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新型冠狀肺炎疫情對審計公費僵固性之影響

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摘要

新型冠狀肺炎(COVID-19)疫情不僅加劇了企業的經營風險，也放大了會計師所承擔的審計風險。本研究使用美國上市上櫃公司樣本來檢驗新型冠狀肺炎疫情對審計公費僵固性的影響。相對於過往結果發現，審計公費向上僵固性較弱，而向下僵固性較強。本研究則發現疫情期間有相反的結果，即疫情期間向上僵固性增強，向下僵固性減弱。這意味著審計公費變得較難上漲而較易下跌。此外，對於大型會計師事務所及產業專精會計師事務所來說，前述疫情對費用僵固性的影響較不明顯，顯示會計師的議價能力可以減輕 COVID-19 對費用僵固性的影響。由於疫情會阻礙會計師蒐集充分適切的審計證據進而提高審計風險，本研究指出審計公費可能無法完全反應疫情造成的審計風險增加，因此本研究實證結果可以提醒審計委員會和監管機構關注審計公費調整的重要性。

關鍵詞：審計公費僵固性、新型冠狀肺炎、四大會計師事務所、產業專精

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The Effect of the COVID-19 Pandemic on Audit Fee Stickiness

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Abstract

COVID-19 not only exacerbated business risks for enterprises but also amplified the audit risks assumed by auditors. Our study used a sample of US-listed companies to examine the effect of the COVID-19 pandemic on the stickiness of audit fees. In contrast to prior research, which demonstrated weaker upward fee stickiness and stronger downward fee stickiness, our results revealed an increase in upward stickiness and a decrease in downward stickiness during the pandemic. This means that audit fees became more resistant to increase and less resistant to decrease. Our results also indicated that the influence of the pandemic on fee stickiness was less pronounced for Big 4 and specialist auditors, suggesting that auditors' bargaining power mitigates the impact of COVID-19 on fee stickiness. Our study informs audit committees and regulators of the importance of paying attention to audit fee adjustment, as audit fees may not fully respond to increased audit risks imposed by the pandemic due to potential challenges in collecting sufficient and appropriate audit evidence.

Keywords: Audit fee stickiness; COVID-19; Big 4 auditors; Industry specialization

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1. Introduction

The COVID-19 pandemic has triggered disruptions worldwide, including the most severe economic downturn since the Great Depression as well as supply chain crises, food shortages, and school closures (Gopinath 2020). To curb the spread of COVID-19, many countries have recommended behavioral changes, distancing measures, and border restrictions. These measures have disrupted business operations. The coronavirus has many interrelated implications for financial reporting and auditing. Specifically, the COVID-19 pandemic has affected financial reporting quality, financial disclosure, audit scope limitations, and tax provision (Levy 2020).

Changes in audit fees are one consequence that interests auditors and their clients. Audit fees are considered sticky if the changes in the *actual* audit fees are *smaller* than the changes in the *expected* audit fees, as determined by various client characteristics accounted for by a fee model. Multiple studies have attributed abnormal audit fees, defined by the difference between actual and expected audit fees, to economic bonding (Choi et al. 2010; Kinney and Libby 2002) or additional audit efforts (Mitra et al. 2009). On the other hand, Causholli et al. (2010) argued that audit fee stickiness may explain abnormal audit fees. Ferguson et al. (2011) provided the first empirical evidence of audit fee stickiness. Furthermore, De Villiers et al. (2014) indicated that audit fees are sticky and tend to become stickier in the downward direction than in the upward direction. Chang et al. (2019) reported an increase in asymmetry in audit fee adjustments when the audit market concentration increased.

In this study, we examined the effect of the COVID-19 pandemic on audit fee stickiness. Specifically, we focused on the degree of asymmetry in the upward and downward stickiness of audit fees during the pandemic. Upward (downward) stickiness means that the upward (downward) adjustments of audit fees are smaller than the expected changes suggested by audit fee models. According to previous research, audit fees reflect the audit efforts devoted and audit risks assumed by auditors (Choi et al. 2008; Simunic 1980). COVID-19 is regarded as an unprecedented incident that has resulted in excessive pressure on auditors. During the pandemic, auditors were unable to access client records, observe and verify inventories, or interview key personnel on-site. COVID-19-related border restrictions also hindered client auditing when it came to foreign operations. In addition, layoffs, furloughs, and illnesses due to the pandemic adversely affected

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internal controls over the financial reporting of audit clients (Appelbaum et al. 2020; Levy 2020).

Facing the new or elevated risks of material misstatement, auditors may need to identify and implement alternative audit procedures, such as first-person-view cameras, drones, video feeds, or other remote auditing tools, to mitigate these risks. They may also need to take on considerable residual risks that are impossible or overly expensive to address adequately. According to previous studies on audit fee models, audit fees were expected to increase during the pandemic. However, when COVID-19 was identified as a global pandemic in 2020, most of the major economies lost approximately 2.9% to 3.4% of their gross domestic product (GDP) (Dyvik 2024). With the pandemic negatively affecting financial performance, companies under financial pressure were unable to withstand any increases in audit fees. They tended to either stabilize or lower their audit fees by negotiating with auditors in pursuit of general cost reductions. Therefore, in contrast to the results of De Villiers et al. (2014), we expected audit fees to become more resistant to increase and less resistant to decrease (conditional on expected fee changes) during the COVID-19 pandemic. This means that upward fee stickiness would increase while downward fee stickiness would decrease.

Next, we examined how the effect of the COVID-19 pandemic on audit fee stickiness varied with auditors' bargaining power. Large auditors, i.e., Big N audit firms, offer higher-quality audit services because of their robust training programs, standardized audit methodologies, and extensive in-house expertise. Big N auditors can also earn audit fee premiums (Hay et al. 2006). Therefore, compared with non-Big 4 auditors, Big 4 auditors may exhibit greater bargaining power with their current clients who endured the repercussions of the COVID-19 pandemic. In this study, we expected COVID-19 to have a mitigated effect on audit fee stickiness for Big 4 auditors. In other words, we expected both the aforementioned increase in upward fee stickiness and the decrease in downward fee stickiness to be less pronounced for Big 4 auditors during the pandemic.

We also operationalized bargaining power using the degree of specialization. Specialist auditors are those with the expertise in evaluating information that pertains to a specific industry or has social implications. Their specialized experience enables them to identify and address complex issues during the audit process and provide high-quality audit services. For these specialist auditors, reputational capital may improve their level of competency (Craswell et al. 1995) and their audit or assurance services (Minutti-Meza 2013; Reichelt and Wang 2010).

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Thus, specialist auditors who develop and accumulate industry expertise typically provide higher-quality audit services than those provided by non-specialist auditors (Balsam et al. 2003; Beasley and Petroni 2001). This differentiation strategy may enhance the bargaining power of auditors. In this study, we expect that the effect of the COVID-19 pandemic on audit fee stickiness may be less pronounced for specialist auditors. In other words, we expected both a minor increase in upward stickiness and a minor decrease in downward fee stickiness for industry specialists.

Our sample comprised public US companies listed on the New York Stock Exchange (NYSE) and Nasdaq Stock Market (NASDAQ). Although other countries, such as China, suffer more severe economic consequences from the pandemic[1], we adopt a US sample for the following reasons. First, as a democracy, the US experienced different levels of restrictions and lockdowns across states. This allows us to observe the pandemic's impact on audit fee stickiness in various sub-markets. Second, there is a wide range of policies in response to the pandemic in the US, including the Public Company Accounting Oversight Board (PCAOB)'s guidance issued in 2020 that provides insights for auditors.[2] Such guidance reminds auditors to take corresponding actions (e.g., quality control and risk assessment) in time and offers a unique opportunity to examine how these reminders may affect audit fees. Lastly, the US has a large number of firms across different industries, and its economy highlights global importance and relevance.

Audit fee stickiness was measured using a model developed by De Villiers et al. (2014). In contrast to De Villiers et al. (2014), who found that audit fees are more likely to increase than decrease when audit conditions change, our study shows that during the COVID-19 pandemic, audit fees became more resistant to increase and less resistant to decrease given expected fee changes. This means that upward fee stickiness increased, and downward fee stickiness decreased during the pandemic. We also discovered that the effect of the pandemic on fee stickiness was less

[1] We do not use a Chinese sample because, in December 2020, the US enacted the Holding Foreign Companies Accountable Act (HFCAA). In accordance with the Act, PCAOB conducted on-site inspections in Mainland China and Hong Kong starting from September 2022. The inspections have caused many Chinese state-owned enterprises and private enterprises to change their accountants. Furthermore, China has urged state-owned enterprises to gradually drop services provided by Big 4. Interventions such as the 2020 HFCAA may affect the Chinese audit market, complicating empirical tests on audit fees during the pandemic. See PCAOB news releases (PCAOB 2022) and Bloomberg news (Bloomberg News 2023).

