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The impact of PCAOB international registration on audit quality and audit fees: Evidence from China ☆

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ABSTRACT

Despite the importance of registration with the PCAOB, there is surprisingly little academic research on the registration process and its impact on audit outcomes (Abernathy et al., 2013). The PCAOB allows registration of audit firms from non-US countries. However, China and a few other countries do not allow the PCAOB to conduct inspections of audit firms. We take advantage of this setting to investigate whether PCAOB-registered audit firms improve audit quality in the absence of inspections and whether they charge an audit fee premium. Our findings indicate that audit quality increases following PCAOB registration and that clients pay higher audit fees for audits by PCAOB-registered firms.

1. Introduction

Following the high-profile audit failures of Enron, WorldCom, Sunbeam, and other companies, the Sarbanes-Oxley Act of 2002 (SOX) created the Public Company Accounting Oversight Board (PCAOB) to oversee the auditing industry. Under SOX, audit firms, including non-U.S. firms that audit or play a substantial role in the audit of clients listed on U.S. stock exchanges, are subject to oversight by the PCAOB. Although PCAOB regulations require inspection of both U.S. and non-U.S. registered audit firms, legal constraints have prevented the PCAOB from inspecting registered audit firms in China. Interestingly, despite these restrictions on PCAOB inspections, some audit firms in China have nevertheless chosen to register with the PCAOB. We examine whether the audit quality of PCAOB-registered audit firms improves and whether the audit fees paid to the auditors increase following PCAOB registration.

Since its inception, the PCAOB and its activities have attracted considerable attention from academics. One widely debated question that has been studied is whether PCAOB inspections are effective at improving audit quality. Critics argue that although PCAOB inspectors may be more independent, PCAOB inspections may not improve audit quality because peer review inspectors may possess greater expertise.[1] Academic research on the effects of PCAOB inspections generally finds that

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[1] For firms that audit public companies, PCAOB inspection replaces the AICPA mandated peer review auditor program.

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they have a positive impact on audit quality (e.g., Carcello et al., 2011; Defond and Lennox, 2017) and that PCAOB inspection reports provide signals about audit quality (e.g., Dee et al., 2011; Abbott et al., 2013; Gunny and Zhang, 2013). We add to research on the impact of the PCAOB by examining whether PCAOB *registration* is associated with increased audit quality in China, a country where inspections are not allowed. Given the weak institutional environment in China, client firms may attempt to communicate the reliability of their financial reports by hiring a credible auditor. Employing a PCAOB-registered auditor may be an approach that client firms take to signal the reliability of their financial statements. Further, if clients value audit firm association with the PCAOB, they may be willing to pay an audit fee premium.

We choose China as the setting for investigating the implications of PCAOB registration for several reasons. First, as indicated earlier, China does not allow PCAOB inspections. Therefore, any implications of PCAOB registration can be attributed to the registration and not to the inspection that will follow. This differentiates our study from prior research, where the effect of PCAOB inspection also includes the registration effect. Second, China has a weaker regulatory and institutional environment than the other countries that, during the period of our study, have not allowed PCAOB inspections (Carcello et al., 2014).[2] Third, there have been many accounting irregularities by Chinese firms listed in the U.S., including Chinese reverse merger frauds, thus intensifying concerns about the reliability of Chinese companies' financial statements and the overall audit quality in China (Du and Stevens, 2013; Darrough et al., 2012; Ghosh and Peltier, 2014). Prompted by these events, the PCAOB has intensified negotiations with the Chinese government to allow inspections of registered audit firms.

Because of the weak institutional structure of the audit market in China, and because the legal liability of auditors is almost non-existent there due to the low level of protection for investors (Gul et al., 2010; Huang et al., 2016), reputation has become the predominant incentive for audit firms to remain independent and maintain high audit quality. Therefore, audit firms in China may rely on creating a favorable reputation by associating with a reputable international regulator such as the PCAOB.[3] Further, to signal the reliability of their financial statements, Chinese companies may choose to associate with a PCAOB-registered auditor, agreeing to increased auditor scrutiny and paying a premium to do so.[4]

Using data from Chinese listed firms, we compare the audit quality of, and the audit fees paid by, client firms with auditors registered with the PCAOB prior to and following registration. We find higher audit quality after the auditor registers with the PCAOB than before registration. In addition, we find an increase in audit fees after the auditor registers with the PCAOB.

Our study contributes to the literature in several ways. First, we document that even without inspections, PCAOB registration is associated with an improvement in audit quality, and that PCAOB-registered firms charge an audit fee premium. These findings complement prior research, which reports improvement in audit quality after firms are inspected by the PCAOB. We find that PCAOB registrants show higher audit quality after registration than before, even in the absence of an inspection regime. Second, our findings indicate that Chinese audit firms registered with the PCAOB may have gained valuable knowledge from self-assessment of internal controls and other knowledge discovery during the registration process, resulting in an overall audit quality increase. Third, we find that the increase in audit quality is accompanied by higher audit fees, a finding that is consistent with prior research suggesting that audit fee increases compensate firms for the increased efforts needed to achieve higher audit quality (Palmrose, 1986; Davis et al., 1993; Gul, 2006; Srinidhi and Gul, 2007).

The rest of this paper is organized as follows. We provide the background for PCAOB registration, discuss the related literature, and develop our hypotheses on the relationships between PCAOB registration, audit quality, and audit fees in Section 2. We describe the sample and present the research design in Section 3, discuss the results of the empirical analyses in Section 4, and provide our conclusions in Section 5.

2. PCAOB registration, literature review, and hypothesis development

2.1. PCAOB registration of international accounting firms

The Sarbanes-Oxley Act (SOX) of 2002 established the PCAOB as a nonprofit corporation via Section 101. To perform its role as the watchdog for audit firms, the PCAOB incorporates four key programs: (1) registration with the PCAOB; (2) inspections; (3) standard setting; and (4) enforcement (Abbott et al., 2013). SOX mandates that a firm be registered with the PCAOB to prepare or issue an audit report for U.S. issuers, brokers, or dealers. Section 106(a) of SOX also requires foreign audit firms with U.S. issuer clients to register with the PCAOB. The PCAOB also allows registration by foreign and domestic audit firms that currently perform no audit work for U.S. issuers, brokers, or dealers. Audit firms may choose to register even though not required to do so by SOX or PCAOB rules, "just to be in a better position to compete for future business for which registration is required" (PCAOB Release 2003-011E).

Registration with the PCAOB requires audit firms to complete and submit an electronic application form that consists of nine mandatory parts and an optional tenth part (PCAOB Form 1 Sample). Part I requires detailed information about the firm (i.e., location, legal form, associated entities, and licenses) and contact and signatory personnel. In Parts II and III, applying

[2] This list included seventeen countries that belong to the EU, plus Switzerland, Hong Kong, and China (Carcello et al., 2014).
[3] The PCAOB takes actions to establish its reputation as an "enforcer of high-quality audits" (Ege et al., 2017).
[4] In addition to the registration fees and annual fees, registering with the PCAOB is costly for audit firms because of the time and effort involved in the registration process. Firms are required to fill out a nine-part form in which they disclose current and anticipated clients along with audit fees, details of employees, unresolved legal disputes, and auditing disagreements with clients, and then provide documentation and testimony upon request by the PCAOB.

firms must list all current clients who are U.S. issuers, brokers, or dealers and the corresponding fees charged to these clients. Fees must be broken down into audit services, other accounting services, and non-audit services. Parts II and III also require a list of U.S. issuers, brokers, or dealers the firm anticipates providing audit services to in the coming year. Part IV consists of "a narrative, summary description, ... of the quality control policies of the applicant for its accounting and auditing practices, including procedures used to monitor compliance with independence requirements" (PCAOB Form 1 Sample, p.13). In Part V, firms must list pending criminal, civil, and administrative legal proceedings involving the firm or associated persons;[5] in Part VI, any audit-related disagreements with issuer, broker, or dealer clients; and in Part VII, the applying firm's roster of associated accountants. Part VIII requires applying firms to agree to provide testimony or documents to fulfill requests made by the PCAOB. They must also agree that all of their associated personnel will comply, and that failure to comply is grounds for revocation of registration. Part IX is the attestation of the application's accuracy, and Part X is for additional exhibits.

Section 101 of SOX requires the PCAOB to conduct annual inspections of PCAOB-registered auditors with more than 100 issuer clients in the U.S., and inspections at least once every three years for PCAOB-registered auditors with 100 or fewer clients (Calderon and Song, 2014). Quality control defects are identified during the inspection process and then communicated privately to firm personnel. For a period of one year, these defects remain non-public. If firms make reasonable progress toward remediating the defects, the report remains private.

