

AUDIT FIRM TENURE AND FRAUDULENT FINANCIAL REPORTING

Joseph V. Carcello
Stokely Distinguished Scholar and Associate Professor
University of Tennessee
601 Stokely Management Center
Knoxville, TN 37996
(865) 974-1757
jcarcell@utk.edu

Albert L. Nagy
Assistant Professor
John Carroll University

January 2004

ACKNOWLEDGEMENTS: We thank Dana Hermanson and Terry Neal, and workshop participants at Georgia State University, particularly Larry Brown and Van Johnson, for their helpful comments on earlier versions of this paper.

AUDIT FIRM TENURE AND FRAUDULENT FINANCIAL REPORTING

SUMMARY

The Sarbanes-Oxley Act (2002) required the U.S. Comptroller General to study the potential effects of requiring the mandatory rotation of audit firms. The General Accounting Office (GAO) concludes in its recently released study of mandatory audit firm rotation that "...mandatory audit firm rotation may not be the most efficient way to strengthen auditor independence" (GAO 2003, Highlights). However, the GAO also suggests that mandatory audit firm rotation may be necessary if the Sarbanes-Oxley Act's requirements do not lead to an improvement in audit quality (GAO 2003, 5).

We examine the relation between audit firm tenure and fraudulent financial reporting. Comparing fraud observations from 1990 through 2001 with both a matched set of non-fraud firms and with the entire population of non-fraud firms, we find that fraudulent financial reporting is more likely to occur in the first three years of the auditor-client relationship. We generally fail to find any evidence that fraudulent financial reporting is more likely given long auditor tenure (defined using multiple definitions). Our results are consistent with the argument that mandatory firm rotation may have adverse effects on audit quality.

Keywords: auditor tenure; fraudulent financial reporting.

Data Availability: The data are from public sources and are available from the second author upon written request.

AUDIT FIRM TENURE AND FRAUDULENT FINANCIAL REPORTING

INTRODUCTION

The Sarbanes-Oxley Act (2002) required the U.S. Comptroller General to study the potential effects of requiring the mandatory rotation of audit firms. The General Accounting Office (GAO) concludes in its recently released study of mandatory audit firm rotation that "...mandatory audit firm rotation may not be the most efficient way to strengthen auditor independence" (GAO 2003, Highlights). However, the GAO also suggests that mandatory audit firm rotation may be necessary if the Sarbanes-Oxley Act's requirements do not lead to an improvement in audit quality (GAO 2003, 5). Moreover, the GAO (2003, 9), New York Stock Exchange (2003, 11), the Commission on Public Trust and Private Enterprise (2003, 33), TIAA-CREF (2004, 9), and federal regulators in settlements of enforcement proceedings (*Wall Street Journal* 2003) all suggest that periodically changing the audit firm on a *voluntary* basis may enhance audit quality. Therefore, there continues to be strong interest by regulators, policy makers, and large institutional investors in the relation between audit firm tenure and various measures of audit quality.

The issue of mandatory audit firm rotation is quite controversial, with strong opinions on both sides of the question. For example, Peter Clapman, the Chief Counsel of TIAA-CREF has recently stated:

At our portfolio companies, we have been concerned about "embedded" auditor relationships, in which there has been a very long-term relationship with the auditor ... We have had strict policies in place for many years with regard to audit firm rotation ... Rotation of TIAA-CREF's external audit firm is formally considered between the fifth and tenth years of service, a policy in place for over 30 years (Clapman 2003).

There are equally strong positions against mandatory audit firm rotation. For example, Roderick M. Hills, a former SEC Chairman, testified before the U.S. Senate as follows:

Forcing a change of auditors can only lower the quality of audits and increase their costs. The longer an auditor is with a company the more it learns about its personnel, its business and its intrinsic values. To change every several years will simply create a merry-go-round of mediocrity (Hills 2002).

Although the U.S. Comptroller General, via the recently released GAO Report, is not currently recommending mandatory audit firm rotation, the SEC and the Public Company Accounting Oversight Board (PCAOB) "...have not taken a position on the merits of mandatory audit firm rotation" (GAO 2003, 40). A move by the SEC or the PCAOB to require mandatory firm rotation would have significant implications for the cost and quality of auditing services received by over 17,000 SEC registrants. Therefore, it is critical that public policy regarding mandatory firm rotation is shaped by reliable empirical data.

