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Corporate Governance: The International Journal of Business in Society
Audit Quality Following the Public Company Accounting Oversight Board's Operation
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Audit Quality Following the Public Company Accounting Oversight Board's Operation

Abstract

Purpose – *The purpose of this paper is to investigate the extent to which the transition from self-regulation to heteronomy has changed the gap in audit quality between Big Four and non-Big Four auditors.*

Design/methodology/approach – *This study analyses publicly held companies in the United States between 1999 and 2012 using univariate analysis, multivariate analysis, and quantile regression analysis. Audit quality is measured with discretionary accruals.*

Findings – *This study shows an insignificant difference in audit quality between the clients of Big Four and non-Big Four auditors after Public Company Accounting Oversight Board (hereafter, PCAOB) began its operations. In the analysis of the effects of PCAOB inspections on the audit quality of audit firms that are inspected annually and triennially, the findings show that the inspections have more positive effects when carried out annually. This suggests that that the frequency of inspection is positively associated with audit quality. Overall, these results provide evidence that recent improvements in audit quality have been caused by changes in regulatory standards*

Originality/value – *The paper provides three major original contributions. First, we add to the literature on audit quality by further demonstrating a reduced gap in audit quality between Big Four and non-Big Four audit firms due to heteronomy. Secondly, this study contributes to the debate as to whether independent inspections on audit firms are beneficial or not, and suggests that the PCAOB inspections help increase audit quality. Finally, the results of this work contribute to the growing literature examining discretionary accruals.*

Keywords *Auditor Size; Audit Quality; Sarbanes Oxley Act of 2002; PCAOB*

Paper type *Research paper*

Audit Quality Following the Public Company Accounting Oversight Board's Operation

1. Introduction

The purpose of the study is to investigate the extent to which the transition from self-regulation to heteronomy has reduced the gap in audit quality between Big Four and non-Big Four auditors. We address whether the Public Company Accounting Oversight Board (hereafter, PCAOB) has reduced the gap in audit quality between Big Four and non-Big Four auditors. Specifically, we shed light on the audit quality in reducing accruals management. Although auditor reporting decisions, *ex ante* cost-of-equity capital, and analyst forecast accuracy are arguably cleaner measures of audit quality than are discretionary accruals, we consider discretionary accruals an appropriate measure because they are most relevant to PCAOB inspections.

This work fills a gap in the current literature on audit quality. The quality of the work of external auditors was criticized sharply after Enron bankruptcy in 2001 and the collapse of Arthur Andersen in 2002. This criticism motivated regulatory changes in the United States, and led to the implementation of Sarbanes–Oxley Act of 2002 (hereafter, SOX) (Francis, 2004). The main provisions of this Act regarding auditors include the prohibition of certain consulting engagements for audit clients, and the establishment of a PCAOB. PCAOB performs inspections annually for firms that audit at least 100 public companies, and triennially for those auditing one hundred or fewer public companies. In March, 2008, the Center for Audit Quality (CAQ) conducted a survey of the audit committee members[1]. The results of this survey showed that eighty two percent of the subjects felt that audit quality had been improved in recent years, and fifty eight percent felt that SOX had had a positive influence on audit quality. Using different proxies for

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[1] See
http://www.google.com.tw/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&cad=rja&ved=0CDM
QFjAA&url=http%3A%2F%2Fwww.thecaq.org%2Fnewsroom%2Fpdfs%2Fauditsurvey.pdf&ei=b8KUUf
CFOMfxkAX3xYGIBg&usg=AFQjCNEXoyNlJWWvGYOQaMPnUZRXW-jPFA

audit quality, the academic literature has also made great efforts to determine whether or not SOX has had any positive effects. To the best of our knowledge, however, little of prior studies has investigated whether SOX has different effects on the audit quality of Big Four and non-Big Four auditors, and it is this gap in the literature that the current work seeks to address.

Our study is potentially relevant to recent calls for research on whether changes to the institutions responsible for monitoring audit firms have proven beneficial (DeFond and Francis, 2005; Nelson, 2006). Many academic studies have found that larger accounting firms provide higher quality audits[2]. The primary argument made by these studies to explain these results is based on the idea that big audit firms have more valuable reputations that they need to protect, are more independent, and have access to more skills capacity and technical expertise. However, while big audit firms dominate the audit market, there are still a surprisingly large number of publicly held companies that choose to be audited by domestic and regional audit firms. A survey conducted by GAO (2008) revealed the important role played by smaller audit firms in the audit market, especially with regard to smaller companies. The results of this survey showed that the largest audit firms audited 98 percent of 1,500 the largest publicly held companies—those with annual revenues of more than $1 billion. In contrast, midsize and smaller audit firms audited almost 80 percent of the 3,600 smallest companies—those with annual revenues of less than $100 million, a finding that was echoed by the PCAOB (2008). However, there is as yet no conclusion in the literature as to whether or not SOX has narrowed the gap in audit quality between big and smaller audit firms, and this is the issue the current study addresses.

We use discretionary accruals, as developed by Jones (1991), as the proxy for audit quality. Because income-increasing earnings manipulations are likely to be reversed in future years and to yield a high absolute value, the use of the absolute value reduces the power of the test. Following Dechow et al. (2011), we studentize the discretionary accruals to mitigate potential effects from the revision of income-increasing earnings management. In addition to income-increasing accruals, we examine the variations in

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[2] See DeAngelo (1981); Simunic and Stein (1987); Francis and Wilson (1988); Davidson and Neu (1993); Becker et al. (1998); Ferguson and Stokes (2003); Francis (2004); Choi et al (2008); Francis and Yu (2009); Lawrence et al (2011)

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discretionary accruals, and conduct both univariate analysis and multivariate analysis. We also perform quantile regression analysis to estimate the median coefficients, because these are more robust against outliers, compared to the ordinary least squares regression (Koenker and Bassett, 1978; Koenker, 2004).

Using a sample of US firms between 1999 and 2012, we find an insignificant difference in discretionary accruals between the clients of Big Four and non-Big Four auditors after PCAOB began its operations. More specifically, examining the impact of the PCAOB inspections on the audit quality of audit firms that are inspected annually and triennially, we find that the inspections have more positive effects when carried out annually, suggesting that the frequency of inspection is positively associated with audit quality. In the robustness analysis, we show that our findings are not driven by different discretionary accrual proxies and client portfolios. Overall, these results provide evidence that recent improvements in audit quality have been caused by changes in regulatory standards.

We add to the literature on audit quality (e.g., DeAngelo, 1981; Simunic and Stein, 1987; Francis and Wilson, 1988; Palmrose, 1988; DeFond, 1992; Teoh and Wong, 1993; Becker et al., 1998) by further demonstrating a reduced gap in audit quality between Big Four and non-Big Four audit firms due to heteronomy. In addition, we contribute to the debate as to whether independent inspections on audit firms are beneficial or not, and conclude that direct inspections helps increase audit quality. Similar to the debate as to whether deregulation of the financial sector has led to financial crises, the peer review program has invited criticisms of putting form over substance. In spite of the great efforts made to improve audit quality carried out by the American Institute of Certified Public Account (AICPA), self-regulation appears to have repeatedly failed, and thus government intervention may have positive effect on the capital markets. The results of this work also contribute to the growing literature examining discretionary accruals.

The rest of the paper is organized as follows: The next section discusses the impact of SOX on auditors, and reviews the related research. Section three develops the predictions and explains the research design. The results are then presented in section four, while conclusions are given in the final section of the paper.

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2. The impact of sox on audit quality and related research

2.1 Provisions relating to auditors under SOX

The U.S. Congress passed the Sarbanes-Oxley Act of 2002 in response to concerns about corporate accountability arising from the Enron bankruptcy. This Act contains a number of provisions that aim to enhance corporate responsibility, strengthen financial disclosures, reduce analyst conflicts of interest, and affect the structure and governance of the public accounting profession.

