use EDGAR to expand the amount of information in their forecasts. Analysts can expand both the number of periods for which they provide EPS forecasts and the number of additional financial performance measures for which they issue forecasts. We therefore test this prediction empirically. Support for this prediction would confirm that EDGAR provides additional useful information in the analysts' information production function.

In our final hypothesis, we focus on the impact of informed analysts' recommendations. Analysts' attention to EDGAR will be more valuable if it informs investor actions and affects company stock prices. Our final hypothesis conjectures that EDGAR usage will lead to more impactful recommendations. Consistent with this idea, Drake at al. (2019) document that the aggregate EDGAR research by sophisticated investors predicts firm abnormal returns and unexpected earnings. We hypothesize that abnormal market reactions to recommendations backed by EDGAR analysis will be larger because these recommendations are viewed as more informative by investors.

Hypothesis 5. *Analysts' recommendations backed by research on EDGAR will result in stronger market reactions.*

A market reaction to a recommendation can be driven by nonredundant analysis of financial information contained in the recommendation or by the analyst's reputation for providing precise advice. Although we cannot fully rule out the latter explanation, we find strong evidence supporting the first channel. To identify the mechanism behind potentially larger abnormal returns, we examine whether recommendations that are backed by the use of primary financial filings from EDGAR are associated with more in-depth and detailed reports. Furthermore, we conjecture that analysts' recommendations that are informed by EDGAR will be more influential on other analysts' subsequent recommendations.

A long literature has established that analyst recommendations are related to significant price reactions (e.g., Womack 1996, Francis and Soffer 1997, Asquith et al. 2005). Bradshaw et al. (2017) show that analysts' use of soft information from the media is related to a larger reaction to analysts' recommendations. In our paper, we provide direct evidence that the increased use of current and past EDGAR forms by an analyst is positively related to the capital market reaction to her recommendation.

3. Data and Summary Statistics

To test our hypotheses, we develop a data set of filings accessed by analysts on EDGAR and link the use of EDGAR data to individual forecast and recommendation updates. This section documents the construction of the data set, provides summary statistics about the analysts' usage of EDGAR, and describes additional data sources.

3.1. EDGAR Data Collection

We use the server log files of all traffic to the U.S. Securities and Exchange Commission's online database of company filings. Since 1996, the U.S. Securities and Exchange Commission has made all company filings available online through the EDGAR database. Therefore, EDGAR is a complete repository of filings by registered companies and is freely available to the public. Two features of this data set are important for this study.

First, EDGAR gives immediate access to the primary filings of companies. These primary filings include both hard information such as financial performance metrics, as well as soft information such as management's discussion and analysis of operations, proxy filings, and transaction disclosures, all of which give context to hard information. Additionally, many companies include a large number of footnotes containing insight that data aggregators have difficulty extracting and quantifying. Thus, measuring an analyst's use of EDGAR can act as a gauge of her depth of research because other sources of company information are often imperfect substitutes.

Second, following a Freedom of Information Act (FOIA) request, the SEC made all the server log files created since 2003 available to the public. These highly granular server log files contain the views of primary filings on EDGAR by unique users (e.g., Form 10-Q filing with accession numbers 000029915-11-000041, accessed on January 1, 2012, at 14:09:07 by a particular IP address).[3] The SEC masks a portion of the IP address requesting a filing. Specifically, the SEC replaces the last octet of an IP address with three letters. For example, the hypothetical IP address 148.106.2.111 is reported as 148.106.2.ehg in the server logs available for download. Critically, these masked IP addresses are unique. Any subsequent views by 148.106.2.111 are recorded as 148.106.2.ehg.

In this paper, we exploit the fact that organizations (i.e., brokerage houses) register large blocks of IP addresses. This enables us to map the partially masked IP address back to the brokerage house. We use a lookup table provided by Digital Elements to link organizations to IP addresses. For example, the partially masked IP address 148.106.2.ehg likely belongs to Cantor Fitzgerald because "Cantor Fitzgerald & Co." is the organization registered to all IP addresses that begin with 148.106.2 (e.g., 148.106.2.0, 148.106.2.1, 148.106.2.2, . . ., 148.106.2.254, 148.106.2.255). Additionally, to isolate an analyst's EDGAR usage, we use the geographic distance between the location of an analyst employed

by the brokerage, as provided by Bloomberg, and the geographic location of the IP address as a key criterion to match brokerages to IP addresses. We provide a detailed description of how we perform the matching procedure in Internet Appendix A.1.

In order to verify that we are correctly identifying the IP address of an individual analyst in the data set, we perform simulation analysis. What we would expect to see is that the IP addresses that we identify as analysts (from the EDGAR log files) concentrate their research on the companies in an individual analyst's coverage portfolio (from the I/B/E/S data).[4] To establish a null hypothesis, we create placebo analyst coverage portfolios that are the same size as the analyst's but randomly assigned across all companies covered by analysts at the same brokerage house. We find that relative to this null, there are fewer unique IP addresses that look at the analyst's actual portfolio and that the research is more concentrated than in the placebo samples, as measured by a Herfindahl index of research activity. Put simply, there are only a few IP addresses at each institution viewing filings in any analyst's portfolio, and these IP addresses tend to only focus on the specific companies in that analyst's portfolio.

It is possible that some views in our data set might originate from other staff at the brokerage house. Hence, we use analyst-level fixed effects in our estimations to address any time-invariant EDGAR usage patterns that might originate outside of the analyst's research team immediately before an estimate/recommendation (e.g., the equity research compliance team). The exclusion of time-invariant viewing patterns within an analyst's brokerage house through the use of analyst-level fixed effects, combined with our previous finding that there are a limited number of IP addresses within the brokerage house that access filings for companies in the analyst's portfolio, gives us confidence that we have a valid measure of the variation in the analyst team's attention to EDGAR for a forecast or recommendation update.

Although the SEC has published log file data since 2003, our sample begins in June of 2006. We choose this as a starting point because the EDGAR log files have a lapse in coverage from September 24, 2005, to May 11, 2006 (Bauguess et al. 2018, Ryans 2017).[5] In total, we start with 85,268,059 views of filings on EDGAR originating from the brokerages we identify over the sample period. In our tests, we focus on the 970,004 views in the two-day window (days [−1, 0]) before analysts' estimate updates and the 79,573 views in the two-day window before analysts' recommendation changes.

3.2. Analysts' Usage of EDGAR

Our analysis begins by examining analysts' EDGAR behavior immediately before a recommendation or a forecast update. Our primary dependent variable is the total number of views of a company's EDGAR filings accessed by the analyst in the two-day window before she makes a recommendation or forecast update for that particular company.[6] We call this variable *Total Views*.

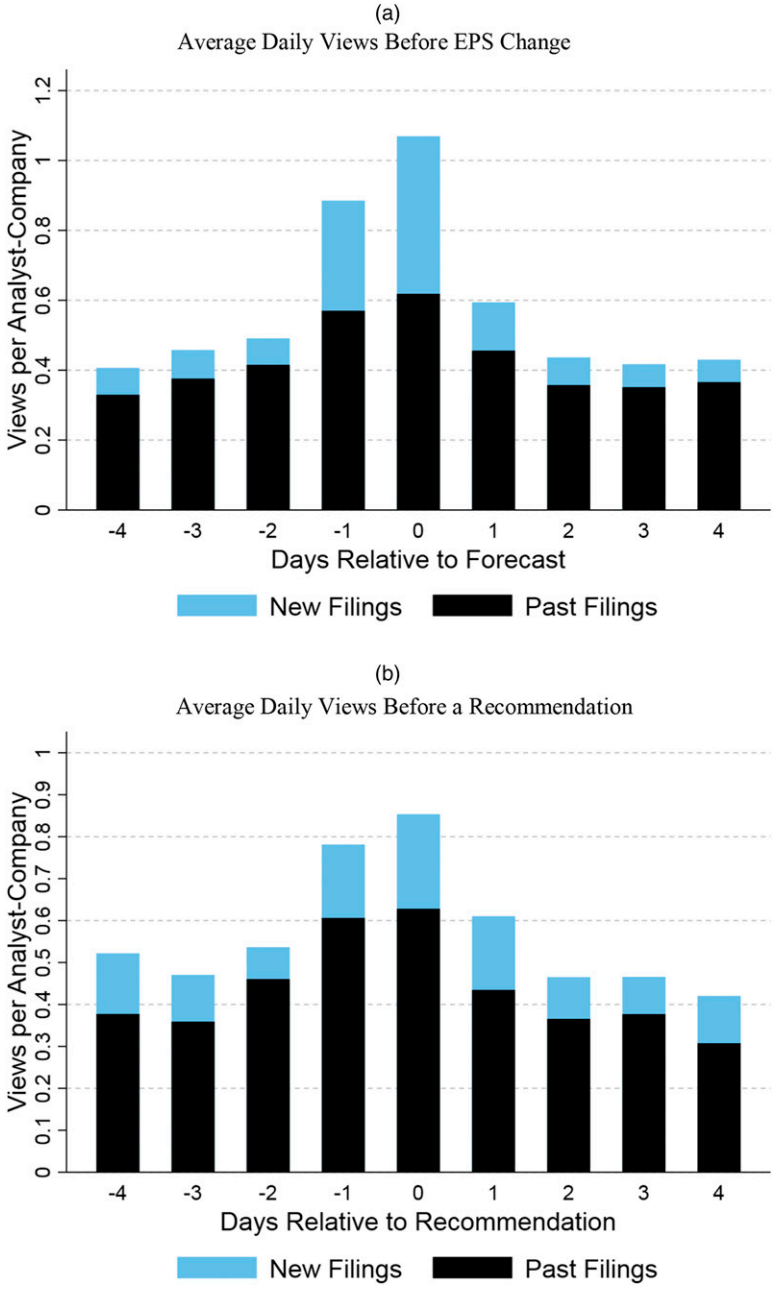
Figure 1 shows an increase in analysts' use of EDGAR in the period immediately before making an EPS forecast estimate (panel (a)) or a recommendation change (panel (b)). Notably, the increase in views is concentrated on the day before and the day of the actual estimate and subsides quickly thereafter.[7] A similar pattern is present in Figure 1 for "past" filings that are at least two days old. This is consistent with the findings of Drake et al. (2016, p. 461), who conclude investors seek out these historical accounting reports because they contain qualitative and quantitative information that helps contextualize current-period information and is useful for current-period decision making."