Until recently, there was only limited research on the relation between audit firm tenure and auditor performance. However, the recent Congressional interest in this issue has spurred further academic research on the relation between firm tenure and auditor performance. Geiger and Raghunandan (2002) find that auditors are more likely to issue a clean audit report prior to a bankruptcy filing in the early years of the auditor-client relationship. Johnson et al. (2002) find that the absolute value of unexpected accruals is higher in the early years of the audit-client relationship (as compared to "medium" auditor tenure), whereas they find no relation between the absolute value of unexpected accruals and auditor tenure when medium tenure is compared with long tenure (nine

years or longer). Similarly, Ghosh and Moon (2003) find that absolute discretionary accruals and the use of large negative special items to manage earnings decline with auditor tenure. Finally, Myers et al. (2003) find that longer auditor tenure is associated with higher earnings quality, using absolute abnormal accruals and absolute current accruals to proxy for earnings quality. These four studies suggest that audit quality is higher given longer auditor tenure.

However, other studies (Davis et al. 2003; Casterella et al. 2002) conclude that audit quality is *lower* given longer auditor tenure. Davis et al. (2003) find that discretionary accruals *increase* with auditor tenure and conclude that management gains additional reporting flexibility as auditor tenure increases. Casterella et al. (2002) find that audit failures are less (more) likely when auditor tenure is short (long).

We provide new evidence on the relation between auditor tenure and audit quality by examining the relation between audit firm tenure and fraudulent financial reporting. Similar to Johnson et al. (2002), we consider the relation between both short (three years or less) and long (nine years or more) audit firm tenure and fraudulent financial reporting.¹ Consistent with many prior studies, we identify instances of fraudulent financial reporting by examining SEC Accounting and Auditing Enforcement Releases (AAERs) issued between 1990 and 2001 that alleged a violation of Rule 10(b)-5 of the 1934 Securities Exchange Act (e.g., Beasley et al. 1999; Bonner et al. 1998; Dechow et al. 1995, 1996). A benefit of using AAERs is that they provide an objective measure of firms with fraudulent financial reporting (Bonner et al. 1998), particularly since the SEC is likely to bring fraud-related enforcement actions where there has been a clear violation of the Securities Acts (DeFond and Smith 1991).

Prior studies that examine auditor tenure and auditor performance fail to directly examine the relation between tenure and fraudulent financial reporting, notwithstanding the fact that much of the Congressional testimony on this issue addressed the perceived link between audit firm tenure and audit failure, often defined in terms of the existence of fraudulent financial reporting (O'Malley 2002; Turner 2002). We directly examine the source of the Congressional interest in audit firm rotation – the potential link between auditor tenure and fraudulent financial reporting.

In addition, a number of the prior studies that consider the effects of audit firm tenure do so within the context of discretionary accrual models of earnings management (Davis et al. 2003; Ghosh and Moon 2003; Myers et al. 2003; Johnson et al. 2002) which have well known limitations (Erickson et al. 2003). Notwithstanding the limitations of discretionary accrual models of earnings management, discretionary accrual models typically involve earnings management within the confines of GAAP. Although the relation between auditor tenure and (largely) *allowable* earnings management is interesting, it is not clear that a solution as dramatic as requiring mandatory audit firm rotation is needed to reduce the incidence of a behavior that is allowable. Conversely, if fraudulent financial reporting is found to increase with an increase in auditor tenure, regulators are more likely to view dramatic remedies as appropriate.

Casterella et al. (2002) is the only prior study that considers auditor tenure and fraudulent financial reporting. The Casterella et al. study differs from ours in three important respects. First, the relation between tenure and SEC enforcement actions is not analyzed separately (i.e., fraud, litigation against the auditor, and auditor reporting prior to bankruptcy are combined). Since these three measures are not analyzed separately, we

do not know the relation between tenure and fraud. Second, their data is much older than ours; their sample period is from 1980 to 1991. Our sample period is from 1990 to 2001, and is more likely to capture the current relation between audit firm tenure and fraudulent financial reporting. Third, and most significantly, Casterella et al. only have 34 SEC enforcement actions in their sample (matched with 34 non-fraud firms). This sample size may be too small to produce reliable empirical conclusions. We have 104 fraud observations in our matched-pairs analysis, and 147 fraud observations in our full population analysis (and over 68,000 non-fraud observations in this analysis). The contemporary nature of our sample and its larger size, coupled with the exclusive focus of our paper on fraud, enables us to provide stronger and more reliable conclusions on the relation between auditor tenure and fraud than the Casterella et al. study. The reliability of our results vis-à-vis the Casterella et al. study is particularly important because the two studies reach different conclusions. We find that fraud is more likely given short auditor tenure and no more likely given long auditor tenure (as compared to medium tenure); Casterella et al. find that audit quality (of which fraud is one component) is *lower* as auditor tenure increases.