[2] Examples include "Staff Observations and Reminders during the COVID-19 Pandemic" and "COVID-19: Reminders for Audits Nearing Completion." See PCAOB news releases (PCAOB 2020a).

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pronounced for Big 4 and specialist auditors than for other auditors, suggesting that auditors' bargaining power mitigated the aforementioned impact of the COVID-19 pandemic.

In our additional analysis, we compare the effect based on audit market competition. We partition the sample into low- and high-competition markets and find that the increased upward stickiness and decreased downward stickiness are less pronounced when the market is less competitive. The results suggest that market concentration mitigated the impact of the COVID-19. Our additional analysis also includes a comparison between the 2007-2008 financial crisis and the pandemic, and the results show that the impact on audit fee stickiness is stronger during the pandemic than during the financial crisis period. The pandemic caused more restrictions on auditors when they perform audits, resulting in a stronger effect on the increase of upward fee stickiness and the decrease in downward fee stickiness. Furthermore, we also compare the impact of COVID-19 in the blue (Democratic) and red (Republican) states. Generally speaking, the red states impose fewer restrictions for controlling the pandemic, and their economy rebounds faster. Consistent with this tendency, we find that audit fees are less resistant to decrease in the blue states.

This paper makes a contribution in the following aspects. First, to the best of our knowledge, our study is the first study to examine the relationship between COVID-19 and audit fee stickiness. There is emerging research examining the impact of COVID-19 on the audit profession. For example, prior studies show that the COVID-19 restrictions are negatively associated with audit quality (Gong et al. 2022) and positively associated with audit fees and audit delays (Harjoto and Laksmana 2023). While audit fee adjustments during the pandemic reflect changes in client size, client risks, operational complexities, and so on, audit fee stickiness gauges the extent to which changes in *actual* audit fees respond to *expected* fee adjustments. Prior literature reports asymmetry between downward and upward fee stickiness under normal circumstances (e.g., De Villiers et al. 2014; Chang et al. 2019). Our study contributes to the literature by demonstrating that COVID-19 reversed the aforementioned asymmetry between upward and downward fee stickiness (i.e., the audit fees became stickier in the upward direction than in the downward direction during the pandemic). Furthermore, unlike prior literature, which finds no difference between the large and small auditors when they face audit fee pressure during financial crises (e.g., Ettredge et al. 2014; Ettredge et al. 2017), this paper elucidates how auditor size and industry specialization mitigated the

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reversing effect.

Second, our paper provides feedback to accounting practitioners. It corresponds to De Villars et al.'s (2014) call that managers and audit committees should be more careful in audit fee management and negotiations during an economic downturn. To absorb auditors' audit risk due to increased inherent and control risks during the COVID-19 crisis, audit fees should increase to the extent that it sufficiently reflects these risks. Our findings suggest that audit fees probably do not reflect the corresponding risk as timely as they should, indicating potential inefficiency for audit fee adjustment. Furthermore, the findings that audit fees are less resistant to decrease implies time budget pressure for audit firms, as heightened client risks may require more actual audit hours, leading to higher unfavorable budget variance (e.g., DeZoort and Lord 1997; Ettredge et al. 2008). Our results imply the potential consequences of higher litigation risk or higher staff dissatisfaction for audit firms (e.g., McNair 1991; Ettredge et al. 2008).[3]

Third, our paper has implications for regulators and financial statement users. Many regulators have expressed deep concern regarding the potential adverse effect of fee cuts on audit quality during economic crises (Whitehouse 2010; McCann 2010). Our paper responds by showing that during economic crises, audit engagements are indeed less resistant to fee cuts than fee increases, which may force auditors to compromise on the rigor of their audits (e.g., Ettredge et al. 2008; Ettredge et al. 2014; Ettredge et al. 2017). For example, prior literature has examined the pressure caused by bank audit fees and the effect of this pressure on the financial reporting quality of the banking industry during the global financial crisis of 2008 and 2009 (Krishnan and Zhang 2014; Porter 2020). Unlike any other global crisis, COVID-19 has resulted in unprecedented levels of uncertainty and disruption (e.g., Ding et al. 2021; Ivanov and Das 2020), which prompted strong government interventions (e.g., Goldstein et al. 2021; Martin et al. 2022). Combined with earlier evidence that audit quality may be affected during the pandemic (e.g., Gong et al. 2022; Harjoto and Laksmana 2023), this study provides regulators and financial statement users with a heads-up on the extent to which clients' actual audit fees may not properly reflect the expected change in audit fees.

[3] To resolve the problem of time pressure, auditors may choose to (1) engage in quality-threatening behavior, (2) work overtime without reporting, or (3) work more intensively within the budget. The first choice may lead to auditors' litigation risk, while the latter two may cause staff dissatisfaction (e.g., McNair 1991; Ettredge et al. 2008).

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The remainder of this paper is organized as follows. In Section 2, we discuss previous studies and propose our hypotheses. In Section 3, we present our sample and research design. In Section 4, we discuss our results. In Section 5, we present the results of additional tests and our robustness analysis. Section 6 discusses the implication of audit fee stickiness and compares a related concept of ratchet effect. Finally, Section 7 concludes the study.

2. Literature review and hypotheses

2.1 COVID-19 and audit fee stickiness

Audit pricing is a commercial decision jointly made by both auditors and their clients. On the demand (i.e., the client) side, companies facing financial pressure tended to either stabilize or lower their audit fees through negotiation with auditors (Krishnan and Zhang 2014). When such pressure is high, such as in the situation of economic recession, not only the clients but also the auditors are affected by the economic shock. To maintain economic bonding, auditors may compromise temporarily in order to keep their clients. For example, Ettredge et al. (2014) examine the association between audit fee pressure and audit quality. They find that audit fee pressure was positively associated with reduced audit quality during the crisis period. In addition, Ettredge et al. (2017) find that during the 2008 financial crisis, clients who extracted fee concessions from auditors were less likely to receive first-time going concern opinions from their auditors, and such relation is strengthened in the case of compensating payments, including increases in expected future total audit fees or higher current non-audit service fees.

COVID-19 caused most of the major economies to lose approximately 2.9% to 3.4% of their GDP. The tourism industry was hit by the border restrictions (Oh 2020; BBC 2020; Turner 2020), and the retail and service sectors shrunk as people stayed home. The manufacturing sector also witnessed factory shutdowns, labor shortages, and logistical disruptions (Yuen et al. 2020). As a consequence, the pandemic negatively affected companies' financial performance, imposing pressure on them to negotiate with their auditors. Audit clients experiencing an abrupt economic downturn tend to avoid unaffordable audit services and typically seek to negotiate the same or even lower audit fees with their auditors. Furthermore, the pandemic also affected auditors economically. If the auditors are economically bonded and intend to maintain client relationships, they may be more willing to cut audit fees

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than under normal circumstances (e.g., Ettredge et al. 2017).[4]

On the supply (i.e., the auditor) side, the COVID-19 pandemic has brought psychological pressure and burdens to auditors. For example, During the pandemic, many auditors had to use remote work, which added pressure to adapt to new technologies (Farcane et al. 2023). The pandemic has complicated the auditing environment and required auditors to invest more time and effort to address these challenges (Levy 2020). Besides, audit pricing is affected by (1) auditors' ability to supply their services and (2) auditors' consideration of clients' audit risk. We discuss these two factors accordingly.

First, when audit services are under-supplied, auditors gain bargaining power and are able to raise audit fees. Ettredge et al. (2018) examine the effect of the Sarbanes-Oxley Act (SOX) 404(b) (internal control audits) on audit fees. They argue that 404(b) caused a sudden increase in audit demand, while the supply did not increase correspondingly. The results suggest that higher audit firms' bargaining power is associated with higher audit fee shocks. Furthermore, non-accelerated filers exempt from the requirement also experience an increase in audit fees. Similarly, because of the abrupt, rapid, and extensive onset of the COVID-19 pandemic, many auditors experienced major challenges, leading to a limited supply of audit services. According to Bauer et al. (2022), COVID-19 has dramatically changed how auditors work and interact with others, and this change is expected to remain even after the pandemic. Morris et al. (2023) also confirmed that the pandemic has resulted in unprecedented challenges for auditors in terms of remote work and auditing. Psychological pressure and burdens inevitably enhance such a consequence (e.g., Levy 2020; Farcane et al. 2023).