The PCAOB started conducting inspections in 2004. However, there are certain non-U.S. jurisdictions where the PCAOB cannot conduct inspections because of legal restrictions, sovereignty issues, or objections of local authorities. In these non-U.S. jurisdictions, the PCAOB is denied access to information that is necessary to inspect the audit firms. The PCAOB contends that inspections are necessary to "protect the interests of investors and further the public interest in the preparation of informative, accurate, and independent audit reports," especially when public companies are accessing capital markets in the U.S. (Section 101 of SOX). Despite this stand, until recently, the PCAOB allowed registration of audit firms even in jurisdictions where it did not have permission to conduct inspections.[6]

2.2. Literature review

Prior literature focuses predominantly on the impact of inspection and enforcement on audit quality. DeFond and Lennox (2011) find a post-SOX reduction in the number of small auditors, predominantly of low quality, in the U.S. They conjecture that the reduction may be partly due to the PCAOB's inspection program. Gramling et al. (2011) study triennially inspected audit firms (i.e., firms with 100 or fewer issuers as clients). They find that firms labeled "audit deficient" in PCAOB inspection reports are more likely to issue going-concern reports for financially distressed clients after inspection. In contrast, audit firms that did not have audit deficiencies in PCAOB inspection reports do not find a significant change in the issuance of going-concern reports. Thus, they conclude that PCAOB inspection reports are valuable indicators of audit quality. Likewise, Defond and Lennox (2017) analyze PCAOB internal control inspection reports from fiscal 2010–2013. They find that after inspection, auditors with higher rates of internal control deficiencies increase their issuance of adverse internal control audit opinions. They also find an increase in post-inspection audit fees for audit firms with higher rates of internal control deficiencies. They conclude that inspections improve the quality of internal control audits.

Carcello et al. (2011) study the impact of PCAOB inspections on audit quality of Big 4 audit firms, using abnormal accruals as a measure of audit quality. They find a significant reduction in abnormal accruals in the two years following inspections. Lamoreaux (2016), using U.S. listed foreign clients, compares differences in audit quality for foreign audit firms in jurisdictions that permit PCAOB inspections and in jurisdictions that do not. He finds a significant improvement in audit quality due to "threat of inspections." Krishnan, Krishnan, and Song (2017) find a post-inspection improvement in audit quality for audit firms. Fung et al. (2017) also find that audit quality improves for non-U.S. client firms listed on foreign exchanges when their non-U.S. auditors are subject to PCAOB inspections. Tanyi and Litt (2017) compare audit firms that are subject to annual inspections to those that are subject to triennial inspections. They find that clients of annually inspected audit firms have significantly higher audit quality and audit fees than clients of triennially inspected audit firms. When viewed as a whole, the findings of these studies show that PCAOB inspections create incentives for audit firms to improve audit quality.[7]

Abbott et al. (2013) study the use of PCAOB inspection reports as a publicly available signal of audit quality. They consider two sets of audit firms: audit firms that were GAAP deficient after the triennial inspection by the PCAOB, and audit firms that were not. They find that clients of GAAP deficient audit firms tend to dismiss their auditors in favor of audit firms that are not GAAP deficient. The authors contend that the PCAOB creates a brand name for auditors that are not GAAP deficient after the triennial inspection.[8] Aobdia and Shroff (2017) conjecture that while the PCAOB does not examine any audit engagement of a non-U.S. client, the inspections positively impact the perception of audit quality of these non-U.S. clients, when the PCAOB is

[5] For criminal proceedings, the requirements are to list any pending cases and any cases settled within the previous five years. For civil and administrative proceedings, to require listing, the dispute needs to arise from audit report activity.

[6] The PCAOB released a letter in 2010 stating that it would no longer register audit firms in countries where it cannot perform inspections (PCAOB Release No. 2010–007 October 7, 2010).

[7] Lennox and Pittman (2010) find that audit clients do not perceive that the PCAOB's inspection reports are valuable for signaling audit quality. These clients do not leave auditors with deficient PCAOB reports. However, their study was done before Part II of the quality control reports was made public.

[8] Abbott et al. (2013) state that PCAOB inspection reports have become a "much more recognizable and accepted publicly available indicator of audit quality."

allowed to inspect the audit firms for U.S.-based clients. They find that PCAOB inspected audit firms increase their market share relative to non-inspected audit firms.

Although there is extensive literature on the impact of PCAOB inspections, there is little research on the impact of registration of audit firms with the PCAOB. SOX requires accounting firms to register with the PCAOB to "prepare or issue an audit report for a public company or another issuer, or a broker-dealer or play certain roles in those audits" (PCAOB, 2003). Further, non-U.S. audit firms that furnish, prepare, or play a substantial role in preparing an audit report for any U. S. issuer, broker, or dealer must also be registered with the PCAOB. Read et al. (2004) suggest that some audit firms might register with the PCAOB just because registration would signal higher audit quality. Based on interviews with partners, they also find that audit firms disengaged from SEC audits because they anticipated PCAOB inspections would be more stringent, increase oversight, and increase auditor legal liability. In addition, DeFond and Lennox (2011) report that many of the non-quality, small audit firms stopped auditing SEC registrants after the PCAOB was formed. While both these studies focus on the determinants of deregistration, they also allude to the fact that auditors believed they must maintain higher levels of quality control after registering with the PCAOB.

2.3. Hypothesis development

2.3.1. Audit quality

Although there is evidence that audit quality is positively associated with PCAOB inspections, it is unclear whether such an association exists with registration itself. In the absence of inspections, it appears unlikely that audit firms would attempt to improve audit quality. This intuitive argument is based on the rationale that the threat of litigation incentivizes auditors to provide high quality audits (e.g., Venkataraman et al., 2008). However, according to DeAngelo (1981b), audit firms earn substantial quasi-rents purely from reputation effects; they gain clients and earn higher audit fees due to a perception that they provide high quality audits. Fung et al. (2017) suggest that registering with the PCAOB in the absence of inspections might increase the threat of reputation damage for PCAOB-registered foreign audit firms if they do not maintain high audit quality.[9] Further, in jurisdictions like China where litigation risk is low, reputation is likely to be the major incentive for audit quality (Weber et al., 2008).

An advantage of registering with a stringent regulator such as the PCAOB is that the process of registration itself could help audit firms identify and address their quality control issues and thereby improve audit quality. The PCAOB registration process requires audit firms to "provide an overview of firm's policies with respect to independence, integrity, and objectivity; engagement performance; personnel management; acceptance and continuance of clients and engagements; and monitoring" (PCAOB Release 2003-011E). In addition, the PCAOB requires audit firms to perform a self-assessment of their quality control policies,[10] and subject themselves and associated persons to mandatory cooperation with the PCAOB when asked to testify or provide documentation.[11] Registered audit firms are also required to provide updated information on at least an annual basis or as events dictate. The periodic reporting requirements inform the PCAOB about basic demographic changes in the audit firm and its personnel, as well as its audit processes and quality (Abernathy et al., 2013). PCAOB registered firms must also provide annual updates indicating that they are maintaining these requirements. By registering with the PCAOB, audit firms must educate themselves about higher standards of financial reporting.[12] Thus, motivation to maintain reputation, combined with self-assessment of quality control of audit processes and knowledge discovery during registration, should be associated with higher audit quality for registered audit firms. For these reasons, we hypothesize the following:

H1: The audit quality of audit firms that register with the PCAOB is higher after registration than before registration.

2.3.2. Audit fees

Prior research finds that client firms will engage with high quality audit firms to signal the credibility of their financial statements (Copley et al., 1994; Firth and Liau-Tan, 1998; Fargher et al., 2001). High quality auditors also are associated with a lower cost of debt, particularly for firms with noninvestment grade securities (Mansi et al., 2004), and act as a mechanism to restrain insiders from financial misreporting in countries with a weak institutional environment (Guedhami et al., 2014). Given the weak institutional environment in China, client firms looking to signal the reliability of their financial statements could align themselves with PCAOB-registered audit firms in an attempt to reputationally bond (e.g., Siegel, 2005), and therefore be willing to pay a premium to hire a PCAOB-registered audit firm. The PCAOB makes it clear during registration that registered firms must maintain the high standards of quality control expected from being associated with the PCAOB. Therefore, audit firms registered with the PCAOB are likely to expend more effort to maintain higher audit quality. The increased effort of audit firms and the willingness of client firms to pay a premium for the reputation of

[9] Although inspection is a powerful tool to enforce audit quality, the PCAOB has other mechanisms besides inspections to oversee registered auditors. For example, it has an anonymous online "tips and referral center" through which anyone can report potential violations of PCAOB rules.

[10] This self-assessment of quality control policies is akin to the self-assessments that business schools perform during the AACSB application process.

[11] Mandatory cooperation with the PCAOB is similar to the conditions the SEC requires of companies who wish to become public. In 2013 the PCAOB and Chinese securities regulators came to an agreement for document exchange for the purpose of improving audit oversight (Liu and Sun, 2019).

[12] For example, the PCAOB outlines how audit firms are expected to comply with auditor independence quality controls.

PCAOB-registered auditors could lead to increased audit fees (Simunic, 1980; DeAngelo, 1981b).[13] Therefore, we hypothesize the following:

H2: The audit fee premium charged by audit firms that register with the PCAOB is higher after registration than before registration.

3. Sample and research design

3.1. Sample

We obtain our sample data from two primary sources that have been used in previous studies (e.g., Aharony et al., 2000; Chen and Yuan, 2004; Huang et al., 2015). We collect client firm data from the Taiwan Economic Journal (TEJ) annual database for 2005 through 2012.[14] From our initial sample of 15,281 company-year observations, we eliminate 229 observations for financial institutions because they are highly regulated and have different financial reporting characteristics and 32 observations for firms in industries with less than the minimum of 8 observations in a given year that we require to calculate discretionary accruals. Since we also test the relationship between audit fees and registration with the PCAOB, we eliminate a further 2,503 company-years with missing audit fee information. We also eliminate 2,250 observations with missing data necessary to calculate discretionary accruals or the control variables in the regression models. We compile a list of Chinese audit firms registered with the PCAOB and identify the date on which each firm registered with the PCAOB from www.pcaobus.org. We eliminate 6,075 company-years with auditors that never registered with the PCAOB.[15] We limit the sample for our main analysis to the company-years of clients of auditors that register with the PCAOB to address concerns that audit firms that register with the PCAOB are systematically different from firms that do not register. By including only audit firms that register, we mitigate self-selection bias that may exist between firms that elect to register and firms that do not. Table 1, Panel A presents the breakdown of how we arrive at our final sample of 4,192 company-years. We refer to this sample as the "full" sample. Of the 4,192 company-year observations audited by PCAOB-registered audit firms, 699 occurred before and 3,493 after registration. Panel B of Table 1 presents a yearly pre- and post-registration breakdown of observations with registered PCAOB auditors.

