The bright side of flight delay: How do flight delays affect auditing quality?

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Abstract

Purpose – This study explores how auditors' emotions, specifically negative moods triggered by flight delays, impact auditing quality.

Design/methodology/approach – Utilizing flight delays during audit assignments as a mood indicator, weather conditions at departure airports serve as an instrumental variable to provide a robustness check between flight delays and audit outcomes, employing a two-stage least squares model.

Findings – The findings suggest that such negative moods improve auditing effort and quality, as evidenced by reduced future accounting restatements and increased audit fees. The positive effect of flight delays on auditing quality is consistent across different tests and measures.

Originality/value – This study highlights the significance of auditors' emotional states on their professional performance, indicating a unique angle on auditing quality research by focusing on the emotional well-being of auditors as influenced by external factors such as flight delays.

Keywords Flight delay, Audit fees, Accounting restatement, Negative mood

Paper type Research paper

1. Introduction

Audit quality has been studied extensively in previous literature as external auditors play an important role in the business world by providing reliable information to investors. Auditors exercise their judgment and make decisions in adherence to established accounting standards, drawing upon their professional expertise. A large body of literature has investigated how auditors' characteristics as well as firm-level factors influence audit quality (Kinney, Palmrose, & Scholz, 2004; Taylor, 2011; Minutti-Meza, 2013; Nagy, 2014; Ettredge, Fuerherm, & Li, 2014; Hardies, Breesch, & Branson, 2015). In recent years, research has expanded its focus to include the impact of auditors' emotions on audit quality auditors'

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emotions (Cianci & Bierstaker, 2009; Lin, 2020; Chen, Tan, & Cao, 2020, Chen, Goyal, Veeraraghavan, & Zolotoy, 2020).

The evidence underscores the impact of psychological and environmental factors on the emotions and judgment of auditors, with potential consequences for audit procedures and the quality of financial statements of the audited firms. For example, studies illustrate how frustration (Saiewitz & Kida, 2018) as well as anxiety and fear influence the auditing process (Guénin-Paracini, Malsch, & Paillé, 2014; Pentland, 1993; Sarens, De Beelde, & Everaert, 2009). Our study aims to deepen the understanding of the influence of psychological factors on audit quality. Previous research has primarily addressed this issue in experimental settings. For instance, Bhattacharjee and Moreno (2002) and Chung, Cohen, and Monroe (2008) find that auditors with more negative emotions provide a more conservative inventory valuation, suggesting that these auditors experience an increased sensitivity toward negative cues. However, the limitations of experimental costs have often led previous research to restrict sample sizes, which in turn constrained the ability to draw broad conclusions about the relationship between mood and real-world auditing practices.

Therefore, our objective is to leverage archived data to investigate this association and contribute to the body of literature concerning the impact of psychological factors on auditing practices. Within this paper, we extend upon earlier experimental investigations and endeavor to address the following query: How do adverse emotions experienced during the auditing process affect the practices of external auditors?

We employ auditors' flight delay experience during the auditing period as a proxy for auditors' negative emotions. Drawing on prior studies in the fields of tourism and marketing, it is well-established that worry and anger are among the most common emotions elicited during a flight delay (Bonifield & Cole, 2007; Casado Diaz & Más Ruíz, 2002; Gelbrich, 2010; Mattila & Ro, 2008). The uncertainty surrounding the duration of waiting time can give rise to concerns among individuals in the context of flight delays (Kim, Miao, & Magnini, 2016; Maister, 1985). If not effectively managed, these negative emotions can lead to reputational damage or the termination of services for transportation companies. For instance, Kim and Park (2016) identified a positive association between service delays and customers' negative emotions, as well as a negative relationship between service delays and customers' intention to make repeat purchases.

Furthermore, the results regarding how negative emotions influence the auditing process are mixed. According to Rowe (2019), the presence of fear, discomfort, or anxiety among auditors can impede their ability to exercise professional skepticism and engage in analytical thinking, leading to a reduction in auditing efficiency. On the other hand, several studies have demonstrated that negative emotions can enhance professional skepticism, leading to increased audit efficiency (Guénin-Paracini *et al.*, 2014; Seckler, Gronewold, & Reihlen, 2017). Due to these mixed arguments from prior literature, we extend this discussion by examining how the experience of flight delays influences the auditing process.

In line with the argument presented by Guénin-Paracini *et al.* (2014), our analysis reveals that the negative mood induced by flight delays enhances auditing quality and auditors' efforts, leading to a reduced likelihood of future financial statement restatements and an increase in audit fees. After consulting with professional auditors, we have exclusively included all direct flights on Fridays from the clients' location to the auditor's local office and on Sundays from the auditor's local office to the clients' location [1]. This approach provides a valid measure for assessing the impact of flight delay experiences on the auditing practices of auditors. In addition, to ensure that air travel is the primary mode of transportation chosen by auditors, we have further limited our sample to cases where the distance between auditors and clients exceeds 100 miles [2].

We obtain the flight operating performance data from the US Department of Transportation (Giroud, 2013; Bernstein, Giroud, & Townsend, 2016). The US Department of Transportation mandates monthly reporting of delays of passenger flights by airlines that earn more than 0.5% of the total domestic scheduled service passenger revenue, providing us

with a dataset of daily flight performance for all major domestic airlines. In this study, our main independent variable, flight delays, is measured by the number of flights delayed for more than 15 minutes as a proportion of the total number of flights during the auditing period. According to the results of the multivariate regression analysis, we find a negative correlation between flight delays and financial restatements and a positive correlation between flight delays and current audit fees. These findings hold true even after controlling for firm and auditor characteristics, as well as industry and year-fixed effects.

To address concerns that our results may be influenced by omitted variables or spurious correlation, we examine the aforementioned relationship using various methods, including instrumental variables, more restricted fixed effects, falsification tests and alternative flight delay measurements.