The principal parts of SOX related to auditors are the Act's independence provisions and the creation of the PCAOB (Cullinan, 2004). The independence provisions restrict auditors from conducting certain consulting services for their audit clients, such as information systems design and evaluation services, which may involve the auditors in future assessments of their own work. The reasoning for this is that if auditors are more independent of the processes underlying their clients' financial statements, they may be more able to objectively recognize problems in them.

The PCAOB[3] is empowered to investigate and discipline public accounting firms and public accountants. In setting audit standards, the Board of PCAOB may decide to adopt those set by the Auditing Standards Board or to create its own criteria. The introduction of the PCAOB undid over 50 years of professional self-regulation by removing the accounting profession from the authority to set standards and to monitor how they are applied (DeFond and Francis, 2005). For example, SOX requires the PCAOB to be involved in a peer review program. Any AICPA member firm that audits publicly held companies is required to belong to the SEC Practice Section (SECPS), and to become subject to peer review once every three years. The self-regulated peer review program has remained in place after SOX, and both the PCAOB and peer reviewers issue reports about the quality of audit firms. The major differences between the PCAOB and peer review programs lies in the fact that audit firms are required to undergo peer reviews every three years, while PCAOB inspections are performed annually for firms that audit

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[3] The PCAOB is funded independently of the SEC, but the SEC has regulatory oversight of the PCAOB, including the appointment of board members. The functions of the Board include the creation or adoption of standards on auditing, quality control, and ethics, as they relate to the audits of public companies.

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more than 100 public held companies and triennially for those auditing 100 or fewer than 100 publicly held companies (PCAOB Rule 4003)[4].

2.2 PCAOB inspections

PCAOB's inspections are designed to identify and address weaknesses and deficiencies related to how an accounting firm conducts audits (PCAOB, 2007). In terms of PCAOB inspection reports, the inspection teams pay attention to important areas, including revenue, related party transactions, equity transactions, business combinations and impairment of assets, going concern considerations, loans and accounts receivable, service organizations, use of other auditors, use of the work of specialists, independence, and concurring partner reviews.

Inspection areas relevant to accruals management are revenue and loans and accounts receivable. PCAOB inspectors keep a close watch on deficiencies regarding accounting firms' testing of their clients' recognition of revenue, which include the firms' failure to (a) perform any or adequate substantive procedures to test the existence, completeness, and valuation of revenue; (b) review representative contracts or appropriately evaluate the specific terms and provisions included in significant contractual arrangements; (c) test whether revenue was recorded in the appropriate period; or (d) test the assertions related to revenue, such as accounts receivable and inventory. The inspection items relating to loans and accounts receivable include the accounting firms' failure to (a) comply with the confirmation process under AU Section 330 of the Statements on Auditing Standards (SAS); (b) test the allowances for doubtful accounts or loan losses; (c) perform sufficient procedures to conclude whether the allowance for loan losses was reasonable; or (d) evaluate management's estimate of the allowance for doubtful accounts.

The PCAOB inspections mainly involve: (1) evaluating the quality of the audit work performed on a specific audit; (2) reviewing the auditor's practices, policies and procedures related to audit quality. Audit deficiencies related to (1) are disclosed in the PCAOB inspection report; however, defects related to (2) are discussed in the nonpublic

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[4] See Rule 4003. Frequency of Inspections, PCAOB.

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portion of this report, and remain nonpublic unless the firm fails to address them to the Board's satisfaction within 12 months (Gunny and Zhang, 2009).

The PCAOB inspection process is different from the peer review process in a number of ways (Carcello et al., 2011). First, PCAOB inspectors are more likely to be independent than the peer reviewers, as the inspected firms are not allowed to choose which inspectors are assigned to their engagement. In contrast, under the peer review program the reviewed audit firm could choose which firm would perform the peer review. Second, the PCAOB inspection process is more thorough than the peer review process. The PCAOB has its own budget, and thus has the resources needed to conduct more thorough firm inspections. Under an AICPA-sponsored peer review, the fees associated with the actual peer review are negotiated between the peer reviewer and the reviewed firm. Third, the PCAOB inspection process is more extensive than the peer review process. The PCAOB inspection teams can inspect all of a firm's engagements, while under the peer review program those that are subject to litigation or enforcement actions are not examined. Fourth, the scope of a PCAOB inspection is greater than the scope of a peer review, with the inspection teams of the former reviewing: (1) the firm's quality control guidelines, and the firm's compliance with generally accepted accounting principles (GAAP), PCAOB auditing standards, and Securities and Exchange Commission (SEC) rules; (2) firm management, including how employees are selected, trained, monitored, and rewarded; and (3) a large sample of audit engagements. Under the peer review program, the peer reviewer focuses on: (1) reviewing the reviewed firm's compliance with quality control systems; (2) interviewing certain staff members; and (3) reviewing work papers, reports, and correspondence for a small sample of engagements.

2.3 Related research

A number of studies have linked higher audit quality to larger audit firm size (DeAngelo, 1981; Simunic and Stein, 1987; Francis and Wilson, 1988; Davidson and Neu, 1993; Becker et al., 1998; Ferguson and Stokes, 2003; Francis, 2004; Choi et al, 2008; Francis and Yu, 2009; Lawrence et al, 2011). The most popular surrogate for audit quality is an indicator variable for Big N/non-Big N membership (Nichols and Smith,

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1983; Simunic and Stein, 1987; Palmrose, 1988; Francis and Wilson, 1988; DeFond, 1992; DeFond and Jiambalvo, 1991; DeFond and Jiambalvo, 1993; Davidson and Neu, 1993; Becker et al., 1998). The larger client base of Big N auditors means that they have more at risk in the event of a loss of reputation. This larger potential loss increases the incentive to be independent, as compared to non-Big N auditors that have a much smaller client base.

Using a sample of firms in the year 1993, Becker et al. (1998) argued that Big N auditors tend to reduce income-increasing earnings management and allow less accounting flexibility, because the risk of damaging their brand-name reputation is greater with regard to income-increasing discretionary accruals. Consistent with their arguments, Becker et al. (1998) found that firms audited by non-Big Six auditors report relatively higher discretionary accruals and lower absolute values of discretionary accruals compared to those audited by Big Six auditors.

Nelson et al. (2002) provided more direct evidence related to managers' earnings management decisions and auditors' concerns about these. Using field - based questionnaires for a sample of 253 auditors from a Big 5 audit firm in 1998, they found that managers tended to make attempts at earnings management that increased current-year income, but the auditors tended to oppose these efforts. Their findings also showed that managers are more likely to make attempts that decrease current-year income when accounting standards are imprecise, and that auditors are more likely to adjust earnings management attempts they consider material and those made by smaller clients.

A number of post-SOX empirical studies have shed light on the impact of this Act on earnings management from the companies' point of view. Using a sample of firms for the period 1987 to 2005, Cohen et al. (2008) investigated the prevalence of both accruals-based and real earnings management activities in the period leading to the passage of SOX and in the period following it. They found that accruals-based earnings management declined after SOX, with managers shifting to real earnings management. Cohen and Zarowin (2010) noted that this shift implies a greater need to avoid detection of accruals-based earnings management in the post-SOX period, inducing managers to move to real earnings management activities instead.

More recently, Lawrence et al. (2011) provided a springboard for rethinking the relation between auditor size and audit quality. Using a sample of firms between 1988 and 2006, they examined whether differences in the proxies for audit used by Big 4 and non-Big 4 audit firms could be a reflection of their respective clients' characteristics. They found the effects of using Big 4 auditors were insignificantly different from those of using non-Big 4 auditors with respect to discretionary accruals, the *ex ante* cost-of-equity capital, and analyst forecast accuracy. Their findings indirectly support the view that the Big 4 distinction may reflect client rather than auditor characteristics.