Our results indicate a higher incidence of fraudulent financial reporting in the early years of the auditor-client relationship. We generally fail to find support for a higher incidence of fraud when auditor tenure is long. These results, coupled with earlier work by others (Geiger and Raghunandan 2002; Johnson et al. 2002; Ghosh and Moon 2003; Myers et al. 2003), suggest that audit quality may be impaired in the early years of the auditor-client relationship, and there is generally no evidence that audit quality is impaired when auditor tenure is long.

The remainder of the paper is organized as follows. The next section discusses alternate views of the relation between auditor tenure and audit quality and presents our hypotheses. We then present our research design, including the statistical model, variable measurement, and data sources. Further sections discuss our sample selection and results. The last section contains a summary, a discussion of the study's limitations, and suggestions for future research.

ALTERNATE VIEWS OF AUDITOR TENURE AND AUDIT QUALITY

There are essentially two opposite views as to the relation between auditor tenure and audit quality. Practitioners argue, based primarily on concerns about auditor knowledge, that audit quality is lowest in the early years of the auditor-client relationship and that quality is higher given longer tenure. Conversely, certain regulators and groups concerned with corporate governance argue, based primarily on threats to auditor objectivity, that audit quality will be impaired given long auditor tenure and that quality may be highest in the early years of the auditor-client relationship. Although these two views are clearly inconsistent with each other, it is possible that they both could be accurate. That is, audit quality could be lower given short auditor tenure because of the auditor's lack of knowledge and lower given long auditor tenure because of the auditor's lack of objectivity, both compared with medium auditor tenure. We therefore test the relation between fraud and both short and long auditor tenure.

The primary argument *against* mandatory audit firm rotation is that audit quality is lower in the early years of the auditor-client relationship (St. Pierre and Anderson 1984; AICPA 1992; O'Malley 2002; BDO Seidman 2003). Audit quality is alleged to be lower in the early years of the relationship because the auditor is unfamiliar with the

client's business, operations, systems, controls, and accounting policies (BDO Seidman 2003). Also, a new auditor may be unfamiliar with industry error patterns. Prior studies have found a relation between industry group and both financial statement error patterns (Maletta and Wright 1996) and fraudulent financial reporting (Beasley et al. 1999, 2000). To the extent that a new auditor may be less familiar with the client's industry, fraudulent financial reporting may be more likely. Therefore, individuals and groups opposing audit firm rotation would expect fraudulent financial reporting to be highest in the early years of the auditor-client relation and lowest given long auditor tenure. This leads to our first hypothesis (expressed in alternate form):

H1: Fraudulent financial reporting is more likely given short auditor tenure (three years or less) as compared with medium auditor tenure (four to eight years)

The primary argument *for* mandatory audit firm rotation is that long auditor tenure leads to a reduction in audit quality. Audit quality may be lower when auditor tenure is long for at least two reasons. First, long auditor tenure may lead, perhaps subconsciously, to complacency among the audit team. Some clients gain a reputation inside the accounting firm as having strong financial reporting controls, accurate financial statements, and top management with integrity and competence. The audit team may expect these attributes to continue in the future, which may reduce the vigor and skepticism with which the auditors undertake the engagement. A new audit firm would bring to bear skepticism and a fresh perspective that the incumbent auditor may lack (Commission on Public Trust and Private Enterprise 2003; Silvers 2003). Second, long-standing clients of an audit firm may be viewed as a source of a perpetual annuity. DeAngelo (1981) argues that an existing audit client provides the auditor with client-

specific quasi-rents, an annuity representing the rents (the present value of excess audit fees over avoidable costs) the auditor expects to receive over the life of the auditor-client relationship. Viewing the client as the source of a perpetual annuity may compromise the auditors' independence. This potential threat to auditor independence is best captured by the Commission on Public Trust and Private Enterprise:

Rotation of auditors would also reduce any financial incentives for external auditors to compromise their judgment on borderline accounting issues. In disagreeing with management, auditors would no longer be risking a stream of revenues that they believed would continue in 'perpetuity,' since the audit engagement would no longer be perceived as permanent (2003, 34).