We also construct a subsample of company-years where the client firm is affiliated with a PCAOB-registered audit firm for at least one year prior to registration and at least one year after registration. This subsample has 699 company-years prior to registration and 815 company-years after registration. We refer to this subsample as the "pre-post sample." Panel C of Table 1 presents a yearly pre- and post-registration breakdown of observations in the pre-post sample.

3.2. Research design

3.2.1. Audit quality

Levitt (1998) notes that upward (aggressive) and downward (conservative) earnings management is equally detrimental to the quality of financial reporting. Therefore, a high-quality independent audit should restrain managers from engaging in both aggressive and conservative earnings management that misleads financial statement users (Khurana et al., 2021). Consequently, a reduction in absolute abnormal accruals is a good proxy for audit quality because both positive (income-increasing) abnormal accruals and negative (income-decreasing) abnormal accruals are signs of earnings management (Becker et al., 1998; Carcello et al., 2011). Additionally, both positive and negative abnormal accruals will eventually revert, leading to less persistent earnings of lesser quality that are less informative about firm value (Sloan, 1996; Carcello et al., 2011).

Following this theoretical reasoning, prior literature finds that absolute abnormal accruals are a good proxy for audit quality (e.g., Becker et al., 1998; Francis et al., 1999; Behn et al., 2008), and this proxy has been extensively used in accounting research, including PCAOB-related research (e.g., Carcello et al., 2011; Khurana et al., 2021). Consistent with prior literature, we conduct our main analysis using absolute abnormal accruals because we are investigating the impact of PCAOB registration on the overall audit quality of the registered audit firms. Absolute abnormal accruals capture the full scope of audit quality, whereas positive (negative) abnormal accruals detect management's efforts to increase (decrease) income through discretionary accruals and by themselves do not present a complete picture of audit quality. Nevertheless, in additional (untabulated) analysis, we examine whether the observed reduction in absolute abnormal accruals is driven by a reduction in income-increasing abnormal accruals and/or income-decreasing abnormal accruals.

We use the modified Jones model to estimate normal accruals and estimate abnormal accruals as the difference between actual accruals and normal accruals.

We then analyze the impact of PCAOB registration on audit quality using the following regression model:

[13] The increased audit fee cannot be attributed to litigation risk in a low litigation country like China.

[14] Our sample period begins one year after the PCAOB began inspections. Therefore, any Chinese audit firm registered or registering this year or later would be aware that the PCAOB inspection regime has begun and that China has not agreed to participate in the inspections. In 2013, the PCAOB and Chinese securities regulators agreed to an exchange of audit documentation from firms to regulators for oversight purposes (Liu and Sun, 2019).

[15] In additional analysis, we add these observations back to the main sample to perform a difference-in-differences analysis to check whether our inferences are just a result of overall trends in audit quality and fees in China.

Table 1
Sample Selection and Distribution.

Panel A: Sample Selection (the unit of observation is a company-year)	
Listed Number of observations during 2005–2012	15,281
Less: Observations related to financial institutions	(229)
Observations from industries with less than eight observations in an industry-year	(32)
Observations with missing data for fees	(2,503)
Observations with missing explanatory variables	(2,250)
Observations related to unregistered audit firms	(6,075)
Final sample	4,192

Panel B: Yearly Pre- and Post-Registration Distributions

Year	**POST_AR = 0*	***POST_AR = 1*	Total
2005	51	210	261
2006	55	200	255
2007	115	235	350
2008	138	266	404
2009	233	410	643
2010	107	526	633
2011	0	739	739
2012	0	907	907
Total	699	3,493	4,192

Panel C: Yearly Pre- and Post-Registration Distributions for Client Firms with at least one year before and after Audit Firm registration with the PCAOB

Year	**POST_AR = 0*	***POST_AR = 1*	Total
2005	51	0	51
2006	55	19	74
2007	115	16	131
2008	138	18	156
2009	233	57	290
2010	107	162	269
2011	0	266	266
2012	0	277	277
Total	699	815	1,514

* If the client firm has an auditor that is registered with PCAOB, but the year is BEFORE the registration, POST_AR = 0.
** If the client firm has an auditor that is registered with PCAOB and the year is AFTER the registration, POST_AR = 1.

$$
\begin{aligned}
|ABNACC|_{it} = \; & \beta_0 + \beta_1 POST\_AR_{i,t} + \beta_2 SWITCH_{i,t} + \beta_3 SWITCH * POST\_AR_{i,t} \\
& + \beta_4 BTM_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 TOP10_{i,t} + \beta_7 BIG4_{i,t} + \beta_8 LEV_{i,t} + \beta_9 ROA_{i,t} \\
& + \beta_{10} INVREC_{i,t} + \beta_{11} CFO_{i,t} + \beta_{12} MAO_{i,t} + \beta_{13} PRIVATE_{i,t} + \beta_{14} AGE_{i,t} \\
& + \beta_{15} CROSSUS_{i,t} + \beta_{16} CROSSOTH_{i,t} + Industry\ \ Fixed\ \ Effects + \varepsilon_{i,t}
\end{aligned} \tag{1}
$$

Please see the Appendix for detailed variable definitions. |*ABNACC*| is the absolute value of abnormal accruals for firm *i* in year *t*; *POST_AR* equals 1 if the client is audited by a PCAOB-registered audit firm after the firm registered with the PCAOB, and 0 otherwise. We use ordinary least squares (OLS) to estimate the model specified in Eq. (1) and compute coefficient standard errors using observations clustered by client firm. We estimate the model using the two samples described in the preceding subsection, i.e., the full sample and the pre-post sample. We also estimate the model separately, using signed positive abnormal accruals and signed negative abnormal accruals as the dependent variable.

The coefficient β_1 on *POST_AR* indicates the change in audit quality from before to after the audit firm registers with the PCAOB, after controlling for other factors. H1 hypothesizes that audit quality is higher following PCAOB registration. Therefore, we expect β_1 to be negative.

We include several control variables in Eq. (1) that may affect audit quality. *SWITCH* and *SWITCH*POST_AR* control for the possibility that the audit quality of a client firm audited by a PCAOB-registered audit firm improves only after the audit firm acquires clients with better accounting quality in the years after registration. *SWITCH* equals 1 if the client firm has a different auditor in year *t* from the previous year. *BTM*, client firms' book-to-market value of equity, controls for the positive relation between growth opportunities and abnormal accruals (Matsumoto, 2002), and *SIZE*, the natural log of total assets, controls for the relation between abnormal accruals and firm size. *TOP10*, which equals 1 if the company-year is audited by one of the top 10 audit firms, and 0 otherwise, controls for the relation between audit quality and the top audit firms

in China. *BIG4*, which equals 1 if the company-year is audited by a Big 4 affiliated firm, and 0 otherwise, controls for the influence of Big 4 affiliated audit firms on audit quality.[16] *LEV*, calculated as long-term debt divided by total assets, and *ROA*, net income divided by total assets, control for the effects of leverage and accounting performance, respectively, on abnormal accruals. *INVREC*, the sum of inventory and receivables scaled by total assets and *CFO*, cash flow from operations scaled by total assets, control for the influence on abnormal accruals that the percentage of inventory and receivables and operating cash flows can have. *MAO*, which equals 1 if the firm received a modified audit opinion in year *t*, and 0 otherwise, controls for the relation between abnormal accruals and receiving a modified audit opinion. *PRIVATE*, which equals 1 if the firm is not a state-owned enterprise, and 0 otherwise, controls for differences between state-owned and privately-owned firms. *CROSSUS*, which equals 1 if the client firm is listed on any stock exchange in the United States and 0 otherwise, and *CROSSOTH* which equals 1 if the client firm is listed on a stock exchange outside of China other than in the U.S. and 0 otherwise, control for the influence of non-Chinese regulatory authorities on accrual quality. Eq. (1) also includes *AGE*, the number of years the company has been listed, and industry fixed effects. We winsorize all continuous variables at 1% and 99% to reduce the influence of extreme values on our estimations.

