The Effect of Investor Attention on Fraud Discovery and Value Loss in Securities Class Action Litigation

by

Anna Abdulmanova
Trulaske College of Business
Department of Finance
509 Cornell Hall
University of Missouri
Columbia, MO 65211
Tel: (573) 882-4505
Email: aa354@mail.missouri.edu

Stephen Ferris
Trulaske College of Business
Department of Finance
446 Cornell Hall
University of Missouri
Columbia, MO 65211
Tel: (573) 882-9905
Email: ferriss@missouri.edu

Narayanan Jayaraman
Scheller College of Business
Georgia Institute of Technology
800 West Peachtree Street NW
Atlanta, GA 30332
Tel: (404) 894-4389
Email: narayanan.jayaraman@scheller.gatech.edu

Pratik Kothari
Trulaske College of Business
Department of Finance
336 Cornell Hall
University of Missouri
Columbia, MO 65211
Tel: (573) 884-7937
Email: ppkp95@mail.missouri.edu

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Abstract

This study examines the effect of investor attention on value losses due to securities class action lawsuits and fraud discovery. We determine that investor attention influences the magnitude of value losses suffered upon lawsuit filing. Furthermore, we find that lawsuit filing has no effect on the long-term value for the group of firms where investor attention is low. These damages to reputational capital due to higher investor attention are also evident by poor performance and lower institutional ownership post filing. We also find that greater investor attention accelerates the diffusion of information regarding fraud and its discovery. We conclude that investor attention affects both the rate and extent of information processed by market participants around litigation.

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1. Introduction

Reputation is a valuable intangible asset that plays an important role in any economic exchange between a principal and an agent (Blau, 1964; Klein and Leffler, 1981; Shapiro, 1983; Karpoff and Lott, 1993). Tirole (1996) contends that reputation and trust improve the efficiency of an economic contract by adding implicit incentives for agents to fulfill their obligations. Therefore, even though the share of reputational capital in a firm's value is not tangible, it is an important resource at the disposal of a firm. However, measuring the value of a firm's reputation empirically is quite challenging. One approach to measuring that value is suggested by Karpoff (2012) who advocates the examination of counterexamples that negatively influence a firm's reputational capital.

By its basic nature, securities class action litigation has a negative effect on a firm's reputation and represents one counterexample that can be used to assess the contribution of corporate reputation to firm value. Indeed, in a study of financial misrepresentation lawsuits, Karpoff, Lee, and Martin (2008) document that reputational losses are more than 7.5 times the sum of all legal penalties. Similarly, Armour, Mayer, and Polo (2017) report that an average stock price reaction to a lawsuit announcement exceeds the accompanying financial penalties by nine times. They attribute this finding to the reputational losses suffered by the firm due to the lawsuit filing. Similarly, Karpoff and Lott (1993) estimate that 66.6% of the negative market reaction to a lawsuit filing is attributable to reputational losses. More recently, a 2017 article in the *Wall Street Journal* reports, *"The rise [in securities class action lawsuits] is being driven by enterprising plaintiffs' firms bringing more, arguably weaker cases under the perceived strategy that companies will settle early to make a case go away. Advisers are alerting clients that in the current era, every company, from small-cap firms to corporate giants, needs a plan for defending against fraud accusations after investor losses."* This suggests that, regardless of the severity

of fraud they commit, firms are becoming more concerned about the reputational damages that arise from a securities class action lawsuit.

A securities class action is a complex event characterized by scarce information, high uncertainty, and increased information asymmetry between stakeholders and firms. Kahneman (1973) suggests that in a high information asymmetry environment, investor attention plays an important role in improving market efficiency by facilitating information diffusion and learning. In the case of securities class actions, investor attention helps to disseminate information regarding fraudulent activity and to shape the market's reaction to the lawsuit filing. In an environment where investor attention is a cognitive resource in limited supply, higher investor attention improves learning about fraudulent activity and exacerbates the negative effect of the litigation event. As more investors learn about fraudulent activity, the negative effect of litigation on a firm's reputational capital increases.[1]

In this study, we investigate the role investor attention plays in shaping the market's response to a securities class action litigation event. First, we analyze the effect of investor attention on losses associated with the filing of litigation event. These losses are largely due to a damaged corporate reputational capital and are measured by the investors' response to lawsuit announcements (Karpoff and Lott, 1993; Karpoff, Lee, and Martin, 2008). We test whether investor attention affects firm's reputation and long-term changes in the firm's value. We then examine how investor attention affects the speed of information diffusion and fraud discovery[2].

A major challenge in testing the effect of investor attention on firm value is to find a non-endogenous measure of attention. The source of endogeneity is the contemporaneous relationship between firm value and traditionally used measures of investor attention. The most commonly used investor attention measures in the literature are abnormal volume and abnormal returns. Both of these

[1] The impact of limited investor attention on asset prices and governance is well documented. For example, in a survey of institutional investors McCahery, Sautner, and Starks (2016) find that limited resources and the number of firms in a portfolio are important impediments to shareholder activism. Liu et al. (2017) report that distracted investors are inferior monitors. Kacperczyk, Van Nieuwerburgh, and Veldkamp (2016) show that the attention of mutual fund managers is a limited resource and managers optimally choose to allocate their limited attention to different information depending on the business cycle.

[2] Amiram et al. (2017) believe that the role of "gatekeepers" in fraud discovery is yet to be determined. To our knowledge, this is the first study to examine the role of investor attention on fraud discovery. The closest paper to ours examines the role of media in distribution of the information about accounting fraud (Miller, 2006).

proxies are contemporaneously affected by changes in firm value.[3]

The other commonly used proxy is media coverage. While this measure is arguably exogenous, it suffers from two significant limitations. First, media coverage captures "information" and not the attention of stakeholders. To elaborate, an article published on back-end pages of a newspaper provides information regarding the litigation event; it does not imply, however, that all or even some of the investors process the information regarding the litigation. Second, firms make an active effort to manage media exposure around negative corporate events (Madsen and Niessner, 2015). Hence, media coverage might be manipulated by firms and thus be unreflective of the true level of investor attention.

To avoid these issues, we follow Da, Engelberg, and Gao (2011) and Drake, Roulstone, and Thornock (2012) and use the number of times investors search a firm on Google.com as our proxy for investor attention. Google provides a normalized search index referred to as Google Search Activity (GSA) that captures the search hits a particular firm generates on Google.com. We estimate our attention proxy by calculating abnormal changes in GSA or the log increase over the median number of searches a particular company receives over a specific time period.

Using GSA, we obtain a number of important results regarding the effect of investor attention on firm's reputational capital. We discover that higher abnormal investor attention prior to the lawsuit filing exacerbates the negative response of investors to litigation news. A 10% increase in GSA is associated with an additional 2.2% or 65.1% of the average loss in firm value at the announcement of the lawsuit filing. We determine that this effect on firm value is long-term. To capture the long-term decrease in firm value due to litigation we calculate the change in Tobin's Q before and after the filing. A 10% increase in GSA prior to lawsuit filing is associated with a further 5.3% reduction in Q. We further attribute the permanent reduction in Tobin's Q to reputational losses in form of lower growth of earnings per share and poor accounting performance following the lawsuit filing. Finally, we document that higher abnormal investor attention affects institutional ownership of defendant firms' stock. A 10% increase in GSA prior to lawsuit filing leads to a 3.3% decrease in the percent of shares held by institutional investors

[3] Refer to Chordia, Huh, and Subrahmanyam (2007) and Da, Engelberg, and Gao (2011), for example.

after the filing.

In a set of robustness tests, we compare GSA against both abnormal volume and returns and media coverage. We find that GSA provides information regarding investor attention beyond that contained in these traditional measures. Additionally, we document that the effect of abnormal investor attention remains significant in the presence of weekly returns and short interest. Finally, we find that our main results are not subject to a selection bias due to the availability of the Google Search Activity data.

We organize the remainder of this study as follows: Section 2 discusses the timeline and the losses associated with class action litigation. Section 3 presents the development of our hypotheses. Section 4 describes the role of investor attention, while Section 5 contains our main findings. Section 6 contains our robustness tests with respect to traditional measures of investor attention. We conclude with a brief summary and a discussion of the importance of our findings in Section 7.

2. Timeline and Economics of Securities Class Action Litigation

Historically, the class action process originated from the desire to obtain economies of scale in litigation.[4] By consolidating similar claims for small amounts from different individuals into a single lawsuit, the class action process was expected to achieve greater economic efficiency by reducing the costs of litigation by each plaintiff individually. While this theoretically implies efficiency, class action litigations are notorious in terms of case complexity, a protracted timeline, increased uncertainty, information asymmetry, and agency conflicts (Alexander, 1996; Zingales, 2007; Bajaj et al., 2014). Because of the limitations of cognitive processing, all of these factors can ultimately influence the amount of investor attention that is given to any specific class action. Consequently, in the following section we discuss the timeline and costs associated with the securities class action litigation process.

2.1. Timeline

We present the typical timeline for a class action lawsuit in Figure 1. The beginning and the

[4] The history of class action lawsuits can be dated to the 17th century when the English Court of Chancery adopted the "Bill of Piece" to allow a single representative to defend on behalf of the entire group.

completion of the alleged fraudulent activity are referred to as the "class action start" and the "class action end," respectively.[5] We define "class length" as the number of days that elapse between the class action start date and the class action end date. The day when such a class action complaint is filed with the court is referred to as the "filing date" or "filing event." The number of days that elapse between the end of an alleged fraud (i.e., the class action end date) and the filing date is defined as the "filing delay." After the filing date, the class action complaint is subject to a certification process by the judge. A judge decides whether the suit can be certified as a class action based on four different criteria listed in Rule 23 of the Federal Rules of Civil Procedure.[6] As part of the certification process, the judge "defines the class," (i.e., identifies the individuals or institutions that are affected by the alleged fraudulent activity) and decides the scope and characteristics of the class action lawsuit. The judge also approves the class action start and end dates.

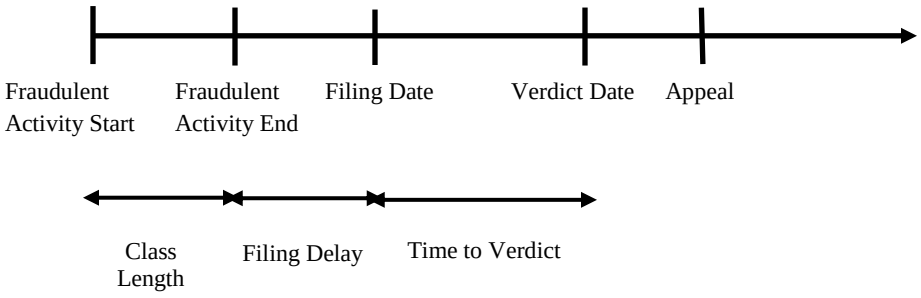

Figure 1. Typical Securities Class Action Timeline
The time between the start and end dates of the fraudulent activity is the class length. The filing delay is the time between the end of the fraudulent activity and the filing date. The time to verdict is the time between the filing and verdict dates.

Once a class action lawsuit receives a certified status, the judge orders the lead plaintiff to notify all potential plaintiffs. At this point, potential plaintiffs have an option to either opt out or remain unnamed and participate in the class action process. If the scope of the certified class action, however,

[5] In cases where multiple plaintiffs file the class action complaint, the class action start date typically is estimated using the complaint that yields the longest class action period.
[6] These criteria are: (1) Numerosity, which implies that the class has to be so numerous that the joinder of all members becomes impractical; (2) Commonality, which refers to the existence of questions of law common to the class; (3) Typicality, which means that the representative member is typical of the class; (4) Adequacy, which requires the named plaintiff to fairly and adequately represent all members of the class.

explicitly defines a "class," all individuals or institutions fitting the criteria are automatically included as a part of the class. Once a set of "class members" and "plaintiffs participating in the proceedings" is defined, the judge selects a counsel of attorneys for all class members.[7] On the final verdict date, the lawsuits are either dismissed or settled. We define the "time to verdict" as the number of days that elapse between the filing and verdict dates.[8]

2.2. The Losses Associated with Class Action Litigation

Cumulative losses experienced by firms in litigation have two main direct and indirect components. In this section, we model direct and indirect losses suffered by defendant firms and identify their main drivers.

2.2.1 Direct Losses

The direct losses of class action litigation include legal fees such as settlement disbursements, attorney's fees, financial penalties imposed by the judicial system, and litigation insurance premiums. Some of these costs are offset by litigation insurance coverage. Most publicly traded firms in the U.S. buy personal coverage insurance (A-side insurance), corporate reimbursement coverage, and optional entity securities coverage (C-side insurance). Although these insurances are limited in terms of coverage, they mitigate at least 50% of the direct costs attributable to the lawsuit (Alexander, 1991).