In Table 1, we break down the use of EDGAR by analysts for the companies in our sample. Panel A presents the total view counts for all EDGAR filings for companies that are covered by an analyst in the sample. Form 4, 8-K, 10-Q, and 10-K views make up approximately 82% of all EDGAR views. Consistent with Chen et al. (2018), the most common filing viewed is the statement of change in the ownership of corporate insiders (Form 4). Not surprisingly, filings associated with fundamental financial performance are also heavily viewed.

In panel B of Table 1, we classify filings into three general categories: annual and quarterly reports on Form 10-K or Form 10-Q, change in inside ownership on Form 4 and Schedule 13G, and current reports on Form 8-K.[8] We previously documented that analysts access many types of filings. However, these three sets of filings stand out as the most important. Filings on Form 4 are viewed the most. This is not surprising given that Form 4 filings are the most numerous EDGAR filing. The second most common type of filings are the annual and quarterly reports filed on forms 10-K and 10-Q. These are the primary vehicles for reporting current financial performance, details about the business, and in-depth discussions about the company's risks and outlook. Filings on Form 8-K are viewed in almost equal numbers to 10-K/Q forms. Form 8-K is essential for analysts because it discloses any material information such as earnings projections, merger and issuance announcements, material definitive agreements, officer departures, changes in control, and shareholder vote results within four business days.

Panels C and D of Table 1 provide view counts by filing type in the window immediately before an EPS forecast or recommendation change.[9] The composition of filings accessed before the two types of updates is largely the same, with two exceptions. In both cases,

Figure 1. (Color online) Average Views Before EPS Forecast Update and Analyst Recommendation Change



Note. This figure presents the average daily EDGAR filings accessed by an analyst for a company in event time, where the events are an EPS forecast update for the company from the analyst (panel (a)), or a recommendation for the company from the analyst (panel (b)).

the analysts rely heavily on annual and quarterly reports, on current reports, and on change in ownership forms. However, the timely information contained in Form 8-K appears to be more pertinent to EPS forecast updates than to recommendation changes. Form 8-K represents 42.3% of all filings accessed before an EPS update compared with 28.7% for a recommendation change. This relationship is not surprising, as companies often announce preliminary details about their earnings on Form 8-K. The announcements almost certainly affect future earnings projections but may not necessarily affect the recommendation of the analyst.

Relative to EPS estimate updates, recommendation updates rely more heavily on change in insider ownership filings. Change in insider ownership filings represent 16.5% of all filings accessed before an EPS update compared with 24.6% for a recommendation change. Insiders have access to a richer set of information than those outside the company and can capitalize on that information through trading. Therefore, analysts may

Table 1. Summary Statistics for Filings Accessed on EDGAR

Filing type	Count	% of total
Panel A: Total views by filing type		
4	34,285,360	40.2
8-K	17,190,876	20.2
10-Q	9,631,526	11.3
10-K	8,319,416	9.8
4/A	1,194,338	1.4
424B2	1,077,194	1.3
6-K	1,066,600	1.3
S-1/A	950,674	1.1
424B4	876,710	1.0
DEF 14A	875,172	1.0
424B5	802,797	0.9
424B3	616,171	0.7
S-1	614,245	0.7
Other	7,766,980	9.1
Panel B: Total views by filing category		
Change in ownership filings	35,289,616	41.4
10-K/Q filings	18,945,220	22.2
8-K filings read	18,456,840	21.6
Panel C: Total views by filing category on the day before or the day of an EPS forecast update		
8-K filings	410,150	42.3
10-K/Q filings	298,426	30.8
Change in ownership filings	160,014	16.5
Panel D: Total views by filing category on the day before or the day of a recommendation change		
10-K/Q filing	25,084	31.5
8-K filing	22,796	28.7
Change in ownership filing	19,537	24.6

Notes. This table presents the view counts of filing types from the EDGAR database in our sample. Panel A presents unconditional views for all filing types across all analyst-brokerages included in the sample. Panel B consolidates views of filings into the categories used in this study. The appendix provides definitions for these filing-type categories. In panels C and D, we report the views on the day before or day of an analyst action. Panel C presents counts for each filing category for views immediately before an EPS forecast update. Panel D presents counts for each filing category for views immediately before a recommendation change.

view insider ownership changes as a particularly informative signal. Indeed, insider transactions have been shown to be informative about how management views future return prospects (Jagolinzer 2009, Ryan et al. 2016). This finding is also consistent with Chen et al. (2018), who document a relationship between institutional investor attention to ownership change filings and trading behavior.

3.3. Data Sources and Summary Statistics

We use the full I/B/E/S history of recommendations and earnings estimates of analysts that we are able to identify based on the last name and first initial of the analyst. We identify the analysts by hand-matching I/B/E/S analyst coverage data from the detailed recommendations files with Bloomberg analyst coverage data by covered company name and the last name and first initial of the analyst. We match an analyst's history of use of EDGAR to the analyst's history of company recommendations and estimates. We measure the analyst's use of EDGAR filings on the day before and the day of a recommendation/estimate update to ensure we are focusing on the views relevant to the analyst's decision. We also create measures of analysts' use of different types of filings, such as annual and quarterly reports, ownership forms, and current reports.

We use stock return data from CRSP, accounting metrics from Compustat, and data on institutional holdings from Thomson Reuters. The sample of earnings estimates and analyst recommendations is limited to the observations for which company data from these sources are available. Our sample of company-analyst-estimate changes includes 496,521 EPS forecast updates from 3,900 unique analysts at 98 institutions covering 4,346 companies. Our final sample of company-analyst-recommendations (excluding recommendation initiations) includes 49,386 recommendation changes from 2,579 unique analysts at 95 institutions covering 3,541 companies.

Table 2 presents the key variables used in our analysis. Panel A presents summary statistics for the company, analyst, and views variables for each EPS forecast update. The unit of observation in the summary statistics table and throughout the tests in Sections 4–6 is a forecast update (or recommendation) from an individual analyst on a company that she follows.

We find that analysts view two filings, on average, in the two days before an estimate change. However, analysts access filings before 24% of forecast estimate changes. Therefore, conditional on accessing EDGAR, an analyst views eight filings, on average. We rely on a sample of analysts that have an average of 8 years of experience and have covered the average company in their portfolio for 3.7 years. The average brokerage size for the estimates we study is large (67 analysts) with significant size variation. In Table IA.1, we document that the smallest brokerages in our sample cover on average only 11 firms and employ 1.3 analysts, whereas the largest brokerages cover 726 companies and employ 97 analysts. We also document that the largest brokerages are more than three times more likely to view EDGAR filings immediately before an update. This result highlights that even the largest brokerages, which should have access to management and the most resources, rely heavily on publicly available information from EDGAR.

Overall, the sample we study is composed of relatively large companies (average market value of $16 billion) that are primarily held by institutional owners (with an average position of 73%). These companies