3.2.2. Audit fees

We analyze the impact of PCAOB registration on audit fees with the following regression model:

$$\begin{aligned} LNFEES_{i,t} = {} & \gamma_0 + \gamma_1 POST\_AR_{i,t} + \gamma_2 SWITCH_{i,t} + \gamma_3 SWITCH * POST\_AR_{i,t} \\ & + \gamma_4 BTM_{i,t} + \gamma_5 SIZE_{i,t} + \gamma_6 TOP10_{i,t} + \gamma_7 BIG4_{i,t} + \gamma_8 LEV_{i,t} \\ & + \gamma_9 INVREC_{i,t} + \gamma_{10} CFO_{i,t} + \gamma_{11} PRIVATE_{i,t} + \gamma_{12} AGE_{i,t} \\ & + \gamma_{13} CROSSUS_{i,t} + \gamma_{14} CROSSOTH_{i,t} + \gamma_{15} LOSS_{i,t} \\ & + \gamma_{16} GOINGCONCERN_{i,t} + \gamma_{17} LIQUIDITY_{i,t} + \gamma_{18} FOREN_{i,t} \\ & + Year\ \ Fixed\ \ Effects + Industry\ \ \ Fixed\ \ Effects + \varepsilon_{i,t} \end{aligned} \tag{2}$$

Please see the Appendix for detailed variable definitions. *LNFEES* is the natural log of audit fees for firm *i* in year *t*. *POST_AR* equals 1 if the client is audited by a PCAOB-registered audit firm after the firm registers with the PCAOB, and 0 otherwise. We estimate the model with OLS and compute standard errors with observations clustered by audit firm. As with Eq. (1), we estimate Eq. (2) using the full sample and the pre-post sample.

The coefficient γ_1 on *POST_AR* indicates the change in audit fees from before to after the audit firm registers with the PCAOB, after controlling for other factors. H2 hypothesizes that audit fees increase following PCAOB registration. Therefore, we expect γ_1 to be greater than zero.

We include several control variables in Eq. (2) that may affect total audit fees. We include *SWITCH* and *SWITCH*POST_AR* to control for the impact new clients have on audit fees before and after the audit firm registers with the PCAOB. We control for the effect of firm size on audit fees by including the natural log of total assets (*SIZE*). We also include the other controls from the audit quality model: the client firm's book-to-market value of equity (*BTM*), leverage (*LEV*), inventory and receivables scaled by total assets (*INVREC*), cash flows from operations scaled by total assets (*CFO*), firm age measured in years (*AGE*), whether the firm is audited by a Top 10 Chinese audit firm (*TOP10*), whether the firm is audited by a Big 4-affiliated audit firm (*BIG4*), whether the firm is cross-listed on a U.S. stock exchange (*CROSSUS*), whether the firm is cross-listed on a stock exchange outside China other than in the U.S. (*CROSSOTH*), whether the firm is not controlled by the government (*PRIVATE*), and industry fixed effects. We include additional control variables from Raghunandan and Rama (2006). These controls include whether the client firm has negative net income (*LOSS*), whether the firm has a going concern report (*GOINGCONCERN*), and current ratio (*LIQUIDITY*). We control for the influence non-Chinese regulatory authorities may have on audit fees by including the variable *FOREN* that equals 1 if the client firm discloses foreign operations, and 0 otherwise. We also control for the effect of increasing audit fees over time by including year fixed effects.

4. Results

4.1. Descriptive statistics

Table 2 presents descriptive statistics for the full sample and for the pre-post sample that includes company-years with audit firms that register with the PCAOB pre-and-post registration. For the full sample, the mean (median) absolute abnormal accruals is 0.065 (0.045) and the mean (median) natural log of audit fees is 4.367 (4.220). For comparison purposes, company-years prior to the audit firm's registration with the PCAOB (*POST_AR* = 0) have higher absolute abnormal accruals, lower total audit fees, lower book-to-market ratios, a higher probability of being audited by one of the top 10 audit firms in China, lower leverage, lower contemporary accounting performance, a higher rate of modified audit opinions, fewer private firms, fewer firms cross-listed on stock exchanges outside of China, more instances of auditor switching, and lower current

[16] For our sample period, any audit firm affiliated with a Big 4 firm is registered with the PCAOB for the entire sample period, meaning for these audit firms there is no comparison of audit quality before and after PCAOB registration. To provide additional robustness we present analysis excluding company-years with Big 4 affiliated auditors.

Table 2
Descriptive Statistics.

	Full Sample (N = 4,192)			POST_AR = 0 (N = 699)			POST_AR = 1 (N = 3,493)		
Variable	**Mean**	**St. Dev**	**Median**	**Mean**	**St. Dev**	**Median**	**Mean**	**St. Dev**	**Median**
|ABNACC|	0.065	0.065	0.045	**0.074**	0.074	0.048	0.064	0.063	0.044
LNFEES	4.367	0.776	4.220	**3.951**	0.589	3.912	**4.450**	0.782	4.290
BTM	0.469	381	0.387	**0.371**	0.370	0.293	**0.489**	0.380	0.407
SIZE	15.13	1.371	15.01	**14.72**	1.221	14.56	**15.21**	1.385	15.11
TOP10	0.679	0.467	1	**0.771**	0.420	1	0.661	0.473	1
BIG4	0.151	0.358	0	**0.000**	0	0	**0.181**	0.385	0
LEV	0.082	0.108	0.032	**0.073**	0.103	0.026	0.084	0.109	0.034
ROA	0.032	0.067	0.031	**0.021**	0.083	0.030	0.034	0.063	0.032
INVREC	0.292	0.196	0.262	0.284	0.176	0.268	0.294	0.200	0.261
CFO	0.051	0.084	0.049	0.054	0.086	0.047	0.050	0.083	0.050
MAO	0.058	0.233	0	**0.080**	0.272	0	0.053	0.225	0
PRIVATE	0.350	0.477	0	**0.299**	0.458	0	0.361	0.480	0
AGE	11.52	4.746	12	**9.810**	4.147	10	**11.86**	4.784	12
CROSSUS	0.015	0.120	0	**0.001**	0.038	0	0.017	0.130	0
CROSSOTH	0.046	0.210	0	**0.019**	0.135	0	0.052	0.221	0
SWITCH	0.210	0.407	0	**0.368**	0.483	0	**0.178**	0.383	0
LIQUIDITY	1.559	1.239	1.262	**1.399**	1.019	1.194	1.591	1.277	1.273
GOINGCONCERN	0.038	0.192	0	**0.056**	0.230	0	0.035	0.183	0
FOREN	0.208	0.406	0	**0.243**	0.429	0	0.200	0.400	0

Note: All continuous variables are winsorized at 1% and 99%. Bold indicates significant difference (<5%) in means compared to the full sample. Please see the Appendix for detailed variable definitions.

ratios than the full sample. Company-years where the auditor is registered with the PCAOB (*POST_AR* = 1) have higher total audit fees, higher book-to-market value of equity, larger size, and fewer auditor switches than the full sample.

4.2. The Relation between PCAOB registration and audit quality

Table 3 presents the coefficient estimates for Eq. (1), which examines the relation between PCAOB registration and audit quality. Column (1) reports results for the full sample and column (2) for the pre-post sample. The coefficient β_1 on *POST_AR* in column (1) indicates the difference in absolute abnormal accruals before and after registration, after controlling for other factors. The results show that β_1 is significantly negative, which indicates that PCAOB-registered audit firms have higher audit quality after registration than before. This result is consistent with H1.

The coefficients on *SWITCH* and *SWITCH*POST_AR* are not significantly different from zero, indicating that there is no difference in the audit quality of client firms that do and do not switch auditors before or after PCAOB registration. The estimates provide support for H1, that the audit quality of audit firms that register with the PCAOB improves after registration. Client firms that are larger, have top 10 auditors, and have better contemporary accounting performance exhibit lower absolute abnormal accruals. Client firms that have more growth opportunities, receive a modified audit opinion, are privately owned, and are older have higher levels of absolute abnormal accruals. For this sample, cross-listing in either the U.S. or elsewhere does not have a significant relationship with the absolute value of abnormal accruals.

An alternative explanation for the results reported in column (1) is that after registration, PCAOB-registered audit firms drop clients with poor accrual quality. To address this concern, we re-estimate Eq. (1) using the pre-post sample, which includes company-years where the client firm is with an audit firm that has been registered with the PCAOB for at least one year prior to registration and at least one year following registration and report the results in column (2). By including only client firms that are with PCAOB-registered audit firms before and after registration, we can test whether audit quality is higher for continuing client firms. The results show that β_1 is significantly negative, which indicates that clients of PCAOB-registered audit firms have higher audit quality after registration than before. These results again are consistent with H1 and indicate that audit quality for continuing clients improves after registration with the PCAOB.

The results in Table 3 provide support for H1, the hypothesis that PCAOB registered audit firms in China exhibit higher audit quality after registration than before. The results show that audit quality is higher even though Chinese registered audit firms are not subject to PCAOB on-site inspections.[17]

[17] In additional (untablulated) analysis, we re-estimate Eq. (1) after removing company-years with Big 4-affiliated auditors from the two samples. We do so because any audit firm in China that is affiliated with a Big 4 firm is registered with the PCAOB for the entire sample period, and there is no pre-registration period to compare it to in order to assess the post-registration improvement in audit quality. The results of this additional analysis are similar to those reported in columns (1) and (2), confirming the significant improvement in audit quality following registration with the PCAOB.

Table 3
Relation between PCAOB registration and abnormal accruals.