Second, it is important for auditors to evaluate audit risk for audit engagement. As early as in 1983, the Statement on Auditing Standards (SAS) No. 47 described the audit risk model as *Audit Risk=Inrerent Risk×Control Risk×Detection Risk* (Hogan and Wilkins 2008). The pandemic has largely elevated audit risks in all

[4] One might argue that clients' economic pressure does not cause reductions in audit fees during the pandemic. Instead, governmental policies such as stay-at-home orders or extended deadlines for submitting financial reports have reduced the need for auditors' fieldwork and overtime, which leads to a reduction in audit fees. We consider this factor to be less likely because reducing fieldwork or working from home does not necessarily lead to a reduction in auditors' overall workloads. On the contrary, the increased risks due to the pandemic required accountants to adjust their audit procedures to cope, which could potentially increase audit fees. These means include adopting technology, changing procedures, enhancing monitoring of junior staff, using more specialists, and increasing interactions with clients, etc. (PCAOB 2020a).

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aspects. According to the PCAOB, the risk of material misstatement due to fraud may increase with increasing pressure on management and with changes in business processes, systems, and controls (PCAOB 2020b). The pandemic and its consequent economic slowdown substantially increased inherent risks. Moreover, control risk also increases during that period. Stay-at-home directives, employee layoffs, furloughs, illnesses, and other factors related to the pandemic hampered internal control over the financial reporting of audit clients. For example, the pandemic caused insufficient segregation of duties and necessitated changes to existing controls, which could not always be implemented in time (Appelbaum et al. 2020; Levy 2020).

Regarding detection risk, during the pandemic, traditional audit methods relying on in-person evidence collection, such as on-site observation, discussion, and document collection, were impractical. To address this problem, auditors were required to identify and implement alternative remote auditing procedures, such as first-person-view cameras, drones, video feeds, or other remote auditing tools, to mitigate these risks. Remote work may increase the effort, time, and communication costs of auditing, thus resulting in inefficiencies in the auditing process. Auditors must also assume substantial residual risks that are impossible or overly expensive to address adequately. If auditors are risk averse, they should be inclined to raise audit fees in order to cover such risks (e.g., Ettredge et al. 2017).

Based on the above discussion, we conjecture that the asymmetry of audit fee adjustment shall be different from De Villiers et al. (2014). On the supply side, the pandemic has imposed psychological pressure on auditors and also limited auditors' ability to conduct audits, given increased audit risks. These factors contribute to an expected strong increase in audit fees. However, actual audit fees may not adjust to the expected level because of time delays or auditors' intention to maintain economic bonding. Therefore, we conjecture that if audit fees are expected to increase by one unit given the economic circumstances, the actual increase shall be smaller than expected. This implies an increase in upward fee stickiness during the pandemic. On the demand side, economic shocks impose financial pressure on the clients, creating strong demand and incentives for the clients to renegotiate audit engagements. Such an attempt is more likely to succeed if the auditors are willing to concede in order to keep their clients. Therefore, we conjecture that if audit fees are expected to decrease by one unit given the economic circumstances, the actual reduction will be more likely to be realized. This implies a decrease in downward fee stickiness during the pandemic. We state our hypothesis 1 as follows.

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H1a: The upward stickiness of audit fees increased during the pandemic.

H1b: The downward stickiness of audit fees decreased during the pandemic.

2.2 Moderating effect: bargaining power

A premise for the above discussion on increased upward stickiness and decreased audit fee stickiness is that auditors are incentivized to maintain economic bonding with their clients. Whether auditors have such an incentive may depend on their ability to reduce the negative impact of the pandemic. Such an ability is reflected in auditors' position in the audit market. During the pandemic, different disruptions create challenges for auditors in conducting their audits (e.g., Bauer et al. 2022; Morris et al. 2023). The dynamic of the audit market has also changed. Chang et al. (2019) examine the implementation of a proposal to encourage the consolidation of domestic audit firms in China and show that audit market concentration is positively (negatively) associated with downward (upward) stickiness. This finding is attributed to auditors having higher bargaining power due to low price competition (Chang et al. 2019). We expect that audit firms with stronger bargaining power are more likely to adjust audit fees to reflect increased risk, and they are also less likely to yield to their clients' requests to cut audit fees. In this section, we investigate whether different levels of bargaining power affect the asymmetry of fee adjustment during the pandemic.

First, we examined the moderating effect of auditor size on the effect of the COVID-19 pandemic on audit fee stickiness. According to the auditing literature, Big 4 auditors with robust training programs, prescribed audit methodologies, global networks, and in-house expertise offer higher auditing quality than their non-Big 4 counterparts. Big 4 auditors with a global reputation to maintain are also less likely than their counterparts to compromise their independence (DeAngelo 1981). According to DeAngelo (1981) and Dopuch and Simunic (1980), audit firm size is a proxy for audit quality. Several studies have empirically indicated that the audit quality of large audit firms, as measured by abnormal accruals, going-concern opinion, and restatements, is higher than that of non-Big 4 auditors (DeFond and Zhang 2014). When a Big 4 auditor is recognized as one of superior quality, an audit fee premium is expected. Therefore, Big 4 auditors were expected to have high bargaining power with their current clients during the pandemic. In this study, we expected the COVID-19 pandemic to have led to dampened effects on audit fee stickiness among Big 4 auditors.

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H2a: For Big 4 auditors, the upward stickiness of audit fees did not considerably increase during the pandemic.

H2b: For Big 4 auditors, the downward stickiness of audit fees did not considerably decrease during the pandemic.

Another factor that affects auditors' bargaining power is auditors' industry specialization. We thus examined the moderating effect of auditor specialization on the effect of the COVID-19 pandemic on audit fee stickiness. To differentiate themselves from their competitors, audit firms invest time and financial resources in formulating industry-specific tools and cultivating industry-specific expertise (Craswell et al. 1995). According to previous research, specialization is positively associated with audit quality (Minutti-Meza 2013; Reichelt and Wang 2010). For specialist auditors, differentiation allows the auditor to charge a fee premium vis-à-vis its competitors (Craswell et al. 1995; DeFond et al. 2000; Porter 2008) and increases the client's switching costs (Porter 2008). Furthermore, Casterella et al. (2004) find that specialist auditors charge fee premiums, particularly for smaller clients. Similarly, Bills et al. (2015) also find that relative bargaining power plays a role in determining audit fees. In this study, we argued that differentiation may enhance the bargaining power of auditors when setting audit fees. In particular, the pandemic may have a negative impact on clients' economic performance, leading to relatively higher bargaining power for auditors who are industry specialists. Thus, we expected the COVID-19 pandemic to have dampened effects on audit fee stickiness among specialist auditors.

H3a: For specialist auditors, the upward stickiness of audit fees did not considerably increase during the pandemic.

H3b: For specialist auditors, the downward stickiness of audit fees did not considerably decrease during the pandemic.

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3. Research design

3.1. Sample

Our sample comprised public companies listed on the NYSE and NASDAQ from 2005 to 2021.[5] We choose the U.S. as our research environment for two reasons. First, listed companies in the U.S. are required to disclose audit and non-audit fees. The complete fee dataset helps us estimate fee models, expected fees, and changes in fee stickiness more accurately. Second, the U.S. has the most confirmed COVID-19 cases. By the end of 2021, over 54 million people in the U.S. had been infected, accounting for approximately 19% of the global total. Therefore, the U.S. is a suitable research environment for examining the effect of the pandemic on fee stickiness.

Financial and fee data were obtained from the Compustat and Audit Analytics databases, respectively. Table 1 presents our sample selection procedure in detail. After selecting 109,769 company-year observations, we excluded the observations of companies not listed on the NYSE and NASDAQ (31,644 observations) and companies operating in the financial industry (24,032 observations, SIC 6000-6999) and in regulated industries (6,261 observations, SIC 4900-4999). We excluded observations lacking necessary data (26 observations lacking audit fee and audit delay data and 10,217 observations lacking financial data). Finally, to ensure the precision of our regression-based estimates of the expected audit fee, we also excluded all observations without enough companies in any two-digit SIC code in any given year (4,692 observations). Our final dataset comprised 31,477 company-year observations.