3. Predictions and research design

3.1 Predictions

This work mainly examines the issue of audit quality after the PCAOB began its operations. Accruals management involves making certain decisions within GAAP in order to obscure or mask a firm's true economic performance (Dechow and Skinner, 2000). The types of accruals used to achieve this include using increasing or decreasing estimates of bad debt reserves, warranty costs, and inventory write-downs. Because accruals are allowed under GAAP, managers are less likely to give up favorable accounting choices in the course of negotiations with their auditors. Instead, managers' final decisions with regard to the amounts reported in financial statements hinge upon the auditors' findings, and their attitudes toward any accruals that they uncover.

PCAOB inspections benefits audit quality in three ways. First, independent inspections provide a solution to the otherwise potentially incestuous peer review process (Lennox and Pittman, 2010), with "you scratch my back, I'll scratch yours" being the prevailing, cynical view of such reviews, as raised by members of Congress, the media and others (The Public Oversight Board, 2002). A good example, highlighted by DeFond and Francis (2005), is that Deloitte & Touche issued a clean peer review report on Arthur Andersen shortly before Enron's collapse. In this regard, PCAOB inspection teams are more likely to faithfully report the material weaknesses and give more insightful feedback. Second, PCAOB inspections enhance the transparency of audit work and make

auditors more cautious of their clients' accruals management. PCAOB, a semi-governmental institute, has more power than AICPA with regard to urging audit firms to be more co-operative in the course of the inspection process. Third, professional PCAOB inspection teams have better capabilities with regard to detecting deficiencies, and full-time inspectors have more time to look into firms' quality control system and examine material issues. This view was supported by Hermanson et al. (2007), who found that PCAOB inspectors are able to catch some of the more serious audit failures, such as insufficiently substantive testing and deficiencies in auditor's tests of control, and their inspections resulted in restatements of the clients' audited financial statements.

There are some disadvantages to being inspected by the PCAOB. First, audit firms that audit publicly held clients have to forgo self-regulation, and thus cannot freely pick favorable peer reviewers (Fogarty, 1996). Second, questions have been raised about the professional abilities of some PCAOB inspection teams. In contrast, peer reviewers are considered to be more familiar with the reviewed firms' industry than the PCAOB inspectors, and have the professional knowledge needed to give the reviewed firms insightful comments. In contrast, PCAOB inspection teams need more time to study the inspected firms and to gain enough industrial knowledge to draw useful conclusions. Third, PCAOB inspections impose additional burdens on accounting firms' daily operations. In addition, a greater frequency of inspection may unduly disrupt the inspected firms' usual activities. Moreover, the semi-governmental nature of PCAOB offers more incentives for the inspected firms to take the deficiencies that are uncovered more seriously, which thus imposes additional costs.

Our first prediction is that clients of the inspected firms report lower abnormal accruals following the full PCAOB inspections. Although concerns exist about the effectiveness of the PCAOB inspection process, we believe the benefits from independent inspection exceed the costs. This is mainly because the PCAOB inspection team offers an independent inspection report that pinpoints material deficiencies of the reviewed accounting firms in sufficient detail. In addition, PCAOB may disclose quality-control defects or criticisms if the inspected firm fails to remediate those defects or criticisms within one year, which is a powerful incentive for the inspected firms to take action. Therefore, we expect that the actions of the PCAOB play a major role in constraining

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earnings management by improving audit firm performance. Specifically, we expect that the extent to which discretionary accruals decline following PCAOB inspections is more pronounced for clients of the Big Four audit firms than those of other firms. This is because that most of the clients of Big Four audit firms are multinational corporations, have more complicated transactions, and are expected to have higher error rates. As a result, PCAOB inspections can help improve the inspected audit firms' procedures. In contrast, clients of smaller audit firms are generally domestic companies, have simpler transactions, and are subject to triennial inspections. Although Lennox and Pittman (2010) suggested that PCAOB inspectors may more thoroughly examine the engagements of smaller accounting firms, we predict that the effect of PCAOB inspections with regard to reducing accrual-based earnings management is limited to the smaller audit firms.

The second prediction is that SOX reduces the difference in audit quality between Big Four and other auditors. We expect that clients of smaller auditors benefit more from the SOX than those of big auditors. This is because they are generally considered as having higher discretionary accruals, and the Act helps reduce managers' incentives to manipulate accruals, which thus narrows the difference in audit quality between the Big Four and other auditors. PCAOB teams can further reduce this gap by conducting qualitative inspections. Accordingly, we expect an insignificant difference in discretionary accruals between the clients of Big Four and non-Big Four auditors following the establishment of the PCAOB.

3.2 Sample selection

We focus on three years before and after the enactment of SOX to rule out other economic factors and regulation changes that may affect audit quality with regard to reducing accruals-based earnings management (Barth et al., 2012). Using data from the COMPUSTAT database over a sample period 1999-2012, we compare the discretionary accruals of sample firms with non-Big Four auditors to those of a sample of firms with Big Four auditors. Our research design is mainly based on Becker et al. (1998). We exclude unaudited firms, firms that were audited by Arthur Andersen before its collapse, as well as firms that changed their auditors during the sample period, to maintain

independence between the samples with and without Big Four auditors. We exclude financial institutions with Standard Industrial Classifications (SICs) between 6000 and 6999, because computing discretionary accruals for these firms is problematic. Utility companies (SICs between 4000 and 4999) are also excluded, because regulation may result in their incentives to manage earnings being different from those in unregulated industries.

We also eliminate firms with insufficient data to compute discretionary accruals, and those that changed fiscal year-ends during the period of analysis. We eliminate 151 observations because their ratio of total liabilities to total assets was above ten, of which 132 observations were audited by Big Four auditors and 19 observations by non-Big Four auditors[5]. Finally, in an attempt to increase comparability, we eliminate Big Four (non-Big Four) clients that did not have at least one non-Big Four (Big Four) counterpart in the same year, industry (two-digit SIC code), and decile of operating cash flows. Comparability across years and industry is desirable, because discretionary accruals are likely to vary across time and by industry. Comparability across cash flow deciles is desirable because the model in Jones (1991), which we use to estimate discretionary accruals, may be sensitive to extreme measures of cash flows (Dechow et al., 1995). The sample selection procedure is not a matched sample design. Instead, the constraints on year, industry, and cash flow are employed in an attempt to induce a reasonable amount of comparability across the Big Four and non-Big Four samples. Because Big Four clients vastly outnumber non-Big Four clients in the COMPUSTAT database, a one-to-one match does not yield a sample that is reflective of the population. The main result (that Big Four auditors have lower discretionary accruals) is not dependent on the sample selection procedure. The results hold even when we use the full population of COMPUSTAT firms. This sample selection procedure yields a sample of 27,924 firm year observations audited by Big Four auditors and 3,036 firm year observations audited by non-Big Four auditors.

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[5] The main results remain unchanged if these extreme values are included.