Table 2. Summary Statistics for EPS Forecast Updates/Recommendation Changes

Variable	Mean	Median	Std. dev.	Observations
Panel A: Summary statistics for EPS forecast changes				
View characteristics				
Total views	1.95	0	23.42	496,521
Past filing views	1.19	0	18.37	496,521
Dummy if filing viewed	0.24	0	0.43	496,521
Time spent	4.62	0	19.75	496,521
Exhibits viewed	2.75	0	24.65	496,521
Analyst characteristics				
Lagged analyst company est. error	0.01	0	0.03	496,521
Analyst career length (years)	8.35	7.00	6.15	496,521
Brokerage size (no. of analysts)	66.81	64	39.60	496,521
Time covering company (years)	3.74	2.46	3.91	496,521
Forecast characteristics				
DAFE	–0.17	–0.09	1.55	496,521
ln(*Analyst-company excluded estimates*)	0.45	0	0.61	496,521
# analysts covering	15.08	14	9.14	496,521
Proportion of analysts changing est.	0.25	0.18	0.26	496,521
Est. change on day of earnings	0.15	0	0.36	496,521
Days since previous forecast update	63.13	60	82.13	496,521
Predicts book value per share (% of analysts)	0.21	0	0.41	496,521
Predicts cash flow per share (% of analysts)	0.15	0	0.36	496,521
Predicts dividend per share (% of analysts)	0.12	0	0.32	496,521
Predicts GAAP EPS (% of analysts)	0.46	0	0.50	496,521
Predicts two-year EPS (% of analysts)	0.86	1	0.34	496,521
Predicts three- to five-year EPS (% of analysts)	0.47	0	0.62	496,521
Predicts quarterly EPS (% of analysts)	0.92	1	0.28	496,521
Company characteristics				
Market value of equity ($ millions)	15,793.72	3,451.27	42,693.38	496,521
Volatility	2.4	1.98	1.53	496,521
M&A deal in month t	0.05	0	0.22	496,521
Total M&A deal value LTM/Total assets	0.08	0	0.21	496,521
Market to book	4.08	2.27	8.98	496,521
Lagged monthly return	0.01	0.01	0.16	496,521
Momentum	0.05	0.04	0.33	496,521
Institutional ownership (%)	0.73	0.80	0.26	496,521
10-K/Q EDGAR filings	0.07	0	0.28	496,521
Current Event EDGAR filings	0.31	0	0.62	496,521
Change in ownership EDGAR filings	0.97	0	3.67	496,521
Panel B: Recommendation changes and total views				
View characteristics				
Total views	1.61	0	17.46	49,386
Dummy if filing viewed	0.22	0	0.41	49,386
Analyst characteristics				
Analyst career length (years)	8.09	7.13	5.38	49,386
Brokerage size (no. of analysts)	66.65	68	39.87	49,386
Time covering company (years)	3.81	2.64	3.62	49,386
Recommendation characteristics				
CAR	–0.51	–0.16	9.82	49,386
|CAR|	4.77	2.30	8.6	49,386
Analyst recommendation	3.39	3	0.85	49,386
Mean recommendation	3.63	3.67	0.44	49,386
Upgrade	0.34	0	0.47	49,386
Downgrade	0.42	0	0.49	49,386
Lagged analyst est. error	–0.11	–0.05	0.77	49,386
# analysts covering	15.37	14	8.87	49,386
Proportion of analysts changing rec.	0.03	0	0.06	49,386
Rec. deviation from consensus	0.72	1.00	0.66	49,386
Rec. change on day of earnings	0.04	0	0.19	49,386
Rec. accompanies EPS forecast change	0.39	0	0.49	49,386

Table 2. (Continued)

Variable	Mean	Median	Std. dev.	Observations
Panel B: Recommendation changes and total views				
Company characteristics				
Market value	11,930.09	2,846.05	33,588.28	49,386
Volatility	2.69	2.20	1.85	49,386
M&A deal in month t	0.06	0	0.24	49,386
Total M&A deal value LTM/Total assets	0.08	0	0.22	49,386
MTB	3.87	2.21	8.53	49,386
Lagged monthly return	0.02	0.02	0.20	49,386
Momentum	0.05	0.03	0.38	49,386
Institutional ownership	0.73	0.80	0.26	49,386
10-K/Q EDGAR filings	0.08	0	0.30	49,386
Current Event EDGAR filings	0.34	0	0.66	49,386
Change in ownership EDGAR filings	1.19	0	3.31	49,386

Notes. This table presents summary statistics for company-level and analyst-level variables in our sample of analyst forecast updates and recommendation changes. Panel A presents summary statistics for the 496,521 EPS forecast changes made by 3,900 analysts for 4,346 companies. Panel B presents the 49,386 recommendation changes made by 2,579 analysts for 3,541 companies. The appendix provides definitions for all variables.

have considerable analyst coverage (15.1 analysts providing EPS estimates, on average) and frequent estimate updates (63 days per analyst, on average).

In panel B, we find similar values for the 49,386 recommendations we study. Approximately 22% of the analysts view filings on EDGAR immediately before making a recommendation change, with the average analyst accessing 1.6 filings. The sample is tilted toward downgrades ($n = 20{,}622$) versus upgrades ($n = 16{,}489$), and therefore, it is not surprising that the average two-day *CAR* following a change in a recommendation is negative. Finally, consistent with previous literature (Barber et al. 2006), we observe that the mean rating by analysts is slightly positively skewed, with a mean rating of 3.63 on a scale of 1 (strong sell) to 5 (strong buy).

We are interested in the informativeness of each recommendation. Following Bradshaw et al. (2017), we measure the cumulative abnormal returns around a recommendation change as the risk-adjusted abnormal returns calculated using the method defined in Daniel et al. (1997). This approach takes the company returns and subtracts the return of a portfolio of companies matched on size, valuation, and momentum characteristics.

The recommendation changes and EPS estimates are made by the same sample of analysts over the 2006–2016 time period. Therefore, it is not surprising that the analyst and company characteristics in the sample of recommendations changes are similar to those in the sample of EPS forecast changes.

4. The Drivers Behind Information Acquisition

We study three broad sets of determinants of the costs and benefits from acquiring information: the demand for information from investors, an analyst's private incentives to provide high-quality advice, and the competitive forces of other analysts' predictions.

4.1. The Demand for Accurate Information

In Table 3 we study the determinants of an analyst's views of EDGAR filings before earnings estimates as a function of important covariates that we hypothesized would affect the analyst's incentives. We use a panel estimation model:

$$\ln(1 + Total\ Views_{i,c,t}) = \beta_1 X_{i,c,t-1} + \beta_2 Z_{i,c,t-1} + \delta_i + \pi_t + \varepsilon_{i,c,t}. \quad (1)$$

We measure the research conducted by analyst i for company c in period t with either the count of the overall views or the views of certain filing categories including 10-Ks/10-Qs, 8-Ks, or change in ownership forms. The first vector of independent variables $X_{i,c,t-1}$ includes variables that proxy for the demand for company information and company informational uncertainty (such as firm size, firm market-to-book ratio, volatility of company returns, and measures of company M&A activity), variables that proxy for the analyst's career incentives (e.g., analyst prior year company error, whether the analyst's estimate was excluded from I/B/E/S consensus), and variables that proxy for the analyst's experience and the size of the brokerage house. To control for the overall information environment of the company, we include a set of lagged covariates ($Z_{i,c,t-1}$) that includes company- and analyst-level controls that might affect an analyst's tendency to use EDGAR for that update (e.g., institutional ownership, the length of time an analyst has covered a company, the availability of

Table 3. Determinants of Views Before EPS Forecast Updates

	(1)	(2)	(3)	(4)
	Log Total	*Log 10-K/Q*	*Log 8-K*	*Log Change in Ownership*
ln(*Market value*)	0.034***	0.021***	0.012***	0.003***
	(0.004)	(0.002)	(0.002)	(0.001)
ln(*Volatility*)	0.076***	0.032***	0.035***	0.008***
	(0.006)	(0.004)	(0.003)	(0.001)
M&A deal in month t	0.079***	0.039***	0.044***	0.004*
	(0.007)	(0.005)	(0.004)	(0.002)
Total M&A deal value LTM/Total assets	0.055***	0.010*	0.036***	0.003
	(0.009)	(0.006)	(0.006)	(0.002)
Lagged analyst company est. error	0.280***	0.189***	0.142***	0.009
	(0.071)	(0.040)	(0.046)	(0.017)
ln(*Analyst-company excluded estimates*)	0.007**	0.002	0.005**	–0.001*
	(0.003)	(0.002)	(0.002)	(0.001)
ln(*Analyst career length*)	0.007***	0.004***	0.003**	–0.001
	(0.002)	(0.002)	(0.001)	(0.001)
ln(*Brokerage size*)	0.069***	0.057***	0.013***	0.001
	(0.007)	(0.005)	(0.004)	(0.001)
ln(*Time covering company*)	–0.007***	–0.004***	0.002***	–0.000
	(0.001)	(0.001)	(0.001)	(0.000)
ln(*MTB*)	–0.018***	–0.011***	–0.008***	–0.002**
	(0.004)	(0.003)	(0.002)	(0.001)
Lagged monthly return	–0.010	–0.017***	–0.000	–0.002
	(0.008)	(0.006)	(0.005)	(0.002)
Momentum	0.027***	0.006**	0.006**	0.001
	(0.004)	(0.003)	(0.002)	(0.001)
Institutional ownership	–0.015	0.010	–0.009	–0.003
	(0.014)	(0.009)	(0.007)	(0.002)
# analysts covering	0.001	0.000	0.001***	–0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Proportion of analysts changing est.	0.090***	0.045***	0.060***	0.003
	(0.007)	(0.005)	(0.004)	(0.002)
Est. change on day of earnings	0.070***	0.037***	0.052***	–0.002**
	(0.005)	(0.003)	(0.004)	(0.001)
log(*10-K/Q EDGAR filings*)	0.007	0.070***	–0.079***	0.005**
	(0.007)	(0.005)	(0.004)	(0.002)
log(*Current Event EDGAR filings*)	0.031***	–0.010***	0.042***	–0.000
	(0.005)	(0.003)	(0.003)	(0.001)
log(*Change in Ownership EDGAR filings*)	0.020***	0.000	–0.005***	0.028***
	(0.003)	(0.002)	(0.001)	(0.001)
Analyst fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adj. R^2	0.211	0.148	0.134	0.073
Observations	496,521	496,521	496,521	496,521

Notes. This table presents regressions of an analyst's EDGAR views prior to an EPS forecast update on analyst and company characteristics. Column (1) uses the logarithm of 1 plus the total count of all filings accessed by the analyst on the day before or the day of a forecast estimate. Columns (2)–(4) use the logarithm of 1 plus the total count of filing views by filing category. The independent variables associated with filing views are defined in the appendix. Analyst fixed effects and year fixed effects are included in all columns. All other variables are defined in the appendix. Standard errors clustered at the company level are reported in parentheses.

Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

new company filings). We further include analyst-level fixed effects (δ_i) to absorb time-invariant factors related to the baseline ability of the analyst and year fixed effects (π_t) to account for any overall change in the level of EDGAR use over time.[10]

Consistent with our first hypothesis, in the first model in Table 3 we find that company size—as measured by the log of the market value of equity—is a strong predictor of an analyst's tendency to access EDGAR before issuing earnings forecasts for a company.

Similarly, the volatility of the company's returns is positively associated with increased EDGAR views. We also document that two measures of changes in the company's operations, the total M&A deal value over the preceding year and a dummy for concurrent deals, are strongly associated with more analyst attention to company filings. These results are consistent with analysts focusing their attention where there is the highest demand for informed analysis—in large companies, companies with high informational asymmetry, and companies with recent operational changes. We document these strong correlations when we include analyst-level fixed effects, suggesting that these measures of information environment complexity are driving EDGAR activity after we implicitly control for an analyst's industry specialization and baseline usage of EDGAR. We also find that the analyst fixed effects lead to a significant increase in the model fit over a model that instead uses brokerage fixed effects,[11] suggesting that an analyst's individual style is an important determinant of EDGAR research.[12] Additionally, in the next three models in Table 3, we find a consistent positive association between the information environment and research via EDGAR when we run our tests on Forms 10-K/Q, Form 8-K, and the change in ownership form, Form 4. In summary, we find consistent support for our first hypothesis—analyst usage of EDGAR is positively associated with investor demand for information.

4.2. Analysts' Private Incentives to Acquire Information

Our second hypothesis revolves around analysts' private incentives to provide informed advice. In particular, Hypothesis 2 predicts that analysts' incentives to acquire information will be driven by career concerns. In a direct test of analysts' incentives in Table 3, we find that an analyst's prior year forecast accuracy affects her incentives to acquire information. A large estimate error, defined as the difference between the analyst's prior year estimate and the realized prior year EPS, normalized by the prior year-end closing price, is related to a subsequent increase in views for that company. Similarly, we find evidence that when an analyst's estimates are excluded from the consensus for a firm she covers, she reads more about the firm on EDGAR before making a forecast update in the following year. Overall, this evidence provides support for analysts' private incentives having a meaningful impact on the effort exerted when making forecast updates.

Consistent with the predictions of Hypothesis 3, Table 3 documents that the overall analyst experience is positively associated with research via EDGAR. In conjunction with this, we also find that the time an analyst has covered the company is negatively associated with her use of EDGAR for research. These results support the idea that an analyst's incentives to acquire primary information shift through her career as her overall skill and company-specific experience change the costs and benefits of acquiring that information. An analyst that covers a company over a long period develops industry knowledge and connections to management that are viewed as more important sources of information than the publicly available information from EDGAR. However, conditional on the time covering a company, more experienced analysts still rely more on EDGAR. We document that one channel of improved quality of research is through the utilization of more primary filings.

Part of the analyst's incentives will also be driven by characteristics of her brokerage house. A large brokerage house can employ larger analyst teams and disseminate estimates to a broader set of clients. Consistent with these lower costs and higher benefits from information, we document that information acquisition is more intense for analysts at larger brokerages.

Finally, an analyst's career evolves in relation to her peer analysts' careers as they compete in the labor market. One observable metric of an analyst's performance is the timing of an analyst's recommendation in comparison with other analysts covering the same company. This observable metric, which may affect career outcomes, would likely affect the incentive to acquire information through EDGAR. Our results in Table 3 provide support for this conjecture; we find that analysts' attention to EDGAR increases with the number of peer analysts that made a forecast update in the preceding 30 days. We also find evidence that analysts' estimates are driven by current events (measured as the number of current event 8-Ks posted on EDGAR over the previous week) and the general availability of new information on EDGAR. This result suggests that analysts are competing to differentiate their estimates through effort allocated to information acquisition. Overall, we find that analyst experience and brokerage size are reliable predictors of the use of EDGAR.

4.3. EDGAR Use Before Recommendations

In Table 4, we document similar patterns when we examine analysts' views before recommendation changes. Interestingly, we see a substantial increase in EDGAR views in cases when the analyst's recommendation follows changes in competitors' recommendations. This finding suggests that analysts have even higher incentives to provide differentiated advice for recommendations. However, the overall similarity of results in Tables 3 and 4 suggests that analysts' research

Table 4. Determinants of Views Before Recommendation Changes

	(1)	(2)	(3)	(4)
	Log Total	*Log 10-K/Q*	*Log 8-K*	*Log Change in Ownership*
ln(*Market value*)	0.033***	0.021***	0.010***	0.003*
	(0.005)	(0.003)	(0.002)	(0.002)
ln(*Volatility*)	0.096***	0.050***	0.046***	0.003
	(0.010)	(0.007)	(0.006)	(0.004)
Dummy M&A deal in month t	0.210***	0.097***	0.114***	0.013**
	(0.018)	(0.012)	(0.012)	(0.007)
Total M&A deal value LTM/Total assets	0.071***	–0.003	0.050***	0.009
	(0.017)	(0.011)	(0.012)	(0.007)
Lagged analyst est. error	0.018***	0.010***	0.009***	0.005*
	(0.005)	(0.004)	(0.003)	(0.003)
ln(*Analyst career length*)	0.009	0.016	–0.004	–0.008
	(0.015)	(0.010)	(0.009)	(0.006)
ln(*Brokerage size*)	0.029**	0.031***	0.005	0.002
	(0.014)	(0.010)	(0.008)	(0.004)
ln(*Time covering company*)	–0.009**	–0.002	–0.000	0.001
	(0.004)	(0.003)	(0.003)	(0.001)
ln(*MTB*)	–0.016***	–0.010***	–0.007**	0.000
	(0.005)	(0.004)	(0.003)	(0.002)
Lagged monthly return	–0.007	–0.024**	0.008	0.005
	(0.018)	(0.012)	(0.012)	(0.006)
Momentum	0.023**	0.007	–0.003	0.000
	(0.010)	(0.007)	(0.006)	(0.003)
Institutional ownership	–0.012	0.022*	–0.007	–0.004
	(0.017)	(0.012)	(0.009)	(0.005)
# analysts covering	0.001	0.001	0.001*	0.000
	(0.001)	(0.001)	(0.000)	(0.000)
Proportion of analysts changing rec.	0.147***	–0.029	0.111***	0.009
	(0.054)	(0.035)	(0.034)	(0.019)
Rec. change on day of earnings	0.126***	0.059***	0.088***	0.006
	(0.019)	(0.013)	(0.013)	(0.006)
Rec. accompanies EPS forecast change	0.040***	0.033***	0.013***	0.002
	(0.007)	(0.005)	(0.004)	(0.003)
log(*10-K/Q EDGAR filings*)	0.065***	0.100***	–0.039***	0.001
	(0.020)	(0.015)	(0.011)	(0.007)
log(*Current Event EDGAR filings*)	0.077***	0.007	0.076***	0.001
	(0.010)	(0.007)	(0.006)	(0.004)
log(*Change in Ownership EDGAR filings*)	0.033***	0.001	–0.001	0.036***
	(0.005)	(0.004)	(0.003)	(0.003)
Analyst fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adj. R^2	0.183	0.130	0.082	0.063
Observations	49,386	49,386	49,386	49,386

Notes. This table presents regressions of analyst EDGAR views prior to a recommendation change on analyst and company characteristics. Column (1) uses the logarithm of 1 plus the total count of all filings accessed by the analyst on the day before or the day of a recommendation change. Columns (2)–(4) use the logarithm of 1 plus the total count of filing views by filing category. The independent variables associated with filing views are defined in the appendix. Analyst fixed effects and year fixed effects are included in all columns. All other variables are defined in the appendix. Standard errors clustered at the company level are reported in parentheses.

Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

patterns are related directly to their incentives. These results tell a more nuanced story between advice and primary information than analysts' simply updating EPS estimates when earnings-related information is released by the company.

In summary, we document that analysts' research via EDGAR is associated with greater demand for information, is more common whenever analysts have private incentives to produce high-quality advice, and is used to differentiate their advice from other analysts.

5. Empirical Analysis of Analyst Forecast Accuracy and EDGAR Research

Next, we test our hypothesis that analysts will use the information contained in the primary filings from EDGAR to improve the accuracy of their EPS forecasts. In order to do so, we use a panel approach and regress the realized forecast error of the estimate on our measure of an analyst's use of EDGAR and a set of standard controls and fixed effects:

$$Forecast\ Error_{i,c,t} = \beta_1 EDGAR\ Use\ Measure_{i,c,t} + \beta_2 Z_{i,c,t-1} + \delta_i + \mu_c + \pi_t + \varepsilon_{i,c,t}. \quad (2)$$

We measure forecast error by analyst i for company c in time period t using the demeaned absolute forecast error (DAFE).[13] We are interested in the conditional correlation between this measure and the analyst research of company c filings on EDGAR, as measured by the coefficient β_1. We use a specification that relies on the total number of filings viewed by an analyst, as well as alternative specifications that measure the time spent engaging with the filings or the number of exhibits viewed. To control for the overall information environment of the company, we include a set of lagged covariates ($Z_{i,c,t-1}$) that include company-level controls such as company size and institutional ownership. We also control for analyst and brokerage covariates that might affect the accuracy of the analyst's recommendations. We further include analyst (δ_i) and company fixed effects (μ_c) to absorb time-invariant factors related to the baseline ability of the analyst or the complexity of the company's operations. Additionally, we use event time monthly fixed effects (π_t) to account for less uncertainty and, therefore, higher accuracy for forecasts that are produced closer to the date that earnings are reported. Finally, we allow for heteroscedastic errors, which we cluster at the company level.