	(1)	(2)
Intercept	0.1101*** (6.10)	0.1065*** (3.51)
POST_AR	−0.0108*** (−2.78)	−0.0079* (−1.82)
SWITCH	−0.0004 (−0.07)	0.0028 (0.50)
SWITCH*POST_AR	0.0036 (0.58)	−0.0014 (−0.16)
BTM	−0.0208*** (−4.18)	−0.0160** (−2.34)
SIZE	−0.0034*** (−2.58)	−0.0031 (−1.39)
TOP10	−0.0055** (−2.04)	−0.0087* (−1.83)
BIG4	0.0069* (1.87)	0.0004 (0.08)
LEV	0.0048 (0.36)	−0.0363 (−1.58)
ROA	−0.0564** (−2.15)	−0.0667 (−1.59)
INVREC	0.0121 (1.30)	−0.0048 (−0.35)
CFO	0.0168 (0.62)	0.0298 (0.68)
MAO	0.0327*** (3.90)	0.0373*** (3.50)
PRIVATE	0.0066** (2.29)	0.0035 (0.73)
AGE	0.0007*** (2.80)	0.0010* (1.92)
CROSSUS	−0.0025 (−0.27)	−0.0209** (−2.02)
CROSSOTH	−0.0008 (−0.16)	−0.0051 (−0.72)
Industry Fixed	Yes	Yes
Adj. R-Square	0.0913	0.1121
Observations	4,192	1,514

Notes: The dependent variable is the absolute value of abnormal accruals. Column (1) includes client firms that are audited by a PCAOB-registered audit firm. Column (2) includes client firms that are audited by a PCAOB-registered audit firm for at least one year before registration and at least one year after registration. Please see the Appendix for detailed variable definitions. T-statistics are reported in parentheses with estimated coefficients and are based on standard errors clustered by client firm. *, **, and *** indicate significance at 10%, 5%, and 1% (two-tailed), respectively.

4.3. The Relation between PCAOB registration and audit fees

Table 4 presents the coefficient estimates for Eq. (2) that relates PCAOB registration to audit fees. The full sample results are reported in column (1). The coefficient γ_1 on *POST_AR* indicates the difference in audit fees before and after registration, after controlling for other factors. The results show that γ_1 is significantly positive, which indicates that clients of PCAOB-registered audit firms pay higher audit fees after registration than they did before. This result is consistent with H2.

The insignificant coefficient on *SWITCH* indicates that prior to the year of PCAOB registration, there is no difference in total audit fees between client firms that switch and those that do not switch auditors. The sum of the coefficients on *SWITCH* and *SWITCH*POST_AR* (i.e., $\gamma_2 + \gamma_3$) is negative and weakly significant (t-value = 1.78, p = 0.076), indicating that following the year of PCAOB registration, clients that switch audit firms experience lower audit fees than those that do not switch audit firms. A reduction in initial engagement fees is consistent with prior research about auditor changes and initial engagement fees (DeAngelo, 1981a; Chan, 1999; Hay et al., 2006). [18]The increase in audit fees found in the main analysis is driven by clients that do not switch firms, which is over 80 percent of the observations in the post-registration period. Client firm size, growth opportunities, being a client of a Big 4-affiliated audit firm, and cross-listing on non-Chinese exchanges are positively associated with audit fees. The level of leverage, percentage of inventory and receivables, and cash flow from operations are negatively associated with audit fees. The results in column (1) provide support for H2, the hypothesis that audit firms registered with the PCAOB charge higher fees after registration than before it.

Column (2) uses the pre-post sample company-years where the client firm has been with a PCAOB-registered audit firm for at least one year before the audit firm's registration and at least one year after. γ_1, the coefficient on *POST_AR*, is significantly positive, indicating that after registration, PCAOB-registered audit firms increased fees for existing clients.[19] This increase could be a sign that PCAOB-registered audit firms charge a premium for PCAOB affiliation or that clients are willing to pay a premium for the additional efforts such audit firms provide. The analysis in Table 4 provides support for H2, the hypothesis that PCAOB-registered firms charge higher audit fees after registration than before it.

[18] This reduction in initial audit fees for switch clients after PCAOB registration could be the result of registered audit firms attempting to increase market share. Further, the registered PCAOB audit firms may be accepting fewer risky clients and taking a long-term view of the costs of incumbency to capitalize on PCAOB registration.

[19] Similar to the additional analysis conducted for Eq. (1), we re-estimate Eq. (2) using subsamples that exclude company-years with Big 4-affiliated audit firms in order to examine whether the observed increase in audit fees is due to increased fees charged by Big 4-affiliated auditors. Untabulated results confirm the findings in Table 4 that the observed increase in audit fees by PCAOB-registered audit firms is not due just to Big 4-affiliated audit firms charging a premium.

Table 4
Relation between PCAOB registration and audit fees.

	(1)	(2)
Intercept	−1.1691*** (−7.32)	−1.4564*** (−4.81)
POST_AR	0.2282*** (3.99)	0.1615*** (3.10)
SWITCH	0.0316 (0.43)	0.0236 (0.37)
SWITCH*POST_AR	−0.1703* (−1.94)	−0.1273 (−1.07)
BTM	−0.1370*** (−3.53)	−0.1545*** (−2.71)
SIZE	0.3569*** (21.35)	0.3810*** (15.62)
TOP10	0.0673 (1.27)	0.1371*** (3.57)
BIG4	0.5498*** (11.34)	0.5150*** (9.64)
LEV	−0.4493*** (−3.47)	−0.4607*** (−3.82)
INVREC	−0.1374** (−2.10)	−0.2237* (−1.74)
CFO	−0.2443* (−1.92)	−0.3597* (−1.90)
PRIVATE	0.0576 (1.40)	0.1735*** (3.21)
AGE	0.0047 (1.13)	−0.0024 (−0.51)
CROSSUS	0.7670*** (15.49)	1.3002*** (10.14)
CROSSOTH	0.6992*** (7.18)	0.9907*** (7.42)
LOSS	−0.0085 (−0.35)	0.0008 (0.02)
GOINGCONCERN	0.0779 (1.34)	−0.0403 (−0.88)
LIQUIDITY	−0.0103 (−1.08)	0.0011 (0.08)
FOREN	0.0111 (0.28)	−0.0216 (−0.63)
Year Fixed	Yes	Yes
Industry Fixed	Yes	Yes
Adj. R-Square	0.7297	0.6639
Observations	4,192	1,514

Notes: The dependent variable is the natural log of total audit fees. Column (1) includes client firms that are audited by a PCAOB-registered audit firm. Column (2) includes client firms that are audited by a PCAOB-registered audit firm for at least one year before registration and at least one year after registration. Please see the Appendix for detailed variable definitions. T-statistics are reported in parentheses with estimated coefficients and are based on standard errors clustered by audit firm. *, **, and *** indicate significance at 10%, 5%, and 1% (two-tailed), respectively.

4.4. Long-term impact of PCAOB registration

The sample used in the main analysis ends in 2012, a year when it should have become clear to audit firms in China that the Chinese government and the PCAOB were not going to come to an agreement on allowing inspections. This awareness may have led PCAOB-registered auditors in China to reduce their audit quality due to the absence of a threat of inspection. Additionally, that sample ends one year prior to the PCAOB and Chinese securities regulators agreeing to an exchange of audit documentation from firms to regulators for oversight purposes (Liu and Sun, 2019). These competing factors, a removal of the threat of inspection and a requirement to hand over audit documentation to the PCOAB if requested, did not exist at the end of our main sample period. In this subsection, we examine the long-term implications of PCAOB registration for audit quality and audit fees by estimating Eqs. (1) and (2) with a sample extending to 2019 for clients of PCAOB-registered audit firms.

Panel A of Table 5 presents the estimated coefficients for Eq. (1) using a sample extended to 2019 with absolute abnormal accruals as the dependent variable. Panel A shows a significant reduction in absolute abnormal accruals during the period after PCAOB registration, revealing that the improvements in audit quality detected in the main analysis continued in subsequent years.

Panel B of Table 5 presents the estimated coefficients for Eq. (2) using a sample extended to 2019, where the natural log of audit fees is the dependent variable. The results show a significant increase in audit fees during the period after PCAOB registration. The increases in audit fees after registration found in the main analysis continue for the extended period.

4.5. Difference-in-differences analysis of the impact of PCAOB registration

The results we present in Tables 3 and 4 could conceivably be due to an overall improvement in audit quality over time in China and an increase in overall audit fees over this same period. We conduct a series of difference-in-differences analyses to examine whether non-PCAOB-registered audit firms experience an increase in audit quality and in audit fees similar to that of PCAOB-registered audit firms. During our sample period, we identify five years[20] during which one or more audit firms in

[20] The years identified are 2005, 2006, 2008, 2009, and 2010. The post registration period begins the following year, i.e., 2006, 2007, 2009, 2010, and 2011, respectively.

Table 5
Relation between PCAOB registration and abnormal accruals/audit fees: Evidence from an extended period.

Panel A: Absolute value of abnormal accruals		
	(1)	(2)
Intercept	0.1517*** (14.09)	0.1641*** (8.81)
POST_AR	−0.0120*** (−3.19)	−0.0112*** (−2.94)
SWITCH	0.0010 (0.19)	0.0020 (0.36)
SWITCH*POST_AR	0.0036 (0.61)	−0.0013 (−0.21)
Controls	yes	yes
Adj. R-Square	0.0833	0.1214
Observations	10,352	3,395
Panel B: Audit fees		
	(1)	(2)
Intercept	−0.9043*** (−5.61)	−1.1842*** (−3.94)
POST_AR	0.2516*** (7.99)	0.2185*** (5.02)
SWITCH	0.0369 (1.16)	0.0343 (1.07)
SWITCH*POST_AR	−0.1530*** (−4.28)	−0.1136** (−2.51)
Controls	yes	yes
Adj. R-Square	0.6917	0.6672
Observations	9,437	3,134

Notes: The dependent variable in panel A is absolute value abnormal accruals; in panel B it is audit fees. The data is extended to include clients of PCAOB-registered audit firms through 2019. Column (1) includes client firms that are audited by a PCAOB-registered audit firm. Column (2) includes client firms that are audited by a PCAOB-registered audit firm for at least one year before registration and at least one year after registration. Abnormal accrual observations are clustered by client firm; audit fee observations are clustered by audit firm; t-statistics are reported in parentheses with estimated coefficients. *, **, and *** indicate significantly different from zero two-tailed at 10%, 5%, and 1%, respectively.