3.3 Research design

3.3.1 Estimation of discretionary accruals

We examine the behavior of total discretionary accruals in an attempt to capture the net effect of all accounting choices that impact reported income. We measure discretionary accruals using the cross-sectional variation of the Jones (1991) accruals estimation model reported in DeFond and Jiambalvo (1994). The model estimates "normal" accruals as a function of changes in revenue and in the levels of property, plant, and equipment. These variables control for changes in accruals that are due to changes in the firm's economic conditions (as opposed to accrual manipulation). The change in revenue is included because changes in working capital accounts, part of total accruals, depend on changes in revenue. Property, Plant, and Equipment is used as a parameter to control for the portion of total accruals related to nondiscretionary depreciation expenses. The portion of total accruals unexplained by normal operating activities is discretionary accruals. Total accruals are measured using COMPUSTAT data, and are defined as income before extraordinary items minus operating cash flow. Industry membership is assessed using two-digit SIC codes, and ordinary least squares is used to obtain industry-specific estimates of the coefficients in equation (1). Discretionary accruals are defined as the residuals from equation (1). Because income-increasing earnings manipulations are likely to be reversed in future years and to yield a high absolute value, the use of the absolute value reduces the power of the test. To mitigate this problem, we follow Dechow et al. (2011) and employ studentized residuals as the proxy for abnormal earnings management.

$$\frac{TA_{tij}}{A_{t-1,ij}} = \alpha_0 \left[\frac{1}{A_{t-1,ij}} \right] + \alpha_1 \left[\frac{\Delta REV_{tij}}{A_{t-1,ij}} \right] + \alpha_2 \left[\frac{PPE_{tij}}{A_{t-1,ij}} \right] + \varepsilon \qquad (1)$$

where TA_{tij} refers to total accruals in year t of the ith firm in the jth industry, measured as the difference between income before extraordinary items and cash flow from operations in year t. $A_{t-1,ij}$ refers to total assets at the beginning of year t of the ith firm in the jth industry. ΔREV_{tij} refers to the revenues in year t less the revenues in year t-1 of the ith firm in the jth industry. PPE_{tij} refers to gross property, plant, and equipment at the end of

the year *t* of the *j*th firm in the *j*th industry.

3.3.2 Approach to testing

The purpose of our analysis is to compare discretionary accruals across the Big Four and non-Big Four samples. In addition to univariate tests, our primary analysis is a multivariate test that controls for potential differences across the sample groups that may confound simple univariate comparisons. In the multivariate analysis, discretionary accruals are regressed on a dummy variable indicating auditor type, or dummy variables indicating sub-periods, and several control variables. Operating cash flows are included in the multivariate regressions. We also include the log of total assets to control for the potential effects of size on the choice of discretionary accruals. To control for the possible effects (either positive or negative) of high leverage on our results, we include a dummy variable that measures whether or not the sample firm falls in the highest decile of leverage for COMPUSTAT firms in the same industry during the year of interest (Becker et al., 1998). To control for the possibility that firms with larger absolute values of total accruals also have larger discretionary accruals, and because the absolute value of total accruals differs across our samples, we include the absolute value of total accruals as a control variable in our multivariate test. Prior studies suggest that managers manage earnings upward in response to incentives related to selling personal holdings as part of subsequent equity offerings (Rangan, 1998; Teoh et al., 1998). It is also conceivable that managers have incentives to manage earnings downward in response to share repurchases and seasoned equity offerings (Beneish, 1997; Teoh et al., 1998). Therefore, to capture incentives with respect to stock transactions, we include dummy variables indicating whether the outstanding shares have increased or decreased by ten percent or more. We include return on assets to control for firm performance (Kothari et al., 2005).

Model (2) examines whether PCAOB full inspections improve audit quality with regard to reducing earnings management. We run separately Model (2) with Big Four clients and non-Big Four clients. We expect a negative sign on *POSTPCAOB* if PCAOB full inspections are effective in enhancing audit quality.

Model (3) examines whether non-Big Four clients still report relatively higher discretion accruals than Big Four clients after full PCAOB inspections. We expect the

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coefficient on *NB4*POSTPCAOB* to be insignificant if PCAOB's full inspections reduce the difference in audit quality between Big Four and non-Big Four auditors.

$$DA_{tij} = \beta_0 + \beta_1 PREPCAOB + \beta_2 POSTPCAOB + \beta_3 OCF_{ti} + \beta_4 ASSETS_{ti} + \beta_5 HILEV_{ti}$$
$$+ \beta_6 ABSACC_{ti} + \beta_7 SHAREINCR + \beta_8 SHAREDECR + \beta_9 ROA_{ti} + \varepsilon$$

(2)

$$DA_{tij} = \gamma_0 + \gamma_1 NB4 + \gamma_2 PREPCAOB + \gamma_3 POSTPCAOB + \gamma_4 NB4 * POSTPCAOB$$
$$+ \gamma_5 OCF_{ti} + \gamma_6 ASSETS_{ti} + \gamma_7 HILEV_{ti} + \gamma_8 ABSACC_{ti} + \gamma_9 SHAREINCR$$
$$+ \gamma_{10} SHAREDECR + \gamma_{11} ROA_{ti} + \varepsilon$$

(3)

where *DA_{tij}* refers to discretionary accruals in year *t* of the *i*th firm in the *j*th industry. *PREPCAOB* refers to an indicator variable that equals one if the firm's fiscal year is between 2002 and 2003, and 0 otherwise. *POSTPCAOB* is an indicator variable that equals one if the firm's fiscal year is after 2004, and 0 otherwise. *NB4* refers to an indicator variable that equals one if auditor is non-Big Four, and 0 otherwise. *OCF_{ti}* refers to the operating cash flows in year *t* of the *i*th firm, scaled by initial total assets. *ASSETS_{ti}* refers to the natural logarithm of total assets in year *t* of the *i*th firm. *HILEV* is an indicator variable indicating whether the firm is among the highest decile of leverage, by year and industry. *ABSACC_{ti}* refers to the absolute value of total accruals in year *t* of the *i*th firm, scaled by initial total assets. *SHAREINCR* is an indicator variable that equals one if there is an increase of more than ten percent of the total outstanding shares during the year. *SHAREDECR* is an indicator variable that equals one if there is a decline of more than ten percent of the total outstanding shares during the year. *ROA_{ti}* refers to income before extraordinary items divided by the mean value of initial total assets and final total assets in year *t* of the *i*th firm.

Discretionary accruals are estimated as described earlier in this section. The rest of the variables are computed from the COMPUSTAT database. Observations with information that is not available are dropped from the analysis.

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3.3.3 Descriptive statistics

Table I shows the descriptive statistics and distribution of the sample firms over the sample period. Panel A shows the descriptive statistics. Columns (A) and (B) present variables for the Big Four and non-Big Four firms, and column (C) presents the results of parametric and nonparametric tests comparing the two groups. The mean values of the log of assets are 5.817 for the Big Four sample and 3.621 for the non-Big Four sample, respectively, and the difference is statistically significant (t=50.72; p<0.01). This indicates that the Big Four sample firms tend to be substantially larger than the non-Big Four ones. The mean difference in cash flow from operations is statistically insignificant (t=0.12; p=0.90), thus raining confidence in the sample selection procedure. On average, non-Big Four sample firms have higher leverage than Big Four ones. Both mean and median total accruals are significantly different across the two samples. The mean and median absolute values of total accruals scaled by assets are statistically larger among the firms audited by non-Big Four auditors.

Panel B presents the time distribution of the average number of publicly held clients served by Big Four and non-Big Four auditors. Both Big Four and non-Big Four auditors show slight variations in the number of clients over the sample period. On average, Big Four accounting firms serve 900 clients per year, and thus meet the annual inspection requirement under SOX. In contrast, non-Big Four accounting firms serve on average approximately 40 clients per year, and thus they are subject to triennial inspections under SOX.

Overall, Table I shows that the sample selection procedure used in this work was successful. In addition, the number of clients shows that the Big Four - non Big Four dichotomy is consistent with the annual and triennial inspections carried out under PCAOB Rule §4003. Furthermore, we observe significant differences in the total assets and discretionary accruals between the samples. Therefore, in addition to a univariate test of the predictions, we also perform a multivariate test that includes control variables for the log of assets and the absolute value of discretionary accruals.