To the extent that long auditor tenure reduces the auditors' skepticism and/or compromises the auditors' independence, fraudulent financial reporting may be more likely. Therefore, individuals and groups supporting audit firm rotation would expect fraudulent financial reporting to be lowest in the early years of the auditor-client relation and highest given long auditor tenure. This leads to our second hypothesis (expressed in alternate form):

H2: Fraudulent financial reporting is more likely given long auditor tenure (nine years or more) as compared with medium auditor tenure (four to eight years)

RESEARCH DESIGN

We test the relation between audit firm tenure and fraudulent financial reporting using the following logistic regression model:

$$FRAUD = b_0 + b_1SHORT + b_2LONG + b_3SIZE + b_4ZFC + b_5YRSPUB + b_6MKTBK + b_7CPA + b_8BDOUT + b_9BDSIZE + b_{10}BOSS + \varepsilon$$

where:

FRAUD = 1 if the company and/or its officers were charged by the SEC with a violation of Rule 10(b)-5 of the 1934 Securities Exchange Act in an Accounting and Auditing Enforcement Release (AAER) issued between 1990 and 2001 (and where the first year of the alleged fraud is post-1987); 0 otherwise.²

SHORT = 1 if the length of the auditor-client relationship is three years or less; 0 otherwise.

LONG = 1 if the length of the auditor-client relationship is nine years or more; 0 otherwise.

SIZE = the natural log of assets (in millions).

ZFC = Zmijewski's (1984) financial condition score.

YRSPUB = number of years the company has been listed on a national stock exchange.

MKTBK = the ratio of the firm's market value to its book value.

CPA = 1 if the company's auditor was a Big 6 firm; 0 otherwise.

BDOUT = the percentage of the company's board of directors who are outsiders (non-employee directors).³

BDSIZE = the number of directors on the board.

BOSS = 1 if the same individual holds the position of chairman of the board and CEO or president; 0 otherwise.

Measuring Financial Fraud

We read all AAERs issued by the SEC between 1990 and 2001 to identify those companies and/or officers charged with a violation of Rule 10(b)-5 by the SEC. Rule

10(b)-5 is the primary antifraud statute contained in Section 10(b) of the 1934 Securities Exchange Act (Arens et al. 2003; Messier 2003).

Measuring Audit Firm Tenure

Consistent with Johnson et al. (2002), we measure audit firm tenure as the number of consecutive years that the audit firm has audited the client (computed by counting backwards from the year the fraud began). We define *SHORT* auditor tenure as three years or less, and *LONG* auditor tenure as nine years or more. We use Standard & Poor's *Research Insight* (version 7.6), proxy statements, Edgar and the Q-Data SEC Files microfiche collection, and annual editions of *Who Audits America* to compute audit firm tenure.

Firm-Specific Control Variables

We measure company size using the natural log of total assets. Prior research indicates that fraud is more prevalent among smaller companies (Beasley et al. 1999). We measure financial stress using Zmijewski's financial condition score (*ZFC*). Specifically, we use Zmijewski's (1984) financial distress prediction model based on: return on assets, financial leverage, and liquidity, and the PROBIT coefficients from his 40 bankrupt / 800 non-bankrupt estimation sample. Higher *ZFC* scores indicate greater financial distress, so we expect a positive relation between *ZFC* and fraudulent financial reporting. We measure company size and compute the *ZFC* score using amounts reported in the last clean set of financial statements, per Standard & Poor's *Research Insight*.

Beneish (1999) found that firms committing financial fraud have more recently been listed on a national stock exchange. We expect recently public companies to face greater pressure to meet earnings targets; hence, we expect a greater incidence of fraud

among recently public companies. Therefore, we expect a negative relation between the number of years a firm's stock has been traded on a national securities exchange (*YRSPUB*) and fraudulent financial reporting. We measure the number of years a firm's stock has been publicly traded using Standard & Poor's *Research Insight* and Disclosure's *Global Access*.

Finally, we control for firm growth. Consistent with a number of prior studies (e.g., Collins and Kothari 1989; Teoh and Wong 1993; Warfield et al. 1995; Wild 1996), we use the market-to-book ratio as a proxy for firm growth. We expect companies that are growing more rapidly to face greater pressure to maintain high growth rates. This pressure may increase the likelihood that management would engage in a fraudulent practice to maintain the appearance of rapid company growth. Therefore, we expect a positive relation between the market-to-book ratio (*MKTBK*) and fraudulent financial reporting. We measure the firm's market and book values using amounts reported in the last clean year and using Standard & Poor's *Research Insight*.