The magnitude of the direct costs is a function of the severity of the alleged violation, plaintiff type, industry litigiousness, and firm size. The verdict time, quantity and quality of presented evidence, and the size of the monetary penalties increase with litigation severity. Institutional investors have more resources and expertise than individual investors (Cheng et al., 2010). Hence, the probability of an adverse verdict for the defendant firm is greatly affected by the identity of the lead plaintiff. Industry litigiousness increases a firm's probability of being sued and positively influences the direct costs of litigation (Gande and Lewis, 2009). Firm size should also positively affect the cost of litigation since larger firms have more resources to pay settlements and penalties. Larger firms generally hold more cash

[7] In most cases, this counsel of attorneys is same as the attorneys who file the class action complaint originally.
[8] We note that most securities class action lawsuits are dismissed because they are not certified as an action as per Rule 23. If the case is certified as a class action, it almost certainly generates a monetary settlement.

on their balance sheets and have more tangible assets that can be liquidated to pay damages or settlements. Thus, we model the direct costs associated with securities class actions as follows:

Direct Costs = f (Severity, Plaintiff Type, Industry Litigiousness, Size) (1)

2.2.2 Indirect Losses

In addition to direct losses, firms can sustain significant indirect losses imposed by the market. They are measured by the market response to the litigation and primarily represent the damage to firms' reputational capital during a securities class action. In most circumstances, these indirect costs are more damaging to shareholder wealth than litigation's direct costs. The indirect costs include the loss of a firm's credibility, an increase in uncertainty about the firm's financial and product market prospects, loss of customers and suppliers, and the diversion of managers' time and resources (Klein and Leffler, 1981; Jarrell and Peltzman, 1985; Karpoff and Lott, 1993; Phillips and Miller, 1996; Johnson, Nelson, and Pritchard, 1999). Engelmann and Cornell (1988) suggest that when these indirect costs are joined with direct costs, the total litigation costs often exceed the benefits plaintiffs are projected to accrue. Terming these indirect costs as "reputational losses," Karpoff, Lee, and Martin (2008a) find that reputational losses exceed the direct costs of litigation by more than 7.5 times. They conclude that the revelation of corporate misconduct at the time of lawsuit filing significantly increases a firm's operating costs, which is consistent with the arguments of Klein and Leffler (1981), Jarell and Peltzman (1985), and Landes and Posner (1987). Given the nature of indirect costs, they are more difficult to measure. Indirect costs can be broadly viewed as the opportunity costs due to the litigation event. Managers must spend considerable time preparing for case defense that would otherwise be used in supervising the firm's business operations. Further, litigation affects the firm's credibility among its customers, suppliers, partners and financial stakeholders. Reputational capital serves as an implicit incentive for the agent to fulfill its contractual obligations. Damaged reputations, however, increase contracting costs and reduce overall transactional profitability.

We estimate these indirect costs as a function of two components: (1) the severity of the alleged fraudulent activity and (2) the likelihood of discovery by investor attention. Fraud severity is defined as

the intensity of the alleged violation. The likelihood of discovery is captured by investor attention. Greater investor attention to a firm produces a higher probability of fraud detection since more individuals are reviewing corporate activities, reports, and disclosures. As more information about the lawsuit is disseminated through the investor community and firms' stakeholders, the effect of a lawsuit on corporate reputations will be stronger. More stakeholders will become aware of a wrongdoing committed by a defendant firm and change their estimates of firm reputation and value. Consequently, it could lead to a more negative market response to the lawsuit announcement and worsened relationships with stakeholders. Thus, greater investor attention affects reputational and total indirect losses to litigation. Hence, we can model indirect costs as:

$$\textit{Indirect Costs} = f(\textit{Investor Attention, Severity}) \quad (2)$$

3. Hypothesis Development

In this section, we develop our primary hypotheses that relate investor attention to the filing delay and cumulative losses associated with the litigation.

3.1. Filing CARs and Investor Attention

Considerable evidence documented by previous literature suggests that cumulative litigation costs are observable in a defendant firm's returns at the event of a lawsuit filing (Karpoff and Lott, 1993; Bhagat, Brickley, and Coles, 1994; Bizjak and Coles, 1995; Bhagat, Bizjak, and Coles, 1998; Pritchard and Ferris, 2001; Karpoff, Lee and Martin, 2008) and not at the verdict date. These studies argue that the probability of a negative verdict and possible settlement costs are observed in the negative market reaction at the filing date. In addition, Karpoff and Lott (1993) and Karpoff, Lee, and Martin (2008) attribute the majority of the negative reactions to lawsuit filing announcement to indirect costs.

Higher investor attention is associated with faster dissemination of information about the lawsuit and alleged fraudulent activity. Upon receiving such information, investors assess the probability of the unfavorable verdict and potential damages from the litigation. They also learn about the firm's alleged wrongdoing and update their beliefs regarding the credibility of the firm. Following this and our model in

Section 2.2.2, we conjecture that, as a primary driver of the indirect costs, investor attention should determine the magnitude of the market reaction at the filing date. Therefore, we hypothesize the following:

> ***Hypothesis 1****: Increased investor attention prior to lawsuit filing leads to more negative announcement period abnormal returns.*

3.2. Investor Attention and Tobin's Q

Cumulative abnormal returns (CARs) around the filing date represent a short-term value loss and could be attributed to a market overreaction. The other possibility is that these negative returns indicate permanent damage to the firm's reputation and a long-term value loss. If investor attention helps to determine the magnitude of the damage to the firm's reputational capital, it will necessarily influence the extent of the firm's long-term value loss. Using Tobin's Q as our measure of long-term value, we contend that investor attention levels influence the changes in long-term value surrounding the filing event. Thus, we hypothesize:

> ***Hypothesis 2****: Increased investor attention prior to the filing of lawsuit leads to a greater decrease in Tobin's Q following the lawsuit's announcement.*

3.3. Filing Delay and Investor Attention

Delay in the filing of the lawsuits postpones the direct costs incurred by the defendant firm and hence affects the total costs of litigation. In addition, until a formal lawsuit against the firm is filed, not all investors are aware of the alleged fraudulent activity. Hence, filing delay also postpones the discovery of the wrongdoing and possible indirect losses. Therefore, by moving the negative cash flows further into the future, filing delay reduces the present value of costs associated with the litigation and is an important aspect of class action litigations.

The timeline of litigation presented in Section 2 explains that before filing the lawsuit, plaintiffs have to collect enough evidence to prove intent of fraud and the existence of damages due to the wrongdoing of the alleged firm. If there are a large number of investors paying attention to the firm's daily activities during the class action period, investors will discover the alleged fraud more quickly. They will also be able to collect and analyze evidence needed to file a lawsuit faster, leading to an

accelerated filing of the lawsuit. This leads us to our first hypothesis:

> ***Hypothesis 3****: Increased investor attention during the class action period accelerates lawsuit filing.*

4. Data and Sample

4.1. Sample Construction

Our sample is limited to securities class action lawsuits brought for reasons of corporate fraud between January 2004 and December 2013.[9] To construct the sample, we refer to the Securities Class Action Clearinghouse Database. We obtain from this dataset all of the class action lawsuit related data, including fraud type, industry classification, class action start date, class action end date, filing date, verdict date, and lead plaintiff and counselor. The Clearinghouse database provides us with a brief description of each case and the documents filed with the court.

The section on jurisdiction in the original complaint typically identifies the sections of the 1934 Securities Exchange Act that the plaintiff contends that the firm has violated. Violation of §§10(b) of the Act is the most common violation in our sample. It relates to the provision of materially false and/or misleading statements or the failure to disclose important material information. One such example of a §§10(b) violation is a misstated financial report. Other violations include §§20(a), which refers to mergers and acquisitions, and §§14(a), which is related to securities offerings. The non-disclosure of material information to obtain an IPO or merger approval exemplifies violations of these sections. This yields a sample of 1,789 litigation events. We further eliminate those lawsuits where the defendant firm is not listed in either the Compustat or CRSP databases. Our final sample consists of 1,093 lawsuits.

To test whether investors react differently to these violation types, we subdivide our sample lawsuits into two groups by fraud type. We describe a case as a secondary market violation when the class action complaint only references §§10(b) of the 1934 Securities Exchange Act as the source of the alleged violation. Cases that reference other sections of the Act are labeled "other violations."

[9] We limit our sample to 2004 because our measure of investor attention discussed in Section 4.2 is only available from 2004 onwards.

Specifically, these other violations consist of cases of alleged fraud related to security offerings and M&A activity.

4.2. Proxies for Investor Attention

Unobservability and lack of a direct measure of investor attention have posed a substantial challenge for empiricists in testing theories related to investor attention. The commonly used indirect proxies are: (1) extreme returns (Barber and Odean, 2008), (2) abnormal trading volume (Barber and Odean, 2008), and (3) media coverage (Chan, 2003; Vega, 2006; Barber and Odean, 2008; Yuan, 2008; Ahern and Sosyura, 2014). More recently, Da, Engelberg, and Gao (2011) and Drake, Roulstone, and Thornock (2012) propose Google Search Activity as a measure of investor attention. GSA is a normalized index that represents the number of times a particular term, such as a firm's ticker, has been searched on Google. This index is available through a service called Google Trends (*https://www.google.com/trends/*). Using Google Trends, we obtain an index of the number of times a particular firm's ticker is searched on Google.com.[10]

The purpose of this study is to examine the effect of investor attention on the value lost during a securities class action litigation. To capture the exogenous effects of investor attention, our proxy cannot be contemporaneously dependent on firm value. The first proposed proxy of investor attention, extreme returns, however, fails to pass this filter. This leaves us with three remaining measures: abnormal volume, media attention, and GSA. However, one could argue that abnormal volume also does not pass this filter (Chordia, Huh, and Subrahmanyam, 2007).

The abnormal volume proxy relies on the critical assumption that if a stock's return or volume is abnormal, then investors must be paying attention to it (Da, Engelberg, and Gao, 2011; Drake, Roulstone,

[10] To identify whether the search on google.com is associated with a firm's stock or some other word, Da, Engelberg, and Gao (2011) advocate the use of firm tickers instead of firm names. For example, instead of getting an index of how many times "Apple" is searched, they use an index of number of times "AAPL" is searched Google.com. On p.1466 they mention - "*A search engine user may search for a stock in Google using either its ticker or company name. Identifying search frequencies by company name may be problematic for two reasons. First, investors may search the company name for reasons unrelated to investing. For example, one may search "Best Buy" for online shopping rather than collect financial information about the firm. This problem is more severe if the company name has multiple meanings (e.g., "Apple" or "Amazon"). Second, different investors may search the same firm using several variations of its name. For example, American Airlines is given a company name of "AMR Corp." in CRSP. However, investors may search for the company in Google using any one of the following: "AMR Corp", "AMR", "AA", or "American Airlines." Searching for a stock using its ticker is less ambiguous."*

and Thornock, 2012). An extreme volume event, however, can be associated with by factors unrelated to investor attention. Simple changes in the systematic risk of a firm or shocks to the overall economy can generate extreme returns as well as extreme volumes. In addition, other market events related to liquidity or releasing locked-up shares can also drive abnormal volumes. There is another concern, however, with this proxy. In testing the effect of investor attention, we need our attention proxy to be as error free as possible in the pre-lawsuit filing time period. Note that this time period has a partial overlap with the class action period, which is when the firm was committing the alleged securities fraud. This, in turn, should affect the returns and volumes observed over this time period, making abnormal volume a less reliable proxy for investor attention.

We are therefore left with two proxies for investor attention: media coverage and GSA. Media coverage is arguably exogenous of contemporaneous changes in firm value and does not suffer the same biases as abnormal volume or extreme returns. This measure, however, has two significant limitations. First, it relies on a critical assumption that investors are reading all the news articles that are published in the media. If the *Wall Street Journal* publishes an article about a class action lawsuit on the back page, it does not guarantee attention from investors unless they actually read it. Second, media attention does not indicate the number of investors that are actually reading the news story. Media coverage does not allow us to measure the extent to which investors actually read or are otherwise aware of the news article. Hence, we contend that media attention is a weak proxy for investor attention.

This leaves us with one remaining proxy for investor attention: GSA. While noisy by construction, GSA appears to be the best proxy for our purposes. Unlike media attention, GSA actually tracks the number of investors following the firm. It is independent of events such as changes in a firm's stock liquidity, unlike abnormal volume. Further, unlike the extreme returns, GSA does not directly capture changes in a firm's value itself.