Table 1 Sample selection process

	Company-years
Initial sample available in Compustat and Audit Analytics from 2005 to 2021	109,769
Observations of companies not listed on the NYSE or NASDAQ	(31,644)
Observations of companies operating in the financial or regulated industries	(30,293)
Missing audit fee or audit delay data for audit fee model	(26)
Observations lacking financial data	(10,217)
Observations without enough companies in any year and industry to estimate expected audit fees	(4,692)
Final sample	31,477

[5] The main reason for starting the sample from 2005 is that one of the additional tests in this study (Section 5.3) compares the impact of the 2008 financial crisis and the 2020 COVID-19 pandemic on audit fee stickiness. We believe that the long sample period may not raise significant concerns regarding the results of this study. When our sample period includes a longer non-pandemic period, the observations with the COVID-19 dummy variable set to 1 are relatively few. With these adverse conditions, we still observe increases in upward stickiness and decreases in downward stickiness during the pandemic, indicating that the pandemic indeed has a significant impact on audit fee stickiness.

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3.2. Model specification

In accordance with previous studies (Asthana et al. 2015; Chen et al. 2007; Craswell and Francis 1999; Craswell et al. 1995; Ghosh and Lustgarten 2006; Ghosh and Pawlewicz 2009; Simon and Francis 1988),[6] we used the following regression model to estimate the expected audit fees each year in the same two-digit SIC code:[7]

$$\begin{aligned} LNAF_i = {} & \beta_0 + \beta_1 LNTA_i + \beta_2 ACCR_i + \beta_3 INV_i + \beta_4 LDELAY_i + \beta_5 LEV_i \\ & + \beta_6 CURRENT_i + \beta_7 CATA_i + \beta_8 ZSCORE_i + \beta_9 LOSS_i + \beta_{10} ROA_i \\ & + \beta_{11} MTB_i + \beta_{12} EXTRA_i + \varepsilon \end{aligned} \quad (1)$$

where the subscript *i* refers to the audit client *i*.
The definitions of the variables are as follows:

$LNAF_i$	=	Natural logarithm of audit fees
$LNTA_i$	=	Natural logarithm of total assets
$ACCR_i$	=	Accounts receivable scaled by total assets
INV_i	=	Inventory scaled by total assets
$LDELAY_i$	=	Natural logarithm of audit report lag
LEV_i	=	Ratio of total liabilities to total assets
$CURRENT_i$	=	Ratio of current assets to current liabilities
$CATA_i$	=	Ratio of current assets to total assets
$ZSCORE_i$	=	Altman's Z-score (Altman 1968)
$LOSS_i$	=	An indicator variable that equals 1 if a client reports negative net income before extraordinary items and 0 otherwise
ROA_i	=	Ratio of net income before extraordinary items to total assets
MTB_i	=	Market-to-book ratio
$EXTRA_i$	=	Nonoperating income divided by the absolute value of net income

In accordance with De Villiers et al. (2014), we used the following model to measure audit fee stickiness and test Hypotheses 1a and 1b, where the subscript *t*

[6] Our model is also consistent with Chang et al. (2019). While the study adopts a sample of Chinese firms, they select factors from previous studies that use samples with U.S. firms or U.S.-listed firms (e.g., Ghosh and Lustgarten 2006, Ghosh and Pawlewicz 2009, and Asthana et al. 2015).

[7] To help readers understand the relationship between audit fees and explanatory variables, we provide Appendix A as an example of the estimates based on the full sample. Please note that the actual approach used in this paper involves estimation by year and industry instead of using the regression results from Appendix A to estimate expected audit fees.

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refers to fiscal year *t*:

$$\Delta LNAF_{it} = \lambda_0 + \lambda_1 COVID_{it} + \lambda_2 \Delta LNEAF_{it} + \lambda_3 \Delta LNEAF_{it} \times COVID_{it} + \lambda_4 D_{it} \times \Delta LNEAF_{it} + \lambda_5 D_{it} \times \Delta LNEAF_{it} \times COVID_{it} + \varepsilon \quad (2)$$

The definitions of the variables are as follows:

$\Delta LNAF_{it}$	=	Change in the natural logarithm of actual audit fees
$COVID_{it}$	=	A dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020 and 0 otherwise
$\Delta LNEAF_{it}$	=	Change in expected audit fees scaled by total assets
D_{it}	=	A dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative and 0 otherwise

Our interest variable $COVID_{it}$ is equal to 1 if a company issues its financial statements in or after February 2020, and 0 otherwise. February 2020 is the month in which the first known death due to COVID-19 occurred in the United States.[8] In the aforementioned model, λ_2 denotes the change in actual audit fees that corresponds to a one-unit increase in expected audit fees before the pandemic, and $\lambda_2+\lambda_3$ denotes the change in actual audit fees that corresponds to a one-unit increase in expected audit fees during the pandemic. Similarly, $\lambda_2+\lambda_4$ denotes the change in actual audit fees that corresponds to a one-unit decrease in expected audit fees before the pandemic, and $\lambda_2+\lambda_3+\lambda_4+\lambda_5$ denotes the change in actual audit fees that corresponds to a one-unit decrease in expected audit fees during the pandemic. In accordance with De Villiers et al. (2014), who reported higher audit fee stickiness in the downward direction than in the upward direction under ordinary circumstances, we expected coefficient λ_4 to be negative. Because Hypothesis 1a predicts an increase in upward fee stickiness during the pandemic, we expected coefficient λ_3 to be negative (i.e., $\lambda_3<0$). Similarly, because Hypothesis 1b predicts a decrease in downward fee stickiness during the pandemic, we expected the sum of coefficients λ_3 and λ_5 to be positive (i.e., $\lambda_3+\lambda_5>0$).

Hypotheses 2a and 2b seek to determine whether the effect of the COVID-19

[8] The first case of COVID-19 in the United States was confirmed on January 20, and President Donald Trump declared a public health emergency on January 31. The signing of engagement letters, which is a result of audit fee negotiations, usually happens in the first quarter of the year under audit (Hackenbrack et al. 2014). The choice of this period may include some samples that already determined their audit fees before the real effect of the pandemic.

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pandemic on audit fee stickiness is moderated by auditor size. We divided the sample into two subsamples: a Big 4 subsample and a non-Big 4 subsample. To test Hypotheses 2a and 2b, Model 2 was separately estimated using the two subsamples. Subsequently, a Chow test (Chow 1960) was conducted to compare the coefficients across the two corresponding linear regressions. Because Hypothesis 2a (Hypothesis 2b) predicts a minor increase in upward stickiness (a minor decrease in downward fee stickiness) for Big 4 auditors during the pandemic, we expected a large λ_3 (a small $\lambda_3+\lambda_5$) in the regression for the Big 4 subsample compared to the non-Big 4 subsample. In other words, Hypothesis 2a expects that $\lambda_{3(\text{Big4})}-\lambda_{3(\text{Non-Big4})}>0$, and Hypothesis 2b expects that $(\lambda_3+\lambda_5)_{(\text{Big4})}-(\lambda_3+\lambda_5)_{(\text{Non-Big4})}<0$.

Hypotheses 3a and 3b state that the effect of the COVID-19 pandemic on audit fee stickiness depends on auditor specialization. We divided the sample into two subsamples: a specialist subsample and a non-specialist subsample. In accordance with previous studies (Balsam et al. 2003; Gramling and Stone 2001; Krishnan 2003), we measured auditor industry specialization by using an auditor's within-industry market share. Using the method proposed by Chin and Chi (2009) and Chi and Chin (2011), we ranked auditors depending on their market share for each two-digit SIC group and defined specialist auditors as those with the largest number of clients in a given industry. To test Hypotheses 3a and 3b, Model 2 was estimated separately using the two subsamples. Subsequently, a Chow test was conducted to compare the coefficients across the two corresponding linear regressions. Because Hypothesis 3a (Hypothesis 3b) predicts a minor increase in upward stickiness (a minor decrease in downward fee stickiness) for industry specialists during the pandemic, we expected a large λ_3 (a small $\lambda_3+\lambda_5$) in the regression for the specialist subsample compared to the non-specialist subsample. That is, Hypothesis 3a expects that $\lambda_{3(\text{SPE})}-\lambda_{3(\text{Non-SPE})}>0$, and Hypothesis 3b expects that $(\lambda_3+\lambda_5)_{(\text{SPE})}-(\lambda_3+\lambda_5)_{(\text{Non-SPE})}<0$. Table 2 lists the definitions of all variables used in the empirical models in this study.