Auditor Type

We control for auditor type (Big 6, non-Big 6) used by the company (Dechow et al. 1996). Prior research suggests that Big 6 firms are quality-differentiated suppliers (Palmrose 1988), suggesting a lower incidence of fraud when a firm retains a Big 6 firm. We measure auditor type (*CPA*) using a dummy variable (1 = Big 6 firm; 0 = other), and we expect a negative relation between the retention of a Big 6 firm and fraudulent financial reporting. We measure auditor type in the year the fraud began, per Standard & Poor's *Research Insight*.

Governance-Specific Control Variables

We control for the percentage of outsiders on the board of directors, whether the same individual serves as both chairman of the board and CEO or president, and board size. Beasley (1996) finds a significant negative relation between the percentage of outsiders (non-management directors) on the board of directors and fraudulent financial reporting. We expect a negative relation between the percentage of outsiders on the board and fraudulent financial reporting.⁴ Proxies were gathered from Q-Data's microfiche collection, Disclosure's *Global Access*, and by contacting Disclosure, Inc. directly (the official repository of SEC documents).

Beasley (1996) finds a positive relation between board size and financial fraud. Prior research (Jensen 1993) suggests that a smaller board is more effective at fulfilling a controlling function whereas larger boards are easier for the CEO to control. We expect a positive relation between board size and fraud.

Finally, we control for whether the same individual held the positions of board chair and CEO or president (*BOSS*). Dechow et al. (1996) find a positive relation between financial fraud and the same individual holding the positions of board chair and CEO. In addition, Beasley et al. (1999) find that corporate power is narrowly concentrated in cases of financial fraud. A person holding both positions will yield significant internal influence and power and may have the wherewithal to orchestrate a financial fraud. We expect a positive relation between *BOSS* and financial fraud.

SAMPLE

We read all the AAERs issued by the SEC between 1990 and 2001, where the first year of the alleged fraud was after 1987. There were 267 companies subject to

AAERs alleging a violation of Section 10(b)-5 during this period. Table 1 presents details of our sample selection procedure.

INSERT TABLE 1 ABOUT HERE

We could not determine auditor tenure for 42 fraud-related observations (financial statement information was missing for 39 of these observations as well). No proxy statement was filed during the last clean year for 28 firms, which was needed to construct our governance-specific control variables. Given the fundamentally different operating characteristics associated with financial institutions, we exclude the 27 banks and insurance companies subject to an AAER. The 25 observations where the firm's initial public filing was fraudulent were excluded because we need a clean set of financial statements for certain control variables. In addition, information on firm size, financial condition (*ZFC*), and the market-to-book ratio was missing for 19 firms (in addition to the 39 firms where both auditor tenure and financial information was not available). Seven observations were missing because the AAER failed to identify the first fraud year or because no audit opinion was issued in the fraud year.

We compare the relation between auditor tenure and fraud using two different sets of control firms. First, each fraud observation was matched with a non-fraud observation. This analysis is referred to as the matched-pairs analysis in the balance of the paper. Second, the fraud observations were compared with all other public companies available on the *Research Insight* database between 1988 and 2000 (the first fraud observation occurred in 1988 and the last occurred in 2000). This analysis is referred to as the full population analysis in the balance of the paper.

We followed Beasley (1996) in matching on year, industry, and size. We matched on those variables related to the incidence of fraud and potentially related to auditor tenure. There is some evidence that the incidence of fraud differs across time and industry (Erickson et al. 2003), and it is plausible that auditor tenure and industry group may be correlated. Prior research (Beasley et al. 1999) finds a higher incidence of fraud among smaller companies and we find that smaller companies have shorter auditor tenure (the correlation between auditor tenure and company size is 0.52). Most importantly, using a matched-pairs design rather than using all non-fraud firms as the control sample enabled us to include governance characteristics in the model.⁵ Prior research finds that governance characteristics are related to fraud (Abbott et al. 2004; Beasley 1996; Dechow et al. 1996), and governance characteristics are at least plausibly related to auditor tenure (e.g., Abbott and Parker 2000 find that companies with better governance are more likely to hire an industry specialist auditor).