Figure 2 presents the comparison between the three non-normalized weekly investor attention

proxies for Macy's from January 2014 to December 2014: GSA, media, and volume.[11] Panel A compares volume and GSA. We note that the correlation between the two proxies of investor attention is rather low (i.e., about 27%). This correlation is similar to that reported by Da, Engelberg, and Gao (2011). Further, GSA appears to be a more stable proxy of investor attention than volume.

Panel B presents the comparison between media and GSA. The advantage of using GSA over media as a proxy of attention is more apparent here. First, we note that the two proxies are largely uncorrelated. In addition, there are multiple weeks where there seems to be no news about the firm in the media. Both GSA and volume, however, are greater than zero during these weeks. It means that even though there is no news about the firm in the media, investors continue to search for information about the firm. This reaffirms our contention that media is a weak proxy for investor attention and does not capture the number of investors that are actively following the firm.[12]

Since Google Trends only provides a normalized index, GSA cannot be converted into the actual number of Google searches. Higher GSA values, however, still indicate a larger number of searches and greater investor attention. Google Trends creates the index by scaling the number of searches by the highest weekly volume over the sample period and assigns it a value between 0 and 100. For example, if searches for "AAPL" reach the historical maximum during the first week of January 2010, the index takes a value of 100 on that particular week. Further, if the number of searches is not significant, GSA assumes a value of zero.

Following the log demeaning approach of Da, Engelberg, and Gao (2011) and Drake, Roulstone, and Thornock (2012), we calculate abnormal GSA as follows:

$$Abnormal\ GSA_t = log(GSA_t) - (median(GSA_{t-1}, GSA_{t-2}, GSA_{t-3}, \ldots, GSA_{t-n})) \quad (3)$$

In equation (3), n represents the standardization period while GSA_{t-i} represents Google Search

[11] Macy's is one of the firms in the sample that we use to provide an illustrative example.

[12] We acknowledge that GSA is not a perfect proxy of investor attention and can be affected by noise in the data due to miss-classification of ticker symbols such as "A," "AB," etc. Further, we agree that media coverage is unarguably the most exogenous proxy for investor attention. Our preference for GSA as an investor attention measure is based on its information richness (Choi and Varian, 2009; Da, Engeleberg, and Gao, 2011; Drake, Roulstone, and Thornock, 2012; Vlastakis and Markellos, 2012). In Section 6, we show that GSA better explains losses around a litigation event than either abnormal returns or volume.

Activity lagged by *i* periods.[13] Subtracting a median from a longer time window captures the "normal" level of attention in a way that is robust to recent jumps in investor attention. While Da, Engelberg, and Gao (2011) and Drake, Roulstone, and Thornock (2012) use a standardization period of 10 weeks, we choose to standardize over 26 weeks because litigation lasts longer than the events in these studies. Further, litigation is a less frequent event than IPOs and earnings announcements. It is important, however, to note that our results are robust to alternative standardization periods of 10, 12, and 52 weeks.

5. Empirical Findings

5.1. Summary Statistics

We note that our investor attention proxy, GSA, is not available for every firm in our sample. Google Trends does not provide weekly attention data when the firm ticker is not searched a sufficient number of times. This limitation reduces our sample to 523 litigation events. Panel A of Table 1 presents the financial and accounting characteristics for our sample. As expected, Google provides weekly attention data more frequently for larger firms. The average value of total assets of the firms in our final sample is $66.9 billion with a median ROA of 0.46%. Our sample firms have a high level of transparency, with the average firm followed by 4.8 analysts. Our firms are moderately levered with an average debt-to-equity ratio of 2.1.

We also compare our sample across different fraud types. We classify fraud as either secondary market fraud or other. We find that the characteristics between the two groups of firms are materially and statistically different. The firms in the secondary market violations group are generally larger in size and have a lower return on assets during the pre-lawsuit filing year. The average size of these firms is $75.4 billion while the firms in the other fraud group have an average size of $26.4 billion. An average firm in our secondary market violations group has a mean ROA of -0.77% in the year prior to the lawsuit filing. The firms that are allegedly committing secondary market violations are also more transparent. These

[13] One of the major issues with the data provided by Google Trends is that it does not provide the raw number of searches for a particular company. Google Trends divides the number of searches for a particular firm at any point in time by the highest number of searches that company has ever received. Our median adjusting nullifies this effect and produces a log-percent-increase in the search activity as compared to the standard level of search activity.

firms are followed by an average of 5.0 analysts while the other firms are followed by an average of 4.12 analysts. The forecast standard deviation for the secondary market violations group is 7.4%, while for the other group it is 7.2%. Both of these differences are statistically significant.

Descriptive statistics concerning the timeline of the litigation events are contained in Panel B. We focus our analysis on class length, filing delay, and the time to verdict. We believe that class length can serve as an indicator of the severity of the violation and a defendant's likely guilt. Intuitively, a longer class action period suggests a prolonged fraudulent activity or possibly even multiple violations. A median class length of 272 days or more implies, on average, a long-term violation by the firm's managers. We also note that the median class length is 435 days for the secondary market violations and 173 days for all other lawsuits.

The plaintiffs are encouraged to file lawsuits as soon as possible after the end of the class action period. The median filing delay of 22 days seems reasonable, considering the standard litigation process of seeking a representative and processing a formal complaint through the court administrative process. This period is much higher for secondary market violations (29 days) compared to all other types of violations (2 days). The median time to verdict of 4 days might be explained by a 70% to 30% ratio of dismissed to settled cases in our sample. It should be noted that the median time to verdict for all other types of lawsuits is 0 days. This happens because the judges immediately dismiss the majority of the cases.

Panel A of Table 2 presents a time-series distribution of our sample lawsuits by fraud type. We find that the lawsuit filings might be related to overall stock market performance and state of the economy. The total number of lawsuits in the sample spikes in 2008 (57 firms), which is likely explained by the financial crisis of the same year. Our sample starts in 2004, but if we examine Clearinghouse statistics since 1996 we observe a local spike in the number of filings in 1998 (242 firms) and again in 2001 (498 firms). These dates correspond with the stock market crashes at the same time. The greatest number of filings in our sample occurs in 2013. We also compare the distribution of the sample over two different fraud types. While the number of secondary market filings remains relatively constant across

the sample period, the number of other violation lawsuits increases from 2 in 2004 to a peak of 26 in 2011. On average, secondary market filings represent 83.7% of all class action lawsuits during our sample period. The chi-square test for a difference in ratios between the two fraud types is significant with a p-value near zero. This indicates that the sample distribution changes significantly over time for the two groups.

The distribution of our sample cases by industry and fraud type is presented in Panel B. We use the FTSE International/Dow Jones industry classification benchmark (ICB) to construct an industry classification.[14] The industries are identified by Clearinghouse for each of our sample firms. The largest number of lawsuits of both fraud types (54%) is filed against firms in the finance (63), technology (75) and services (94) industries. We also find that secondary market lawsuits are filed more frequently than other violations in all industries. The number of secondary market violations as a percent of total filings ranges from 44.4% in utilities to 100% in conglomerates. The chi-square test for the distribution of proportions in the two groups is significant with a p-value of almost zero, suggesting that the proportion of secondary market violations is different for different industries.

5.2. Investor Attention Proxies

In this section, we compare our chosen measure of investor attention with the two other commonly used measures of investor attention: media attention and abnormal volume. The estimation details for the abnormal GSA are presented in Section 4. For media attention, we search for press releases using the firm's ticker in the LexisNexis database. We limit our searches to the newswire services: PR Newswire, Business Newswire, and Canada Newswire. Finally, to calculate our weekly attention measure using media, we estimate the log transformation of the number of news articles in a given week. For abnormal trading volume, we follow the method of Chordia, Huh, and Subrahmanyam (2007).

The results using all three measures of investor attention are presented in Table 3. Panel A shows the summary statistics for all three measures. Note that GSA is constructed from a normalized index

[14] ICB is a private industry classification system maintained by FTSE. It consists of 10 industries that are further dissected into 19 super sectors, 41 sectors, and 114 sub-sectors. Each firm in the database is assigned a sub-sector based on its primary revenue-generating activity.

between 0 and 100 and thus has a lower standard deviation than the other two measures. Panel B presents the correlations between the three measures. We note that none of the measures are significantly correlated with each other. The correlation coefficient between GSA and media is actually negative (-1.53%). In un-tabulated results, we compare the correlation of the non-normalized measures of attention. We find that GSA is significantly correlated with abnormal volume, but the correlation coefficient is only 9%. These results are similar to those obtained by Da, Engelberg, and Gao (2011).

5.3. Value Loss in Litigation and Investor Attention

Investors generally view the filing of a lawsuit as negative news about the future cash flows associated with the defendant firm (Romano, 1991). Therefore, lawsuit filing events are generally associated with negative cumulative abnormal returns surrounding the filing date. The previous literature attributes the majority of these negative returns to the loss of reputational capital (Karpoff and Lott, 1993; Karpoff, Lee, and Martin, 2008). In Section 2.2, we model reputational losses as a function of fraud severity and investor attention. Following this model, our first hypothesis contends that the loss of reputational capital should be larger if investor attention in the weeks prior to the filing of the lawsuit is higher.

Table 4 presents our univariate analysis of the announcement period effects of lawsuit filing. Panel A presents our sample's cumulative abnormal returns for multiple windows around the filing. Our findings are consistent with previous studies, recording negative abnormal returns surrounding the filing (Karpoff and Lott, 1993; Bhagat, Brickley, and Coles, 1994; Bizjak and Coles, 1995; Bhagat, Bizjak, and Coles, 1998; Pritchard and Ferris, 2001; Karpoff, Lee, and Martin, 2008). On average, over the two days surrounding the filing date, the firms in our sample lose 3.5% of their value. This CAR has a t-statistic of -5.94 and is both economically and statistically significant. Similarly, the change in Tobin's Q[15] is also economically and statistically significant surrounding the filing date. This implies that the loss in value is not temporary, but is permanent which is consistent with reputational loss theory.

Panel B further examines the market's response and value loss based on GSA intensity. We

[15] We calculate Tobin's Q as the ratio of market value of equity and book value of debt to book value of assets.

divide firms into two groups based on their investor attention levels over the pre-filing week. The "high investor attention" group are the firms with an above-median GSA while the "low investor attention" group contains those firms with a below median GSA over the week prior to the lawsuit filing. We observe that firms in the high investor attention group have more negative CARs and as well as a greater reduction in Tobin's Q. The CARs in two days surrounding the filing event for the low attention group are -2.3% while the corresponding value is -4.5% for the high attention group. The difference is statistically significant.

The difference is even more striking for the change in Tobin's Q. The average losses suffered by the low investor attention group are 0.2% and are nearly insignificant. This result is consistent with Romano (1991) who states that the value lost due to a litigation event is a temporary market response. For the high investor attention group, however, the average change in Tobin's Q is -6.1%. This implies that, in our sample, the firms involved in securities class action litigation do not lose value in the long term unless they are also subject to high investor attention.

Next, we undertake a multivariate analysis. First, we test if greater investor attention in the weeks prior to the filing has any effect on the CARs surrounding the litigation filing date. To test this hypothesis, we regress the filing CARs on lagged GSA and a set of control variables. Specifically, we use $GSA_{lag(i)}$ or the abnormal Google Search Activity (as defined in Section 4.2) for 1 to 10 weeks prior to the class action end date. Our discussion in Section 2.2 suggests that the losses incurred due to a litigation event are also a function of fraud severity. Hence, we include the ex-post settlement amount divided by total assets of the firm as to proxy for the severity of the alleged violation.[16,17] In addition, we use several other variables to control for the severity of the fraudulent activity such as a fraud type indicator variable for secondary market violations and the length of the filing delay.

Our results are presented in Table 5. Consistent with hypothesis 1 and the univariate results in

[16] We note that this proxy of severity is an ex-post measurement. Even though it is also a function of other variables, such as the number of class members and the length of the trial, it represents a good estimate of the wrongdoing committed by the defendant firms.

[17] In unreported results, we also proxy severity using abnormal accruals measure of Kothari, Leone, and Wasley (2005). Our results are unaffected by this choice.

Table 4, we find that higher investor attention prior to the filing of lawsuit increases the reputation losses incurred at the lawsuit filing. Further, we find that $GSA_{lag(i)}$ is significantly negative from 1 to 9 weeks prior to the filing date. The filing CARs are less negative when there is a longer filing delay. This is partly due to the amount of surprise associated with the litigation. A longer filing delay generates less surprise for the market. In both these cases, it is no surprise that higher filing delay is associated with more negative CARs. We also observe that the CARs are more negative for secondary market fraud cases compared to other cases. This suggests the severity with which secondary market fraud cases are perceived by the investors.