We initially employ an instrumental variable method to address concerns that our results may be influenced by omitted variables. Adverse weather conditions represent important external factors that affect delays in the air traffic system (Coy, 2006; Koetse & Rietveld, 2009). Depending on the year and month, these conditions account for up to 50% of air traffic delays within the US national airspace system (Federal Aviation Administration, 2017). Robinson (1989) analyzed the impact of various weather shocks on airline operations at the Atlanta Hartsfield International Airport for a single airline. He discovered that over 165,000 minutes of delays annually can be attributable to adverse weather conditions. Changnon (1996) shows that in the late 1970s, rainfall significantly increased the number of departures with delays exceeding 30 minutes at Chicago O'Hare airport. Hsiao and Hansen (2006) analyzed the daily average delay in the US domestic transportation system and discovered that delays on days with adverse weather conditions were, on average, 14 minutes longer than on clear days. However, there is no direct link between the weather conditions in the departing city and the firm's auditing practice [3]. To address this issue, we obtain three weather-related variables: wind speed, cloud cover and precipitation from the Integrated Surface Database, which contains hourly weather observations from its weather stations.

To enhance the accuracy of weather information in the vicinity of the airport, we limit our samples to weather stations providing the required data within a 5-mile radius of the airport. Given the strong correlation between flight delays and adverse weather conditions, such as high wind speeds, heavy rainfall and increased cloud cover, we anticipate a greater likelihood of flight delays during unfavorable weather. The results are robust with the implementation of a two-stage least squares (2SLS) regression. A higher incidence of flight delays is associated with increased audit fees and a reduced likelihood of future financial statement restatements.

Our results also remain robust when addressing various empirical concerns. In our initial regression analysis, we only incorporate industry and year-fixed effects. However, previous research identifies that audit practice can be influenced by unobserved firm or auditor characteristics, which could impact our results. For instance, DeFond and Zhang (2014) revealed a wide range of firm-specific risk factors that may influence audit outcomes. More recently, Chen, Chen, Pittman, Podolski, and Veeraraghavan (2021) concluded that a firm's collaborative culture influences audit fees. To account for this concern, we conducted a new regression analysis by replacing industry-fixed effects with the firm-fixed effects and adding auditor-fixed effects to our original model specification. Furthermore, Choi, Kim, Qiu, and Zang (2012) concluded that the geographic proximity between auditors and clients can affect audit quality. To mitigate concerns that our results might be partially influenced by the distance between auditors and client companies, we additionally introduce city-pair fixed effects between auditors' regional offices and clients' locations. These additional analyses yield statistically significant results that are consistent with our main regression findings.

The final set of tests aims to mitigate potential measurement validity issues related to our flight delay variable. First, we conducted a falsification analysis for all samples where the distance between auditors and clients was less than 100 miles. If our flight delay measurement

accurately captures the negative mood induced by flight delay in auditors, we should not observe any significant results for flights within 100 miles, as this is unlikely to be their primary mode of transportation. The outcomes align with this reasoning, as the results are statistically insignificant for the sample that exclusively includes auditors and clients with distances of less than 100 miles. Next, we divided the sample into two sub-samples by the flight date, considering only Fridays and Sundays. This division helps address the concern that our results may be influenced by the direction of travel, either when auditors are flying back home or to work. Both flight delay measurements yielded statistical significance across all specifications.

Our findings offer several important contributions to the existing literature. First, given the challenges associated with estimating how auditors' emotions can impact auditing practices, our paper provides initial evidence that negative emotions play a substantial role in auditing outcomes. Although the emotional aspect of auditing appears to be particularly prominent due to the numerous human judgments and controls involved, most prior research has primarily focused on experimental settings. Our paper, on the other hand, provides a more general and comprehensive proxy for changes in auditor mood.

Drawing on insights from Cianci and Bierstaker (2009) regarding negative performance feedback pressure and complemented by research conducted by Chen, Tan *et al.* (2020) and Chen, Goyal *et al.* (2020) on the effects of air pollution on auditors' behavior, our investigation leverages archival data to establish connections between auditors' psychological states, external pressures and audit quality. Notably, unlike Lin (2020), which centered on the rare occurrence of terrorist attacks, our study examines more commonplace events such as flight delays, thereby offering a broader understanding of how everyday stressors influence audit quality. This critical perspective challenges conventional notions and posits that adverse factors could potentially enhance audit practices, thus carrying significant implications for the field of accounting.

More importantly, our paper provides the first evidence of how negative emotions, fear and anger influence auditing outcomes. According to psychological research, there is evidence to show that individuals often experience mixed emotions when confronted with challenging decisions that involve conflicting aims or purposes (Kung & Chao, 2019). However, the concept of mixed emotions has been largely ignored by accounting scholars (Repenning, Löhlein, & Schäffer, 2022).

Second, we demonstrate that flight delays impact auditing practices by influencing auditor emotions. To the best of our knowledge, none of the previous research in accounting has employed flight delay information as a proxy for auditors' mood changes. Previous research in transportation mainly identifies a positive association between service delays and customers' negative emotions (Kim & Park, 2016). However, these studies often neglect to investigate the consequences of such delays. By using audit outcomes, we document how the mood changes induced by flight delays can potentially influence auditing practices. Future research could employ individuals' flight delay experiences as a proxy for mood changes in other important economic actors in the market, such as analysts and loan officers.

The remainder of the paper is organized as follows. Section 2 summarizes previous literature and develops our main hypotheses. Section 3 describes the research design and sample construction. Section 4 presents our baseline empirical analyses and results. Finally, Section 5 concludes the paper.

2. Prior literature and hypothesis development

2.1 Flight delays, emotions and decision-making process

Psychological factors play an essential role in individuals' information processing, decision-making, judgment and risk preference (Finucane, Alhakami, Slovic, & Johnson, 2000; Breiter, Aharon, Kahneman, Dale, & Shizgal, 2001; Knutson, Adams, Fong, & Hommer, 2001; Kuhnen & Knutson, 2005). In the fields of economics and business, researchers have begun to

explore how individuals' emotions are affected, ultimately leading to different judgments and decisions (Elster, 1998). For example, through an experiment examining subjects' emotions and investment choices, Kuhnen and Knutson (2011) discovered an inverse association between negative emotions and conservative investment decisions. The influence of terrorist attacks has been a subject of investigation in a body of literature as they are considered exogenous shocks that induce temporary negative emotions (Schlenger *et al.*, 2002; Mathewson, 2004). Previous studies provide compelling evidence of how terrorist attacks influence investors' risk preferences and decision-making processes (Wang & Young, 2020; Chen, Tan *et al.*, 2020; Chen, Goyal *et al.*, 2020; Cuculiza, Antoniou, Kumar, & Maligkris, 2021). Other factors that trigger individuals' moods and emotions have also been studied. For instance, Saunders (1993) argued that stock prices are significantly affected by local weather conditions. Lo and Wu (2018) investigated how seasonal affective disorder influences the behavior of financial analysts by examining their forecasts of quarterly earnings.