Each fraud observation was matched with a non-fraud observation using as the match year the last clean year for those firms committing fraud. We then matched on industry, preferably at the 4-digit SIC code level.⁶ We also matched on size, based on total assets. Each non-fraud observation was within 30 percent of the total asset amount for the corresponding fraud observation.⁷ We were unable to locate a suitable matching firm for 15 fraud-related observations. Our final sample size was 208 (104 fraud observations, and 104 matched non-fraud observations).⁸

As an additional analysis, we also used all non-fraud companies listed on *Research Insight* between 1988 and 2000 as the control sample. There were 68,195 non-fraud observations over this 13 year time period. Since we do not match in the full

sample analysis, we regain the 15 observations lost in the matched-pairs analysis because we were unable to identify a suitable matching company. Also, since it is impractical to gather governance characteristics for 68,000 observations, we regain the 28 observations lost due to missing proxy statements. Our final sample size was 68,342 (147 fraud observations, and 68,195 non-fraud observations).

RESULTS

Descriptive Statistics

Table 2 presents descriptive statistics, separately for fraud and non-fraud observations, for each of the study's independent variables.⁹ There is a positive relation between short auditor tenure and fraud ($p < 0.01$), and a negative relation between long auditor tenure and fraud ($p < 0.01$). Fraud is less likely for firms that have been public longer ($p < 0.01$) and less likely when the auditor is a Big 6 firm ($p < 0.01$). For the full population analysis, fraud is less likely for larger companies ($p < 0.01$), and more likely in cases of financial distress ($p < 0.10$) and where the market-to-book ratio is higher ($p < 0.05$). Finally, for the matched-pairs analysis, fraud is less likely when a higher percentage of outsiders sit on the board of directors ($p < 0.01$), and more likely when the same individual serves as both the CEO and board chair ($p < 0.01$).

INSERT TABLE 2 ABOUT HERE

In results not tabulated, there are a number of relatively high correlations among the independent variables. In particular, the correlation between *LONG* and *YRSPUB* is 0.59. Given some relatively high correlations, we compute variance inflation factors to assess the susceptibility of our model to problems of multicollinearity. The largest variance inflation factor (VIF) is 2.22. Gujarati (1995, 339) suggests that

multicollinearity is unlikely to be problematic if the variance inflation factors are below 10.0.

Primary Tests

Table 3 presents the results of the logistic regression model used to test the relation between auditor tenure and fraud-related SEC enforcement actions. In performing the matched-pairs analysis, we performed the logistic analysis on the *differences* between the observations in the test sample and the control sample (Cram et al. 2003).¹⁰ According to Hosmer and Lemeshow (2000, 236), previous authors (e.g., Moolgavkar et al. 1985; Pregibon 1984) show that for 1-1 matched studies, the logistic regression diagnostics may be computed in the same manner as for unmatched studies. For our study, the overall model is highly significant ($p < 0.0001$), and the model's pseudo- R^2 is 43 percent.

The full sample model is also highly significant ($p < 0.0001$) and the model's pseudo- R^2 is 13 percent. In a further attempt to assess model fit, we computed the Hosmer-Lemeshow goodness-of-fit statistic.¹¹ The Hosmer-Lemeshow goodness-of-fit test puts observations into groups based on estimated probabilities and then computes a Pearson chi-square statistic based on the observed and estimated expected frequencies in each of the groups (Hosmer and Lemeshow 2000, 148). A significant Hosmer-Lemeshow statistic suggests differences between the observed and expected frequencies in the groups, and thus a lack of model fit. For the full population analysis, the Hosmer-Lemeshow goodness-of-fit statistic is 8.63 and not significant ($p > 0.10$), suggesting that the data fits the model well.¹²

INSERT TABLE 3 ABOUT HERE

Consistent with arguments that audit quality is lower in the early years of the auditor-client relationship and with our prediction in H1, we find a significant positive relation between short auditor tenure and fraudulent financial reporting ($p < 0.01$). Unlike our prediction in H2, we fail to find a significant positive relation between long auditor tenure and fraud ($p > 0.10$). Moreover, our results fail to offer any evidence to support the regulatory concern that long auditor tenure is associated with a reduction in financial reporting quality. To the contrary, our results suggest that short auditor tenure may be associated with reduced audit quality.

In an attempt to provide additional interpretation on the economic significance of the relation between short auditor tenure and fraud, we computed the increase in the probability of fraud over the interquartile range (see Raghunandan and Subramanyam (2003, 18) for an example of this procedure for a dummy variable). Short auditor tenure equals zero at the 25th percentile and one at the 75th percentile. The remaining independent variables were set equal to their mean levels. If auditor tenure is short, the probability of fraud increases by 94 percent (matched-pairs analysis)¹³ and 103 percent (full population analysis).