These results are also economically significant. As stated previously, a unit increase in GSA represents a 1% increase in investor attention. We show that a 10% increase in investor attention during the week prior to the filing date is associated with 2.2% more negative CARs at filing event. Recall from Table 5 that the average CARs surrounding the filing date in our sample is 3.5%. This means that a 10% increase in investor attention is associated with an average of about 67% more negative CARs at the filing.

In addition, we find that the effect of investor attention is less prominent as we approach the filing date. Figure 4 plots the different lagged GSA coefficients from Table 5. The negative values imply that higher GSA in the weeks prior to the filing event is related to a more negative abnormal return. Note that the impact of GSA vanishes at about 12 weeks before the filing event. In addition, the magnitude of the coefficient on GSA does not change by much as we move closer to the filing date. This suggests that the investor attention in the 2 months prior to the filing date is the major determinant of the value losses.

Next, we conduct a multivariate test of hypothesis 2 to test the impact of investor attention on the long-term value loss, measured by the change in Tobin's Q surrounding the filing date. We regress the change in Tobin's Q on lagged GSA and the same set of controls from Table 6. Specifically, we use $GSA_{lag(i)}$ or the abnormal Google Search Activity (as defined in Section 4.2) for 1 to 10 weeks prior to the class action end date. Table 6 presents the results of this regression. Consistent with the univariate results from Table 4 that suggest that investor attention determines long-term value losses, we find that

higher investor attention leads to a greater decrease in Tobin's Q surrounding the filing event. Similar to the CARs surrounding the filing event, the change in Tobin's Q is more negative for firms having higher investor attention during the weeks prior to the filing event. Specifically, a 10% increase in GSA prior to lawsuit filing is associated with a further 5.3% reduction in Tobin's Q.

To summarize, consistent with hypotheses 1 and 2, we find that investor attention plays an important role in determining the losses suffered by a firm due to the filing of a class action lawsuit. We document that investor attention exacerbates the short-term losses experienced by a defendant firm, measured as the cumulative abnormal returns to filing. We also find that investor attention magnifies long-term value losses as measured by the change in Tobin's Q.

5.4 Reputational Losses and Investor Attention

We further explore what factors drive the reputational losses and the permanent reduction in Tobin's Q due to litigation. These losses represent the damage to firms' reputational capital and should be reflected in worsened relationships with customers, suppliers, stakeholders, and shareholders. These negative changes in firms' decisions and operations consequently affect firm value and Tobin's Q. According to our model of reputational losses presented in Section 2.2, indirect losses are a function of investor attention. Thus, we expect the abnormal GSA to have a deteriorating effect on firms' operations. The filing of securities class action lawsuits also serves as a signal to firms' investors. It indicates certain problems within a firm and affects investors' interest in holding its stock. The more investors are aware of a lawsuit against the defendant firm and a violation it has committed, the fewer of them remain interested in a firm with a damaged corporate reputation. Thus, we expect the investor attention to negatively impact institutional ownership after the filing of a lawsuit.

We test the effect of investor attention on firms' changes in industry adjusted EPS growth, returns on asset and equity, and institutional ownership before and after the filing[18]. We regress these measures on GSA lagged prior to lawsuit filing and the same set of control variables. The regression results are presented in Table 7. Consistent with our model of reputational losses, we find that higher investor

[18] We follow Barber and Lyon (1996) in the calculation of industry adjusted EPS growth, ROA, and ROE.

attention is associated with negative change in firm performance. Specifically, a 10% increase in GSA prior to lawsuit filing is associated with a 39.0% decrease in EPS growth, 0.92% change in return on assets, and 6.6% decrease in return on equity. Additionally, we document a negative effect of abnormal GSA on institutional ownership of defendant firms' stock. A similar increase in GSA prior to lawsuit filing leads to a 3.3% decrease in the percent of shares held by institutional investors.

Overall, we conclude that GSA has a negative effect on reputational losses incurred by defendant firms in litigation and measured by EPS growth, return on assets, and return on equity. Additionally, we document that higher abnormal investor attention prior to filing is associated with a lower institutional ownership of firms stocks. The evidence presented in this section provides additional information about the types of reputational losses suffered by firms and helps to explain how they contribute to a permanent decrease in Tobin's Q.

5.5. Filing Delay and Investor Attention

Following our last hypothesis in Section 3.1, we use GSA as our measure of investor attention in testing its effect on the filing delay. Recall that our hypothesis states that greater investor attention during the class action period when the firm was allegedly committing a fraudulent activity should reduce the filing delay. To test this hypothesis, we regress the filing delay on lagged GSA and a set of control variables. Specifically, we use $GSA_{lag(i)}$ or the abnormal Google Search Activity (as defined in Section 4.2) for 1 to 10 weeks prior to the class action end date. Our control variables include the class length or the time in days over which the firm has allegedly conducted the fraud, a dummy variable which equals 1 when a fraud is related to financial misrepresentation, the number of violations in the firm's industry prior to the class action end date, firm, leverage as measured by the debt-to-equity ratio prior to the class action end date, the standard deviation of analyst forecasts prior to the class action end date, firm size as measured by the log of equity market capitalization, and the firm's ROA over the year immediately preceding the class action end date. To capture the intensity of the fraudulent activity we include the settlement amount as a percentage of the value of the firm's total assets. Figure 3 shows the timeline over which the variables are calculated.

This is the first study in the literature that examines filing delay in the securities class action litigation process. Our empirical results are presented in Table 8.[19] Consistent with the last hypothesis, we find that higher investor attention during the class action period reduces the filing delay. In addition, we discover that investor attention only becomes significant as we approach the end of the class action period. Lagged GSA has a negative coefficient that is strongly significant in weeks 1, 2, and 4 prior to the class action end date. Lagged GSA in weeks 3 and 5 prior to the class action end date are negative, but not statistically significant. GSA for 6 weeks before the filing date is weakly significant and negative. Filing delay also increases with firm size, but does not appear to be affected by leverage, analyst following, industry litigiousness, or the settlement amount.[20]

These results are also economically significant. Recall that GSA is constructed as a log measure. Therefore, a unit increase in GSA represents an approximately 1% increase in investor attention. The coefficients on GSA in Table 8 can be interpreted as follows: a 1% increase in investor attention in the last week of fraudulent activity is associated with 1.2 days of decrease in the filing delay. Note that the average (median) filing delay in Table 1 is 94 days (22 days). This means on average, a 10% increase in investor attention is associated an average of about 13% acceleration in filing of the lawsuit.

To summarize, investor attention affects the speed of lawsuit filing. When more investors pay attention to the firm's daily activities during the class action period, they discover the alleged fraud more quickly. This can be due to the easier collection of evidence or the more rapid discovery of the fraudulent activity itself. We acknowledge that disentangling these two possibilities is rather impossible and can be only achieved with anecdotal evidence. Regardless of the mechanism, we conclude that investor attention significantly affects the speed with which a class action is filed.

6. Robustness and Alternative Tests

[19] Note that we use a 12-week period to estimate abnormal GSA as described in Section 3, with the first available GSA measure occurring during the first week of 2004. This results in a decrease in the number of observations as we increase the lag length in Table 8.

[20] These results are robust to the inclusion of industry and year fixed effects.

6.1. Google Search Activity and Weekly Returns

We examine whether the effect of GSA on cumulative abnormal returns to the filing is robust to the inclusion of additional controls. It is possible that there is a significant relation between a stock performance and an investors' reaction to the announcement of a lawsuit if they incorporate stock returns into their estimation of filing losses. Then the effect of GSA on the filing abnormal returns could be capturing this relation instead. We add weekly returns as an additional control variable and reestimate the regression presented in Table 5. The regression results are presented in Table 9. We find a weekly return variable to be both statistically and economically insignificant. The sign and economic magnitude of GSA regressions coefficients, however, is similar to those presented in Table 5. These results suggest that the deteriorating effect of GSA on the filing value loss is not affected by other factors potentially correlated with filing announcement returns and remains robust.

6.2 Placebo Tests

We conduct a series of placebo tests to confirm that the GSA is not simply associated with changes in stock returns. To isolate the effect of investor attention on the filing announcement returns only, we regress cumulative abnormal returns before and after filing on GSA. If there is a relation between the lagged investor attention and any abnormal returns, we would expect to see GSA regression coefficients to be significant. The results for the CARs regressions before and after the filing are presented in panels A and B of Table 10, respectively.[21] We document that GSA coefficients are negative but statistically insignificant in most regressions, suggesting that the investor attention has an effect on filing CARs only. Additionally, the r-square of presented regressions is low, which confirms that there is no significant relation between GSA and abnormal returns before and after the filing of a lawsuit.

6.3 Short Interest and Filing CARs

In this section we examine whether the short interest in the market has an effect on the filing losses incurred by defendant firms. If investors anticipate the filing of a lawsuit and the negative market

[21] For brevity, we do not report the regression coefficients of control variables in Table 10. However, we use the same controls as in Table 5.

response to the filing announcement, they might act on this information and short sell stocks of defendant firms. Short interest could also capture the effect of the information leakage initiated by some of the parties involved in a lawsuit. Therefore, the number of short contracts could be related to the cumulative abnormal returns to the filing. At the same time, short interest might represent the ex-ante proxy of the severity of a wrongdoing allegedly conducted by a defendant firm. Consequently, in this case we would expect a negative relation between short interest and filing CARs.

Panel A of Table 11 presents the statistical summary of the short interest variables. Instead of a nominal short interest, we use a ratio of the cumulative volume of short contracts to a market capitalization of a defendant firm to proxy for the expectations of investors. The mean (median) adjusted short interest in our sample equals 0.54% (0.35%) of firms' market value. We also report that an average change in the adjusted short interest before and after the filing event equals 161.71%. Finally, we examine a relation between the Google Search Activity and the adjusted short interest. We find their correlation to be negative with a coefficient of 4.86%.

The results of filing CARs regressions on the adjusted short interest are presented in Panel B of Table 11.[22] The regression coefficient of the adjusted short interest, reported in column 1, is positive but insignificant. This result suggests the lack of a significant anticipation or leakage of information about the upcoming lawsuit. At the same time, we again do not find the effect of the severity of a violation on filing announcement returns, as measured by the short interest. Columns 2 through 7 report the results of regressions including both the adjusted short interest and the GSA. We document a significant negative effect of the investor attention on the filing CARs even in the presence of the short interest variable, which remains insignificant. Therefore, we conclude that the effect of investor attention on the market reaction to a lawsuit announcement remains robust to the inclusion of short interest. Additionally, short interest alone does not help to explain the negative market returns to the filing event.

6.4. Google Search Activity and Other Measures of Investor Attention

[22] For brevity, we do not report the regression coefficients of control variables in Table 11. However, we use the same controls as in Table 5.

In this section, we test whether the relation between GSA and reputational losses incurred by defendant firms is robust to the effect of the media coverage and abnormal volume. To reexamine our hypothesis 1, presented in Section 3, we add other measures of investor attention to see if GSA possesses additional explanatory information beyond the traditional attention proxies. We regress cumulative abnormal returns to the filing event on lagged GSA, media, and trading volume in the same model.

The results for the filing CARs regression are presented in Table 12. We document that out of three proxies of investor attention only GSA regression coefficients are statistically and economically significant. As expected, the sign of GSA regression coefficients and their statistical significance resemble those of the GSA coefficients reported in Section 5. Thus, we conclude that, consistent with our expectations, GSA contains meaningful new information about investor attention in litigation even after controlling for media coverage and abnormal trading volume.

6.5. Selection Bias

Our final sample consists only of sued firms whenever GSA data is available on Google Trends. As we mention in Section 4.2, if a firm is not sufficiently searched on Google, Google Trends does not generate a search index for it. Therefore, our investor attention measure, GSA, becomes unavailable and this observation is not included in our sample. Thus, the results presented in Section 5 could be subject to a selection bias.

To address a possible selection bias, we estimate a two-stage Heckman (1979) selection model. In this model, the first stage involves a probit regression to estimate the probability that GSA is available. This regression involves all the 1,093 lawsuit observations with available Compustat and CRSP data, and is not limited to whether a GSA estimate exists. To estimate the probability of GSA availability, we refer to Da, Engelberg, and Gao (2011) for a set of possible explanatory variables.