In this study, we explore the influence of auditors' negative emotions induced by flight delays, which are more frequent and common when traveling by air. Although flight delays have been rarely studied in the accounting field, there is a substantial body of literature in tourism and marketing that analyzes emotion (Taylor, 1994; Hui & Tse, 1996; Wen & Chi, 2013). Worry and anger are among the most frequent emotions experienced during a flight delay (Bonifield & Cole, 2007; Casado Diaz & Más Ruíz, 2002; Gelbrich, 2010; Mattila & Ro, 2008).

Worry can be described as a psychological state characterized by feelings of fear and uncertainty arising from an unpleasant consumption experience (Mattila & Ro, 2008; Menon & Dube, 2004). The uncertainty regarding the duration of waiting time can elicit concerns among individuals in the context of flight delays (Kim *et al.*, 2016; Maister, 1985). On the other hand, anger can be characterized as an emotional response that emerges when an individual perceives an offense that affects them (Gelbrich, 2010; Smith & Bolton, 2002). Using cognitive appraisal theory, Jiang, Li, Huang, and Scott (2020) found that anger can lead to individual's complaining behavior and negative word-of-mouth during a flight delay event. Moreover, Kim and Park (2016) conducted a survey to investigate the effect of airline service delays on passengers' emotions and behavior. They identified a positive association between service delays and customers' negative emotions, as well as a negative relationship between service delays and repurchase intention.

In the context of auditing, worry and anger primarily arise from pressures related to performance evaluation, the auditing process and emotional responses from their supervisors (Hopwood, 1974; Boedker & Chua, 2013; Johnson, Keune, & Winchel, 2019; Cushen, 2013; Andiola, Bedard, & Westermann, 2019; Nelson & Proell, 2018). These emotions have also been identified as crucial factors influencing auditing outcomes. For instance, Bhattacharjee, Moreno and Riley (2012) documented that auditors may conduct more extensive testing when experiencing negative emotions while dealing with the client.

However, there is a lack of consensus regarding the impact of negative emotions on the auditing procedure. Rowe (2019) posited that auditors' capacity to employ analytical thinking and exercise professional skepticism may be hindered by the presence of dread, unease or anxiety, ultimately resulting in a decline in auditing efficiency. Conversely, numerous studies have provided evidence that negative emotions can, in fact, bolster professional skepticism, thereby resulting in enhanced audit efficiency (Guénin-Paracini *et al.*, 2014; Seckler *et al.*, 2017).

In light of the contradictory findings in the prior literature, we proceed with this discourse by examining the impact of auditors' negative emotional states, induced by flight delay experiences, on the auditing process. The subsequent subsection introduces the primary audit practices that will be employed in the course of this study.

2.2 Audit practice

Audit practice and quality are crucial topics in industry and accounting research. A wide range of aspects regarding audit quality has been discussed in previous accounting research over the years. However, measuring audit quality remains a subject of controversy in academic literature. In this paper, we primarily focus on the two most commonly examined factors that represent two dimensions of audit quality: audit fee to reflect the inputs to the audit process and financial statement restatements to represent the outcomes of the audit process (DeFond & Zhang, 2014).

2.2.1 Audit fees. Simunic (1980) conducted the original research that thoroughly discusses factors related to audit fees. Following this study, several papers have provided evidence of the associations between audit fees and various factors. For example, there is substantial evidence demonstrating a positive correlation between client size and complexity with audit fees (Simunic, 1980; DeFond, Francis, & Wong, 2000; Carson & Fargher, 2007). Nelson and Mohamed-Rusdi (2015) discovered a significantly positive association between audit fees and firms with larger foreign ownership and government ownership. In addition to client companies' characteristics, individual auditors also exert influence on audit fees, as discussed in a substantial body of literature. Prior studies have explored several auditor attributes, including auditors' quality, tenure, gender, specialization and location, among others (Kinney *et al.*, 2004; Taylor, 2011; Minutti-Meza, 2013; Nagy, 2014; Ettredge *et al.*, 2014; Hardies *et al.*, 2015).

In the past few years, the influence of auditor characteristics on audit fees has been examined from various angles. Chen, Tan *et al.* (2020) and Chen, Goyal *et al.* (2020) demonstrated a positive relationship between air pollution and abnormal audit fees based on auditors' pessimistic bias. Lin (2020) connected audit practices and terrorist attacks, finding that audit fees are positively related to local terrorist attacks due to auditors' negative emotions.

2.2.2 Restatements. In previous literature, the quality of auditing has been defined in various ways. Among different measures, financial statement restatements are commonly adopted because they provide direct evidence of auditing quality by acknowledging that previous statements did not comply with GAAP (Generally Accepted Accounting Principles) (Kinney *et al.*, 2004; DeFond & Zhang, 2014). Most of the literature focuses on the influence of external characteristics on misstatements. For example, a negative relationship exists between the auditor's industry specialization and expertise and the likelihood of issuing restatements (Romanus, Maher, & Fleming, 2008; Chin & Chi, 2009). In Hoopes, Merkley, Pacelli, and Schroeder (2018), the percentage of restatements is higher in cases with lower audit personnel salaries. Garcia-Blandon, Argilés-Bosch, and Ravenda (2019) provided evidence that the number of accounting restatements is lower for female auditors and the Big 4 firms. Focusing on metropolitan statistical areas, Newton, Wang, and Wilkins (2013) discovered a positive relationship between audit market competition and the likelihood of client restatements.

In recent years, there has been a growing body of literature that explores how auditor behavior is influenced by psychological characteristics. According to these studies, auditors with negative emotions tend to make more conservative judgments and risk-averse decisions. Chung *et al.* (2008) provided evidence by conducting an experiment among audit professionals and their inventory valuation decisions. Lin (2020) further investigated the influence of auditors' emotions by exploring how terrorist attacks affect audit practice. This study suggests an inverse relationship between negative emotions and accounting misstatements. Similarly, Chen, Tan *et al.* (2020) and Chen, Goyal *et al.* (2020) discovered a negative association between financial statement restatements and the level of air pollution, which induces negative moods in auditors.