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Table 2 Variable definitions

Variable	Definition
Fee model	
LNAF	Natural logarithm of audit fees
LNTA	Natural logarithm of total assets
ACCR	Accounts receivable scaled by total assets
INV	Inventory scaled by total assets
LDELAY	Natural logarithm of audit report lag
LEV	Ratio of total liabilities to total assets
CURRENT	Ratio of current assets to current liabilities
CATA	Ratio of current assets to total assets
ZSCORE	Altman's Z-score
LOSS	An indicator variable that equals 1 if a client reports negative net income before extraordinary items and 0 otherwise
ROA	Ratio of net income before extraordinary items to total assets
MTB	Market-to-book ratio
EXTRA	Nonoperating income divided by the absolute value of net income
Fee stickiness model	
Δ*LNAF*	Change in the natural logarithm of actual audit fees
COVID	A dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise
Δ*LNEAF*	Change in expected audit fees scaled by total assets
D	A dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative and 0 otherwise
Dichotomous variable for audit firm size	
BIG4	A dummy variable that equals 1 if a company is audited by a Big 4 auditor
Dichotomous variable for auditor specialization	
SPE	A dummy variable that equals 1 if a company is audited by a specialist auditor

4. Empirical results

4.1. Descriptive statistics

Table 3 presents the descriptive statistics. For the entire sample, the mean and median values of *LNAF* were 13.8931 (1,080,679 USD) and 13.9344 (1,126,245 USD), respectively, and the mean values of *LNTA* and *LDELAY* were 6.3454 and 4.6307, respectively. These results indicated that the companies in the sample had total assets of USD$569.8653 million on average, with approximately 103 days required by their auditors to complete the auditing process. Accounts receivable and inventory accounted for 13.25% and 10.67%, respectively, on average of the total assets. The Altman's Z-score had a mean of 2.6256, indicating that the credit risk of our sample companies was acceptable.[9] Overall, our results indicated that our sample companies were slightly unprofitable. Their *ROA* on average is −0.5%, and 35.56% of the company-year reported losses. The mean (median) of Δ*LNAF* was

[9] Z-scores below 1.8 indicate an increased likelihood of bankruptcy, whereas Z-scores above 3 indicate a decreased likelihood of bankruptcy.

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0.4111 (0.0262), and the mean (median) of Δ*LNEAF* was 0.0449 (0.0351). The fact that the mean and median values of Δ*LNAF* were smaller than those of Δ*LNEAF* indicated that the increase observed in the actual audit fees was less than that expected in our sample. In total, 7.35% of the observations in our sample were made during the pandemic, and 74.32% and 29.34% of our sample companies engaged a Big 4 and specialist auditor, respectively.

Table 3 Descriptive statistics of variables (N=31,477)

Variable	Mean	Std. dev.	Median	Minimum	Maximum
Panel A					
LNAF	13.8931	1.2696	13.9344	0.0000	18.1375
LNTA	6.3454	2.0569	6.3270	0.0010	12.8355
ACCR	0.1325	0.1092	0.1126	0.0000	0.8872
INV	0.1067	0.1199	0.0733	0.0000	0.8175
LDELAY	4.6307	0.3253	4.6052	2.3979	7.6592
LEV	0.5743	5.6034	0.4763	0.0037	937.4630
CURRENT	3.1011	3.6708	2.1494	0.0000	198.3442
CATA	0.5252	0.2407	0.5188	0.0000	1.0000
ZSCORE	2.6256	173.6899	3.2793	-23,466.2900	1,074.5210
LOSS	0.3556	0.4787	0.0000	0.0000	1.0000
ROA	-0.0055	2.1718	0.1016	-303.0000	1.7458
MTB	0.1340	430.8619	2.2765	-70,559.5900	15,900.0700
EXTRA	0.6032	21.9263	0.0043	0.0000	2,576.3330
Panel B:					
Δ*LNAF*	0.4111	0.3315	0.0262	-11.6805	12.3959
COVID	0.0735	0.2609	0.0000	0.0000	1.0000
Δ*LNEAF*	0.0449	0.2875	0.0351	-9.5620	9.2158
D	0.4251	0.4944	0.0000	0.0000	1.0000
BIG4	0.7432	0.4369	1.0000	0.0000	1.0000
SPE	0.2934	0.4553	0.0000	0.0000	1.0000

LNAF: natural logarithm of audit fees; *LNTA*: natural logarithm of total assets; *ACCR*: accounts receivable scaled by total assets; *INV*: inventory scaled by total assets; *LDELAY*: natural logarithm of audit repot lag; *LEV*: ratio of total liabilities to total assets; *CURRENT*: ratio of current assets to current liabilities; *CATA*: ratio of current assets to total assets; *ZSCORE*: Altman's Z-score; *LOSS*: an indicator variable that equals 1 if a client reports negative net income before extraordinary items, and 0 otherwise; *ROA*: ratio of net income before extraordinary items to total assets; *MTB*: market-to-book ratio; *EXTRA*: nonoperating income divided by the absolute value of net income; Δ*LNAF*: change in the natural logarithm of actual audit fees; *COVID*: a dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise; *BIG4*: a dummy variable that equals 1 if a company is audited by a Big 4 auditor; *SPE*: a dummy variable that equals 1 if a company is audited by a specialist auditor.

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4.2. Regression analysis

After Model 1 was estimated by industry and year, the expected audit fees derived from Model 1 were used to estimate Model 2. Table 4 presents the results. The coefficient of *COVID* (λ_1) was significantly positive at the 1% level (coeff. = 0.0358), reflecting the inherent differences in audit fee changes between the pandemic and non-pandemic periods. This difference could be caused by the overall economic environment (e.g., inflation due to quantitative easing during the pandemic), leading to an *ex-post* increase in actual audit fees.[10] The coefficient of $\Delta LNEAF$ (λ_2) was 0.5443 and was statistically significant at the 1% level. In other words, a 1% increase in the expected audit fees resulted in an increase of approximately 0.54% in the actual audit fees before the pandemic. The coefficient on $\Delta LNEAF \times COVID$ (λ_3) was −0.2860 and was statistically significant at the 1% level. In other words, a 1% increase in the expected audit fees resulted in an increase of approximately 0.26% (0.5443 – 0.2860) in actual audit fees during the pandemic. This indicates that upward fee stickiness has been strengthened due to the pandemic. Hypothesis 1a is therefore supported. For Hypothesis 1b, the sum of λ_2 and λ_4 is 0.4611 (0.5443 – 0.0832), suggesting that a 1% decrease in the expected audit fees resulted in a decrease of approximately 0.46% in the actual audit fees before the pandemic. The sum of λ_2, λ_3, λ_4, and λ_5 is 0.8564, which means that a 1% decrease in the expected audit fees resulted in a decrease of approximately 0.86% in the actual audit fees during the pandemic. The sum of λ_3 and λ_5 was 0.3953 and was statistically significant at the 1% level, indicating a decrease in downward fee stickiness due to the pandemic. The result is consistent with Hypothesis 1b, that the downward stickiness of audit fees weakens during the pandemic period. In summary, our results support Hypotheses 1a and 1b.

[10] Note that a positive λ_1 simply suggests that during the COVID period, it is evident that both parties (clients and auditors) negotiated audit fees based on a higher baseline compared to before. It does not reflect the *ex-ante* expectation for fee increase/decrease before negotiation, nor does it imply the deviation of the actual results from expected fees (i.e., stickiness).

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Table 4 Descriptive statistics of variables (N=31,477)

Variable		Coefficient
COVID	λ_1	0.0358***
		(4.3200)
Δ*LNEAF*	λ_2	0.5443***
		(59.3100)
Δ*LNEAF*×*COVID*	λ_3(H1a)	-0.2860***
		(-8.0300)
D×Δ*LNEAF*	λ_4	-0.0832***
		(-5.0000)
D×Δ*LNEAF*×*COVID*	λ_5	0.6813***
		(12.6500)
Intercept		0.0126***
		(5.3700)
$\lambda_3+\lambda_5$ (H1b)		0.3953***
F statistic		(148.2700)
Observations		31,477
Adjusted R-squared		0.2061

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.

COVID: a dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise.

4.3 Audit fee stickiness for big 4 and non-big 4 auditors

To examine Hypotheses 2a and 2b, we separately estimated Model 2 for Big 4 and non-Big 4 auditor subsamples. The results are presented in Table 5. First, we observe that the coefficient of *COVID* (λ_1) for Big 4 is significantly negative (coeff. = –0.0212, t = –2.34), suggesting a decrease in *ex-post* audit fees during the pandemic. This is consistent with Ettredge et al.'s (2014) prediction that larger auditors face more pressure from oversight agencies and the risk of class action, and they also have deeper pockets to absorb temporary losses. On the other hand, λ_1 is significantly positive for non-Big 4 auditors (coeff. = 0.0846, t = 4.50), suggesting a higher audit fee level compared to earlier years. For non-Big 4 auditors, it may be easier for them to raise the fee to reflect inflation because, compared to Big 4 auditors who tend to charge a premium (e.g., Whisenant et al. 2003), no premiums were charged before. As discussed in Section 4.2, these coefficients reflect audit fee levels for the two groups as a result of negotiation, and they do not capture the effect of the pandemic on audit fee stickiness.