Our results are presented in Table 13. Columns 1 through 10 use lagged values of GSA prior to the filing event. Panel A reports the results for the first stage probit regression. Consistent with the results in Da, Engelberg, and Gao (2011) we find that a firm's market capitalization and media mentions are positively related to the probability of firm searches and, consequently, GSA. The results of the

second stage OLS regression are presented in Panel B. In this regression, the dependent variable is the cumulative abnormal returns surrounding the filing date and the main independent variable is sigma, which represents the predicted probability of GSA availability from the first stage. The model specification only allows us to estimate the effect of investor attention availability, but not its magnitude. Thus, we can interpret sigma but the inference is different from the OLS regression results presented in Table 5. The coefficient on the sigma variable is positive and statistically significant across all of the 10 model specifications. It shows that GSA availability is positively related to reputational losses suffered by defendant firms at filing. The rho coefficient from the second stage regression indicates the severity and direction of any selection bias. Note that except for $GSA_{lag(2)}$ and $GSA_{lag(10)}$, this coefficient is statistically insignificant. This result indicates that the findings contained in Table 5 do not suffer from a selection bias.

In summary, only 2 out of 10 model specifications contain any suggestion of a selection bias. For these models, the negative coefficient on rho actually works against the probability of finding a significant effect of GSA on filing CARs. We conclude that our results are robust and a selection bias does not drive the main conclusions of this study.

7. Summary and Discussion

Securities class action litigation represents a challenging corporate event for any defendant firm. It negatively impacts a firm's reputation and is associated with large losses, regardless of a lawsuit outcome (Karpoff and Lott, 1993; Karpoff, Lee, and Martin, 2008). We continue the research on the losses suffered by defendant firms in securities class action litigation and model their indirect costs as a function of investor attention. Using this model, we obtain evidence that investor attention plays an important role in the litigation process and strongly impacts the damages experienced by defendant firms.

In this study, we use Google Search Activity as an alternative proxy for investor attention to corporate fraud preceding any actual lawsuit filing. We provide evidence that a 10% increase in GSA constitutes an additional 2.2% loss in firm value. In the long term, we are able to provide evidence of an

average additional decline in Tobin's Q of 5.3% due to a negative change in accounting performance. Additionally, we report the higher investor attention is associated with a significant decrease in institutional ownership following the lawsuit. We also show that a 10% increase in GSA accelerates lawsuit filing by 12 days or by 12.8% of the average filing delay in the sample. Finally, we discover that our GSA measure is robust to the effect of traditional measures of investor attention and other control variables, such as weekly returns and short interest.

This paper makes three important contributions. First, it illustrates the process of information diffusion in securities class action litigation. Our results explain how investors receive and process the information about the lawsuit filing. We find that information about the upcoming litigation reaches the public and firms' investors as early as two months before the actual filing. Second, this study identifies an important factor, determining the legal process and driving the amount of short-term and, most importantly, long-term damages suffered by firms in class action litigation. Our results suggest that investor attention is a rather more prominent driver of value losses than the severity of the lawsuit. In addition, investor scrutiny is not limited to investors simply following the firms' stock performance. In the litigation process, attention provides the investors with important information about a firm's future cash flows and operations and helps to shape the market response to the upcoming lawsuit. Finally, the evidence presented in this paper contributes to the literature on investor attention. We test the effect of GSA and traditional attention proxies, such as media coverage and abnormal volume. We document that GSA impacts the fraud discovery and cumulative losses associated with litigation, even controlling for traditional measures on investor attention. Thus, we conclude that in the litigation setting GSA better conveys the information about the firm and the lawsuit and is superior to media coverage and abnormal volume.

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Table 1: Sample Summary Statistics

This table presents summary statistics of our sample firms. Panel A provides summary statistics on financial and accounting characteristics of our sample firms while Panel B provides summary statistics on lawsuit related variables. TA represents total assets in millions of US dollars. Tobin's Q is calculated as the ratio of market value of equity and book value of debt to total book assets. Leverage is calculated as the ratio of total debt to market equity. Log(market cap) is calculated as the natural log of market equity. ROA is calculated as the ratio of net income to total book assets. ROE is calculated as the ratio of net income to market equity. Forecast Stdev is the standard deviation of the EPS forecasts for each firm. Analyst Following represents the average number of analysts covering the firm. Class Action Length is the number of days between the beginning and the end of alleged fraudulent activity. Filing Delay is the number of days between the end of the class action period and the filing of a lawsuit. Time to Verdict is the number of days between filing and verdict. All variables in Panel A are calculated one quarter prior to the lawsuit filing. Secondary refers to sample of lawsuits which are related to Secondary Market Violation and Other refers to all other lawsuits in our sample.

Panel A: Financial and Accounting Characteristics

	Full Sample		Secondary		Other	
	Mean	Median	Mean	Median	Mean	Median
TA	66,861	1,880	75,497	2,047	26,398	1,560
Tobin's Q	1.96	1.42	2	1.46	1.75	1.31
Leverage	2.13	0.52	2.25	0.52	1.54	0.52
Log (market cap)	7.46	7.43	7.5	7..48	7.23	7.17
ROA	-0.68%	0.46%	-0.79%	0.37%	-0.14%	0.62%
ROE	-2.76%	0.46%	-0.14%	0.92%	-0.80%	0.61%
Forecast Stdev	0.07	0.03	0.07	0.03	0.07	0.02
Analyst Following	4.88	3.7	5.04	3.91	4.12	3

Panel B: Lawsuit Characteristics

	Full Sample		Secondary		Other	
	Mean	Median	Mean	Median	Mean	Median
Class Length	392	272	435	315	173	52
Filing Delay	94	22	109	29	38	2
Time to Verdict	526	4	556	8	405	0
N	523	52	431	431	92	92

Table 2: Lawsuit Distribution

This table presents distributional characteristics of lawsuits in our sample. Panel A provides a distribution of lawsuits by year and alleged violation type. Panel B provides a distribution of the sample lawsuits by industry and alleged violation type. Secondary refers to sample of lawsuits that are related to Secondary Market Violation, and Other refers to all other lawsuits in our sample. The Chi-sq test p-value represents the p-value from a test of equality of distribution between secondary market violation and other categories. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Lawsuit Summary by Year

Year	Secondary Market Violations		Others		Total
	N	%	N	%	
2004	16	88.89%	2	11.11%	18
2005	35	92.11%	3	7.89%	38
2006	35	92.11%	3	7.89%	38
2007	33	78.57%	9	21.43%	42
2008	57	86.36%	9	13.64%	66
2009	36	90.00%	4	10.00%	40
2010	54	81.82%	12	18.18%	66
2011	42	61.76%	26	38.24%	68
2012	52	80.00%	13	20.00%	65
2013	71	86.59%	11	13.41%	82
Total	431	82.41%	92	17.59%	523
Chi-Sq test p-value		<0.0001***			

Panel B: Lawsuit Summary by Industry

Sector	Secondary Market Violations		Others		Total
	N	%	N	%	
Basic Materials	22	81.48%	5	18.52%	27
Capital Goods	11	84.62%	2	15.38%	13
Conglomerates	3	100.00%	0	0.00%	3
Consumer Cyclical	33	94.29%	2	5.71%	35
Consumer Non-Cyclic	15	75.00%	5	25.00%	20
Energy	24	80.00%	6	20.00%	30
Financial	63	87.50%	9	12.50%	72
Healthcare	64	87.67%	9	12.33%	73
Services	94	81.74%	21	18.26%	115
Technology	75	75.76%	24	24.24%	99
Transportation	5	71.43%	2	28.57%	7
Utilities	4	44.44%	5	55.56%	9
Other	18	90.00%	2	10.00%	20
Total	431	82.41%	92	17.59%	523
Chi-Sq test p-value		<0.0001***			

Table 3: Measures of Investor Attention

This table provides a comparison of attention measures in our sample. Panel A presents the statistical summary of attention measures. Panel B presents correlations between attention measures. GSA represents Google Search Activity, the average number of weekly searches for each firm. Media is the number of weekly press mentions of each firm. Abnormal trading volume (in millions) is a weekly abnormal trading volume of each firm.

Panel A: Summary of Attention Measures

	N	25th Pctl	Mean	Median	75t Pctl	St Dev
Google Search Activity	544	-0.07	0.37	0.02	0.15	3.36
Media	544	0.00	3.05	0.00	0.49	10.10
Trading Volume	544	6.15	12.13	18.62	21.85	13.64

Panel B: Correlation between Attention Measures

	Google Search Activity	Media	Trading Volume
Google Search Activity	1		
Media	-1.53%	1	
Trading Volume	2.12%	-0.74%	1

Table 4: Comparative CARs and Changes in Tobin's Q at Filing Announcement

This table presents the univariate results of the effect of investor attention on short-term and long-term losses from lawsuit filing. Panel A shows the cumulative abnormal return for various windows surrounding the filing event and the change in Tobin's Q surrounding the filing. Panel B compares the average cumulative abnormal returns and change in Tobin's Q for below and above median Google Search Activity.

Panel A: Firm value around the filing event

	N	Mean	Median
CAR (-2, +2)	462	-3.38% (-5.94***)	-0.57%
CAR (-1, +1)	462	-1.90% (-5.12***)	-0.46%
Change in Tobin's Q	421	-2.90% (-1.61*)	-6.30%

Panel B: Comparison by Google Search Activity

	GSA		
	Below Median	Above Median	Difference (t-stat)
CAR (-2, +2)	-2.28%	-4.48%	2.20% (2.00**)
CAR (-1, +1)	-1.49%	-2.29%	0.80% (1.12)
Change in Tobin's Q	0.20%	-6.10%	6.30% (1.75*)

Table 5: Effect of Investor Attention on Filing Announcement Period CARs

This table presents the effect of investor attention on the short-term losses due to lawsuit filing. The dependent variable, the cumulative abnormal returns, are calculated over the window of (-2, 2) days around the filing event. Column 1 to Column 10 use the GSA (lag 1) to GSA (lag 10) data. GSA lag(i) is the abnormal GSA estimated i week prior to filing date. GSA coefficients are multiplied by 100. Class Length coefficients are multiplied by 1,000. Definitions of control variables are presented in the Table 1. T-stats are presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-0.0198 (-0.54)	-0.0203 (-0.55)	-0.0205 (-0.56)	-0.0214 (-0.58)	-0.0216 (-0.58)	-0.0216 (-0.58)	-0.0215 (-0.58)	-0.0214 (-0.58)	-0.0199 (-0.53)	-0.0205 (-0.55)
GSA (lag i)	-0.0223* (-1.68)	-0.0223* (-1.93)	-0.0221** (-2.18)	-0.0228** (-2.54)	-0.0231*** (-2.75)	-0.0234*** (-2.75)	-0.0249*** (-2.66)	-0.0266** (-2.33)	-0.0282* (-1.83)	-0.0264 (-1.38)
Filing Delay	0.0001*** (3.71)	0.0001*** (3.72)	0.0001*** (3.72)	0.0001*** (3.69)	0.0001*** (3.67)	0.0001*** (3.67)	0.0001*** (3.69)	0.0001*** (3.70)	0.0001*** (3.72)	0.0001*** (3.70)
Class Length	0.0023 (0.16)	0.0026 (0.17)	0.0024 (0.16)	0.0030 (0.20)	0.0029 (0.19)	0.0029 (0.19)	0.0019 (0.13)	0.0021 (0.14)	0.0015 (0.10)	0.0001 (0.01)
Type of Fraud	-0.0407*** (-3.21)	-0.0409*** (-3.22)	-0.0409*** (-3.21)	-0.0420*** (-3.28)	-0.0419*** (-3.27)	-0.0419*** (-3.27)	-0.0419*** (-3.27)	-0.042*** (-3.28)	-0.0421*** (-3.28)	-0.0467*** (-3.85)
Log (Market Cap)	0.0029 (0.87)	0.0030 (0.90)	0.0030 (0.90)	0.0030 (0.89)	0.0030 (0.89)	0.0030 (0.89)	0.0031 (0.93)	0.0031 (0.94)	0.0031 (0.93)	0.0035 (1.04)
Leverage	0.0010 (0.57)	0.0010 (0.57)	0.0010 (0.56)	0.0011 (0.59)	0.0011 (0.59)	0.0011 (0.59)	0.0011 (0.61)	0.0011 (0.61)	0.0012 (0.63)	0.0011 (0.60)
Sector Violations	-0.0032 (-0.65)	-0.0032 (-0.65)	-0.0032 (-0.65)	-0.0029 (-0.59)	-0.0029 (-0.58)	-0.0029 (-0.58)	-0.0031 (-0.61)	-0.0031 (-0.62)	-0.0033 (-0.66)	-0.0026 (-0.53)
Analyst Following	0.0014 (1.13)	0.0014 (1.11)	0.0014 (1.10)	0.0014 (1.09)	0.0014 (1.10)	0.0014 (1.10)	0.0014 (1.11)	0.0014 (1.12)	0.0014 (1.13)	0.0014 (1.09)
Forecast Stdev	-0.0216 (-0.28)	-0.0197 (-0.26)	-0.0190 (-0.25)	-0.0192 (-0.25)	-0.0194 (-0.25)	-0.0199 (-0.26)	-0.0209 (-0.27)	-0.0224 (-0.29)	-0.0250 (-0.32)	-0.0346 (-0.44)
ROA	0.1851 (1.14)	0.1822 (1.12)	0.1802 (1.11)	0.1614 (0.98)	0.1588 (0.97)	0.1575 (0.96)	0.1519 (0.92)	0.1496 (0.91)	0.1508 (0.91)	0.1100 (0.68)
Settlement /TA	-0.0174 (-1.30)	-0.0170 (-1.29)	-0.0169 (-1.30)	-0.0178 (-1.37)	-0.0179 (-1.38)	-0.0179 (-1.39)	-0.0180 (-1.40)	-0.0183 (-1.41)	-0.0188 (-1.41)	-0.0226 (-1.60)
N	476	475	475	471	470	470	469	469	467	466
Adj R2	3.9%	4.0%	4.1%	4.1%	4.1%	4.1%	4.3%	4.2%	4.0%	3.5%