In this paper, we focus on how auditors' flight delays between their home cities and client companies' locations affect audit fees and financial statement misstatements. A body of

literature has been examining how auditors' moods and emotions influence their judgment and decisions, with a focus on the client likability (Bhattacharjee & Moreno, 2002; Bhattacharjee *et al.*, 2012), auditors' feelings of anxiety (Kadous, 2001; Bagley, 2010), and auditors' general positive and negative emotions (Chung *et al.*, 2008; Cianci & Bierstaker, 2009).

Nevertheless, the findings regarding the impact of negative sentiments on the auditing procedure remain ambiguous. As stated by Rowe (2019), auditors who experience fear, distress or anxiety may find it difficult to employ analytical thinking and maintain professional skepticism, which ultimately results in a decline in auditing efficiency. On the contrary, several research studies have provided support for the notion that negative emotions could potentially bolster professional skepticism, thereby leading to enhanced audit efficiency (Guénin-Paracini *et al.*, 2014; Seckler *et al.*, 2017). If flight delays generally lead to more working hours and potentially induce negative emotions in auditors, we expect that auditors with more negative moods would exert greater effort, make more conservative judgments and opt for risk-averse decisions. Hence, we propose the following hypotheses:

H1a. Audit fees are positively associated with flight delays between their home cities and clients' company locations.

H1b. Audit fees are negatively associated with flight delays between their home cities and clients' company locations.

H2a. The likelihood of accounting misstatements is negatively associated with the flight delays between auditors' home cities and clients' company locations.

H2b. The likelihood of accounting misstatements is positively associated with flight delays between auditors' home cities and clients' company locations.

3. Research design and descriptive statistics

3.1 Sample construction

We create our sample by merging the Compustat Annual Fundamentals database with the Audit Analytics database from 2000 to 2017. Since Auditor Analytics systematically started collecting data only after 2000, our sample period began in 2000. We also end our sample in 2017 to allow 3 more years for misstatements to be revealed (Lennox & Li, 2014). Table 1 reports our sample construction process. The sample does not include firms headquartered outside the United States, and we further exclude firms in the financial and utility industries. As our focus is the effect of flight delays on auditor's behavior, we further restrict our sample to those where the distance between the firm and auditor offices is more than 100 miles. This ensures that airlines are the primary choice for auditors when traveling to clients' firm locations. Due to limitations in flight data, we cannot measure indirect flights with

Firm with necessary variables from Audit Analytics, Compustat and Center for Research in Security Prices (CRSP) from 2000 to 2017	55,975
Excluding	
Firm or auditor located outside of the United States	(1,396)
Remove firms in the finance or utility industry	(4,574)
The distance between the auditor and the firm is less than 100 miles	(13,007)
No direct flight between the firm's location and the auditor's location	(11,065)
Final sample	25,933

Note(s): This table describes the construction and composition of our sample
Source(s): Table by authors

Table 1.
Sample construction

connections between the two cities. Furthermore, we assume that individuals prefer direct flights to indirect flights if direct flights are available. As a result, we further restrict our sample to city pairs between auditors' offices and clients' firm locations with direct flights available. This process results in an initial sample of 25,933 firm-year observations.

3.2 Measurement of flight delay

Building on prior research (Giroud, 2013; Bernstein *et al.*, 2016), we use flight operating performance data provided by the US Department of Transportation for the period spanning from 2000 to 2017. The US Department of Transportation mandates monthly reporting of delays for passenger flights by airlines that contribute more than 0.5% of the total domestic scheduled service passenger revenue. This dataset encompasses daily flight performance information from all major domestic airlines. Subsequently, we aggregate the data from the original airline route level into a daily airport pair level. To illustrate, we consolidate flights from San Francisco (SFO) to New York City (JFK airport) from different carriers into a single entry, representing the total number of flights from SFO to JFK on a given day. We then focus on airports located within 25 miles of the physical addresses of each firm's headquarters or the auditor's office, as determined by their respective zip codes. Flight delays between these two locations were calculated using the following formula [4]:

$$Flight\ Delay = \frac{Total\ Number\ of\ Flights\ Delay\ More\ Than\ 15\ min}{Total\ Number\ of\ Flights} \tag{1}$$

We measure flight delay as the number of flights delayed for more than 15 minutes, expressed as a percentage of the total number of flights during a specific period [5]. To eliminate confounding effects, we consider only flights on Fridays and Sundays during the auditing period. Specifically, we include flights from client firms' headquarters to auditors' office locations on all Fridays and from auditors' office locations to firms' headquarters on all Sundays during the auditing period, which spans from the fiscal year-end date to the auditor signature date. This percentage measurement reflects the likelihood that the auditors will experience flight delays during their commute to work or back home. A higher percentage indicates a greater probability of auditors experiencing flight delays.

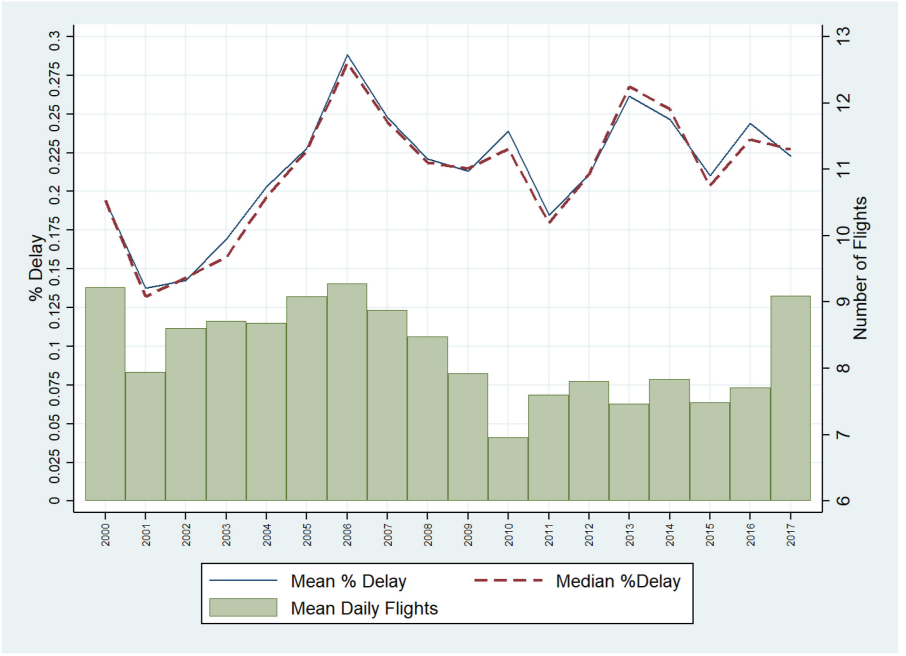
Figure 1 illustrates the average overall flight delays across all years in our sample, as well as the average number of daily flights. While there are variations in average flight delays, the median and mean yearly delays do not exhibit a noticeable time trend. On average, 21.9% of flights are delayed per day, with a standard deviation of 8.4%. There is an average of eight flights per day.