China registered with the PCAOB. We compare changes in audit quality and audit fees between the pre- and post-registration periods for clients of registered and non-registered audit firms. For this analysis, we include the 6,075 company-years where client firms are audited by firms that did not register with the PCAOB. We create an indicator variable, *REGISTER*, that equals 1 for all company-years of client firms with auditors that registered with the PCAOB (both before and after registration), and 0 for company-years of client firms with non-registered auditors. We also create an indicator variable, *POST*, that equals 1 in each year following the year of audit firm registration with the PCAOB, and 0 otherwise. We include *REGISTER*, *POST*, and their interaction, *POST* REGISTER*, in the model. For each of the sub-periods, we eliminate any company-years when the client firm's auditor is registered with the PCAOB in the non-post period.[21]

Panel A of Table 6 presents the estimated coefficients for the difference-in-differences analyses for the five identified years when at least one audit firm in China registered with the PCAOB (columns 1 through 5) and a mean coefficient estimate across the five periods (column 6) with absolute value of abnormal accruals as the dependent variable. For all five sub-periods the coefficient on *POST*REGISTER* is significantly negative, while the coefficient on *POST* is significantly positive for two of the five periods and significantly negative for one of the periods. Further, the coefficient on *REGISTER* is positive for all five periods. This positive relationship between PCAOB-registered audit firms and abnormal accruals in the preregistration period implies that the firms registering with the PCAOB are not the highest quality firms in China looking to signal their quality through PCAOB association. The results indicate the opposite: these are audit firms of lower quality looking to improve either their reputation by associating with the PCAOB or possibly their actual audit quality by registering with the PCAOB and complying with its higher standards. These results imply that the increase in audit quality we find for clients of registered audit firms is not just a reflection of overall improvement of auditors in China, but is associated particularly with the audit firms that register with the PCAOB.

Panel B of Table 6 presents estimated coefficients for the difference-in-differences analyses for the five identified years when at least one audit firm in China registered with the PCAOB (columns 1 through 5) and a mean coefficient estimate across the five periods (column 6) with natural log of total audit fees as the dependent variable. We find a significant positive coefficient on *POST*REGISTER* in all five periods and a significant positive coefficient on *POST* for three of the five periods. These results imply that while audit fees do rise over the period in China, the increase we observe for clients of PCAOB-registered auditors is incremental to this overall increase.

[21] This process ensures that company-years audited by firms registered with the PCAOB only occur in the post period for each identified registration year.

Table 6
Relation between PCAOB registration and abnormal accruals/audit fees: Using difference-in differences analysis.

Panel A: Abnormal value of abnormal accruals

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.0792*** (5.92)	0.0825*** (6.05)	0.0760*** (5.32)	0.0748*** (5.15)	0.0729*** (4.94)	0.0771***
REGISTER	0.0091*** (2.69)	0.0087** (2.57)	0.0105*** (3.09)	0.0101*** (2.95)	0.0094*** (2.70)	0.0096***
POST	0.0059** (2.35)	0.0070*** (3.18)	−0.0026 (−1.26)	−0.0032 (−1.58)	−0.0060*** (−2.73)	0.0002
POSTREG	−0.0101*** (−3.12)	−0.0101*** (−3.12)	−0.0091*** (−2.75)	−0.0081** (−2.30)	−0.0075** (−1.96)	−0.0090***
Controls	yes	yes	yes	yes	yes	yes
Adj. R-Square	0.0938	0.0958	0.0961	0.0945	0.0936	
Observations	10,057	9,857	9,356	8,946	8,420	

Panel B: Audit Fees

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	−1.0572*** (−7.49)	−1.0471*** (−7.18)	−1.0393*** (−6.82)	−1.0268*** (−6.54)	−0.9926*** (−6.31)	−1.0326***
REGISTER	−0.0505 (−0.98)	−0.0518 (−1.01)	−0.0561 (−1.09)	−0.0490 (−0.99)	−0.0333 (−0.72)	−0.0481***
POST	0.0063 (0.32)	0.0089 (0.43)	0.0429* (1.77)	0.0689*** (2.92)	0.1255*** (5.38)	0.0505*
POSTREG	0.2279*** (4.15)	0.2258*** (4.08)	0.2097*** (3.51)	0.1789*** (3.05)	0.1346** (2.58)	0.1954***
Controls	yes	yes	yes	yes	yes	yes
Adj. R-Square	0.6720	0.6649	0.6403	0.6276	0.6135	
Observations	10,057	9,857	9,356	8,946	8,420	

Notes: The dependent variable in panel A is absolute abnormal accruals, and in panel B it is total audit fees. In column (1) one or more audit firms register with the PCAOB in 2005, and the post registration period begins in 2006. In column (2) one or more audit firms register with the PCAOB in 2006, and the post registration period begins in 2007. In column (3) one or more audit firms register with the PCAOB in 2008, and the post registration period begins in 2009. In column (4) one or more audit firms register with the PCAOB in 2009, and the post registration period begins in 2010. In column (5) one or more audit firms register with the PCAOB in 2010, and the post registration period begins in 2011. Please see the Appendix for detailed variable definitions. In columns (1)–(5), the t-statistics reported in parentheses with the estimated coefficients in panel A are based on observations clustered by client firm, and in panel B based on observations clustered by audit firm. Column (6) reports mean coefficients across columns (1)–(5) with significance levels based on Newey-West adjusted standard errors. *, **, and *** indicate significance at 10%, 5%, and 1% (two-tailed), respectively.

4.6. The relation between PCAOB registration and audit quality and audit fees for existing clients

We identify eight Chinese audit firms that registered with the PCAOB during our sample period. The clients of these eight firms offer an opportunity to investigate the relation between PCAOB registration and the audit quality and audit fees of client firms that choose to remain with audit firms that register with the PCAOB. We estimate Eqs. (1) and (2) using a subsample of client firms that have at least one year with a registered auditor prior to registration (*POST_AR* = 0) and at least one year after (*POST_AR* = 1).[22] Table 7 presents the estimated coefficients for the impact of PCAOB registration on the audit quality and audit fees of clients that remain with an audit firm through the registration process. Consistent with the results presented in Table 3, *POST_AR* is significantly negatively related to absolute abnormal accruals. Also, consistent with the results reported in Table 4, *POST_AR* is significantly positively related to the natural log of total audit fees. These results show increases in audit quality and audit fees for client firms that remain with the auditor through the registration process. They indicate that PCAOB registration by Chinese audit firms is associated with improved audit quality and increased audit fees.

4.7. Additional analysis

4.7.1. Matched firm difference-in-differences

To further examine whether the implications of PCAOB registration we document in our main analysis are just a function of overall improvements in audit quality and increases in audit fees over time, we construct a propensity score matched sample of clients of audit firms that register with the PCAOB and clients of audit firms that do not. We identify the client firms in the year of registration for each of the eight audit firms identified as registering with the PCAOB during our sample period. We propensity score match these client firms on the likelihood to be a client with a registered audit firm in the year of registration with client firms that are never associated with a PCAOB registered auditor. We match client firms on book-to-market, company size, leverage, return on assets, inventory and receivables scaled by assets, cash flow from operations scaled by assets, whether the company is state owned, whether the company received a modified audit opinion, whether the company had a loss for the year, and its length of time as a listed company.[23] Using company-years from the matched sample of firms, we perform a difference-in-differences analysis between the company-years of the clients of PCAOB-registered audit firms and the company-years of clients of non-PCAOB-registered audit firms. Similar to the procedure used in Table 6, *REGISTER* equals 1 for all company-years of clients of registered audit firms (both before and after registration)

[22] We exclude *SWITCH*POST_AR* from Eqs. (1) and (2) for this analysis because any auditor switch occurs prior to the registration year and there are no company-years with an auditor switch after registration. This analysis focuses on the audit quality and audit fee implications of PCAOB registration for existing clients that continue with an audit firm through the registration process.

[23] Untabulated *t*-tests reveal no significant differences in the means of the criteria used to propensity score match the client firms in the year of registration.