Table 6: Effect of Investor Attention on Tobin's Q Around Filing Announcement

This table presents the effect of investor attention on long-term losses due to lawsuit filing. The dependent variable is the change in Tobin's Q from one quarter before and after the filing event. Column 1 to Column 10 use the GSA (lag 1) to GSA (lag 10) data. GSA lag(i) is the abnormal GSA estimated i weeks prior to filing date. GSA coefficients are multiplied by 100. Class Length coefficients are multiplied by 1,000. Definitions of control variables are presented in Table 1. T-stats are presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	0.1207 (1.08)	0.1208 (1.09)	0.1281 (1.15)	0.1302 (1.16)	0.1308 (1.17)	0.1275 (1.14)	0.1209 (1.07)	0.1214 (1.07)	0.1255 (1.10)	0.1282 (1.12)
GSA (lag i)	-0.0531*** (-2.64)	-0.0515*** (-2.91)	-0.0493*** (-3.10)	-0.0480*** (-3.22)	-0.0480*** (-3.35)	-0.0493*** (-3.47)	-0.0512*** (-3.43)	-0.0545*** (-3.23)	-0.0589*** (-2.81)	-0.0597** (-2.27)
Filing Delay	0.0003** (2.43)	0.0003** (2.43)	0.0003** (2.40)	0.0003** (2.36)	0.0003** (2.36)	0.0003** (2.36)	0.0003** (2.36)	0.0003** (2.37)	0.0003** (2.37)	0.0003** (2.37)
Class Length	-0.0346 (-0.93)	-0.0346 (-0.92)	-0.0353 (-0.94)	-0.0353 (-0.92)	-0.0354 (-0.92)	-0.0338 (-0.88)	-0.0377 (-0.97)	-0.0372 (-0.96)	-0.0373 (-0.95)	-0.0372 (-0.95)
Type of Fraud	-0.0129 (-0.28)	-0.0132 (-0.28)	-0.0116 (-0.25)	-0.0144 (-0.30)	-0.0145 (-0.30)	-0.0034 (-0.07)	-0.0035 (-0.07)	-0.0037 (-0.08)	-0.0039 (-0.08)	-0.0073 (-0.15)
Sector Violations	-0.0355* (-1.83)	-0.0356* (-1.84)	-0.0368* (-1.89)	-0.0367* (-1.88)	-0.0368* (-1.89)	-0.0384* (-1.96)	-0.0371* (-1.88)	-0.0371* (-1.88)	-0.0377* (-1.89)	-0.0374* (-1.86)
Forecast Stdev	-0.1673 (-1.15)	-0.1627 (-1.12)	-0.1628 (-1.12)	-0.1602 (-1.09)	-0.1591 (-1.08)	-0.1576 (-1.07)	-0.1557 (-1.06)	-0.1582 (-1.07)	-0.1650 (-1.12)	-0.1735 (-1.17)
Analyst Following	0.0025 (0.88)	0.0025 (0.86)	0.0023 (0.81)	0.0023 (0.79)	0.0023 (0.78)	0.0025 (0.84)	0.0025 (0.85)	0.0025 (0.85)	0.0024 (0.83)	0.0024 (0.81)
Leverage	0.0111*** (4.55)	0.0112*** (4.58)	0.0111*** (4.58)	0.0113*** (4.49)	0.0114*** (4.50)	0.0115*** (4.52)	0.0116*** (4.53)	0.0115*** (4.52)	0.0115*** (4.50)	0.0115*** (4.45)
ROA	-1.0594*** (-2.80)	-1.0602*** (-2.80)	-1.0488*** (-2.77)	-1.0882*** (-2.82)	-1.0894*** (-2.82)	-1.0971*** (-2.83)	-1.1052*** (-2.85)	-1.1071*** (-2.85)	-1.1056*** (-2.84)	-1.1132*** (-2.80)
Settlement /TA	5.3356 (1.44)	5.3967 (1.45)	5.3889 (1.45)	5.3734 (1.44)	5.3723 (1.43)	5.2395 (1.40)	5.2497 (1.41)	5.2060 (1.40)	5.1110 (1.38)	4.9274 (1.34)
N	435	434	433	429	428	429	427	427	426	425
Adj R2	5.3%	5.3%	5.3%	5.4%	5.4%	5.4%	5.3%	5.3%	5.3%	5.1%

Table 7: Effect of Investor Attention on Firm Performance and Institutional Ownership

This table presents the effect of investor attention on reputational losses due to lawsuit filing. Panel A presents an OLS regression of a change in EPS growth on Google Search Activity. Panel B presents a regression of a change in return on assets on Google Search Activity. Panel C presents a regression of a change in return on equity on Google Search Activity. Panel D presents a regression of a change in institutional ownership on Google Search Activity. Changes in variables are calculated as a difference from one quarter before and after the filing. Column 1 to Column 10 use the GSA (lag 1) to GSA (lag 10) data. GSA lag(i) is the abnormal GSA estimated i weeks prior to filing date. GSA coefficients are multiplied by 100. T-stats are presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Change in EPS growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-4.7040	-4.7690	-4.9542	-4.9599	-4.9588	-4.9581	-5.5547*	-5.5392*	-5.4551	-5.3808
	(-1.49)	(-1.51)	(-1.52)	(-1.52)	(-1.52)	(-1.52)	(-1.66)	(-1.66)	(-1.62)	(-1.60)
GSA (lag i)	-0.3901**	-0.3700**	-0.3558**	-0.3428**	-0.3359**	-0.3380**	-0.3531**	-0.3787**	-0.4090**	-0.4065*
	(-2.31)	(-2.35)	(-2.34)	(-2.30)	(-2.27)	(-2.25)	(-2.23)	(-2.20)	(-2.08)	(-1.77)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	464	462	460	458	458	458	454	454	450	448
Adj R2	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.5%	2.5%	2.5%	2.5%

Panel B: Change in ROA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-0.0825**	-0.0835**	-0.0874**	-0.0877**	-0.0877**	-0.0877**	-0.0963**	-0.0958**	-0.0963**	-0.0942**
	(-2.23)	(-2.26)	(-2.27)	(-2.28)	(-2.28)	(-2.28)	(-2.43)	(-2.42)	(-2.39)	(-2.33)
GSA (lag i)	-0.0092***	-0.0091***	-0.0089***	-0.0090***	-0.0088***	-0.0088***	-0.0091***	-0.0095***	-0.0099***	-0.0096***
	(-4.68)	(-5.44)	(-6.18)	(-7.17)	(-7.40)	(-7.24)	(-6.21)	(-5.28)	(-3.99)	(-3.18)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	464	462	460	458	458	458	454	454	450	448
Adj R2	3.9%	3.9%	4.1%	4.2%	4.2%	4.2%	4.6%	4.5%	4.5%	4.5%

Panel C: Change in ROE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-2.2414 (-1.55)	-2.2509 (-1.55)	-2.3340 (-1.56)	-2.3360 (-1.57)	-2.3348 (-1.57)	-2.3339 (-1.57)	-2.3963 (-1.57)	-2.3922 (-1.57)	-2.4349 (-1.57)	-2.4219 (-1.57)
GSA (lag i)	-0.0655* (-1.91)	-0.0646* (-1.95)	-0.0653** (-1.98)	-0.0655** (-2.01)	-0.0623** (-2.03)	-0.0612** (-2.01)	-0.0613* (-1.96)	-0.0622* (-1.90)	-0.0613* (-1.73)	-0.0528 (-1.50)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	464	462	460	458	458	458	454	454	450	448
Adj R2	12.0%	12.0%	12.1%	12.1%	12.1%	12.1%	12.2%	12.2%	12.2%	12.2%

Panel D: Change in institutional ownership

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-0.1427** (-2.11)	-0.1442** (-2.14)	-0.1452** (-2.15)	-0.1439** (-2.11)	-0.1437** (-2.11)	-0.1440** (-2.11)	-0.1456** (-2.11)	-0.1446** (-2.09)	-0.1447** (-2.08)	-0.1413** (-2.03)
GSA (lag i)	-0.0320 (-1.63)	-0.0333* (-1.85)	-0.0336** (-2.07)	-0.0338** (-2.26)	-0.0341** (-2.39)	-0.0344** (-2.39)	-0.0351** (-2.25)	-0.0362** (-1.98)	-0.0365 (-1.61)	-0.0312 (-1.27)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	424	423	423	419	418	419	417	417	416	416
Adj R2	4.8%	5.0%	5.2%	5.2%	5.2%	5.2%	5.1%	5.0%	4.7%	4.2%

Table 8: Effect of Investor Attention on Filing Delay

This table reports the effect of investor attention on the Filing Delay. The dependent variable, Filing Delay, is estimated as the number of days between the class action end date and filing of the lawsuit. Column 1 to Column 10 use the GSA (lag 1) to GSA (lag 10) data. GSA lag(i) represents the abnormal GSA estimated i weeks prior to class action end date. Definitions of control variables are presented in Table 1. T-stats are presented in the parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-51.4897 (-1.05)	-50.1505 (-1.02)	-43.7877 (-0.86)	-43.8803 (-0.85)	-41.4399 (-0.79)	-40.2420 (-0.76)	-28.8479 (-0.55)	-27.6127 (-0.52)	-21.4678 (-0.40)	-11.2798 (-0.20)
GSA lag(i)	-1.2048* (-1.86)	-1.3368** (-1.99)	-0.2711 (-0.13)	-1.6561** (-2.08)	-1.1330 (-1.57)	-0.9125* (-1.77)	-0.3719 (-0.77)	-0.1095 (-0.12)	1.3640 (1.01)	1.5294 (0.87)
Class Length	0.0043 (0.24)	0.0037 (0.21)	0.0043 (0.24)	0.0005 (0.03)	-0.0011 (-0.06)	-0.0042 (-0.23)	-0.0052 (-0.29)	-0.0053 (-0.29)	-0.0016 (-0.09)	-0.0048 (-0.26)
Fraud Type	70.3001*** (5.08)	64.7913*** (4.46)	63.5643*** (4.14)	59.3689*** (3.68)	56.1549*** (3.26)	53.5522*** (3.01)	49.1108** (2.56)	48.4903** (2.45)	47.1478** (2.34)	47.2675** (2.26)
Sector Violations	-3.3866 (-0.54)	-3.2707 (-0.52)	-4.0213 (-0.63)	-2.3092 (-0.35)	-3.3528 (-0.51)	-3.3240 (-0.50)	-4.2208 (-0.62)	-4.3548 (-0.64)	-4.4011 (-0.65)	-5.5826 (-0.79)
Leverage	0.0735 (0.03)	0.0755 (0.03)	0.1565 (0.07)	0.7621 (0.32)	0.9271 (0.39)	0.7780 (0.33)	0.5690 (0.24)	0.5894 (0.25)	0.5048 (0.21)	0.5008 (0.21)
Log (market cap)	12.3875*** (2.78)	12.8575*** (2.86)	12.7086*** (2.77)	11.8867** (2.53)	12.6812*** (2.70)	13.0091*** (2.73)	12.2947** (2.57)	12.3038** (2.56)	11.1915** (2.32)	10.9193** (2.25)
Forecast Stdev	199.1148** (2.13)	194.3111** (2.06)	196.0360** (2.07)	175.9178* (1.86)	169.6564* (1.75)	182.0713* (1.84)	186.8860* (1.88)	185.7706* (1.86)	216.8981** (2.14)	217.9949** (2.12)
Analyst Following	-1.9501 (-1.12)	-2.0083 (-1.13)	-2.0922 (-1.14)	-1.5972 (-0.85)	-1.3918 (-0.74)	-1.5013 (-0.79)	-1.0311 (-0.54)	-1.0172 (-0.54)	-1.1558 (-0.61)	-0.9901 (-0.52)
ROA	67.3043 (0.42)	67.7479 (0.43)	70.7476 (0.43)	102.7782 (0.63)	90.8075 (0.55)	81.7009 (0.49)	80.1278 (0.48)	83.9335 (0.50)	58.8951 (0.34)	61.1470 (0.35)
Settlement /TA	37.0114 (0.07)	199.2647 (0.36)	202.4044 (0.35)	224.5240 (0.39)	249.4481 (0.41)	303.1710 (0.46)	320.5806 (0.49)	329.5884 (0.50)	238.7343 (0.37)	221.0088 (0.35)
N	476	472	461	448	435	430	418	415	408	400
Adj R2	5.0%	4.3%	3.8%	3.2%	3.1%	2.9%	2.4%	2.2%	2.4%	2.2%