For the two subsamples, the two coefficients of Δ*LNEAF*×*COVID* (i.e., $\lambda_{3(Big4)}$ and $\lambda_{3(Non\text{-}Big4)}$) were negative and statistically significant, indicating an increase in upward fee stickiness during the pandemic for both Big 4 and non-Big 4 auditors. In

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addition, Hypothesis 2a predicts that $\lambda_{3(Big4)}-\lambda_{3(Non\text{-}Big4)}>0$. As shown in the table, $\lambda_{3(Big4)}$ was significantly larger than $\lambda_{3(Non\text{-}Big4)}$ (diff. = 0.2341), indicating that the upward stickiness of audit fees strengthens less for Big 4 auditors during the pandemic. Moreover, Hypothesis 2b predicts that $(\lambda_3+\lambda_5)_{(Big4)}-(\lambda_3+\lambda_5)_{(Non\text{-}Big4)}<0$. Consistent with this prediction, $\lambda_3+\lambda_5$ in Table 5 had values of −0.149 for the Big 4 subsample and 0.662 for the non-Big 4 subsample; this difference in values (−0.8109) between both subsamples was statistically significant. This indicated that the downward stickiness of audit fees weakens less during the pandemic for Big 4 auditors. In summary, our results support Hypotheses 2a and 2b.

Table 5 Descriptive statistics of variables (N=31,477)

Variable		*Non-Big 4*	*Big 4*
COVID	λ_1	0.0846***	-0.0212**
		(4.5000)	(-2.3400)
Δ*LNEAF*	λ_2	0.5963***	0.5239***
		(34.9300)	(47.6200)
Δ*LNEAF*×*COVID*	λ_3	-0.3824***	-0.1483***
		(-5.2800)	(-3.6700)
D×Δ*LNEAF*	λ_4	0.0559*	-0.2211***
		(1.8600)	(-10.7800)
D×Δ*LNEAF*×*COVID*	λ_5	1.0444***	-0.0007
		(10.5500)	(-0.0100)
Intercept		0.0120**	0.0073***
		(2.2100)	(2.8600)
Observations		8,083	23,394
Adjusted R-squared		0.3176	0.1464
$\lambda_{3(Big4)}-\lambda_{3(Non\text{-}Big4)}$		0.2341**	
F statistics (H2a)		(10.0800)	
$(\lambda_3+\lambda_5)_{(Big4)}-(\lambda_3+\lambda_5)_{(Non\text{-}Big4)}$		-0.8109***	
F statistics (H2b)		(151.8600)	

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.

COVID: a dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise; *BIG4*: a dummy variable that equals 1 if a company is audited by a Big 4 auditor.

4.4 Audit fee stickiness for specialist and non-specialist auditors

For Hypotheses 3a and 3b, we also separately estimated Model 2 for specialist and non-specialist auditor subsamples. Table 6 presents the results. For the two subsamples, the two coefficients of Δ*LNEAF*×*COVID* (i.e., $\lambda_{3(SPE)}$ and $\lambda_{3(Non\text{-}SPE)}$ were negative and statistically significant, indicating a decrease in the speed of upward fee adjustments during the pandemic for both specialist and non-specialist auditors. Hypothesis 3a predicts that $\lambda_{3(SPE)}-\lambda_{3(Non\text{-}SPE)}>0$. Consistently, $\lambda_{3(SPE)}$ was significantly larger than $\lambda_{3(Non\text{-}SPE)}$ (diff = 0.2317), indicating that the speed of the

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upward fee adjustments did not significantly decrease during the pandemic for specialist auditors. In addition, the sum of λ_3 and λ_5 was −0.2879 for the specialist subsample and 0.4801 for the non-specialist subsample, indicating that only auditors who possess industry expertise experienced downward fee stickiness during the pandemic. Hypothesis 3b evaluates the equality of the sum of λ_3 and λ_5 between the two subsamples and predicts that $(\lambda_3+\lambda_5)_{(SPE)}-(\lambda_3+\lambda_5)_{(Non\text{-}SPE)}<0$. The results in Table 6 revealed that $(\lambda_3+\lambda_5)_{(SPE)}$ was significantly smaller than $(\lambda_3+\lambda_5)_{(Non\text{-}SPE)}$ (diff. = −0.7590), indicating that the downward stickiness of audit fees did not significantly decrease during the pandemic for specialist auditors. In summary, our results support Hypotheses 3a and 3b.

Table 6 Audit fee stickiness for specialist and non-specialist auditors

Variable		*Non-SPE*	*SPE*
COVID	λ_1	0.0480***	-0.0305**
		(4.7400)	(-2.1500)
Δ*LNEAF*	λ_2	0.5612***	0.4969***
		(51.0300)	(30.3600)
Δ*LNEAF*×*COVID*	λ_3	-0.3289***	-0.0972*
		(-7.2800)	(-1.7600)
D×Δ*LNEAF*	λ_4	-0.0640***	-0.1523**
		(-3.2200)	(-5.0200)
D×Δ*LNEAF*×*COVID*	λ_5	0.8090***	-0.1817*
		(12.4600)	(-1.7400)
Intercept		0.0114***	0.0144***
		(3.9400)	(3.6800)
Observations		22,243	9,234
Adjusted R-squared		0.2217	0.1646
$\lambda_{3(SPE)}-\lambda_{3(Non\text{-}SPE)}$		0.2317**	
F statistics (H3a)		(8.9400)	
$(\lambda_3+\lambda_5)_{(SPE)}-(\lambda_3+\lambda_5)_{(Non\text{-}SPE)}$		-0.7590***	
F statistics (H3b)		(66.6700)	

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.

COVID: a dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise; *SPE*: a dummy variable that equals 1 if a company is audited by a specialist auditor.

5. Robustness and additional tests

5.1. Moderating effect of audit market competitiveness

The results of Hypotheses 2 and 3 show that competitive advantages and bargaining power mitigate the effect of the pandemic on audit fee stickiness. In a similar vein, we

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segment the sample into two subgroups based on the Herfindahl-Hirschman Index (HHI) of audit markets across the states.[11] Specifically, we identify high-competition (low HHI) and low-competition (high HHI) audit markets based on the sample median. Our Model 2 is estimated separately for the two subsamples, and the results are presented in Table 7. As shown in Table 7, $\lambda_{3(\text{Low-competition})}$ is significantly larger than $\lambda_{3(\text{High-competition})}$, indicating that the effect of the pandemic on upward fee stickiness is weaker in less competitive audit markets. We also find that $(\lambda_3+\lambda_5)$ of the low-competition subsample is significantly smaller than $(\lambda_3+\lambda_5)$ of the high-competition subsample, suggesting that the effect of the pandemic on downward fee stickiness is also weaker in less competitive audit markets. Specifically, during the pandemic, actual audit fees in less competitive audit markets increased to a larger extent than expected, while actual audit fees dropped to a smaller extent than expected.

Table 7 Audit fee stickiness across different levels of competition

Variable		*High Competition*	*Low Competition*
COVID	λ_1	0.0780***	-0.0472***
		(6.7400)	(-3.6200)
Δ*LNEAF*	λ_2	0.5521***	0.5358***
		(44.0300)	(37.4600)
Δ*LNEAF*×*COVID*	λ_3	-0.4212***	-0.0665
		(-8.7600)	(-1.1900)
D×Δ*LNEAF*	λ_4	-0.0671***	-0.0885***
		(-3.0000)	(-3.2300)
D×Δ*LNEAF*×*COVID*	λ_5	1.0370***	-0.1018
		(15.3100)	(-1.0400)
Intercept		0.0108***	0.0142***
		(3.3200)	(3.9900)
Observations		14,697	14,680
Adjusted R-squared		0.2573	0.1692
$\lambda_{3(\text{Low-Competition})}-\lambda_{3(\text{High-Competition})}$		0.3547***	
F statistics		(23.2500)	
$(\lambda_3+\lambda_5)_{(\text{Low-Competition})}-(\lambda_3+\lambda_5)_{(\text{High-Competition})}$		-0.7846***	
F statistics		(109.1000)	

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.

COVID: a dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise.

[11] In calculating the Herfindahl-Hirschman Index (HHI) of audit markets across the states, 2,000 observations are excluded because their state variable data is missing.