[Insert Table I here]

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4. Empirical results

4.1 Univariate results

Table II reports the univariate analysis and absolute values of discretionary accruals. The mean and median discretionary accruals and the absolute value of discretionary accruals are presented for the Big Four and non-Big four samples in Sections A and B, respectively. Section C presents the differences from subtracting the means and medians reported in Section A from those in Section B, along with the results of the off-tests and Wilcoxon two-sample tests of the differences between the two samples. The sample period is sub-divided into three sub-periods: the period before enactment of the SOX (pre-SOX period), the period after enactment of the SOX but before full inspections by PCAOB (pre-PCAOB period), and the period after full inspections by PCAOB (post-PCAOB period).

Panel A of Table II shows the univariate analysis of discretionary accruals, Section A indicates that clients of Big Four auditors reported mean (median) discretionary accruals of 0.021 (0.032) in the pre-SOX period, -0.016 (-0.002) in the pre-PCAOB period, and -0.040 (-0.015) in the post-PCAOB period. The mean (median) discretionary accruals fell significantly by 0.037 (0.030) after the implementation of SOX, and by a further 0.023 (-0.013) after PCAOB began conducting full inspections. As indicated in Section B, clients of non-Big Four auditors reported mean (median) discretionary accruals of 0.096 (0.062) in the pre-SOX period, -0.006 (0.011) in the pre-PCAOB period, and -0.021 (0.009) in the post-PCAOB period, respectively. The difference in mean (median) discretionary accruals between the pre-SOX and post-SOX periods is -0.021 (-0.051), and is significant at 0.1 (0.01) significance level, which indicates that clients of non-Big Four auditors reported significantly lower levels of discretionary accruals after SOX. The difference in mean (median) discretionary accruals between the pre-PCAOB and post-PCAOB periods is only -0.015 (-0.002), but is statistically insignificant. This suggests that there was no significant change in discretionary accruals after PCAOB began its triennial firm inspections. In Section C, the discretionary accruals reported by

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non-Big Four clients are significantly higher than those by Big Four clients in the pre-SOX period (0.075; p=0.03). The mean differences in discretionary accruals fell to 0.01 in the pre-PCAOB period and 0.018 in the post-PCAOB one, both of which are statistically insignificant. Consistent with our prediction, the results in Section C show that the gap in audit quality with regard to reducing income-increasing earnings management between the Big Four and non-Big Four auditors was significantly reduced after SOX.

Panel B of Table II presents the univariate analysis of the absolute value of discretionary accruals. The absolute value of discretionary accruals is an additional indicator of the degree to which management is allowed to exercise discretion in reporting earnings. Sections A and B show that the mean and median values of the absolute value of discretionary accruals are largest among the non-Big Four clients. In the case of Big Four clients, the mean (median) absolute value of discretionary accruals is 0.367 (0.187) in the pre-SOX period, and falls to 0.264 (0.124) in the pre-PCAOB period, suggesting that Big Four auditors allowed less discretion in reporting earnings after the implementation of SOX. The mean (median) absolute value of discretionary accruals increased to 0.306 (0.135) in the post-PCAOB period. Combined with the results in Panel A, the increased absolute value of discretionary accruals mainly comes from large amounts of negative discretionary accruals. A plausible explanation for this is that Big Four auditors became more conservative after the PCAOB inspections, so they tended to leave more room and flexibility for opportunistic earnings management when their clients preferred income-decreasing accounting choices, as compared to when they preferred income-increasing ones. In comparison, the mean absolute value of discretionary accruals for non-Big Four clients rose slightly over the sub-periods. Lennox and Pittman (2010) investigated the informativeness of PCAOB inspections, and argued that PCAOB inspectors may more thoroughly examine the engagements of smaller audit firms auditing publicly held companies. Combined with the results in Panel A, the insignificant changes in non-Big Four clients' absolute value of discretionary accruals suggest that PCAOB's full inspections did not significantly alter the triennial firms' attitudes toward discretionary accruals. The findings in Section C indicate that non-Big Four auditors allow greater flexibility in management's choice of discretionary accruals. Section C also

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shows that the difference between Big Four and non-Big Four clients became larger in the post-SOX period, which further supports the non-Big Four auditors' more conservative attitudes under SOX.

Overall, Table II shows that income-increasing earnings management reduced under SOX. It also shows that PCAOB inspections are more effective with regard to annual firms than triennial ones. We also observe a higher level of accounting flexibility in the post-SOX period, which arises mainly from increases in income-decreasing earnings management.

[Insert Table II here]

4.2 Multiple comparisons of audit quality differences among auditors

We further compare the mean discretionary accruals and mean absolute value of discretionary accruals among non-Big Four clients, PricewaterhouseCoopers clients, Ernst & Young clients, Deloitte & Touche clients, and KPMG clients. Tukey tests are used to determine if each pair of group means are significantly different. Panels A, B, and C of Table III show the multiple comparisons in the pre-SOX, pre-PCAOB, and post-PCAOB periods, respectively.

In Panel A, it is shown that the mean discretionary accruals for non-Big Four clients are on average significantly higher than those for Big Four clients in the pre-SOX period. In Panels B and C, it can be seen that the differences in mean discretionary accruals between the Big Four and non-Big Four clients fall and become statistically insignificant after the implementation of SOX. However, the differences in discretionary accruals among Big Four clients are statistically insignificant in all the sub-periods. These results provide further evidence of the consistent audit quality provided by Big Four auditors, and that substantial improvements have been made to non-Big Four auditors' audit quality with regard to reducing income increasing earnings management.

The mean absolute value of discretionary accruals for non-Big Four clients is significantly higher than those for each of the Big Four clients in all the sub-periods,

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suggesting that non-Big Four auditors commonly allow more flexibility in earnings management than the Big Four do. The results also show that earnings management flexibility does not vary significantly among Big Four clients throughout the sample period.

Overall, the multiple comparisons presented in Table III provide further evidence of substantial improvements in the non-Big Four auditors' audit quality with regard to limiting income increasing earnings management, and also show consistent audit quality among the Big Four firms.

[Insert Table III here]

4.3 Multivariate and quantile regression analysis

A limitation of univariate analysis lies in the fact that it ignores a number of variables that could potentially confound our results, and thus we also conduct multivariate analysis. Because the OLS results could be driven by outliers, we also perform quantile regression to estimate the median coefficients in Model (2) and Model (3). In the regression models, we mainly examine two indicator variables. The first indicator variable, *PREPCAOB*, takes a value of one if the discretionary accruals are during fiscal years 2002 and 2003, and 0 otherwise. The second indicator variable, *POSTPCAOB* takes on a value of one if the discretionary accruals are in fiscal years after 2004, and 0 otherwise.

Table IV presents the results of the impact of SOX on income increasing earnings management for Big Four and non-Big Four clients, respectively. The mean and median coefficients on *PREPCAOB* for Big Four clients are -0.061 and -0.048 respectively, and both are statistically significant. Similarly, the mean and median coefficients on *PREPCAOB* for non-Big Four clients are -0.125 and -0.042, and both are statistically significant. Consistent with the univariate comparison, these results suggest that provisions under SOX effectively reduced earnings management. The mean and median coefficients on *POSTPCAOB* for Big Four clients are -0.089 and -0.065, respectively, and both are statistically significant. The mean coefficient on *POSTPCAOB* for non-Big Four clients is -0.071, but is statistically insignificant. Compared with the coefficients on

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PREPCAOB, these results indicate that full PCAOB inspections are effective at improving the audit quality of the Big Four audit firms.

The regression results for several of the control variables are consistent with those in the literature on this topic. The negative coefficients on the operating cash flow variable are consistent with Dechow et al. (1995), who found that discretionary accruals are negatively correlated with operating cash flows. Consistent with DeAngelo et al. (1994), the negative coefficients on *HILEV* suggest that high leverage leads to contractual renegotiations that provide incentives to reduce earnings.