3.3 Measurement for audit quality and effort

Following prior research, we use two measurements as proxies for audit quality and effort. First, we construct an indicator variable, *Restatement*, which equals one when the current earnings are restated in subsequent years and zero otherwise. The second measurement is the audit fee (DeFond & Zhang, 2014). We calculate the audit fee as the natural logarithm of the audit fee obtained from Audit Analytics.

3.4 Research design

To test the influence of flight delays on audit efforts and audit outcomes, we adopt a model based on previous studies, with a focus on controlling for determinants associated with firm risk, audit efforts, audit opinions and client industries (Blankley, Hurtt, & MacGregor, 2012; Lobo & Zhao, 2013; Kalelkar & Khan, 2016; Gul, Khedmati, Lim, & Navissi, 2017; Gao, Merkley, Pacelli, & Schroeder, 2023). Consequently, we assess the relationships between



Note(s): This figure shows the average and median flight delay over our sample period
Source(s): Figure by authors

Figure 1.
Yearly flight delay over time: 2000–2017

audit efforts, audit opinions and flight delays during the auditing period using the following regression model:

$$\begin{aligned} Y_{it} = {} & \alpha + \beta_1 Total\ Delay_{it} + \beta_2 Big4_{it} + \beta_3 ROA_{it} + \beta_4 Loss_{it} + \beta_5 Ln(Size)_{it} + \beta_6 Leverage_{it} \\ & + \beta_7 Book\ to\ Market_{it} + \beta_8 Receivable_{it} + \beta_9 Inventory_{it} + \beta_{10} Busy_{it} \\ & + \beta_{11} Auditor\ Change + \beta_{12} Debt + \beta_{13} Unqualified\ Opinion + \beta_{14} Major\ Exchange \\ & + \beta_{15} Restatement + \beta_{16} Internal\ Control\ Weakness + \beta_{17} Auditor\ Tenure \\ & + \beta_{18}\ Net\ Tone\ in\ 10K + \omega_i + \mu_t + \epsilon \end{aligned} \tag{2}$$

where i denotes firms, and t denotes the fiscal year. Y_{it} stands for our measurements of audit quality and efforts. $Total\ Delay_{it}$ is the estimation for the percentage of flight delays during the auditing period. We also control for firms' characteristics and auditors' characteristics, such as return on assets, leverage ratio, book-to-market ratio, net sentiment in 10K etc., which could impact the firms' financial reporting quality, as documented in prior literature (e.g., Cao, Myers, & Omer, 2012; Lobo & Zhao, 2013; Lennox & Li, 2014; Lisic, Myers, Seidel, & Zhou, 2019; Loughran & McDonald, 2011). Additionally, we include industry-fixed effects, ω_i, to control for industry-specific but time-invariant omitted variables, such as different industry reporting standards. Furthermore, we include year-fixed effects, μ_t, to account for time-varying factors, such as the regulatory environment and accounting rule changes that could affect all audit efforts or outcomes [6].

4. Empirical results

4.1 Descriptive statistics

Table 2 presents summary statistics for audit efforts and quality, flight delays, and other control variables. The mean value for total delay is 21.9% with a standard deviation of 8.4%. Furthermore, on average, 16.8% of firms in the sample restate their earnings in the following years. In terms of audit effort, the mean audit fee is around 1.6 million dollars. As for other control variables, the average log-transformed firm size is 5.499, which translates to 244 million. The average book-to-market ratio is 0.342. In addition, a typical firm in this sample has a leverage ratio of 0.184 and an inventory of 0.092.

4.2 Flight delay and audit outcomes

As stated earlier, we hypothesize that total flight delays influence audit quality by decreasing future financial restatements and increasing audit fees. Table 3 presents the results of estimating the impact of flight delays on audit outcomes. In Column (1), the logit regression results are reported with only industry- and year-fixed effects included. The coefficients for total delay are negative and significant at the 1% level, suggesting that more flight delays result in a significantly lower chance of future accounting misstatements. Column (2) includes a series of time-varying firm and auditor characteristics. The coefficient for total delay remains negative and statistically significant at the 1% level. These results are consistent with the hypothesis that flight delays create negative emotions, inducing more conservative

Variables	N	Mean	Std Dev	Q1	Median	Q3
Total delay	25,933	0.219	0.084	0.163	0.215	0.267
Restate	25,933	0.169	0.375	0	0	0
Ln(Audit Fee)	25,933	13.26	1.459	12.23	13.33	14.29
Total delay Friday	25,933	0.225	0.106	0.154	0.218	0.287
Total delay Sunday	25,933	0.211	0.0862	0.153	0.204	0.259
Big4	25,933	0.694	0.461	0	1	1
ROA	25,933	−0.008	1.422	−0.0375	0.007	0.044
Loss	25,933	0.330	0.470	0	0	1
Ln(Size)	25,933	5.499	2.490	4.000	5.609	7.197
Leverage	25,933	0.184	0.254	0	0.0892	0.288
Book-to-market	25,933	0.342	1.596	0.175	0.385	0.698
Receivable	25,933	0.139	0.124	0.0474	0.114	0.194
Inventory	25,933	0.092	0.126	0	0.0383	0.141
Busy	25,933	0.726	0.446	0	1	1
Major exchange	25,933	0.790	0.408	1	1	1
Unqualified opinion	25,933	0.630	0.483	0	1	1
Auditor change	25,933	0.080	0.272	0	0	0
Restatement	25,933	0.076	0.265	0	0	0
Internal control weakness	25,933	0.192	0.388	0	0	0
Auditor tenure	25,933	5.071	4.002	2	4	7
Net tone in 10K	25,933	−0.009	0.005	−0.012	−0.009	−0.006
Debt	25,933	0.798	2.406	0.279	0.485	0.686
Wind speed	25,827	4.455	0.716	3.967	4.553	4.988
Cloud cover	25,827	4.781	0.720	4.388	4.885	5.273
Precipitation	25,827	1.812	1.114	0.960	1.688	2.511