There were significant relations between a number of our control variables and fraudulent financial reporting. Companies with a fraud-related SEC enforcement action have been public for a shorter period of time ($p < 0.01$) and are less likely to use a Big 6 auditor ($p < 0.01$) than are non-fraud companies. For the matched-pairs analysis only, companies with fraud have a higher market-to-book ratio ($p < 0.01$), a lower percentage of outsiders on the board of directors ($p < 0.01$), a larger board ($p < 0.05$), and are more likely to combine the positions of chairman of the board and CEO ($p < 0.01$).¹⁴

Additional Analyses

To assess the robustness of our results, we perform three sets of additional analyses (results not tabled). First, we define long auditor tenure using different cutoffs, and we measure auditor tenure using the natural log of tenure. Second, we limit our analysis to clients of Big 6 firms. Third, for those companies with an audit committee, we replace the board-related variables in our main model with various audit committee variables.

Alternate Measures of Auditor Tenure

Similar to Johnson et al. (2002), we define long auditor tenure as nine years or more. However, any cutoff for long auditor tenure is inherently arbitrary. To test the sensitivity of our results to alternate cutoffs for long auditor tenure, we define long auditor tenure as six, seven, eight, or ten years or more. There is a significant positive relation between long auditor tenure and fraud for the matched-pairs analysis when tenure is defined as six years or more ($p < 0.01$), seven years or more ($p < 0.05$), and eight years or more ($p < 0.10$), but no relation when long tenure is defined as ten years or more ($p > 0.10$). In addition, there is no relation between long auditor tenure and fraud for the full population analysis using any of these alternate definitions of long tenure ($p > 0.10$).

The significant positive relation between long auditor tenure and fraud given some of these alternate cutoffs was unexpected, particularly given the significant *negative* relation between long auditor tenure and fraud on a univariate basis. Although our earlier testing indicated that multicollinearity was not a problem for the overall model, the correlation between long auditor tenure and *YRSPUB* is high. High correlations among the predictor variables can cause the coefficients to have the wrong sign (Hair et al. 1987,

42). We reran these analyses excluding *YRSPUB* from the model. When *YRSPUB* is removed from the model, there is a significant positive relation between long auditor tenure and fraud only when long tenure is defined as six years or more ($p < 0.05$); in the case of the other cutoffs considered there was no significant relation between long auditor tenure and fraud ($p > 0.10$).

Finally, we replace both *SHORT* and *LONG* with the natural log of auditor tenure. There is a significant negative relation between the natural log of auditor tenure and fraud ($p < 0.05$ for the matched-pairs analysis, $p < 0.01$ for the full population analysis).

Big 6 Only Analysis

Although we control for auditor type in our main model, we also examine the relation between auditor tenure and fraudulent financial reporting for Big 6 firms only. The remaining sample size is 140 for the matched-pairs analysis and 56,438 (including 93 fraud observations) for the full population analysis. For both sets of analyses, there is a significant positive relation between short auditor tenure and fraud ($p < 0.01$), and no significant relation between long tenure and fraud ($p > 0.10$).

Consideration of Audit Committee Characteristics

We do not control for audit committee characteristics because Beasley (1996) fails to find a significant relation between these characteristics and fraudulent financial reporting. Nevertheless, it is reasonable to expect a relation between audit committee characteristics and both fraudulent financial reporting and auditor tenure, and more recent work (Abbott et al. 2004) finds a negative relation between audit committee independence and financial fraud. Therefore, we incorporate the relation of audit committee characteristics into our study by replacing *BDOOUT* and *BDSIZE* with *ACOUT*

and *ACSIZE* for those companies that maintain an audit committee.¹⁵ Consistent with our original results, there is a significant positive relation between short auditor tenure and fraud ($p < 0.01$), and no significant relation between long tenure and fraud ($p > 0.10$).

SUMMARY, IMPLICATIONS, AND LIMITATIONS

The recently released GAO study on mandatory audit firm rotation (GAO 2003) does not recommend *mandatory* firm rotation. However, there are increasing calls for audit committees to consider *voluntary* firm rotation as a means of enhancing audit quality (see NYSE 2003, TIAA-CREF 2004, among others). These calls for voluntary audit firm rotation presuppose that audit quality increases when a new audit firm is retained. We find no such evidence. Rather we find that fraudulent financial reporting is more likely when auditor tenure is three years or less. Our results indicate that financial fraud is more likely in the early years of the auditor-client relation and suggest that long auditor tenure is not problematic.