[Insert Table IV here]

Table V compares discretionary accruals between Big Four and non-Big Four clients before and after the enactment of SOX. The coefficient, *NB4*, in the regressions is an indicator variable representing membership in the sample audited by non-Big Four firms. In the full-period model, both mean and median coefficients on the interaction term *NB4*POSTPCAOB* are 0.003 and 0.009, and are statistically insignificant, suggesting that clients of non-Big Four auditors do not report significantly higher discretionary accruals as compared to those of Big Four auditors. Overall, the findings in Table V suggest that the gap in audit quality between Big Four and non-Big Four auditors has been insignificant since the PCAOB began its inspections.

[Insert Table V here]

4.4 Additional Test

4.4.1 Different proxy for discretionary accruals

It is likely that the findings reported above are driven by the selection of discretionary accruals. To mitigate this concern, we also use performance matched discretionary accruals, as developed by Kothari et al. (2005), as an alternative proxy for audit quality. Untabulated results reveal that our primary inferences remain unchanged.

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4.4.2 Is the findings caused by differences in client portfolios?

As mentioned previously, the primary reason we use studentized discretionary accruals in this study is to mitigate potential effects of accrual reversals (Dechow et al., 2011). In their study, however, Lawrence et al. (2011) found that the differences in audit quality between Big Four and non-Big Four firms may be attributable to differences in client portfolios rather than to differences in quality. We replicate their work, and use discretionary accruals and studentized discretionary accruals in the analysis, respectively. The unreported results present that the audit quality difference are more likely to be driven by accrual reversals instead of different client portfolios.

4.4.3 Did Arthur Anderson have poor audit quality before its collapse?

Did Arthur Anderson have poor audit quality before its collapse? To answer this research question, we conduct univariate analysis during the sample period before the collapse of this firm (1999-2002), with the results reported in Table VI. It can be seen that the mean (median) differences in discretionary accruals and absolute value discretionary accruals between Arthur Anderson and Big Four clients are negative, which suggests that Arthur Anderson's audit quality was similar to that of the other Big Four auditors before its collapse. In addition, the mean (median) differences in discretionary accruals and absolute value of discretionary accruals between Arthur Anderson and non-Big Four clients are significantly negative, which suggests that Arthur Anderson's audit quality was better than that of the smaller auditors before its collapse. Table VII presents Tukey multiple comparisons of accounting firms prior to Arthur Anderson's collapse. The findings in Table VII further show that Arthur Anderson had similar audit quality to that of the other Big Four audit firms. Overall, these findings suggest that Arthur Anderson did not have especially poor audit quality prior to its collapse.

[Insert Table VI here]

[Insert Table VII here]

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5. Summary and conclusions

A considerable body of research has examined the relation between audit quality and auditor size, yet few works have examined this issue with respect to the switch from auditors' self-regulation to heteronomy. In this study, we investigate the effect that the adoption of SOX had on the relation between audit quality and auditor size. Prior studies have found that big audit firms have better audit quality and are more likely to detect questionable accounting practices. We extend these studies and examine the following two issues. First, we examine whether SOX has improved the audit quality of both Big Four and non-Big Four auditors. Secondly, we examine whether SOX has reduced the gap in audit quality between Big Four and non-Big Four auditors. Specifically, we shed light on the effect of PCAOB inspections on audit firms' audit quality.

Two predictions are proposed in this work. The first is that clients of inspected firms report lower abnormal accruals following the full PCAOB inspections. The second is that SOX and PCAOB inspections reduce the difference in audit quality between Big Four and non-Big Four auditors.

We use the concept of discretionary accruals, as developed by Jones (1991), as the proxy for audit quality. In addition to income-increasing accruals, we examine the variation in discretionary accruals. We perform both univariate and multivariate analysis in testing our predictions. We also conduct quantile regression analysis to estimate the median coefficients, because this approach is more robust against outliers compared to the ordinary least squares regression.

Using a sample of US firms between 1999 and 2012, we find that the audit quality of both non-Big Four and Big Four auditors has become better under SOX. Consistent with the literature, we find that non-Big Four auditors had relatively low audit quality compared to Big Four ones in the pre-SOX period. However, this is not found after PCAOB began its operations. We also find that PCAOB inspections are more effective when carried out annually, which suggests there is a positive relation between the frequency of inspections and audit quality. We interpret our results as supporting the view that audit quality has improved after the shift from self-regulation to government regulation, as required by SOX.

However, some important caveats are needed with regard to these results. First, it is

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difficult to control for potential auditor self-selection. Ideally, we should examine the amount of discretionary accruals prevented by certain auditors, and thus be able to conclude that the type of auditor that prevented the most accruals is of higher quality. It is conceivable that non-Big Four auditors prevent more discretionary accruals, even though their clients have relatively high levels of pre-audit earnings management. Secondly, discretionary accruals only reflect audit quality insofar as it reduces the accruals management that clients carry out, and thus these accruals are a proxy for audit quality. However, although we believe that discretionary accruals are a very relevant indicator with regard to the PCAOB's inspections and its reports, other proxies, such as likelihood of an auditor issuing a clean going concern opinion, may also be considered in future works.

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Table 1: Descriptive statistics and time distribution of the sample firms

Panel A: Descriptive statistics

	Section A: Observations with Big Four auditors (n=27,924)			Section B: Observations with non-Big Four auditors (n=3,036)			Section C: Test of null (A=B)	
	Mean	Median	Standard Deviation	Mean	Median	Standard Deviation	t-statistics (p-value)	Z-statistics (p-value)
Natural log of total Assets	5.817	5.665	2.125	3.621	3.591	2.279	50.72 (<0.01)***	47.86 (<0.01)***
Income before extraordinary items / beginning total assets	-0.186	0.021	8.141	-0.903	0.009	19.74	1.98 (0.04)**	6.45 (<0.01)***
Cash flow from operations / beginning total assets	-0.047	0.065	4.37	-0.075	0.039	12.99	0.12 (0.90)	10.01 (<0.01)***
Total liabilities / total assets	0.535	0.498	0.414	0.695	0.514	0.901	-9.27 (<0.01)***	-4.58 (<0.01)***
Total accruals / beginning total assets	-0.139	-0.059	4.041	-0.828	-0.058	17.76	2.13 (0.03)**	1.84 (0.06)*
Absolute value of (total accruals / beginning total assets)	0.195	0.072	4.038	1.189	0.091	17.74	-3.08 (<0.01)***	-10.58 (<0.01)***

Panel B: Distribution of the number of clients audited by Big Four or Non-Big Four accounting firms over the sample period

Year	Big-Four auditors	Non-Big Four auditors	Year	Big-Four auditors	Non-Big Four auditors
1999	916	34	2006	953	45
2000	950	37	2007	941	41
2001	894	36	2008	918	39
2002	882	39	2009	922	41
2003	993	41	2010	909	33
2004	971	46	2011	894	30
2005	954	45	2012	708	19

Notes: *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The samples consist of 3,036 non-Big Four and 27,924 Big Four firm year observations with data to compute discretionary accruals using COMPUSTAT data from 1999-2012. Tests are two-tailed. t-statistics are from t-tests of the differences in the means, and Wilcoxan Z-statistics are from Wilcoxon two-sample tests.