Table 9: Google Search Activity and Weekly Returns

The dependent variable in this regression is cumulative abnormal returns calculated over the window of (-2, 2) days around the filing event. The results show an OLS regression of filing cumulative abnormal returns on the abnormal Google Search Activity and weekly returns. GSA lag(i) represents the abnormal GSA estimated i weeks prior to filing date. Column 1 to Column 10 use the GSA (lag 1) to GSA (lag 10) data. GSA coefficients are multiplied by 100. Class Length coefficients are multiplied by 1,000. Definitions of control variables are presented in Table 1. T-stats presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-0.0037	-0.0212	-0.0201	-0.0201	-0.0194	-0.0175	-0.0277	-0.0290	-0.0329	-0.0223
	(-0.10)	(-0.58)	(-0.55)	(-0.54)	(-0.53)	(-0.47)	(-0.75)	(-0.78)	(-0.90)	(-0.60)
GSA (lag i)	-0.0216	-0.0222*	-0.0221**	-0.0232***	-0.0230***	-0.0226***	-0.0253***	-0.0270**	-0.0268*	-0.0268
	(-1.63)	(-1.94)	(-2.17)	(-2.60)	(-2.72)	(-2.84)	(-2.73)	(-2.32)	(-1.81)	(-1.40)
Return (week)	13.6321**	-1.6983	-0.5267	-7.6740*	3.6902	-8.3483	3.3844	-3.7165	13.3010	-2.6499
	(2.15)	(-0.32)	(-0.17)	(-1.94)	(0.56)	(-1.50)	(0.49)	(-0.60)	(1.57)	(-0.35)
Filing Delay	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
	(3.04)	(3.57)	(3.73)	(3.85)	(3.67)	(3.86)	(3.65)	(3.73)	(3.72)	(3.68)
Class Length	-0.0009	0.0029	0.0002	0.0028	0.0026	0.0029	0.0029	0.0031	0.0006	0.0010
	(-0.06)	(0.19)	(0.16)	(0.19)	(0.17)	(0.19)	(0.19)	(0.20)	(0.04)	(0.06)
Type of Fraud	-35.6295***	-41.8213***	-41.2614***	-43.0046***	-40.8690***	-45.1346***	-37.6573***	-40.1011***	-43.2845***	-48.6578***
	(-2.96)	(-3.15)	(-3.17)	(-3.35)	(-3.21)	(-3.47)	(-2.87)	(-3.08)	(-3.59)	(-4.18)
Log (Market Cap)	0.0021	0.0030	0.0030	0.0027	0.0028	0.0026	0.0035	0.0036	0.0045	0.0037
	(0.60)	(0.89)	(0.90)	(0.81)	(0.83)	(0.78)	(1.06)	(1.08)	(1.36)	(1.09)
Leverage	0.0007	0.0010	0.0010	0.0011	0.0011	0.0010	0.0009	0.0008	0.0004	0.0006
	(0.39)	(0.55)	(0.56)	(0.60)	(0.60)	(0.52)	(0.44)	(0.42)	(0.18)	(0.33)
Sector Violations	-0.0040	-0.0031	-0.0032	-0.0029	-0.0031	-0.0029	-0.0031	-0.0028	-0.0023	-0.0021
	(-0.81)	(-0.63)	(-0.65)	(-0.58)	(-0.62)	(-0.58)	(-0.63)	(-0.57)	(-0.46)	(-0.42)
Analyst Following	0.0012	0.0014	0.0014	0.0015	0.0014	0.0016	0.0014	0.0014	0.0014	0.0012
	(0.99)	(1.12)	(1.11)	(1.14)	(1.08)	(1.22)	(1.07)	(1.10)	(1.11)	(0.97)
Forecast Stdev	-0.0163	-0.0193	-0.0192	-0.0203	-0.0203	-0.0223	-0.0167	-0.0172	-0.0198	-0.0288
	(-0.22)	(-0.25)	(-0.25)	(-0.26)	(-0.26)	(-0.29)	(-0.22)	(-0.22)	(-0.27)	(-0.37)
ROA	0.1764	0.1834	0.1789	0.1706	0.1592	0.1659	0.1449	0.1426	0.1128	0.1212
	(1.11)	(1.13)	(1.09)	(1.04)	(0.97)	(1.00)	(0.88)	(0.86)	(0.68)	(0.75)
N	475	474	475	471	470	470	467	467	462	460
Adj R2	5.9%	3.8%	3.9%	4.5%	4.0%	4.3%	4.0%	4.0%	4.6%	3.4%

Table 10: Placebo Tests

The dependent variables in these regressions are cumulative abnormal returns calculated before and after the filing announcement. Panel A shows results of an OLS regression of cumulative abnormal returns one week before the filing on the abnormal Google Search Activity. Panel B shows results of an OLS regression of cumulative abnormal returns one week after the filing on the abnormal Google Search Activity. GSA lag(i) represents the abnormal GSA estimated i weeks prior to filing date. Column 1 to Column 10 use the GSA (lag 1) to GSA (lag 10) data. T-stats presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Filing CARs (-2, -5)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-0.1159***	-0.1158***	-0.1153***	-0.1152***	-0.1152***	-0.1152***	-0.1154***	-0.1154***	-0.1173***	-0.1153***
	(-3.38)	(-3.38)	(-3.34)	(-3.33)	(-3.33)	(-3.33)	(-3.34)	(-3.33)	(-3.40)	(-3.33)
GSA (lag i)	-0.0022	-0.0011	-0.0011	-0.0018	-0.0019	-0.0033	-0.0053	-0.0092	-0.0160	-0.0265**
	(-0.20)	(-0.10)	(-0.11)	(-0.18)	(-0.18)	(-0.30)	(-0.43)	(-0.68)	(-1.26)	(-2.50)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	475	475	471	470	470	469	469	467	466	465
Adj R2	5.1%	5.1%	4.6%	4.6%	4.6%	4.7%	4.7%	4.7%	5.0%	5.2%

Panel B: Filing CARs (2, 5)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-0.0057	-0.0044	-0.0046	-0.0047	-0.0056	-0.0056	-0.0056	-0.0101	-0.0100	-0.0102
	(-0.18)	(-0.14)	(-0.15)	(-0.15)	(-0.18)	(-0.18)	(-0.18)	(-0.33)	(-0.33)	(-0.33)
GSA (lag i)	0.2628***	-0.0109	-0.0114	-0.0116*	-0.0119**	-0.0118**	-0.0119**	-0.0122**	-0.0128*	-0.0127
	(2.62)	(-1.33)	(-1.56)	(-1.78)	(-2.04)	(-2.11)	(-2.09)	(-1.96)	(-1.73)	(-1.34)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	457	478	477	477	473	472	472	470	470	468
Adj R2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 11: Effect of Short Interest on Filing Announcement Period CARs

This table presents the univariate and multivariate results of the effect of short interest on the filing event. Panel A shows the univariate statistics of the short interest adjusted by market capitalization, change in adjusted short interest surrounding the filing, and the correlation between Google Search Activity and adjusted short interest. Panel B presents an OLS regression of filing cumulative abnormal returns on short interest adjusted by market capitalization and Google Search Activity. GSA lag(i) represents the abnormal GSA estimated i weeks prior to filing date. Column 2 to Column 7 use the GSA (lag 1) to GSA (lag 6) data. T-stats presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Short interest around the filing event

	N	Mean	Median
Short interest/Market Cap	464	0.54%	0.35%
Change in short interest	458	161.71%	-3.16%
Correlation with GSA	-4.86%		

Panel B: Short Interest, Google Search Activity, and Filing Announcement CARs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	-0.0564* (-1.83)	-0.0367 (-0.94)	-0.0372 (-0.95)	-0.0370 (-0.94)	-0.0358 (-0.92)	-0.0370 (-0.94)	-0.0356 (-0.90)
Short Interest/ Market Cap	0.4897 (0.71)	0.6171 (0.56)	0.5790 (0.53)	0.5634 (0.51)	0.7172 (0.64)	0.6403 (0.57)	0.5359 (0.47)
GSA (lag i)		-0.0010* (-1.90)	-0.0012** (-2.20)	-0.0014** (-2.42)	-0.0013** (-2.34)	-0.0012** (-2.25)	-0.0012** (-2.30)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	904	455	455	453	452	450	449
Adj R2	3.7%	2.8%	3.0%	3.2%	3.2%	3.0%	3.1%

Table 12: Google Search Activity and Other Measures of Attention

The dependent variable in this regression is cumulative abnormal returns calculated over the window of (-2, 2) days around the filing event. The results show an OLS regression of filing cumulative abnormal returns on Google Search Activity, abnormal media coverage, and abnormal trading volume. GSA lag(i) represents the abnormal GSA estimated i weeks prior to filing date. Media lag(i) is the abnormal media coverage estimated i weeks prior to filing date. Volume lag(i) is the abnormal trading volume estimated i weeks prior to filing date. Class Length coefficients are multiplied by 1,000. Media and GSA coefficients are multiplied by 100. Definitions of control variables are presented in Table 1. T-stats presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	0.0062	0.0048	-0.0017	-0.0014	-0.0093	-0.0091	-0.0129	-0.0074	-0.0058	-0.0070
	(0.13)	(0.10)	(-0.03)	(-0.03)	(-0.18)	(-0.18)	(-0.26)	(-0.15)	(-0.11)	(-0.14)
GSA (lag i)	-0.0220**	-0.0220**	-0.0219**	-0.0225**	-0.0226**	-0.0228**	-0.0243**	-0.0259**	-0.0275**	-0.0261*
	(-2.07)	(-2.21)	(-2.33)	(-2.47)	(-2.53)	(-2.52)	(-2.57)	(-2.52)	(-2.35)	(-1.88)
Media (lag i)	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	(0.71)	(0.70)	(0.68)	(0.70)	(0.68)	(0.67)	(0.66)	(0.69)	(0.68)	(0.70)
Volume (lag i)	-0.0002	-0.0002	-0.0003	-0.0003	-0.0003	-0.0003	-0.0002	-0.0003	-0.0003	-0.0003
	(-0.49)	(-0.50)	(-0.55)	(-0.61)	(-0.66)	(-0.70)	(-0.35)	(-0.62)	(-0.67)	(-0.58)
Filing Delay	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
	(2.99)	(2.97)	(3.00)	(3.00)	(2.99)	(2.98)	(3.04)	(3.07)	(3.09)	(3.11)
Class Length	0.0021	0.0019	0.0023	0.0012	0.0020	0.0021	0.0021	0.0016	0.0029	0.0012
	(0.12)	(0.11)	(0.13)	(0.07)	(0.11)	(0.11)	(0.11)	(0.09)	(0.16)	(0.07)
Type of Fraud	-0.0390**	-0.0378**	-0.0386**	-0.0401**	-0.0375**	-0.0374**	-0.0380**	-0.0376**	-0.0388**	-0.0450**
	(-2.11)	(-2.03)	(-2.08)	(-2.13)	(-1.98)	(-1.98)	(-2.01)	(-1.98)	(-2.06)	(-2.39)
Log (Market Cap)	0.0019	0.0020	0.0023	0.0022	0.0028	0.0028	0.0033	0.0029	0.0027	0.0032
	(0.43)	(0.44)	(0.50)	(0.48)	(0.62)	(0.62)	(0.73)	(0.63)	(0.60)	(0.71)
Leverage	0.0010	0.0010	0.0010	0.0012	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	(0.58)	(0.58)	(0.57)	(0.66)	(0.36)	(0.36)	(0.40)	(0.39)	(0.40)	(0.36)
Sector Violations	-0.0068	-0.0068	-0.0060	-0.0057	-0.0055	-0.0055	-0.0058	-0.0060	-0.0059	-0.0051
	(-1.12)	(-1.12)	(-0.99)	(-0.94)	(-0.90)	(-0.90)	(-0.94)	(-0.97)	(-0.96)	(-0.83)
Analyst Following	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018
	(1.08)	(1.09)	(1.11)	(1.14)	(1.11)	(1.12)	(1.09)	(1.13)	(1.14)	(1.10)
Forecast Stdev	-0.0680	-0.0664	-0.0653	-0.0698	-0.0659	-0.0659	-0.0663	-0.0699	-0.0720	-0.0827
	(-0.88)	(-0.86)	(-0.85)	(-0.90)	(-0.85)	(-0.85)	(-0.85)	(-0.90)	(-0.92)	(-1.06)
ROA	0.1853	0.1801	0.1637	0.1563	0.1426	0.1417	0.1370	0.1351	0.1399	0.0882
	(1.31)	(1.27)	(1.15)	(1.10)	(1.00)	(0.99)	(0.96)	(0.94)	(0.97)	(0.61)
Settlement/TA	-0.0156	-0.0154	-0.0153	-0.0153	-0.0150	-0.0151	-0.0150	-0.0156	-0.0157	-0.0201
	(-0.36)	(-0.36)	(-0.36)	(-0.36)	(-0.35)	(-0.35)	(-0.35)	(-0.36)	(-0.36)	(-0.47)
N	386	385	384	381	379	379	378	377	378	377
Adj R2	3.5%	3.6%	3.8%	4.1%	4.0%	4.0%	4.0%	4.1%	3.9%	3.2%