Note(s): This table presents summary statistics for all variables in our sample. The sample period is 2000–2017. Detailed definitions for each variable are provided in Appendix. All continuous variables are winsorized at 1% and 99% level

Source(s): Table by authors

Table 2.
Descriptive statistics

Variables	(1) Restate Logit	(2) Restate Logit	(3) Ln(Audit fee) OLS	(4) Ln(Audit fee) OLS
Total delay	−1.124***	−1.182***	1.504***	0.195***
	[−3.81]	[−3.53]	[9.37]	[3.41]
Big4		0.106		0.378***
		[1.25]		[18.52]
ROA		−0.371		−1.009***
		[−1.03]		[−12.76]
Loss		−0.196**		−0.011
		[−2.17]		[−0.59]
Ln(Size)		0.104***		0.485***
		[5.27]		[89.57]
Leverage		0.228**		0.034
		[2.06]		[1.20]
Book-to-market		0.050***		−0.009**
		[2.93]		[−2.56]
Receivable		0.143		0.744***
		[0.57]		[10.60]
Inventory		−0.229		0.374***
		[−0.66]		[4.42]
Busy		−0.425***		0.051***
		[−6.19]		[2.73]
Auditor change		0.027		−0.289***
		[0.35]		[−15.35]
Debt		−0.005		0.037***
		[−0.40]		[13.87]
Unqualified opinion		0.008		−0.102***
		[0.15]		[−9.03]
Major exchange		−0.237***		0.025
		[−2.79]		[1.17]
Restatement		3.256***		0.055***
		[48.51]		[3.80]
Internal control weakness		1.110***		0.153***
		[15.38]		[8.42]
Auditor tenure		−0.008		0.000
		[−0.91]		[0.10]
The net tone in 10K		−15.884**		−15.853***
		[−2.27]		[−9.08]
Constant	−1.722***	−2.790***	13.478***	10.434***
	[−4.77]	[−6.59]	[256.11]	[238.10]
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	25,933	25,933	25,933	25,933
Pseudo/Adjusted R^2	0.045	0.251	0.272	0.853

Note(s): This table shows multiple regression results for the relationship between flight delay and audit quality and effort. We measure the audit quality as the restatement which equals one if the firm's 10-K is subsequently restated, and zero otherwise. In terms of audit effort, we use the total audit fees. For columns (1) and (3), we only add fixed effects to determine the base relationship between flight delay and each dependent variable. We add control variables, which are described in the Appendix, in columns (2) and (4). Standard errors are clustered by firm and *t*-statistics are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, $p < 0.1$

Source(s): Table by authors

Table 3.
Flight delay and audit quality

thinking from auditors. As a result, client companies are less likely to restate their financial statements in the future.

Columns (3) and (4) present the results of the influence of flight delays on audit fees. To be specific, we apply OLS regression using audit fees as the dependent variable in equation (2). Following a similar layout as the above two columns, we use only industry-fixed effect and year-fixed effect in Column (3). In Column (4), we further add all the control variables. The results support our argument that the coefficient for total delay is significantly and positively related to audit fees.

Overall, the results support the idea that negative emotions might positively influence professional skepticism, hence resulting in improved audit efficiency by prompting more effort in the financial report evaluation and reducing potential accounting restatements (Guénin-Paracini *et al.*, 2014; Seckler *et al.*, 2017).

4.3 Instrumental variables

In our empirical setting, the effect of flight delays should be exogenous to auditing outcomes since flight delays are not directly associated with auditing practice. In this case, flight delays should be a "clean" measurement in terms of auditors' emotions. However, potential endogeneity concerns may arise. For example, an omitted factor, such as local infrastructure conditions, could affect both the chance of flight delays and firm's auditing outcomes.

To address this endogenous concern, we employ 2SLS as an alternative approach. The 2SLS method requires at least one exogenous variable for estimating the endogenous variable. In our setting, the ideal instrument variable should be correlated with flight delays but not with the auditor outcomes. To this end, we use three weather-related variables as our instrumental variables for flight delays, including wind speed, precipitation level and cloud cover around the airport during the auditing period. We construct these instrumental variables based on the Integrated Surface Database (ISD), which is available from the National Oceanic and Atmospheric Administration (NOAA). The ISD contains hourly weather observations, such as cloud cover, wind speed, sea pressure, etc., from 1901 to 2017. Since we only focus on US firms, we collect data from all active weather stations located in the United States. The ISD also provides the latitude and longitude coordinates of each weather station, enabling us to calculate the distance between each weather station and the airport location.

To ensure that the calculation of the weather information around the airport is as accurate as possible, we only include weather stations with the required weather information within 5 miles of the airport in our sample. As flight delays are related to weather conditions, we expect a higher probability of flight delays during adverse weather, which includes high wind speed, heavy precipitation and increased cloud cover. There is no obvious reason that weather around airport locations would directly affect auditing outcomes. Therefore, the three weather conditions are reasonable instrumental variables in this study.

Table 4 reports the results of the 2SLS analysis. In Column (1), flight delay is regressed on weather conditions and other control variables in the first stage. As expected, all weather variables are positively associated with flight delays. The Wald F statistic for weak instruments shows a value of 196.464 and a p-value of less than 0.000 confirming the strength of the instruments; and finally, the Sargan–Hansen test for instrument validity shows a value of 0.531 and a p-value of 0.758 confirming the validity of the instruments. Thus, weather conditions around airport locations are reliable and statistically valid instruments.