Table II: Discretionary accruals and absolute value of discretionary accruals for a sample of Big Four and non-Big Four auditors during 1999-2012

Panel A: Discretionary accruals

	Section A: Big Four auditors			Section B: non-Big Four auditors			Section C: Difference across samples (B-A)	
	n	Mean	Median	n	Mean	Median	Mean	Median
Pre-SOX (Before 2002)	11,037	0.021***	0.032***	1,503	0.096	0.062***	0.075**	0.030***
(Two-tailed p-value)		(<0.01)	(<0.01)		(0.12)	(<0.01)	(0.03)	(<0.01)
Pre-PCAOB (2002~2003)	7,501	-0.016*	-0.002***	997	-0.006	0.011*	0.010	0.013***
(Two-tailed p-value)		(0.09)	(<0.01)		(0.20)	(0.06)	(0.83)	(<0.01)
Post-PCAOB (2004~2012)	32,672	-0.040***	-0.015***	3,629	-0.021**	0.009	0.018	0.006***
(Two-tailed p-value)		(<0.01)	(<0.01)		(0.03)	(0.13)	(0.46)	(<0.01)
Post-SOX minus Pre- PCAOB		-0.037***	-0.030***		-0.102*	-0.051***		
(Two-tailed p-value)		(<0.01)	(<0.01)		(0.09)	(<0.01)		
Post-PCAOB minus Pre- PCAOB		-0.023***	-0.013***		-0.015	-0.002		
(Two-tailed p-value)		(<0.01)	(<0.01)		(0.78)	(0.34)		

Panel B: Absolute value of discretionary accruals

	Section A: Big Four auditors			Section B: non-Big Four auditors			Section C: Difference across samples (B-A)	
	n	Mean	Median	n	Mean	Median	Mean	Median
Pre-SOX (Before 2002)	11,037	0.367***	0.187***	1,503	0.649***	0.284***	0.281***	0.097***
(Two-tailed p-value)		(<0.01)	(<0.01)		(<0.01)	(<0.01)	(<0.01)	(<0.01)
Pre-PCAOB (2002~2003)	7,501	0.264***	0.124***	997	0.702***	0.249***	0.438***	0.125***
(Two-tailed p-value)		(<0.01)	(<0.01)		(<0.01)	(<0.01)	(<0.01)	(<0.01)
Post-PCAOB (2004~2012)	32,672	0.306***	0.135***	3,629	0.723***	0.263***	0.417***	0.128***
(Two-tailed p-value)		(<0.01)	(<0.01)		(<0.01)	(<0.01)	(<0.01)	(<0.01)
Post-SOX minus Pre- PCAOB		-0.103***	-0.063***		0.005	-0.035***		
(Two-tailed p-value)		(<0.01)	(<0.01)		(0.32)	(<0.01)		
Post-PCAOB minus Pre- PCAOB		0.042***	0.011***		0.021	0.014		
(Two-tailed p-value)		(<0.01)	(<0.01)		(0.67)	(0.60)		

Notes: *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The samples consist of 3,036 non-Big Four and 27,924 Big Four firm year observations with data to compute discretionary accruals using COMPUSTAT data from 1999-2005. In sections A and B, p-values for means are from t-tests and p-values for medians are from sign rank tests. In section C, p-values for means are from t-tests, and p-values for medians are from Wilcoxon two-sample tests.

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Table III: Tukey multiple comparisons of discretionary accruals among audit firms

Panel A: Pre-SOX audit firms comparison

Group Comparison	Difference between Mean Discretionary Accruals	Difference between Mean Absolute Value of Discretionary Accruals
Non Big Four v. s. Big Four:		
Non Big Four –Ernst &Young	0.085**	0.298***
Non Big Four –Deloitte &Touche	0.058	0.263***
Non Big Four –KPMG	0.069	0.262***
Non Big Four –PricewaterhouseCoopers	0.081**	0.293***
Comparisons among Big Four:		
PricewaterhouseCoopers–Ernst &Young	0.005	0.004
PricewaterhouseCoopers–Deloitte &Touche	-0.002	-0.030
PricewaterhouseCoopers–KPMG	-0.001	-0.032
Ernst &Young–Deloitte &Touche	-0.027	-0.035
Ernst &Young–KPMG	-0.017	-0.036
Deloitte &Touche–KPMG	0.011	-0.001

Panel B: Pre-PCAOB audit firms comparison

Group Comparison	Difference between Mean Discretionary Accruals	Difference between Mean Absolute Value of Discretionary Accruals
Non Big Four v. s. Big Four:		
Non Big Four –Ernst &Young	0.028	0.442***
Non Big Four –Deloitte &Touche	-0.011	0.436***
Non Big Four –KPMG	0.001	0.425***
Non Big Four –PricewaterhouseCoopers	0.017	0.447***
Comparisons among Big Four:		
PricewaterhouseCoopers–Ernst &Young	0.012	-0.005
PricewaterhouseCoopers–Deloitte &Touche	-0.027	-0.011
PricewaterhouseCoopers–KPMG	-0.016	-0.021
Ernst &Young–Deloitte &Touche	-0.039	-0.006
Ernst &Young–KPMG	-0.028	-0.016
Deloitte &Touche–KPMG	0.011	-0.010

Panel C: Post- PCAOB audit firms comparison

Groups Comparison	Difference between Mean Discretionary Accruals	Difference between Mean Absolute Value of Discretionary Accruals
Non Big Four v. s. Big Four:		
Non Big Four –Ernst &Young	0.022	0.413***
Non Big Four –Deloitte &Touche	0.002	0.412***
Non Big Four –KPMG	0.024	0.411***
Non Big Four –PricewaterhouseCoopers	0.026	0.432***
Comparisons among Big Four:		
PricewaterhouseCoopers–Ernst &Young	-0.003	-0.019
PricewaterhouseCoopers–Deloitte &Touche	-0.023	-0.019
PricewaterhouseCoopers–KPMG	-0.002	-0.020
Ernst &Young–Deloitte &Touche	-0.021	-0.001
Ernst &Young–KPMG	0.015	-0.001
Deloitte &Touche–KPMG	0.024	-0.001

Notes: *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The samples consist of 3,036 non-Big Four and 27,924 Big Four firm year observations with data to compute discretionary accruals using COMPUSTAT data from 1999-2012.

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Table IV: Pooled OLS regression and quantile regression of discretionary accruals on Non-Big Four membership and control variables

	Big Four auditors		Non-Big Four auditors	
	OLS	QUANTILE REGRESSION	OLS	QUANTILE REGRESSION
	Coefficients	Median Coefficients	Coefficients	Median Coefficients
Intercept	0.205***	0.146***	0.584 ***	0.248***
	(19.54)	(10.99)	(10.99)	(20.33)
PREPCAOB	-0.061***	-0.048***	-0.125**	-0.042***
	(-6.48)	(-8.09)	(-2.15)	(-3.26)
POSTPCAOB	-0.089***	-0.065***	-0.071	-0.052***
	(-12.68)	(-13.04)	(-1.64)	(-4.88)
OCF	-0.049**	-0.287***	-0.000	0.002
	(-25.34)	(-8.19)	(-0.36)	(0.65)
ASSETS	-0.021***	-0.009***	-0.094***	-0.036***
	(-15.44)	(-9.88)	(-10.29)	(-23.67)
HILEV	-0.051***	-0.001	-0.174***	-0.025
	(-4.77)	(-0.21)	(-2.93)	(-0.95)
ABSACC	-0.094***	-0.354***	-0.006***	-0.013**
	(-45.25)	(-4.91)	(-3.68)	(-2.00)
SHAREINCR	0.069***	0.025***	-0.057	0.026***
	(10.04)	(2.95)	(-1.39)	(2.72)
SHAREDECR	-0.015	-0.000	-0.134	-0.050**
	(-1.02)	(-0.05)	(-1.47)	(-1.98)
ROA	0.528***	0.402***	0.535***	0.434***
	(57.17)	(10.48)	(22.87)	(14.98)
Adjusted R^2	11.5%		10.5%	
F-statistic	724.11		81.25	
Pseudo-R^2		5.5%		4.7%

Notes: *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The samples consist of 3,036 non-Big Four and 27,924 Big Four firm year observations with data to compute discretionary accruals using COMPUSTAT data from 1999-2012. *DA* refers to estimated discretionary accruals. *PREPCAOB* refers to an indicator variable that equals one if the firm's fiscal year locates between 2002 and 2003, and 0 otherwise. *POSTPCAOB* refers to an indicator variable that equals one if the firm's fiscal year locates after 2004, and 0 otherwise. *ASSETS* refers to natural logarithm of total assets. *HILEV* refers to a dummy variable indicating whether a firm is among the highest decile of leverage, by year and industry. Leverage refers to the ratio of total liabilities to total assets. *ABSACC* refers to the absolute value of total accruals scaled by beginning total assets. *SHAREINCR* refers to a dummy variable equal to 1 if there is an increase of more than 10 percent of the total outstanding shares during the year; 0 otherwise. *SHAREDECR* refers to a dummy variable equal to 1 if there is a decline of more than 10 percent of the total outstanding shares during the year; 0 otherwise. *ROA* refers to income before extraordinary items divided by mean value of beginning and ending total assets.