We expect that attention to EDGAR filings will enhance the accuracy of analysts' recommendations. This would present as a negative association between research via EDGAR and the demeaned absolute forecast error. We report our results in Table 5. The first two columns of Table 5 present regressions of the forecast error on two different measures which relate to the number of filings viewed. In column (1), we regress forecast error on the log of 1 plus the count of total filings viewed, and in column (2) we only measure views of filings that are more than two days old. In both specifications, the measure of research via EDGAR is negatively associated with forecast error, which is consistent with Hypothesis 4. Our results suggest that a 1% increase in filings reviewed is associated with a 1.45% lower forecast error relative to peer analysts.[14] These results support the notion that an analyst's accuracy is related to her ability to incorporate current company information into her analysis as well as her ability to reinterpret historical publicly available information in the context of the current economic environment.

When we examine a simple indicator for the decision of an analyst to do any research through EDGAR before making an estimate (column (3)), we find a reduction in forecast error of 3.7%.[15] This is an economically meaningful increase in accuracy and is of the same magnitude as the decrease in accuracy observed when an analyst is distracted by an IPO in her industry (Pisciotta 2019) or the decrease in accuracy associated with companies in her portfolio deemed "low priority" (Harford et al. 2019). Indeed, this direct measure of analyst research effort and increased forecast accuracy is consistent with the mechanism underlying the results established by Pisciotta (2019) and Harford et al. (2019).

We next examine two measures that capture the depth of research conducted. In column (4) of Table 5, we present results based on a measure of the number of minutes an analyst engages with filings related to a company,[16] whereas in column (5), we examine a measure of the number of exhibits viewed by an analyst. In both specifications, the measures that capture the intensity of effort are negatively related to the forecast error. A 1% increase in time spent viewing relevant filings is associated with a 0.8% reduction in relative forecast error, whereas a similar increase in the number of exhibits viewed is associated with a 1.26% reduction in relative forecast error. These results suggest that both attention to information disseminated via EDGAR and the depth of processing of that information are meaningfully related to an analyst's ability to forecast future earnings accurately.

To minimize the possibility that the association between EPS forecast accuracy and EDGAR research is due to common information shocks, we repeat this analysis excluding all forecasts within the 30-day window centered on the date of the company's earnings report. Additionally, to rule out a spurious association between EDGAR research, brokerage size, and analyst skill, we exclude the institutions in the top 25 positions in Bloomberg's investment banking league tables. In both analyses, we find similar results—analyst research via EDGAR is associated with more accurate forecasts. These results are reported in the internet appendix in Tables IA.8 and IA.9, respectively.

In addition to EDGAR-backed research being associated with more accurate EPS forecasts, we find that EDGAR-backed research is also associated with analysts forecasting more types of company performance measures. In column (1) of Table 6, we regress the number of additional financial measures for which the analyst provides forecasts on EDGAR views. These additional measures are forecasts of generally accepted accounting principles (GAAP) EPS, book value, cash flow, and dividend. In columns (2)–(4), this

Table 5. EDGAR Views and Relative EPS Forecast Accuracy

	(1)	(2)	(3)	(4)	(5)
	DAFE	*DAFE*	*DAFE*	*DAFE*	*DAFE*
ln(*Total views*)	−0.022***				
	(0.004)				
ln(*Past filing views*)		−0.019***			
		(0.004)			
Dummy if filing viewed			−0.037***		
			(0.006)		
ln(*Time spent*)				−0.012***	
				(0.002)	
ln(*Exhibits viewed*)					−0.019***
					(0.003)
ln(*Market value*)	0.164***	0.164***	0.164***	0.164***	0.164***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Total M&A deal value LTM/Total assets	0.004	0.003	0.003	0.003	0.004
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
ln(*Analyst career length*)	−0.021***	−0.021***	−0.021***	−0.021***	−0.021***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ln(*Brokerage size*)	0.033**	0.033**	0.033**	0.033**	0.033**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
ln(*Time covering company*)	−0.023***	−0.023***	−0.023***	−0.023***	−0.023***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Institutional ownership	−0.003	−0.003	−0.003	−0.003	−0.003
	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)
# *analysts covering*	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
ln(*Days since previous forecast update*)	0.024***	0.024***	0.024***	0.024***	0.024***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Est. change on day of earnings	−0.049***	−0.050***	−0.049***	−0.049***	−0.049***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Analyst fixed effects	Yes	Yes	Yes	Yes	Yes
Company fixed effects	Yes	Yes	Yes	Yes	Yes
Event time monthly fixed effects	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.126	0.126	0.126	0.126	0.126
Observations	496,521	496,521	496,521	496,521	496,521

Notes. This table presents regressions of relative forecast accuracy on analyst EDGAR usage and analyst and company characteristics. The dependent variable is the demeaned absolute forecast error (*DAFE*), ln(*Total views*) is the logarithm of 1 plus the count of all filings that the analyst accessed on the day before or the day of a forecast estimate, ln(*Past filing views*) is the logarithm of 1 plus all past filings that the analyst accessed on the day before or the day of a forecast estimate, *Dummy if filing viewed* is a dummy variable equal to 1 if the analyst viewed a filing on these two days, ln(*Time spent*) is the logarithm of 1 plus the sum of all minutes an analyst viewed filings related to the company on the day before or day of a forecast estimate, and ln(*Exhibits viewed*) is the logarithm of 1 plus the number of unique extensions viewed by an analyst on the day before or the day of a forecast estimate. All other variables are defined in the appendix. Analyst fixed effects, company fixed effects, and event time monthly fixed effect dummies are included in all models. Standard errors clustered at the company level are reported in parentheses.

Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

measure is replaced by indicator variables for providing an EPS estimate for the following time horizons: quarterly EPS, two-year EPS, and three- to five-year EPS. In all specifications, EDGAR usage by the analyst is associated with a higher likelihood of that type of forecast being disseminated by the analyst.[17] Interestingly, total EDGAR views has the largest economic magnitude in predicting three- to five-year EPS forecasts. This suggests that analysts are using the financial information acquired through EDGAR to predict further into the future where there is inherently more uncertainty. This result is complementary to the findings in Table 3, in which we document that analysts are more likely to use EDGAR when the information environment is more complex.

Taken together, this set of results suggests that analysts' use of EDGAR is associated with more accurate (Table 5) and more detailed (Table 6) EPS estimates. Thus, we find consistent and robust support for our fourth hypothesis.

Table 6. EDGAR Views, Prediction Types, and Prediction Frequency

	(1)	(2)	(3)	(4)
	# additional measures	*Quarterly EPS*	*Two-year EPS*	*Three- to five-year EPS*
ln(*Total views*)	0.025***	0.004***	0.007***	0.013***
	(0.002)	(0.000)	(0.001)	(0.001)
ln(*Market value*)	0.011*	0.006***	0.016***	0.020***
	(0.007)	(0.001)	(0.002)	(0.004)
ln(*Volatility*)	–0.047***	0.004***	0.024***	–0.008***
	(0.004)	(0.001)	(0.002)	(0.003)
M&A deal in month t	0.036***	0.002	0.008***	0.010***
	(0.005)	(0.002)	(0.002)	(0.003)
Total M&A deal value LTM/Total assets	0.048***	0.001	0.008***	0.014***
	(0.008)	(0.002)	(0.003)	(0.005)
Lagged analyst company est. error	0.100	–0.014	0.016	0.133***
	(0.072)	(0.021)	(0.023)	(0.043)
ln(*Analyst-company excluded estimates*)	0.031***	–0.005***	–0.000	0.009***
	(0.003)	(0.001)	(0.001)	(0.002)
ln(*Analyst career length*)	0.040***	0.006***	0.009***	0.025***
	(0.003)	(0.001)	(0.001)	(0.002)
ln(*Brokerage size*)	0.068***	0.009***	0.012***	0.066***
	(0.011)	(0.002)	(0.003)	(0.006)
ln(*Time covering company*)	–0.029***	–0.002***	–0.011***	–0.022***
	(0.001)	(0.000)	(0.000)	(0.001)
ln(*MTB*)	–0.015**	–0.004***	–0.006***	–0.008**
	(0.007)	(0.001)	(0.002)	(0.003)
# analysts covering	0.004***	0.000*	0.000**	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
Institutional ownership	0.015	0.019***	0.012**	0.026**
	(0.019)	(0.005)	(0.006)	(0.011)
Est. change on day of earnings	0.035***	0.001	0.010***	0.027***
	(0.005)	(0.001)	(0.002)	(0.003)
Analyst fixed effects	Yes	Yes	Yes	Yes
Company fixed effects	Yes	Yes	Yes	Yes
Event time monthly fixed effects	Yes	Yes	Yes	Yes
Adj. R^2	0.518	0.344	0.100	0.519
Observations	496,521	496,521	496,521	496,521

Notes. This table presents regressions of the number of additional measures besides EPS for which the analyst provides a forecast (column (1)) and indicator variables for whether the analyst provides a quarterly EPS estimate (column (2)), a two-year EPS estimate (column (3)), or a three- to five-year EPS estimate (column (4)) on analyst EDGAR usage, as well as analyst and company characteristics. The additional forecast measures are GAAP EPS, book value, cash flow, and dividend. ln(*Total views*) is the logarithm of 1 plus the count of all filings that the analyst accessed on the day before or the day of a forecast estimate. All other variables are defined in the appendix. Analyst fixed effects, company fixed effects, and event time monthly fixed effect dummies are included in all models. Standard errors clustered at the company level are reported in parentheses.

Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

6. EDGAR-Backed Research and the Market Response to Analysts' Recommendations

Analysts' forecasts that are backed by research via EDGAR are more accurate, on average. In our final hypothesis, we conjectured that market reactions to recommendations backed by research via EDGAR would be larger because these recommendations would be more informative. This would imply that these outsized reactions are due to the nonredundant analysis of financial information contained in the recommendation report. We test this hypothesis by examining the cumulative abnormal return following an analyst's recommendation change. Similar to Bradshaw et al. (2017), we use the approach of Daniel et al. (1997) and calculate two-day risk-adjusted abnormal returns.

Table 7 examines the size of the cumulative abnormal returns in the two-day window after a recommendation change. We use the following specification:

$$|CAR|_{i,c,t} = \beta_1 EDGAR\ Use\ Measure_{i,c,t} + \beta_2 Z_{i,c,t-1} + \delta_i + \varepsilon_{i,c,t}. \quad (3)$$

The dependent variable is the absolute value of the CARs (as a measure of the informational content of each recommendation). The inclusion of analyst-level fixed effects ensures that our results are driven by the

Table 7. EDGAR Views and Recommendation Announcement Returns

	(1)	(2)	(3)	(4)	(5)
	|*CAR*| [0,+1]	|*CAR*| [0,+1]	|*CAR*| [0,+1]	|*CAR*| [0,+1]	|*CAR*| [0,+1]
ln(*Total views*)	0.720***				
	(0.066)				
ln(*Past filing views*)		0.606***			
		(0.069)			
Dummy if filing viewed			1.216***		
			(0.109)		
ln(*Time spent*)				0.516***	
				(0.048)	
ln(*Exhibits viewed*)					0.636***
					(0.056)
ln(*Market value*)	−0.972***	−0.966***	−0.968***	−0.970***	−0.973***
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
ln(*Volatility*)	1.968***	1.977***	1.972***	1.953***	1.962***
	(0.140)	(0.140)	(0.140)	(0.140)	(0.140)
Lagged analyst est. error	−0.118	−0.115	−0.116	−0.114	−0.118
	(0.073)	(0.073)	(0.073)	(0.073)	(0.073)
ln(*Analyst career length*)	0.582***	0.601***	0.586***	0.598***	0.573***
	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
ln(*Brokerage size*)	−0.075	−0.070	−0.084	−0.077	−0.075
	(0.205)	(0.205)	(0.205)	(0.205)	(0.205)
ln(*Time covering company*)	−0.159***	−0.160***	−0.157***	−0.157***	−0.158***
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
ln(*MTB*)	0.321***	0.319***	0.318***	0.319***	0.323***
	(0.089)	(0.089)	(0.089)	(0.089)	(0.089)
Lagged monthly return	−2.643***	−2.629***	−2.632***	−2.647***	−2.642***
	(0.331)	(0.332)	(0.332)	(0.331)	(0.331)
Momentum	−1.036***	−1.034***	−1.034***	−1.031***	−1.040***
	(0.259)	(0.259)	(0.260)	(0.259)	(0.259)
Rec. deviation from consensus	0.696***	0.696***	0.694***	0.697***	0.695***
	(0.071)	(0.072)	(0.071)	(0.071)	(0.071)
Rec. change on day of earnings	3.772***	3.823***	3.761***	3.763***	3.761***
	(0.287)	(0.287)	(0.287)	(0.287)	(0.287)
Rec. accompanies EPS forecast change	1.077***	1.085***	1.069***	1.073***	1.072***
	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)
Analyst fixed effects	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.210	0.209	0.210	0.211	0.210
Observations	49,386	49,386	49,386	49,386	49,386

Notes. This table presents regressions of abnormal recommendation announcement returns on EDGAR filing views. The dependent variable |*CAR*| is the two-day [0, +1] cumulative absolute abnormal return following a recommendation change event, ln(*Total views*) is the logarithm of 1 plus the count of all filings that the analyst accessed on the day before or the day of a forecast estimate, ln(*Past filing views*) is the logarithm of 1 plus all past filings that the analyst accessed on the day before or the day of a forecast estimate, *Dummy if filing viewed* is a dummy variable equal to 1 if the analyst viewed a filing on these two days, ln(*Time spent*) is the logarithm of 1 plus the sum of all minutes an analyst viewed filings related to the company on the day before or day of a forecast estimate, and ln(*Exhibits viewed*) is the logarithm of 1 plus the number of unique extensions viewed by an analyst on the day before or the day of a forecast estimate. All other variables are defined in the appendix. Analyst fixed effects are included in all models. Standard errors clustered at the company level are reported in parentheses.

Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

varying intensity of the analyst attention to EDGAR and not driven by time-invariant characteristics of the analyst, such as her reputation. We also include a vector of controls that account for company *c* and analyst *i* characteristics that might correlate with the magnitude of the market reaction to an analyst's recommendation for the company.

We test whether these cumulative abnormal returns are associated with the five measures of analysts' use of EDGAR. In column (1) of Table 7, we document that the magnitude of the stock price reaction to an analyst's recommendation is increasing with the total count of EDGAR views prior to the recommendation. When we examine the magnitude of the price reaction

when an analyst uses past filings to back her research (in column (2)), we also find a positive and statistically significant relationship. This is consistent with an analyst being able to reinterpret existing public information in the context of the current economic environment to create a valuable recommendation. Column (3) of Table 7 shows that the CARs are on average 1.22% larger for an analyst recommendation backed by EDGAR research.[18] When we examine our measures of intensity of effort, such as the time an analyst devoted to research or the number of exhibits viewed, we find a similarly strong positive relationship between the depth of research and the value of a recommendation.

The results are consistent with a mechanism where analysts can gather and analyze EDGAR information to add value to their recommendation and suggest that EDGAR information and private communication with management teams are complements, or that EDGAR information is an equal or better substitute for private communication with management. On the basis of the characterizations by analysts of these private communications as useful for cross-checking and providing context (Brown et al. 2015), we believe the former is more likely than the latter. Moreover, this complementarity helps explain why larger brokerages are associated with more EDGAR research—these brokerages have greater access to management, and thus the public information in EDGAR is more valuable because it can be used in conjunction with the direct communication with management.

In sum, analysts act as effective information intermediaries—transforming publicly available information into recommendations that have an impact on prices.

In further tests included in the internet appendix, we find that the abnormal reactions are concentrated in the day of and day after the recommendation (Table IA.13). We also document that the market reacts strongly to upgrades that are backed by EDGAR views but not to downgrades backed by EDGAR views. We repeat the analysis from Table 7 excluding all forecasts within the 30-day window centered on an earnings report date (Table IA.14) or excluding the top 25 institutions from Bloomberg's investment banking league tables (Table IA.15). In both analyses, our inferences are unchanged—analyst research via EDGAR is associated with stronger market reactions to recommendation changes.

A natural question that arises is how investors determine that an analyst's recommendation is backed by research via EDGAR. We conjecture that the recommendations backed by this type of research are more informative than those not backed by research, and thus, investors are reacting to more thorough

Table 8. Report Content Analysis—High EDGAR Viewers vs. Low EDGAR Viewers

	Total			High viewers			Low viewers			High/low	
	Mean	Median	*N*	Mean	Median	*N*	Mean	Median	*N*	mean diff.	*p*-value
Total pages											
All Rec. Changes	13.6	11.0	98	19.0	14.0	42	9.6	8.0	56	9.4	0.001***
Rec. Changes ex. Earnings/Company Events	16.3	12.0	59	26.1	20.0	22	10.5	10.0	37	15.6	0.002***
Pages excluding front page, model, and disclosures											
All Rec. Changes	3.2	1.0	98	5.4	2.0	42	1.6	1.0	56	3.9	0.032**
Rec. Changes ex. Earnings/Company Events	4.3	1.5	59	8.4	2.5	22	1.9	1.0	37	6.5	0.051*
No. of figures											
All Rec. Changes	5.7	1.5	98	10.1	4.0	42	2.3	1.0	56	7.8	0.001***
Rec. Changes ex. Earnings/Company Events	8.3	4.0	59	17.6	14.5	22	2.8	1.0	37	14.8	0.000***
% including industry information											
All Rec. Changes	49.0%	0.0%	98	59.5%	100.0%	42	41.1%	0.0%	56	18.5%	0.072*
Rec. Changes ex. Earnings/Company Events	69.5%	100.0%	59	81.8%	100.0%	22	62.2%	100.0%	37	19.7%	0.098*
% including proprietary data											
All Rec. Changes	5.1%	0.0%	98	4.8%	0.0%	42	5.4%	0.0%	56	−0.6%	0.895
Rec. Changes ex. Earnings/Company Events	8.5%	0.0%	59	9.1%	0.0%	22	8.1%	0.0%	37	1.0%	0.900

Notes. This table presents an analysis of the content of recommendation change reports. We hand-collect reports published by a group of analysts identified as "high viewers"—analysts who view a median of more than two filings on EDGAR before making a recommendation change. Similarly, we hand-collect reports for "low viewers"—analysts who view a filing on EDGAR for less 10% of their recommendation changes. Our screening criteria also require that analysts have completed 10 or more recommendations and that we can identify the full recommendation report in the Investext database of analysts' reports. We evaluate the total number of pages in the report; the total number of pages excluding the front page of the report, the standard financial model, and the required disclosures at the end of the report; the number of figures and tables included in the report; the number of reports containing industry information (i.e., information about competitors or current industry conditions); and the number of reports that include proprietary data (e.g., a survey conducted by the analyst). For each category, we provide a subsample that excludes reports prompted by company events such as earnings reports, merger announcements, and other news. Mean differences between high and low viewers are compared in the final two columns.

Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

and insightful recommendation reports. We test this conjecture by manually inspecting a sample of analyst reports that are available through the data provider Investext.[19] We examined reports from analysts that are "high viewers" (analysts who typically view more than two filings on EDGAR prior to making a recommendation change) and "low viewers" (analysts that use EDGAR for less than 10% of their recommendation changes).

With this sample of analyst reports, we examine the reports' length, the number of figures, the inclusion of industry information, and the inclusion of proprietary data. As shown in Table 8, we find that analysts who regularly use EDGAR issue longer reports, include more figures, and are more likely to include industry commentary. Interestingly, the reports are not more likely to include proprietary data, which suggests that investors are reacting to the analysts' interpretation of company and industry conditions and not reacting to the presentation of new facts. These results, in conjunction with the results of Table 7, strongly suggest that analysts are acting as effective

Table 9. Recommendation Changes and Previous Analyst Use of EDGAR

	(1)	(2)	(3)
	Rec. Change	*Rec. Change*	*Rec. Changes ex. Earnings*
Previous analyst used EDGAR × *Previous analyst's rec. change*	0.048***	0.046***	0.048***
	(0.012)	(0.012)	(0.017)
Previous analyst used EDGAR	0.014	0.011	0.019
	(0.014)	(0.014)	(0.020)
Previous analyst's recommendation change	0.104***	0.100***	0.080***
	(0.005)	(0.005)	(0.007)
Analyst used EDGAR		0.043***	0.075***
		(0.016)	(0.022)
ln(*Market value*)		0.015***	0.011*
		(0.004)	(0.006)
ln(*Volatility*)		−0.077***	−0.114***
		(0.015)	(0.021)
Lagged analyst est. error		0.005	−0.001
		(0.009)	(0.013)
ln(*Analyst career length*)		−0.108***	−0.118***
		(0.014)	(0.021)
ln(*Brokerage size*)		−0.022	−0.058
		(0.029)	(0.047)
ln(*Time covering company*)		−0.007	−0.002
		(0.006)	(0.008)
ln(*MTB*)		−0.021***	−0.015
		(0.007)	(0.011)
Lagged monthly return		−0.458***	−0.606***
		(0.047)	(0.066)
Momentum		0.128***	0.105***
		(0.022)	(0.029)
Rec. deviation from consensus		0.156***	0.138***
		(0.019)	(0.022)
Rec. change on day of earnings		−0.144***	
		(0.035)	
Rec. accompanies EPS forecast change		−0.051***	−0.007
		(0.014)	(0.020)
Analyst fixed effects	Yes	Yes	Yes
Adj. R^2	0.009	0.023	0.038
Observations	43,823	43,823	23,743

Notes. The table presents regressions of the level and direction of an analyst recommendation change on the level and direction of the change of the previous analyst to update their recommendation, a dummy variable measuring if the previous analyst used EDGAR, and an interaction term. The dependent variable is the change in the analyst recommendation on a −4 to +4 scale. The sample excludes recommendations identified as initiations of coverage. Column (3) restricts the sample to exclude observations from the 30-day [−15, +15] window surrounding a company's earnings report date. All columns include analyst fixed effects. All other variables are defined in the appendix. Standard errors clustered at the company level are reported in parentheses.

Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

information intermediaries and that investors value analysts' expertise at placing information in the context of current market conditions.

One implication of EDGAR research-backed recommendations being more informative to investors is that these recommendations could also be more informative to other analysts. Because analysts covering the same company are aware of the recommendations of other analysts, we would expect that the release of an analyst's recommendation that is backed by research via EDGAR to influence the next analyst that issues a recommendation.

When we test this conjecture in Table 9, we find evidence that an EDGAR-backed recommendation strongly influences the next analyst's recommendation. If an analyst changes her recommendation, the following analyst is also likely to change her recommendation in the same direction. This is suggestive of analyst herding behavior but also is consistent with common information shocks resulting in multiple analysts updating in the same direction. When we interact the previous analyst's recommendation update with whether she used EDGAR, we find a strong effect—about half the economic magnitude of the primary effect. These interactions suggest that analysts tend to herd when the recommendations of preceding analysts use EDGAR as a source of information. This result is also present in specification 3 of Table 9 when we exclude recommendations around earnings announcements—the largest predictable common information shock. Therefore, we conclude that analysts' attention to EDGAR produces influential recommendations that are more likely to affect subsequent analysts' recommendations.

In summary, the recommendations issued by analysts that are backed by research via EDGAR are associated with a stronger market reaction. This reaction is indicative of their higher information content, as the EDGAR-backed recommendations are longer, have more figures, and contain industry commentary. The informed recommendations are also more influential on subsequent analysts' recommendation updates.

7. Conclusion

Using detailed data on filings accessed on the SEC's EDGAR database by sell-side equity analysts, we find evidence that analysts concentrate their effort on larger companies with higher informational uncertainty. We also show that analysts' private incentives matter in determining effort toward EDGAR research. Analysts exert greater effort toward analyzing primary filing when their prior predictions are less accurate. Analyst career length also plays a role, with more experienced analysts relying more heavily on acquiring information from EDGAR. Interestingly, we document that larger brokerages use more public information in their analysis.

We provide direct evidence that analysts' forecasts backed by research via EDGAR are associated with more accurate predictions of earnings. Furthermore, we establish a strong relationship between recommendations backed by research via EDGAR and the market's reaction to those recommendations. Our tests suggest that analysts' attention to filings improves both the quality and the amount of information the analyst provides. Estimates backed by EDGAR research often include additional financial measures and forecast horizons, and recommendations based on EDGAR provide longer and more in-depth analysis.

Our study highlights the important role of analysts in the information intermediation process. Our research contributes directly to the understanding of analysts' use of "inputs," such as primary filings, and their production of "outputs," such as accurate estimates and informative recommendations. We offer direct evidence that analysts strategically allocate their effort among companies in their portfolios, as well as provide nonredundant analysis of primary filings relevant to these companies. The findings suggest that even with the advent of the internet and the explosion in financial advice from various sources, analysts continue to serve as a primary information intermediary and provide useful analysis based on publicly available sources.

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Appendix. Variable Definitions