The subsequent columns of Table 4 present the results for the second-stage model, where we substitute the original flight delay measurement with the Estimated total delay obtained from the first-stage estimation. All results remain consistent with our primary findings in Table 3 and maintain statistical significance at the 5% level in every case. This 2SLS analysis

Stage Variables	(1) 1st Total delay	(2) 2nd Restate	(3) 2nd Ln(Audit fee)
Wind speed	0.013***		
	[15.88]		
Cloud cover	0.006***		
	[7.33]		
Precipitation	0.005***		
	[9.68]		
Estimated total delay		−4.914***	0.641**
		[−2.59]	[2.11]
Big4	−0.001	0.130**	0.373***
	[−0.63]	[2.12]	[35.35]
ROA	−0.018**	−0.482	−1.002***
	[−2.51]	[−1.55]	[−18.22]
Loss	−0.003*	−0.224***	−0.010
	[−1.72]	[−2.98]	[−0.75]
Ln(Size)	0.002***	0.112***	0.484***
	[6.82]	[7.55]	[185.30]
Leverage	0.004*	0.236**	0.033**
	[1.70]	[2.54]	[2.04]
Book-to-market	0.000	0.054***	−0.009***
	[0.87]	[3.70]	[−3.71]
Receivable	0.012**	0.139	0.729***
	[2.55]	[0.72]	[20.68]
Inventory	0.000	−0.200	0.367***
	[0.05]	[−0.83]	[8.56]
Busy	0.002	−0.395***	0.050***
	[1.34]	[−8.03]	[5.48]
Auditor change	0.002	0.023	−0.294***
	[0.99]	[0.30]	[−21.33]
Debt	−0.000	−0.003	0.037***
	[−0.08]	[−0.26]	[22.16]
Unqualified opinion	−0.002*	0.003	−0.101***
	[−1.72]	[0.07]	[−11.92]
Major exchange	−0.004***	−0.247***	0.026**
	[−2.91]	[−4.06]	[2.36]
Restatement	−0.006***	3.236***	0.058***
	[−3.39]	[52.57]	[4.38]
Internal control weakness	0.001	1.108***	0.153***
	[0.46]	[17.57]	[12.30]
Auditor tenure	−0.001***	−0.011	0.001
	[−3.36]	[−1.49]	[0.44]
The net tone in 10K	−0.243**	−15.716***	−15.817***
	[−2.00]	[−3.02]	[−17.42]
Constant	0.090***	−0.568	10.335***
	[17.21]	[−1.15]	[132.61]
Year FE	YES	YES	YES
Industry FE	YES	YES	YES
Observations	25,789	25,789	25,789
Pseudo/Adjusted R^2	0.246	0.250	0.852
Wald F-statistics		196.464	
p-value		0.000	
Sargan–Hansen test		0.531	
p-value		0.758	

Note(s): This table shows multiple regression results for the relationship between flight delay and audit effort based on instrumental variable method. Column (1) reports the results for our first-stage regression. The remaining two columns present our main regression results by using the value we generated in the first stage. We add control variables, which are described in Appendix, in columns (2) and (4). Standard errors are clustered by firm and t-statistics are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Source(s): Table by authors

Table 4.
Instrumental variable analysis

further strengthens the evidence supporting the argument of the relationship between flight delays and audit outcomes.

4.4 Robustness check

Table 5 presents results for a series of robustness tests that incorporate additional fixed effects. Our results remain consistent across all of these robustness tests. The first set of tests aims to address the concern that the potential firm-specific characteristics might partially drive our results. We tackle this concern by replacing industry-fixed effects with firm-fixed effects. The second set of tests attempt to mitigate the regional effects stemming from the auditor's local office. For instance, each auditor's local office may have a distinct working environment that could influence the auditors' work attitude. The last set of analyses further considers cultural or religious conflicts between auditors' locations and clients' locations.

As shown in Table 5, the first two columns incorporate firm-fixed effects instead of industry-fixed effects into our regression analysis to address concerns related to the potential influence of certain firm characteristics. Columns (3) and (4) introduce auditor regional office fixed effects to control for variations in the working environment across different local offices. Further, the last two columns replace auditor-fixed effects with city-pair fixed effects to address concerns related to differences between cities. All of these results align with our primary argument that flight delays induce negative emotions in the auditor, leading to a decrease in future restatements and an increase in audit fees.

4.5 Additional analysis

In this section, we bolster our findings with several additional analyses to demonstrate that our results are not driven by spurious correlations and specific measurements of flight delays. To achieve this, we first initially examined the relationship between flight delays and auditor outcomes using only the distance between the firm and regional auditor offices of less than 100 miles. In such cases, when taking flights is not the primary option for auditors, flight delays should not statistically affect audit outcomes.

The results are reported in the first two columns of Table 6. As predicted, the insignificant coefficient for total delay confirms our argument that the relationship between flight delay and auditor outcomes is not spurious.

Variables	(1) Restate	(2) Ln(Audit fee)	(3) Restate	(4) Ln(Audit fee)	(5) Restate	(5) Ln(Audit fee)
Total delay	−0.052*	0.108***	−0.048*	0.046*	−0.058**	0.056*
	[−1.66]	[2.71]	[−1.82]	[1.73]	[−2.21]	[1.78]
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Auditors' location FE	NO	NO	YES	YES	NO	NO
City pairs	NO	NO	NO	NO	YES	YES
Observations	25,124	25,124	24,966	24,966	24,915	24,915
Adjusted R^2	0.265	0.929	0.413	0.938	0.381	0.932

Note(s): This table shows multiple regression results for the relationship between flight delay and audit effort. Column (1) and (2) add firm-fixed effects. We control for the auditors' location in the next two columns. For the last two columns, we further control the city pairs between firms' location and auditors' location. We add control variables, which are described in Appendix, in columns (2) and (4). Standard errors are clustered by firm and *t*-statistics are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Source(s): Table by authors