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Table V: Pooled OLS regression and quantile regression of discretionary accruals portioned by sub-periods

	Pre-SOX		Pre-PCAOB		Post-PCAOB		Full Period	
	OLS Coef.	QUANTILE Median Coef.	OLS Coef.	QUANTILE Median Coef.	OLS Coef.	QUANTILE Median Coef.	OLS Coef.	QUANTILE Median Coef.
Intercept	0.209***	0.110***	0.232***	0.078***	0.154***	0.059***	0.235***	0.116***
	(9.02)	(11.47)	(9.38)	(4.10)	(10.97)	(4.80)	(19.39)	(10.39)
NB4	0.058**	0.008	0.037	0.020*	0.057	0.020***	0.048***	0.011
	(2.52)	(0.73)	(1.50)	(1.90)	(4.01)	(3.17)	(2.91)	(0.95)
PREPCAOB							-0.064***	-0.045***
							(-6.00)	(-9.19)
POSTPCAOB							-0.083***	-0.059***
							(-10.01)	(-15.29)
POSTPCAOB*NB4							0.003	0.009
							(0.16)	(0.83)
OCF	0.013***	-0.004	-0.005**	-0.082	-0.0001***	-0.054	0.003***	-0.031
	(11.15)	(-0.13)	(-2.04)	(-0.87)	(-0.18)	(-0.56)	(8.66)	(-0.53)
ASSETS	-0.026***	-0.011***	-0.035***	-0.010***	-0.028***	-0.011***	-0.027***	-0.010***
	(-7.26)	(-10.45)	(-9.57)	(-10.56)	(-14.37)	(-14.93)	(-17.50)	(-18.57)
HILEV	-0.089***	-0.036***	-0.039	0.001	-0.048***	-0.015*	-0.064***	-0.017*
	(-3.39)	(-2.68)	(-1.50)	(-1.71)	(-3.07)	(-1.67)	(-5.28)	(-1.83)
ABSACC	-0.019***	-0.051	-0.045***	-0.106	-0.012***	-0.019	-0.021***	-0.053
	(-18.31)	(-1.36)	(-14.63)	(-0.01)	(-9.23)	(-0.20)	(-31.31)	(-0.51)
SHAREINCR	0.047***	0.046***	0.048**	0.015*	0.049***	0.023***	0.045***	0.026***
	(2.89)	(6.99)	(2.52)	(-0.44)	(4.97)	(4.45)	(5.82)	(2.74)
SHAREDECR	-0.091**	-0.022**	0.021	0.014	-0.025	-0.007	-0.034**	-0.008
	(-2.39)	(-2.07)	(0.54)	(-0.28)	(-0.16)	(-0.79)	(-2.01)	(-1.20)
ROA	0.321***	0.160***	0.771***	0.397***	0.555***	0.298***	0.486***	0.253***
	(22.15)	(4.41)	(35.51)	(4.27)	(49.22)	(3.44)	(59.57)	(4.00)
Adjusted R^2	12.7%		15.9%		7.2%		9.0%	
F-statistic	229.8		202.9		357.2		517.5	
Pseudo-R^2		2.5%		3.9%		2.1%		2.5%

Notes: *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The samples consist of 3,036 non-Big Four and 27,924 Big Four firm year observations with data to compute discretionary accruals using COMPUSTAT from 1999-2012. *DA* presents estimated discretionary accruals. *NB4* refers to a dummy variable equal to one if the auditor is non-Big four; 0 otherwise. *PREPCAOB* presents a dummy variable that takes one if the firm's fiscal year is between 2002 and 2003; 0 otherwise. *POSTPCAOB* presents a dummy variable that takes one if the firm's fiscal year locates after 2004; 0 otherwise. *ASSETS* presents natural logarithm of total assets. *HILEV* presents a dummy variable indicating whether a firm is among the highest decile of leverage, by year and industry. Leverage refers to the ratio of total liabilities to total assets. *ABSACC* presents the absolute value of total accruals scaled by beginning total assets. *SHAREINCR* presents a dummy variable equal to 1 if there is a decline of more than 10 percent of the total outstanding shares during the year; 0 otherwise. *SHAREDECR* presents a dummy variable equal to 1 if there is an increase of more than 10 percent of the total outstanding shares during the year; 0 otherwise. *ROA* presents income before extraordinary items divided by mean value of beginning and ending total assets.

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Table VI: Multiple comparison of discretionary accruals and absolute value of discretionary accruals among Arthur Anderson and other auditors' clients during 1999-2002

		Discretionary Accruals		Absolute Value of Discretionary Accruals	
	N	Mean	Median	Mean	Median
Arthur Anderson	2,608	0.008***	0.023***	0.326***	0.156***
Big Four	11,697	0.029***	0.032	0.334***	0.148
Non-Big Four	1,472	0.162	0.071	0.281	0.268
Comparison between sub-groups					
Arthur Anderson-Big Four		-0.021	-0.009**	-0.007	-0.008*
		(-1.41)	(-2.08)	(-0.58)	(-1.88)
Arthur Anderson-Non Big Four		-0.154***	-0.048***	-0.281***	-0.112***
		(-4.55)	(-5.92)	(-9.50)	(-11.89)

Notes: *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The samples consist of 2,608 Arthur Anderson, 1,472 non-Big Four, and 11,697 Big Four firm year observations with data to compute discretionary accruals using COMPUSTAT data from 1999-2002. P-values for means are from t-tests and p-values for medians are from sign rank tests. In the comparison of two sub-groups, p-values for means are from t-tests, and p-values for medians are from Wilcoxon two-sample tests.

Table VII: Tukey multiple comparisons of discretionary accruals among audit firms before Arthur Anderson' collapse

Group Comparisons	Difference between Mean Discretionary Accruals	Difference between Mean Absolute Value of Discretionary Accruals
Non Big Four v. s. Big Four:		
Non Big Four –Arthur Anderson	0.154***	0.281***
Non Big Four –Ernst &Young	0.137***	0.302***
Non Big Four –Deloitte &Touche	0.128***	0.239***
Non Big Four –KPMG	0.146***	0.250***
Non Big Four –PricewaterhouseCoopers	0.122***	0.288***
Comparisons among Big Four:		
PricewaterhouseCoopers–Arthur Anderson	0.322	0.007
PricewaterhouseCoopers–Ernst &Young	0.015	0.013
PricewaterhouseCoopers–Deloitte &Touche	0.006	-0.049*
PricewaterhouseCoopers–KPMG	0.024	-0.038
KPMG–Arthur Anderson	0.008	0.031
KPMG–Deloitte &Touche	-0.017	-0.011**
KPMG–Ernst &Young	-0.008	0.052
Deloitte &Touche–Arthur Anderson	0.026	0.042
Deloitte &Touche–Ernst &Young	0.008	0.063***
Ernst &Young &Touche–Arthur Anderson	0.017	-0.021

Notes: *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. The samples consist of 2,608 Arthur Anderson, 1,472 non-Big Four, and 11,697 Big Four firm year observations with data to compute discretionary accruals using COMPUSTAT data from 1999-2002.

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