Table 13: Selection Bias

This table presents the results from a two-stage Heckman (1979) selection model. Panel A presets the results of the first stage probit regression where the dependent variable is a dummy which equals one if the GSA (lag i) data is available for the firm under consideration and is zero otherwise. GSA lag(i) is the abnormal GSA estimated i week prior to filing date. Column 1 to Column 10 use the GSA (lag 1) to GSA (lag 10) data. Panel B presents the second stage OLS regression where the dependent variable is cumulative abnormal returns calculated over the window of (-2, 2) days around the filing event. The independent variables consist of Sigma, which represents the predicted probability from the first stage, and all other control variables from Table 5. For brevity, we do not present the coefficients on control variables in the second stage. Rho represents the selection bias coefficient. T-stats presented in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

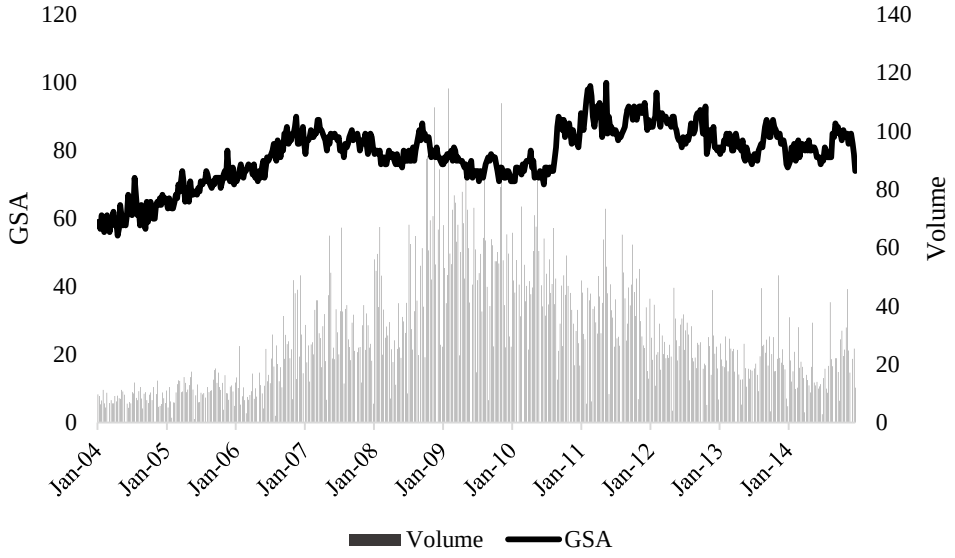
Panel A: First Stage Probit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	-1.5079*** (-7.35)	-1.3321*** (-7.49)	-1.5361*** (-7.47)	-1.5233*** (-7.40)	-1.4457*** (-7.08)	-1.4421*** (-7.08)	-1.5416*** (-7.47)	-1.5512*** (-7.50)	-1.5142*** (-7.32)	-1.3218*** (-7.44)
Log (Market Cap)	0.2145*** (7.46)	0.1766*** (6.90)	0.2125*** (7.36)	0.2162*** (7.47)	0.2211*** (7.63)	0.2111*** (7.18)	0.2175*** (7.53)	0.2104*** (7.23)	0.2103*** (7.19)	0.1828*** (7.02)
News_Dummy	0.2253** (2.56)	0.1340** (2.38)	0.3237*** (3.68)	0.2611*** (2.96)	0.0947 (1.08)	0.2160** (2.42)	0.2834*** (3.22)	0.4028*** (4.52)	0.3326*** (3.73)	0.0655 (1.20)
Abnormal Volume	-0.0065* (-1.76)	0.0020 (0.87)	-0.0075** (-2.01)	-0.0060 (-1.63)	-0.0071* (-1.93)	-0.0081** (-2.17)	-0.0068* (-1.84)	-0.0083** (-2.21)	-0.0077** (-2.03)	0.0014 (0.59)
Analyst Following	-0.0043 (-0.43)	-0.0110 (-1.20)	-0.0052 (-0.52)	-0.0102 (-1.00)	-0.0090 (-0.89)	-0.0070 (-0.69)	-0.0084 (-0.83)	-0.0075 (-0.74)	-0.0074 (-0.72)	-0.0114 (-1.23)
Adj R2	13.4%	13.5%	13.8%	13.5%	13.5%	13.5%	13.8%	13.8%	13.7%	13.7%

Panel B: Second Stage OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sigma	0.1189*** (30.00)	0.1730*** (23.46)	0.1193*** (29.00)	0.1195*** (29.09)	0.1193*** (30.64)	0.1194*** (29.33)	0.1198*** (28.66)	0.1201*** (27.97)	0.1203*** (27.93)	0.1734*** (23.26)
N	960	957	958	954	952	948	948	946	944	942
Rho	0.0640 (0.32)	-0.9674*** (-109.63)	0.1059 (0.59)	0.0949 (0.51)	-0.0057 (-0.02)	-0.0485 (-0.14)	0.1139 (0.66)	0.1487 (0.94)	0.1438 (0.89)	-0.9686*** (-112.18)

Panel A: GSA and Trading Volume Comparison



Panel B: GSA and Media

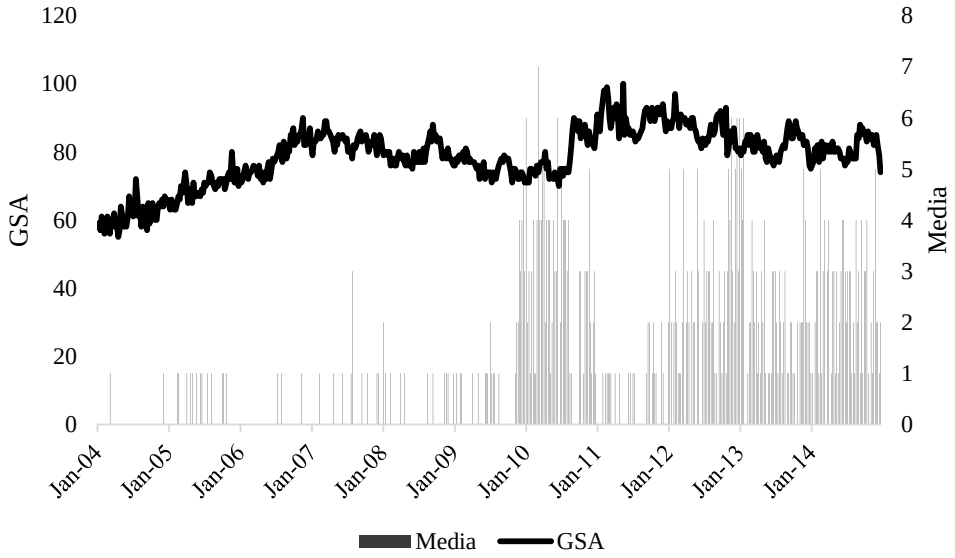


Figure 2. Comparison of Investor Attention Proxies

This figure shows the comparison between three different investor attention proxies for Macy's between January 2004 and December 2015. Panel A compares GSA and trading volume while Panel B compares Media and GSA. GSA is measured from 0 to 100, trading volume is measured in millions of dollars, and media is measured as the number of articles published. All the proxies are measured on a weekly basis.

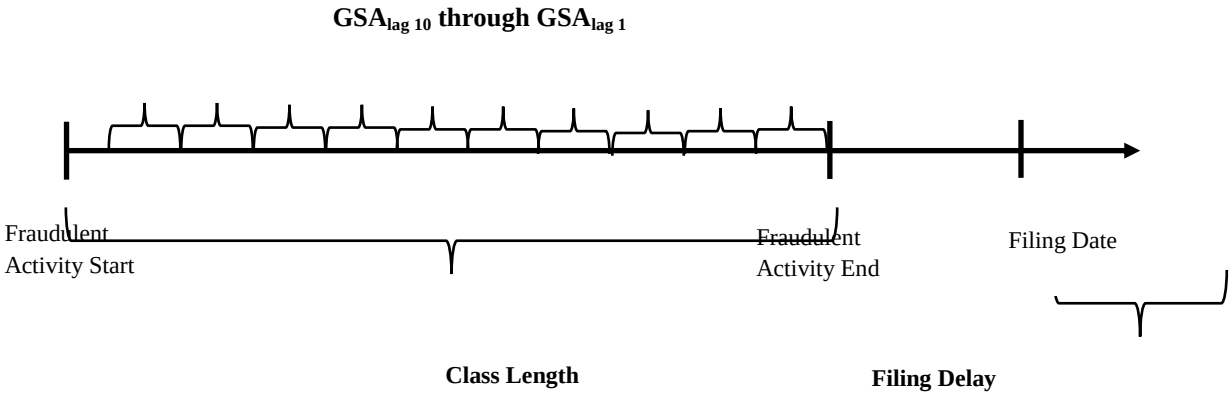


Figure 3. Investor Attention and Filing Delay
This figure shows the timeline over which we measure the main dependent and independent variables in the regression of Filing Delay on GSA. $GSA_{lag\ i}$ represents abnormal Google Search Activity lagged by *i* weeks prior to the end of fraudulent activity.

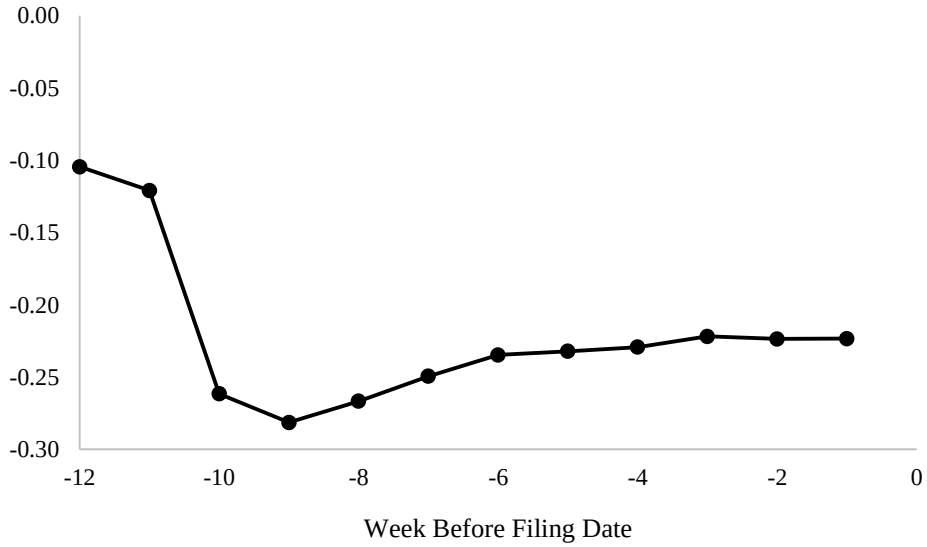


Figure 4: Effect of GSA on Filing CARs
This figure plots the coefficients of $GSA_{lag\ i}$ from the regression that measures the impact of investor attention on CARs surrounding the filing event. The X-axis represents weeks before filing event. The regression results are presented in Table 6.