Table 7
Relation between PCAOB registration and abnormal accruals/audit fees: Using clients of PCAOB-registered audit firms that are clients both before and after PCAOB registration.

	|ABNACC|		LNFEES
Intercept	0.1271*** (3.95)	Intercept	−1.4038*** (−3.88)
POST_AR	−0.0107** (−2.33)	POST_AR	0.1687** (2.52)
SWITCH	0.0038 (0.59)	SWITCH	0.0353 (0.61)
BTM	−0.0173* (−1.88)	BTM	−0.1527* (−1.67)
SIZE	−0.0039 (−1.65)	SIZE	0.3808*** (13.27)
TOP10	−0.0146*** (−2.71)	TOP10	0.1073** (2.32)
LEV	−0.0209 (−0.79)	LEV	−0.7169*** (−5.32)
ROA	−0.0355 (−0.74)	INVREC	−0.1762 (−1.52)
INVREC	−0.0046 (−0.29)	CFO	−0.4227* (−1.77)
CFO	0.0040 (0.08)	PRIVATE	0.1415** (2.14)
MAO	0.0470*** (4.13)	AGE	−0.0067 (−1.18)
PRIVATE	0.0043 (0.84)	CROSSUS	1.4804*** (8.59)
AGE	0.0010* (1.76)	CROSSOTH	1.0327*** (5.84)
CROSSUS	0.0022 (0.22)	LOSS	−0.0305 (−0.67)
CROSSOTH	−0.0055 (−0.62)	GOINGCONCERN	−0.0401 (−0.94)
		LIQUIDITY	0.0285** (2.58)
		FOREN	−0.0064 (−0.16)
		Year Fixed	yes
Industry Fixed	Yes	Industry Fixed	yes
Adj. R-Square	0.1154	Adj. R-Square	0.6100
Observations	1215	Observations	1215

Notes: The dependent variable is identified at the top of the column. Observations include only company-years where the firm was a client of an auditor that registered with the PCAOB during the 2005 to 2012 sample period, was a client in the year of registration, and continued to be a client of the same auditor after registration. The t-statistics reported in parentheses with the estimated coefficients are based on observations clustered by client firm for |ABNACC|, and on observations clustered by audit firm in column for LNFEES. *, **, and *** indicate significance at 10%, 5%, and 1% (two-tailed), respectively.

and 0 for the company-years of clients of non-registered audit firms, *POST* equals 1 for all company-years at least one year after the audit firms register with the PCAOB and 0 otherwise, and *POSTREG* equals 1 if the company-year falls in the post-registration period, and the client firm's auditor is registered with the PCAOB in the post-registration period, and 0 otherwise. We perform this analysis on two samples. The first sample consists of matched pairs for clients of all the audit firms that register with the PCAOB during our sample period. The second sample consists of matched pairs for clients of audit firms that register with the PCAOB but do not have any U.S. cross-listed clients during the entire sample period.[24] We analyze this second sample of matched firms to determine whether the observed increases in audit quality and in audit fees are a result of U.S. cross-listed clients instead of overall changes at the audit firm.

Table 8 presents the estimated coefficients for a difference-in-differences analysis using Eqs. (1) and (2) with the additional indicator variables and the matched company-years of the propensity matched sample. The first two columns are for the sample that includes all matched pairs, and the third and fourth columns are for the sample that includes only matched pairs for clients of audit firms that register with the PCAOB and have no U.S. cross-listed clients for the entire sample period. Consistent with the results in Table 6, *POSTREG* is significantly negatively related to absolute abnormal accruals and significantly positively related to the natural log of total audit fees. These results reinforce those of our main analyses, which indicate that audit quality and audit fees increase after audit firms register with the PCAOB. The insignificant coefficients on *POST* show that the audit quality and audit fees of unregistered auditors' matched client firms do not also increase in the post-registration period.

4.7.2. Alternative measures of audit quality

In this subsection, we assess the sensitivity of our findings to the use of restatements and modified audit opinions as alternative indicators of audit quality. We conduct these additional analyses using the following two logistic models:

$$\begin{aligned} RESTATEMENT_{i,t} = {} & \delta_0 + \delta_1 POST\_AR_{i,t} + \delta_2 SWITCH_{i,t} + \delta_3 SWITCH * POST\_AR_{i,t} \\ & + \delta_4 BTM_{i,t} + \delta_5 SIZE_{i,t} + \delta_6 TOP10_{i,t} + \delta_7 BIG4_{i,t} + \delta_8 LEV_{i,t} \\ & + \delta_9 ROA_{i,t} + \delta_{10} INVREC_{i,t} + \delta_{11} LOSS_{i,t} + \delta_{12} MAO_{i,t} \\ & + \delta_{13} PRIVATE_{i,t} + \delta_{14} ABNORMALACCRUALS_{i,t} + \delta_{15} CROSSUS_{i,t} \\ & + \delta_{16} CROSSOTH_{i,t} + Industry\ \ Fixed\ \ Effects \\ & + Year\ \ Fixed\ \ Effects + \varepsilon_{i,t} \end{aligned} \tag{3}$$

[24] Of the eight audit firms that register with the PCAOB during our sample period, only one has clients that are cross-listed in the U.S.

Table 8
Relation between PCAOB registration and abnormal accruals/audit fees: Using difference-in-differences analysis of propensity score- matched client firms of PCAOB-registered audit firms and nonregistered audit firms.

	All Matched Pairs		Matched Pairs of Registered Firms without US Listed Clients	
	|ABNACC|	LNFEES	|ABNACC|	LNFEES
Intercept	0.0809*** (3.55)	−1.0152*** (−3.55)	0.0923*** (3.68)	−0.7682*** (−2.84)
REGISTER	0.0116** (2.26)	−0.0064 (−0.25)	0.0113** (2.12)	−0.0440 (−0.74)
POST	−0.0014 (−0.38)	0.0366 (1.48)	−0.0011 (−0.27)	0.0274 (0.76)
POSTREG	−0.0114** (−2.25)	0.0807*** (2.82)	−0.0125** (−2.27)	0.1258*** (2.66)
Controls	yes	yes	yes	yes
Adj. R-Square	0.0956	0.6089	0.0944	0.5544
Observations	2,678	2,678	2,048	2,048

Notes: The dependent variable is identified at the top of the column. Observations include propensity score matched client firms of Chinese audit firms that register with the PCAOB and those that do not. The propensity score match is based on the likelihood to be a client of a registered audit firm in the year of registration with the PCAOB. The first two columns are for matched pairs of clients of all of the audit firms that registered with the PCAOB during the sample period. The third and fourth columns are for matched pairs of the clients of the audit firms that registered with the PCAOB during the sample period and have no U.S. cross listed clients. Please see the Appendix for detailed variable definitions. |ABNACC| observations are clustered by client firm; LNFEES observations are clustered by audit firm; t-statistics are reported in parentheses with estimated coefficients. *, **, and *** indicate significantly different from zero two-tailed at 10%, 5%, and 1% respectively.

$$\begin{aligned} MAO_{i,t} = {} & \varphi_0 + \varphi_1 POST\_AR_{i,t} + \varphi_2 SWITCH_{i,t} \\ & + \varphi_3 SWITCH * POST\_AR_{i,t} + \varphi_4 BTM_{i,t} + \varphi_5 SIZE_{i,t} \\ & + \varphi_6 TOP10_{i,t} + \varphi_7 BIG4_{i,t} + \varphi_8 LEV_{i,t} + \varphi_9 ROA_{i,t} \\ & + \varphi_{10} INVREC_{i,t} + \varphi_{11} LOSS_{i,t} + \varphi_{12} LIQUIDITY_{i,t} \\ & + \varphi_{13} PRIVATE_{i,t} + \varphi_{14} ABNORMALACCRUALS_{i,t} \\ & + \varphi_{15} CROSSUS_{i,t} + \varphi_{16} CROSSOTH_{i,t} \\ & + Industry\ \ Fixed\ \ Effects + Year\ \ Fixed\ \ Effects + \varepsilon_{i,t} \end{aligned} \tag{4}$$

Please see the Appendix for detailed variable definitions. *RESTATEMENT* equals 1 if the client restates its financial statements for year *t*, and 0 otherwise. MOA equals 1 if the client receives a modified audit opinion in year *t*, and 0 otherwise. *POST_AR* equals 1 if the client is audited by a PCAOB-registered audit firm after the firm registers with the PCAOB, and 0 otherwise. As with Eqs. (1) and (2), we estimate Eqs. (3) and (4) using the full sample and the pre-post sample described earlier.

The coefficient δ_1 (φ_1) on *POST_AR* indicates the change in the likelihood of a restatement (modified audit opinion) from before to after the audit firm's registration with the PCAOB. The control variable *ABNORMALACCRUALS* is the signed value of abnormal accruals. All other control variables are as defined earlier.

Panel A of Table 9 presents the estimated coefficients for Eq. (3), which relates PCAOB registration to the likelihood of a restatement. The results in column (1) indicate a significant negative relationship between PCAOB registration and the likelihood of a restatement for the full sample. This reduction in the likelihood of a restatement after registration provides further support for H1. As expected, a restatement is more likely for clients with higher levels of signed abnormal accruals.

Panel B of Table 9 presents the estimated coefficients for Eq. (4), which relates PCAOB registration to the likelihood of receiving a modified audit opinion. The results in column (2) show a significant negative relationship between PCAOB registration and the likelihood of receiving a modified audit opinion for the pre-post sample. This reduction in the likelihood of receiving a modified audit opinion for continuing clients provides further support for H1. As expected, and in concurrence with the results in Panel A, a modified audit opinion is more likely to be issued to clients with higher levels of signed abnormal accruals.

4.7.3. Signed abnormal accrual analysis

As indicated earlier, prior research finds that positive abnormal accruals are a sign of earnings management (Becker et al., 1998; Krishnan, 2003). If PCAOB registration does improve audit quality by restraining earnings management, then by limiting the sample to either positive abnormal accruals or negative abnormal accruals, we can examine whether the negative relationship between PCAOB registration and the absolute value of abnormal accruals documented in Table 3 is attributable mainly to a reduction of positive abnormal accruals or to an increase in negative abnormal accruals.