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5.2 Differential effect of the COVID-19 pandemic over the years

By the end of 2020, COVID-19 was ranked as the third leading cause of death in the United States (Bendix 2022; McKeever 2021). Fortunately, mRNA vaccines mitigated the severity of the pandemic after they became available in December 2020. Thus, we expected that, compared with 2021, the effect of the pandemic on audit fee stickiness was greater in 2020.

This additional test is primarily to compare the effect of the pandemic on audit fee stickiness between the first year of the pandemic (2020) and the second year (2021). Therefore, we take the pre-pandemic observations as the control group, while 2020 and 2021 are separately treated as the experimental groups. Specifically, we compare the changes in audit fee stickiness between 2020 and the pre-pandemic period, as well as between 2021 and the pre-pandemic period. Table 8 presents the results. First, we find that, during 2020, the coefficient of Δ*LNEAF*×*COVID* (λ_3) is significantly negative and ($\lambda_3+\lambda_5$) is significantly positive at the 1% level, consistent with H1a and H1b. Second, the coefficients of λ_3 and ($\lambda_3+\lambda_5$) show predicted signs, but they are only significant at the 5% level. Furthermore, λ_3 of the 2021 subsample (−0.2673) was larger than λ_3 of the 2020 subsample (−0.2854). Similarly, ($\lambda_3+\lambda_5$) of the 2021 subsample (0.2019) was smaller than ($\lambda_3+\lambda_5$) of the 2020 subsample (0.4116). In summary, our results indicated that the effect of the pandemic on audit fee stickiness was more pronounced in the first year than in the second year.

Table 8 Audit fee stickiness in 2020 and 2021

Variable		2020	2021
COVID	λ_1	0.0354***	0.0296
		(4.0500)	(1.1000)
Δ*LNEAF*	λ_2	0.5443***	0.5443***
		(54.5800)	(54.9800)
Δ*LNEAF*×*COVID*	λ_3(H1a)	-0.2854***	-0.2673**
		(-6.9000)	(-2.1400)
D×Δ*LNEAF*	λ_4	-0.0832***	-0.0832***
		(-5.5000)	(-5.5400)
D×Δ*LNEAF*×*COVID*	λ_5	0.6970***	0.4693***
		(13.1000)	(2.8400)
Intercept		0.0126***	0.0126***
		(5.6700)	(5.7200)
$\lambda_3+\lambda_5$		0.4116***	0.2019**
F statistics (H1b)		(149.6300)	(3.2400)
Observations		31,241	29,400
Adjusted R-squared		0.2056	0.1967

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.

COVID: a dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise.

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5.3 The effect of the financial crisis on audit fee stickiness

Before the COVID-19 pandemic, the 2007–2008 financial crisis, or the Global Financial Crisis (GFC), was deemed as the most severe economic crisis since the Great Depression of 1929. Due to increased risk and complexity, auditors might need more extensive testing, deeper analysis of internal controls, and a focus on critical audit areas to maintain high-quality audit and independence. On the other hand, businesses facing a downturn were able to negotiate lower audit fees, and around 63% of the S&P 500 companies successfully received fee concessions from their auditors (Whitehouse 2010). Because both the GFC and COVID-19 are significant economic crises, we examine the effect of the financial crisis on audit fee stickiness and compare it with our main results. We exclude observation after the GFC and construct a sample covering observations from 2005 to 2009. We re-estimate a revised Model 2 where we replace the variable $COVID_{it}$ with a dummy variable $FCRISIS_{it}$ that equals 1 if the fiscal year is in the 2008-2009 financial crisis period, and 0 otherwise. The treatment (control) group includes observations between 2008 and 2009 (before 2008). The results are shown in Table 9.

In Table 9, the coefficient of $\Delta LNEAF \times FCRISIS$ (λ_3) is −0.1219. It is statistically significant but is much smaller than the coefficient of $\Delta LNEAF \times COVID$ (-0.2860) of our main results in Table 4. In other words, the effect of the COVID-19 pandemic on upward fee stickiness is 235% greater than that during the financial crisis. Besides, the sum of λ_3 and λ_5 is not statistically significant. We do not find evidence that the downward stickiness of audit fees weakens during the financial crisis period. To sum up, the results suggest that the pandemic has a more noticeable impact on fee stickiness compared to the financial crisis. This also corresponds to the finding of Goldstein et al. (2021) that COVID-19 crisis is not just "another" large-scale shock. Instead, COVID-19 has a long-term impact, given the unprecedented magnitude and the scope of interventions.[12]

[12] *"While both Congress and the Federal Reserve stepped in right away to apply lessons learned from the GFC, the U.S. economy has not fully recovered more than a year later. Hence, putting the origin of the shock aside, the magnitude and scope of the intervention are surely unprecedented and will affect economics and finance research for years to come."* (Goldstein et al. 2021, p. 5137)

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Table 9 Regression results of audit fee stickiness during financial crisis

Variable		Coefficient
FCRISIS	λ1	-0.0473***
		(-4.9800)
Δ*LNEAF*	λ2	0.5757***
		(26.9600)
Δ*LNEAF*×*FCRISIS*	λ3	-0.1219***
		(-3.0200)
D×Δ*LNEAF*	λ4	-0.2584***
		(-5.5700)
D×Δ*LNEAF*×*FCRISIS*	λ5	0.1667**
		(2.3600)
Intercept		0.0216***
		(3.3100)
$\lambda_3+\lambda_5$		0.0448
F statistics		(0.9400)
Observations		8,823
Adjusted R-squared		0.1822

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.
FCRISIS: a dummy variable that equals 1 if the fiscal year is in the 2008-2009 financial crisis period, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise.

5.4. Differential effect between blue and red states

For a long time, the "Democratic blue" and "Republican red" color scheme has been referred to the political party affiliation of most voters in US states. The red and blue states in the United States often exhibited differences in their approaches to handling the COVID-19 pandemic (Bendix 2022). For example, blue states tended to implement stricter and earlier measures to mitigate the spread of the virus, including mask mandates, business and school closures, and travel restrictions. Red states, in contrast, had a more gradual or relaxed approach to restrictions, emphasizing individual freedoms and the economy (e.g., VanDusky and Shvetsova 2021). In 2020, seven states chose not to issue stay-at-home orders, and these states were all led by Republican governors (e.g., Rainey and Mueller 2021).

Less strict policies in the red states also contributed to quicker economic recovery afterward, as these states were also early to lift business restrictions (e.g., Halaschak 2022; Rainey and Mueller 2021). For example, 9 out of 10 states that show the lowest unemployment rates in 2020 were led by Republican governors (e.g., Miltimore 2020). In addition, 13 states have no laws or regulations against price gouging,[13] which is a

[13] These states include Alaska, Arizona, Delaware, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, South Dakota, Washington, and Wyoming. (Conners 2022).

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practice of raising the price of essential goods or services unreasonably or unfairly during a declared state of emergency (e.g., Conners 2022). Among them, 8 are led by Republican governors, and 7 have Republican state attorneys general. Therefore, we conjecture that different policies across states may also affect price setting during the pandemic period.

In this additional test, we examine the differential effect of the COVID-19 pandemic in blue and red states. We exclude the observation in swing states[14] and separately estimated Model 2 for blue-state and red-state subsamples. Table 10 presents the results.

As shown in Table 10, $\lambda_{3(Blue)}$ is not significantly different from $\lambda_{3(Red)}$, indicating that the effect of the pandemic on upward fee stickiness is comparable in both blue and red states. Moreover, we find that $(\lambda_3+\lambda_5)$ of the blue-state subsample is significantly larger than $(\lambda_3+\lambda_5)$ of the red-state subsample, suggesting that the effect of the pandemic on downward fee stickiness is greater in blue-states. Specifically, during the pandemic, actual audit fees in blue states dropped to a larger extent compared to red states when decreases were expected in audit fees. This is consistent with the fact that the red states imposed fewer restrictions on economic activities and showed earlier economic rebounds. In sum, we find partial evidence that the pandemic's influence on audit fee stickiness exhibited a more significant effect in blue states than in red states.

Table 10 Audit fee stickiness in red and blue States

Variable		*Red*	*Blue*
COVID	λ_1	-0.0570**	0.0677***
		(-2.5100)	(6.3200)
ΔLNEAF	λ_2	0.7701***	0.4836***
		(41.6500)	(37.7700)
ΔLNEAF×COVID	λ_3	-0.3775***	-0.2611***
		(-4.1500)	(-5.6000)
D×ΔLNEAF	λ_4	0.0088	-0.1516***
		(0.2900)	(-6.2500)
D×ΔLNEAF×COVID	λ_5	-0.2330	0.9946***
		(-1.4300)	(14.6900)
Intercept		0.0068	0.0105***
		(1.2800)	(3.2600)
Observations		5,484	19,208
Adjusted R-squared		0.4137	0.1598
$\lambda_{3(Blue)}-\lambda_{3(Red)}$		0.1164	
F statistics		(1.3300)	
$(\lambda_3+\lambda_5)_{(Blue)}-(\lambda_3+\lambda_5)_{(Red)}$		1.3440***	
F statistics		(139.1900)	

[14] We define the swing states as Arizona, Florida, Georgia, Iowa, Michigan, Ohio, Nevada, New Hampshire, North Carolina, Pennsylvania, and Wisconsin.