Variable	Definition
EDGAR variables	
Total views	The count of views of company filings by an analyst on the day before or day of a recommendation/forecast update by the analyst for that company. (*Source*: EDGAR log files)
Time spent	The sum of the all minutes an analyst viewed filings related to the company on the day before or the day of an analyst recommendation/forecast update. The number of minutes an analyst viewed a filing is the difference in minutes between the initial request for a filing by an analyst and the next request for a different filing from that analyst. If another filing is not requested for more than 60 minutes after the last view of a session, the last view in the session is censored. (*Source*: EDGAR log files)
Exhibits viewed	The number of unique extensions viewed for a company by an analyst on the day before or day of an analyst recommendation/forecast update by the analyst for that company. An extension is a variant of a filing's main URL that often links to an attached exhibit. (*Source*: EDGAR log files)
10-K/Q filings viewed	10-K, 10-K/A, 10-Q, 10-Q/A, 11-K, 11-K/A, 20-F, 20-F/A, 40-F, 40-F/A filings viewed. (*Source*: EDGAR log files)
Change in ownership filings viewed	3, 4, SC 13G, SC 13G/A filings viewed. (*Source*: EDGAR log files)
8-K filings viewed	8-K, 8-K/A, 6-K, 6-K/A filings viewed. (*Source*: EDGAR log files)
10-K/Q EDGAR filings	The count of the number of 10-K and 10-Q filings posted by the company on EDGAR in the week [−8, −2] prior to a recommendation/forecast update by the analyst for that company. (*Source*: EDGAR log files)
Current event EDGAR filings	The count of the number of 8-K filings posted by the company on EDGAR in the week [−8, −2] prior to a recommendation/forecast update by the analyst for that company. (*Source*: EDGAR log files)
Change in ownership EDGAR filings	The count of the number of change in ownership filings posted by the company on EDGAR in the week [−8, −2] prior to a recommendation/forecast update by the analyst for that company. (*Source*: EDGAR log files)
Analyst variables	
Time covering company	The number of days since an analyst rating/estimate for a given company first appeared in the I/B/E/S data set. (*Source*: I/B/E/S)
Analyst career length	The number of years since an analyst first recommendation in the I/B/E/S data set. (*Source*: I/B/E/S)
Brokerage size	The size of a brokerage as measured by the number of analysts issuing a recommendation/forecast for any company in a given year. (*Source*: I/B/E/S)
Analyst prior year company est. error	The lagged average forecast error, where *AFE* is $\lvert Forecast_{i,j,t} - Actual_{j,t}\rvert / Share\ Price_{j,t-1}$, across all estimates from analyst i for company j in the prior year. Equal to 0 for the first observation in the series. (*Source*: I/B/E/S)
Analyst-company excluded estimates	The count of the total number of estimates from analyst i for company j in the prior year $t-1$ that were excluded from the I/B/E/S consensus. (*Source*: I/B/E/S)
Recommendation/EPS variables	
CAR	Risk-adjusted abnormal returns are calculated using the method defined in Daniel et al. (1997). The adjusted return takes the company returns and subtracts the return of a portfolio of companies matched on size, valuation, and momentum characteristics. (*Source*: CRSP)
DAFE	Accuracy is measured by *DAFE*, the de-meaned absolute forecast error. *DAFE* compares an analyst's absolute forecast error for their most recent EPS estimate in a fiscal year to the mean absolute forecast error for the other analysts covering the same stock in the same fiscal year. *DAFE* is calculated as $AFE_{i,j,t} - \overline{AFE}_{j,t}$ (*AFE* defined above). Winsorized at the 1% level. (*Source*: I/B/E/S)
Analyst recommendation	The I/B/E/S recommendation rating of the analyst on an inverted scale where 1 = strong sell and 5 = strong buy. (*Source*: I/B/E/S)
Mean recommendation	The mean recommendation rating for all analysts with a recommendation available for the company. (*Source*: I/B/E/S)
Upgrade	An indicator denoting if an analyst's recommendation increases ≥ 1 on the rating scale. (*Source*: I/B/E/S)
Downgrade	An indicator denoting if an analyst's recommendation decreases ≥ 1 on the rating scale. (*Source*: I/B/E/S)
# analysts covering	The number of analysts with a recommendation/forecast estimate available for the company. (*Source*: I/B/E/S)
Proportion of analysts changing rec./est.	The number of analysts who also changed their rating or estimate/# *analysts covering* in the 30 days before the rating change/estimate change. This variable is top coded at 1. (*Source*: I/B/E/S)
Rec. deviation from consensus	*Analyst recommendation* − *Mean recommendation*. (*Source*: I/B/E/S)
Days since previous forecast update	The number of days between the current recommendation/forecast and prior recommendation/forecast from the same analyst for a company. Equal to 0 for first observation in the series. (*Source*: I/B/E/S)

Appendix. (Continued)

Variable	Definition
Rec./Est. change on day of earnings	An indicator denoting if an analyst updated a recommendation/forecast on the same day as the company's earnings announcement. (*Source*: I/B/E/S)
Rec. accompanies EPS forecast change	An indicator denoting if an analyst also updated EPS forecasts at the same time as the recommendation change. (*Source*: I/B/E/S)
Company variables	
Market value	Current adjusted *Share Price* × *Total Shares Outstanding* at the close of the prior fiscal year before a recommendation/forecast change. (*Source*: Compustat)
MTB	Current adjusted *Share Price* × *Total Shares Outstanding*/(*Total Assets* – *Total Liabilities*) at the close of the prior fiscal year before a recommendation/forecast change. (*Source*: Compustat)
Lag monthly return	The cumulative adjusted share price returns for the month before a recommendation/forecast change. Used as a measure of lagged stock returns. (*Source*: CRSP)
Volatility	The standard deviation of daily share price returns during the two months before a recommendation/forecast change. (*Source*: CRSP)
Momentum	The cumulative adjusted share price returns for the company six months to one month before a recommendation/forecast change (Jegadeesh and Titman 2002). (*Source*: CRSP)
Institutional ownership	The fraction of the company's common shares outstanding held by institutional owners, as reported in the most recent 13-F filing. (*Source*: Thomson S34 file)
M&A deal in month t	An indicator denoting if the company completed a merger or acquisition in the month of the recommendation/forecast change. (*Source*: Thomson ONE Banker)
Total M&A deal value LTM/Total assets	The total deal value of mergers and acquisitions completed by the company in the 12 months prior to a recommendation/forecast change/total assets at the close of the prior fiscal year. Winsorized at the 1% level. (*Source*: Thomson ONE Banker)

Endnotes

[1] We communicated with 11 employees in the equity research department at seven large and midsized investment banks in August 2018. The analysts spanned all experience levels from associate to managing director and covered six different industry groups. We asked, "Do you ever use the SEC's EDGAR system" "How frequently?" "When do you find it most helpful to look at EDGAR filings?" "Does this information get incorporated into EPS changes or recommendation changes?" "When do you use other sources for EPS or recommendation changes?" "What are the other sources?" And we asked an open-ended question requesting comments about the use of fundamental information from EDGAR or other sources by their team.

[2] To the degree that we are observing the activity of other users at the same brokerage and this research is unrelated to the analysts' actions we study, we will overstate the true use of information and underestimate the effect of using EDGAR, biasing against finding support for our hypotheses.

[3] The Division of Economic and Risk Analysis maintains this public data set. It is available on the SEC website in a set of daily files.

[4] In this analysis, we assume that each unique IP address is used by a separate analyst. However, as pointed out in Bozanic et al. (2017), firms commonly aggregate external internet traffic through IP addresses across groups of individuals. This will bias us against finding a significant clustering of EDGAR views in the analyst's actual portfolio.

[5] The lookup table provided by Digital Elements is a single cross section of IP address registrations from April 2016. It is possible that an organization's underlying network infrastructure could change while matching this cross section back through time. This would result in a broken link between the EDGAR server log data and the IP address registration data. Hence, we confirm that we get similar results with a shortened time frame of 2010–2016. These tests mitigate the possibility that a brokerage could have changed IP addresses during the sample.

[6] We count each server log row as a "view." The server log indicates that the linked IP address accessed the document. In most cases, this means that the end user viewed either part of or the whole filing. It is also possible that the user downloaded the filing for further reading.

[7] We believe that analysts use EDGAR for a recommendation or an earnings estimate in the day right before they issue their recommendation/estimate. In the internet appendix (Table IA.10 and Table IA.16), we provide evidence that analyst views of EDGAR in the preceding month are much weaker predictors of earnings precision, do not enhance the predictive power of current research, and do not correlate with the recommendation announcement returns. Although analysts must perform a certain amount of research to maintain their coverage, our results suggest that it is less costly to conduct most of their information processing immediately prior to an update.

[8] In each category, we also use filing amendments (e.g., Form 10-K/A) and additional related forms such as initiation of ownership forms (e.g., Form 3). See the appendix for a detailed description of the composition of each category.

[9] We focus on the window around an analyst estimate because the attention literature shows that if information acquisition is costly, it is optimal to have brief bursts of attention alternating with long periods of inattention (see, e.g., Abel et al. 2007 and Huang and Liu 2007).

[10] In further robustness tests, we report additional specifications that include company fixed effects. Our inferences regarding the analyst- and brokerage-level incentives to conduct research are unchanged when we include company fixed effects. These results are reported in Table IA.2 (estimate updates) and Table IA.3 (recommendations).

[11] We performed a nested significance test on the inclusion of analyst fixed effects in a model that already features brokerage fixed effects. The *F*-test value is 12.5, which is statistically significant at the 1% level, suggesting that the inclusion of analyst fixed effects helps in explaining the total observed variation in EDGAR research over and above a model with brokerage fixed effects.

[12] Furthermore, as shown in Table IA.4, based on a sample of analysts that switch between brokerage houses, we find that research intensity at the new brokerage is meaningfully related to both the new brokerage's research practices (as measured before the analyst joins) and the analyst's research at her previous brokerage. We conclude that

research behavior is shaped by both brokerage-level and analyst-level time-invariant effects.

[13] In supplemental robustness tests provided in the internet appendix, we confirm that all results are robust to using an alternative construction of the demeaned absolute forecast error as well as the proportional mean absolute forecast error, and we provide supplemental tests based on specific types of filings viewed. The results of these test are presented in Tables IA.5 and IA.6. Details on the construction of these alternative variables are available in the appendix.

[14] The implied change in the dependent variable for 1% change in the independent variable is measured by the coefficient of 0.022 × (average total views)/(1 + average total views), equal to 0.022 × (1.95/2.95) = 0.0145 = 1.45%.

[15] We find similar effects when we create indicators for views of each individual filing type (i.e., 10-K/Q, 8-K, change in ownership). The results of this test are reported in Table IA.7 of the internet appendix.

[16] This measure requires us to censor the observations when the length of research is implausibly long (e.g., the analyst looks at a filing at the end of the day and goes home for the evening).

[17] In supplemental analysis provided in Table IA.11 of the internet appendix, we decompose the number of additional forecasts provided and document robust results. More research via EDGAR is associated with a higher likelihood of GAAP EPS, book value, and dividend forecasts.

[18] We find effects of similar magnitude when we break out what analysts are viewing and create indicators for views of each individual filing type (i.e., 10-K/Q, 8-K, change in ownership) before a recommendation change. The results of these tests are reported in Table IA.12 of the internet appendix.

[19] Investext is a Thomson Reuters database covering 42,000 companies globally in 125 industries and contains 18 million research reports from over 1,700 sources.

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