We re-estimate Eq. (1) using only company-years with positive abnormal accruals or only company-years with negative abnormal accruals. The (untabulated) results of this analysis show a significant reduction in positive abnormal accruals after registration for both the full sample and the pre-post sample. When we use only company-years with negative abnormal accruals, the (untabulated) results show a significant reduction in negative abnormal accruals after registration only for the pre-post sample but not for the full sample.

The results of this additional analysis show that the reduction in abnormal accruals documented in Table 3 is predominantly a result of a decrease in aggressive earnings management and provide further support for H1. Interestingly, the results

Table 9
Relation between PCAOB registration and alternate measures of audit quality.

Panel A: Restatement		
	(1)	(2)
Intercept	−5.2338	−8.0693
POST_AR	−0.4241**	−0.3557
SWITCH	−0.0623	−0.1597
SWITCH*POST_AR	0.5373	0.9383
BTM	0.2249	0.0817
SIZE	−0.0466	0.0877
TOP10	−0.1967*	−0.2093
BIG4	−0.2692	−0.0952
LEV	0.4843	−2.0815**
ROA	−0.6644	−0.6680
INVREC	−0.1025	−0.4215
LOSS	0.3165	0.8780**
MAO	0.1527	−0.1474
PRIVATE	−0.0329	−0.0113
ABNORMALACCRUALS	1.1956**	3.4074***
CROSSUS	−3.7510	−3.7879
CROSSOTH	−0.0790	0.1654
Industry Fixed	Yes	Yes
Year Fixed	Yes	Yes
Pseudo R-Square	0.0404	0.0634
Observations	4,192	1,514
Panel B: Modified Audit Opinion		
	(1)	(2)
Intercept	4.8180***	4.9092***
POST_AR	−0.1247	−0.5204**
SWITCH	−0.1574	−0.1727
SWITCH*POST_AR	0.3817*	0.4754
BTM	−0.1520	−0.5212**
SIZE	−0.3855***	−0.3202***
TOP10	−0.0216	0.0822
BIG4	0.2555	0.4173
LEV	−1.1180**	−0.6743
ROA	−3.9336***	−3.6412***
INVREC	−1.0221***	−1.5176***
LOSS	0.5898***	0.7751***
LIQUIDITY	−0.2730***	−0.4229***
PRIVATE	0.0437	0.0317
ABNORMALACCRUALS	2.4534***	2.6637***
CROSSUS	−3.5103	1.8154
CROSSOTH	0.5220**	−0.1897
Industry Fixed	Yes	Yes
Year Fixed	Yes	Yes
Pseudo R-Square	0.1461	0.1896
Observations	4,192	1,514

Notes: The dependent variable in panel A is restatement; the dependent variable in panel B is modified audit opinion. Panel A estimates Eq. (3); panel B estimates Eq. (4). Column (1) includes client firms that are audited by a PCAOB-registered audit firm. Column (2) includes client firms that are audited by a PCAOB-registered audit firm for at least one year before registration and at least one year after registration. *, **, and *** indicate significantly different from zero two-tailed at 10%, 5%, and 1% respectively.

from the negative abnormal accruals analysis indicate that for the pre-post sample there is also a reduction in negative abnormal accruals. This finding implies that, for the pre-post sample, PCAOB-registered audit firms experienced a general reduction in both positive and negative abnormal accruals after registration.

We also re-estimate Eq. (1) using the extended years sample presented in Table 5 using only company-years with positive abnormal accruals or company-years with negative abnormal accruals. The results of this analysis show a significant reduction in positive abnormal accruals during the period after PCAOB registration, indicating that over the long-term PCAOB-registered auditors are associated with a reduction in upward earnings management. This additional analysis does not show

a significant reduction in negative abnormal accruals after PCAOB registration. This result indicates that the initial across-the-board reduction in abnormal accruals documented for the period right after registration does not continue for clients with negative abnormal accruals.

Additionally, we re-estimate Eq. (1) using the continuing clients sample presented in Table 7, using only company-years with positive abnormal accruals or company-years with negative abnormal accruals. Consistent with the signed abnormal accruals results for the full sample and the pre-post sample, after registration, there is a reduction in positive abnormal accruals and further reduction in negative abnormal accruals for continuing clients.

5. Conclusion

Although there is a growing literature on the determinants of the PCAOB inspection process and its impact on audit quality, there is a paucity of research related to the PCAOB registration process (Abernathy et al., 2013). Our study is an attempt to fill this gap. Specifically, we investigate the implications of audit firms' PCAOB registration for audit quality and audit, fees in China, where the PCAOB is not allowed to inspect registered firms.

We document that audit firms that register with the PCAOB exhibit higher audit quality. We argue that registration may result in audit firms improving their knowledge and expertise to comply with international quality controls. The simultaneous increases in audit fees and audit quality post-registration suggest that Chinese client firms perceive value in associating with PCAOB-registered audit firms and are willing to pay a premium for the validation of the reliability of their financial statements that such reputational bonding provides. Our results concur with auditor reputation theory, which suggests that in the absence of auditor litigation risk, auditor reputation becomes a major motivation for audit firms to maintain high audit quality (Ball, 2009; Weber et al., 2008; Srinivasan et al., 2014).

In a meta-analysis, Hay et al. (2006) outline the factors that can impact audit fees. Our research contributes to this line of research by suggesting that auditors associated with an international regulatory body that has a reputation for stringent standards of audit quality can charge a fee premium without any assurances that their audit quality is actually higher. We find that auditors nevertheless maintain higher audit quality when they are registered with the PCAOB. Based on our results, we infer that audit firms likely increase their audit efforts because of registration with the PCAOB, which in turn leads to increased fees. There is evidence that SOX led to increased audit fees in the U.S. (Choi et al., 2009; Griffin and Lont, 2011). Our research shows that there is an international impact on audit fees in China, via PCAOB registration. We conclude that the Chinese audit firms improve their reputation via association with the PCAOB.

The results of our study may be informative to those already invested in or interested in investing in Chinese listed companies. Due to the sustained improvement in audit quality for PCAOB-registered auditors, investors may be less skeptical of the financial information provided by companies with registered auditors. Since prior research finds that the PCAOB inspections also improve audit quality (Lamoreaux, 2016; Fung et al., 2017), Chinese regulators may want to reconsider their stance on not allowing the PCAOB to inspect registered audit firms. If registration alone provides sustained improvement in audit quality, allowing inspections could provide greater assurance to investors worldwide of the reliability of Chinese companies' financial reporting.

Our results may also be relevant for private U.S. client firms. Given that these firms are not listed on U.S. stock exchanges, they are not required to be audited by PCAOB-registered auditors. However, our research can advise private clients that they may have better audit quality with PCAOB-registered audit firms. Audit firms may also attract private clients by signaling higher audit quality by registering with the PCAOB (Abernathy et al., 2013).

Our results are also useful for those PCAOB-registered audit firms in jurisdictions that allow inspections, but which never audit an SEC client. Thus, these registered audit firms are not subject to inspections, even when they are in jurisdictions that allow inspections. Our results suggest that these audit firms may benefit from registering with the PCAOB, even though their clients do not require PCAOB registration. Finally, our study informs the PCAOB and other regulatory bodies that registration alone with an entity known for enforcing stringent auditing standards is associated with improvement in the registering firm's audit quality.

None

Data availability

All data used in the study are publicly available from the sources cited.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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None.

Appendix

See Table A1.

Table A1
Variable Definitions.

Variable	Definition
|ABNACC|	Absolute value of abnormal accruals
LNFEES	The natural log of total audit fees paid by client firm in '000 RMB
RESTATEMENT	1(client restates financial statements); 0(client does not restate financial statements)
POST_AR	1(year after audit firm registers with PCAOB); 0(year of PCAOB registration and prior)
POSTREG	1(auditor is registered with PCAOB and the year is after the identified year where one or more audit firms register with the PCAOB); 0 (auditor is not registered with PCAOB and/or the year is before the identified year where one or more audit firms register with the PCAOB)
SWITCH	1(client firm has different auditor than prior year); 0(client firm has same auditor as prior year)
BTM	The book value of stockholders' equity divided by market value of stockholders' equity
SIZE	The natural log of total assets
TOP10	1(audit firm is one of the top 10 audit firms in China); 0(audit firm is not one of the top 10 audit firms in China)
BIG4	1(audit firm is affiliated with a Big 4 audit firm); 0(audit firm is not affiliated with a Big 4 audit firm)
LEV	Long-term liabilities to total assets
ROA	Net income to total assets
INVREC	Sum of inventory and receivables to total assets
CFO	Cash flow from operations scaled by total assets
MAO	1(client firm is issued a modified audit opinion); 0(client firm does not receive a modified audit opinion)
PRIVATE	1(client firm is privately owned); 0(client firm is owned by the government)
AGE	The number of years since company was first listed
CROSSUS	1(client firm is cross listed on a US stock exchange); 0(client firm is not listed on a U.S. stock exchange)
CROSSOTH	1(client firm is listed on a stock exchange outside of China other than the U.S.); 0(client firm is not listed on a stock exchange outside China other than the U.S.)
LIQUIDITY	The current ratio calculated as current assets divided by current liabilities
GOINGCONCERN	1(client firm is issued a going concern report); 0(client firm is not issued a going concern report)
FOREN	1(client firm has operations outside China); 0(client firm does not have operations outside China)
REGISTER	1(auditor is registered with PCAOB); 0 (auditor is not registered with PCAOB)
POST	1(the year is after the identified year where one or more audit firm registers with the PCAOB); 0(the year is before the identified year where one or more audit firms register with the PCAOB)

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