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*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.
COVID: a dummy variable that equals 1 if the date on which the financial statements are issued is in or after February 2020, and 0 otherwise; Δ*LNEAF*: change in expected audit fees scaled by total assets; *D*: a dummy variable that equals 1 if $\Delta LNEAF_{it}$ is negative, and 0 otherwise.

6. Discussion: audit fee stickiness and ratcheting

As shown in prior literature, "audit fee stickiness" usually refers to the case that audit fees increase more when we expect an increase than decrease when we expect a decrease (e.g., De Villiers et al. 2014). One question that readers might have is whether this situation can also be explained by "target ratcheting," which has been discussed in economic literature (e.g., Weitzman 1980). Target ratcheting refers to the determination of future targets based on current performance (Indjejikian et al. 2014). That is, current performance plays the role of a "notched gear wheel" that fixes the point of departure for the target in the next period (Weitzman 1980). A consequence of target ratcheting is the "ratchet effect," which implies that rational agents anticipating target ratcheting would conceal their type and restrict their output (Charness et al. 2011). Based on the concepts, Leone and Rock (2002) examine how managers revise performance budgets upward (downward) based on favorable (unfavorable) budget variances. They find that, based on the same magnitude of budget variances, downward revisions of the performance budget are smaller than upward revisions of the performance budget. In other words, there exists an asymmetry between higher responses to favorable changes and lower responses to unfavorable changes.

It appears that the fee stickiness and target ratcheting are similar in the aspect that both concepts compare the actual versus the predicted adjustment, regardless of whether these adjustments refer to individual performance, company profitability, audit fees, etc.[15] In regular times, the asymmetry between higher responses to favorable changes and lower response to unfavorable changes may imply that both asymmetric fee stickiness and asymmetric ratcheting can explain audit fee changes. However, we do not think that the results of this paper may be explained by both reversed fee stickiness and ratcheting. Given the impact of the pandemic, we note that audit fee stickiness is different from ratcheting in several aspects, which makes the findings of this paper more likely a result of fee stickiness.

First, ratcheting usually applies to compensation and incentive problems. This

[15] In accounting, target ratcheting is documented in situation such as income smoothing or incentive contracts (e.g., Holthausen et al. 1995; Murphy 2000).

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is because targets are usually ratcheted on the same agents' prior performance, such as a firm's previous earnings per share or a worker's actual hours in the last season. In other words, prior performance updates managers' beliefs about future performance (e.g., Ettredge et al. 2008). In contrast, audit fee stickiness focuses on audit pricing, which requires *negotiation* with clients (e.g., De Villiers et al. 2014). Following the previous point, ratcheting is subject to information asymmetry (e.g., Ettredge et al. 2008), and alleviating information asymmetry shall mitigate the ratchet effect (e.g., Aranda et al. 2014; Indjejikian et al. 2014; Bol and Lill 2015). In comparison, the negotiation process between clients and auditors is less related to information asymmetry, particularly when the expected audit fee adjustment is responsive to underlying economic changes.

The fact that audit fees are determined through negotiation is crucial in the above comparison. The results of this paper show that during the pandemic, audit fees are more responsive to expected drops of audit fees compared to expected increases. The result is more likely a reversal of traditional audit fee stickiness because audit pricing reflects a compromise between clients' and auditors' expectations. Our arguments and empirical results of bargaining power further support this point because higher bargaining power mitigates the need to negotiate. Therefore, we observe lower levels of reversed asymmetry of audit fee stickiness. On the other hand, target ratcheting is less likely to explain such a reversed asymmetry because audit firm managers may be reluctant to quickly revise their budgeted audit hours downward during a crisis. Furthermore, if clients consider audit fees a proxy of audit quality, they may prefer the fee not to decrease as much as expected (De Villiers et al. 2014). Based on these differences, we consider our findings of reversed asymmetry more likely a result of mitigated audit fee stickiness than mitigated target ratcheting.

7. Conclusion

This study investigates how the COVID-19 pandemic influences audit fee stickiness. Prior literature on audit fee stickiness refers to the tendency of audit fees to increase more easily than decrease when audit conditions change (e.g., De Villiers et al. 2014). Given the new and elevated risks of material misstatement associated with COVID-19, auditors are required to both implement alternative remote audit procedures and assume substantial residual risks that are impossible or overly expensive to address, thus resulting in an increase in expected audit fees. However, audit clients who experience the consequences of a pandemic may seek to lower

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their audit fees by negotiating with their auditors. In this study, we show that audit fees become more resistant to increase and less resistant to decrease during the pandemic. We also show that this effect is smaller for Big 4 and specialist auditors, who have more leverage and bargaining power to maintain their fees. We also observe similar mitigating results for auditors in less competitive markets. Additional results show that the results are stronger during the pandemic than during the 2007-2008 financial crisis. We also show that the results are more pronounced for the Democratic blue states than for the Republican red states, consistent with the tendency of the blue states to intervene more during the pandemic, and the economy recovers slower.

Recently, many researchers have focused on audit fee stickiness. The extant literature provides evidence suggesting weaker upward fee stickiness and stronger downward stickiness (De Villiers et al. 2014), as well as a link between competition and audit fee stickiness (Chang et al. 2019). In this study, we examined the relationship between COVID-19 and audit fee stickiness and the moderating effects of bargaining power and market concentration. Overall, our findings provide feedback to related literature on audit fee stickiness. Our paper also serves to inform accounting practitioners, regulators, and financial statement users of the importance of appropriate audit fee adjustment during the crisis because audit fees may not fully respond to elevated audit risks caused by potential challenges in collecting audit evidence during large-scale crises such as COVID-19.

This study is subject to certain limitations. First, as this study examines the impact of COVID-19, we do not winsorize or trim the data because company and auditor related variables during the pandemic are more likely to exhibit extreme values. If extreme values during the pandemic reflect actual abnormal situations, winsorization or trimming may introduce new biases. Second, instead of incorporating more control variables in the estimation model for the full sample, we run the estimation model on a per industry per year basis (i.e., estimation based on smaller groups). We examine the directions of the estimated coefficients, and in most industry-years they do not differ largely from previous literature. However, there may still be certain variables that are not captured by the homogeneity in an industry-year. Researchers may advance the research by using different approaches of sample selections and estimations.

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Appendix A An Example of Regression of the Audit Fee Model (based on full sample)†

	LNAF
LNTA	0.5998***
	(310.9400)
ACCR	0.3400***
	(9.7100)
INV	-0.0127
	(-0.3600)
LDELAY	0.0997***
	(9.5900)
LEV	0.0041***
	(5.2400)
CURRENT	-0.0310**
	(-30.6600)
CATA	0.4159***
	(21.9400)
ZSCORE	0.0002***
	(5.3200)
LOSS	0.2126***
	(29.0800)
ROA	0.0058
	(1.4400)
MTB	-0.0000
	(-0.3900)
EXTRA	-0.0000
	(-0.2800)
Intercept	8.7604***
	(125.0700)
Year fixed effects	Included
Industry fixed effects	Included
Observations	31,477
Adjusted R-squared	0.8198

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively, for two-tailed tests. The t-statistics are presented in parentheses.

† Please note that the actual approach used in this paper involves estimation by year and industry instead of using the regression results from Appendix A to estimate expected audit fees.

LNAF: natural logarithm of audit fees; *LNTA*: natural logarithm of total assets; *ACCR*: accounts receivable scaled by total assets; *INV*: inventory scaled by total assets; *LDELAY*:Natural logarithm of audit report lag; *LEV*: ratio of total liabilities to total assets; *CURRENT*: ratio of current assets to current liabilities; *CATA*: ratio of current assets to total assets; *ZSCORE*: Altman's Z-score (Altman 1968); *LOSS*: an indicator variable that equals 1 if a client reports negative net income before extraordinary items and 0 otherwise; *ROA*: ratio of net income before extraordinary items to total assets; *MTV*: market-to-book ratio; *EXTRA*: nonoperating income divided by the absolute value of net income.

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