Table 5.
Robustness check

Conditions	(1) Less than 100 miles		(3) Only flights on Fridays		(5) Only flights on Sundays	
Variables	Restate	Ln(Audit fee)	Restate	Ln(Audit fee)	Restate	Ln(Audit fee)
Total delay	−1.028	0.151				
	[−1.00]	[0.98]				
Total delay Friday			−0.987***	0.109**		
			[−3.76]	[2.24]		
Total delay Sunday					−0.421*	0.203***
					[−1.79]	[3.52]
Controls	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	1,148	1,148	25,905	25,905	24,849	24,849
Pseudo/Adjusted R^2	0.308	0.889	0.251	0.853	0.252	0.853

Note(s): This table shows multiple regression results for the relationship between alternative flight delay measurements and auditing outcomes. For columns (1) and (3), we only add fixed effects to determinate the base relationship between flight delay and each dependent variable. We add control variables, which are described in Appendix, in columns (2) and (4). Standard errors are clustered by firm and *t*-statistics are shown in parentheses. Significance level: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Source(s): Table by authors

Table 6.
Additional analysis: Local auditor and alternative measurements

Next, we shift our focus to two alternative measurements for flight delays by restricting the analysis to flights on Friday and Sunday separately. The independent variable, flight delay, in our main analysis, combines both Fridays and Sunday's flights, encompassing auditors' trips to work and back home. However, some might argue that our results could be influenced by one direction only. To overcome this concern, we reconstruct the measurement for total delay by calculating the average number of flight delays exceeding 15 minutes on Friday and Sunday, separately. Then, we construct two related measurements as the total delay Friday and total delay Sunday. The remaining columns of Table 6 present the results with these new delay measurements. As the results indicate, all the coefficients of the main independent variables remain statistically significant and consistent with our primary regression results.

5. Conclusion

In this paper, we explore the relationship between flight delays and auditing quality. Consistent with prior research in psychology, we find that auditors' negative moods induced by flight delays experience enhanced audit quality and auditors' dedication, resulting in a decreased likelihood of future financial statement restatements and increased audit fees. To address potential endogeneity concerns, our findings remain robust under various conditions, including instrumental variables, more stringent fixed effects, falsification tests and alternative measurements of flight delay.

The investigation into how flight delays impact auditors' moods and subsequently influence auditing quality not only adds depth to academic research but also carries practical implications for the auditing profession. Practically, our findings indicate that audit firms should adapt their operational strategies, particularly concerning the logistics of scheduling audit engagements.

Acknowledging that such delays may heighten auditors' attention to detail, audit firms could leverage this effect by strategically planning audits to accommodate such disruptions, especially in tasks requiring meticulous scrutiny. Additionally, our study may prompt firms to develop comprehensive support systems aimed at mitigating the negative effects of travel stress while preserving the unintended positive impacts on audit focus and quality.

Consequently, such an approach could cultivate an environment where the inconveniences of business travel are transformed into opportunities for enhancing audit effectiveness.

Collectively, our results offer preliminary evidence of the significant impact of negative emotions induced by flight delays during the auditing period on auditing outcomes. In contrast to previous research, which primarily explores this issue in experimental settings incurring substantial costs with limited samples (Bhattacharjee & Moreno, 2002; Chung *et al.*, 2008), the usage of flight delays during the auditing period provides a more cost-efficient and broadly applicable proxy for understanding auditors' mood changes. Furthermore, future research could explore the utilization of flight delays as a proxy for mood changes among other key economic actors.

Notes

1. It is a common practice among auditing firms to cover the travel expenses incurred by their external auditors during the auditing period. Specifically, auditors are reimbursed for travel costs associated with visiting clients' locations on Sundays and returning home on Fridays.
2. In cases where the distance between the client's location and the auditing firm is less than 100 miles, it is deemed most efficient for auditors to commute via ground transportation. Our results are still consistent if we use 250 miles or 500 miles as the thresholds.
3. To further minimize the influence of weather-induced moods on auditors' judgment, we focus on weather information within a 5-mile radius of the departure airport.
4. Our results remain consistent whether we use a 10-mile or 50-mile radius for the calculation.
5. The United States Federal Aviation Administration defines a flight as delayed when it is 15 minutes or more behind its scheduled time. However, our findings remain valid even if we modify our delay definition to include flights delayed for more than 30, 45 or 60 minutes.
6. Our results are robust to various sets of controls that summarized by Dechow, Ge, and Schrand (2010).

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Appendix

Variable	Definition
Restate	The indicator equals to one if the firm's 10-K is subsequently restated, and zero otherwise
Audit fee	Natural log of the total audit fees charged by the auditor that year
Total delay	Percentage of flights delayed more than 15 minutes in terms of total flights on Friday & Sunday
Total delay Friday	Percentage of flights delayed more than 15 minutes in terms of total flights on Friday only
Total delay Sunday	Percentage of flights delayed more than 15 minutes in terms of total flights on Sunday only
Big4	The indicator variable takes the value of 1 if the auditor is Deloitte, Ernst & Young, KPMG, or PriceWaterhouseCoopers
ROA	The ratio of income before extraordinary items to the beginning total assets for that year
Loss	The indicator variable takes the value of 1 if the client showed negative income before extraordinary operations and o otherwise
Ln(Size)	Natural log of total client assets for that period
Leverage	The sum of the firm's short-term debt and long-term debt is divided by total assets
Book-to-market	Firms' book value of equity is divided by the market value of equity
Receivable	Accounts receivable is divided by total assets
Inventory	Total inventory divided by total assets at the end of the year
Busy	The indicator equals one if the company's fiscal year ends on December 31, and 0 otherwise
Auditor change	The indicator equals one if the auditor changes in the fiscal year, and zero otherwise
Debt	Total liability to total assets
Unqualified opinion	The indicator equals one if the auditor issues an unqualified opinion without any additional language, and zero otherwise
Major exchange	The indicator equals one if the firm is a public company trading on a major exchange, and zero otherwise
Internal control weakness	An indicator variable equal to 1 for firm years disclosing an internal control weakness in one or more of the following reports: Section 302 quarterly certifications, 404(a) management assessment, and/or 404(b) audit report, 0 otherwise
Restatement	An indicator variable equals 1 if the firm announces a restatement during year t, and 0 otherwise
Auditor tenure	Number of years the current auditor serves the company
The net tone in 10K	The percentage of positive words minute negative words from Loughran and McDonald's (2011) dictionary

Source(s): Table by authors

Table A1.
Variable definitions

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