We do offer one caveat relative to our results, as well as for the results reported in earlier studies. All studies in the U.S. that have examined the relation between audit quality and auditor tenure have examined this relation in a regime where auditor changes were *voluntary*, and these prior studies examined voluntary auditor changes at a time when management rather than the audit committee drove the selection of the audit firm. It may be that the heightened incidence of financial reporting problems associated with the early years of an auditor-client relationship reflects the fact that companies that change auditors are more likely to have financial reporting problems, rather than reflecting any problems with the audit process itself during the early years of the auditor-client relationship. Therefore, it is uncertain whether our results would extend to a regulatory

regime of *mandatory* audit rotation. Moreover, it also is not certain whether our results would apply in an environment where audit committees of public companies have a policy of systematically changing auditors rather than having the change driven by management for potentially opportunistic reasons. Further research is clearly needed on the relation between auditor tenure and financial reporting quality where auditor changes are mandated or are driven by the audit committee rather than by management (see Elitzur and Falk 1996 for an initial attempt to model auditor behavior in a regime with mandatory firm rotation).

REFERENCES

- Abbott, L. J., and S. Parker. 2000. Auditor selection and audit committee characteristics. *Auditing: A Journal of Practice & Theory* (Fall): 47-66.
- Abbott, L. J., S. Parker, and G. F. Peters. 2004. Audit committee characteristics and restatements: A study of the efficacy of certain Blue Ribbon Committee recommendations. *Auditing: A Journal of Practice & Theory* (forthcoming).
- American Institute of Certified Public Accountants (AICPA). 1992. *Statement of Position: Regarding Mandatory Rotation of Audit Firms of Publicly Held Companies*. New York, NY: AICPA.
- Arens, A. A., M. S. Beasley, and R. J. Elder. 2003. *Auditing and Assurance Services: An Integrated Approach*. 9th edn. Upper Saddle River, NJ: Prentice Hall.
- BDO Seidman LLP. 2003. Comment letter on the SEC's proposed rules on auditor independence (File No. S7-49-02). 13 January.
- Beasley, M. S. 1996. An empirical analysis of the relation between the board of director composition and financial statement fraud. *The Accounting Review* (October): 443-465.
- Beasley, M. S., J. V. Carcello, and D. R. Hermanson. 1999. *Fraudulent Financial Reporting 1987-1997: An Analysis of U.S. Public Companies*. Committee of Sponsoring Organizations of the Treadway Commission. Jersey City, NJ: AICPA.
- Beasley, M. S., J. V. Carcello, D. R. Hermanson, and P. Lapedes. 2000. Fraudulent financial reporting: Consideration of industry traits and corporate governance mechanisms. *Accounting Horizons* (December): 441-454.
- Beneish, M.D. 1999. Incentives and penalties related to earnings overstatements that violate GAAP. *The Accounting Review* (October): 425-457.
- Bonner, S. E., Z-V. Palmrose, and S. M. Young. 1998. Fraud type and auditor litigation: An analysis of SEC Accounting and Auditing Enforcement Releases. *The Accounting Review* (October): 503-532.
- Casterella, J., W. R. Knechel, and P. L. Walker. 2002. The relationship of audit failures and auditor tenure. Working paper, University of Florida.
- Clapman, P. C. 2003. Comment letter on the SEC's proposed rules on auditor independence (File No. S7-49-02). 13 January.

- Collins, D. W., and S. P. Kothari. 1989. An analysis of intertemporal and cross-sectional determinants of earnings response coefficients. *Journal of Accounting & Economics* (July): 143-182.
- Commission on Public Trust and Private Enterprise. 2003. *Findings and Recommendations Part 2: Corporate Governance Part 3: Audit and Accounting*. New York, NY: The Conference Board.
- Cram, D. P., I. Stuart, and V. Karan. 2003. Matched sample analysis in accounting research. Working paper, California State University – Fullerton.
- Davis, L. R., B. Soo, and G. Trompeter. 2003. Auditor tenure, auditor independence and earnings management. Working paper, Boston College.
- DeAngelo, L. E. 1981. Auditor independence, ‘low balling,’ and disclosure regulation. *Journal of Accounting and Economics* (August): 113-127.
- Dechow, P. M., R. G. Sloan, and A. P. Sweeney. 1995. Detecting earnings management. *The Accounting Review* (April): 193-225.
- Dechow, P. M., R. G. Sloan, and A. P. Sweeney. 1996. Causes and consequences of earnings manipulation: An analysis of firms subject to enforcement actions by the SEC. *Contemporary Accounting Research* (Spring): 1-36.
- DeFond, M. L., and D. B. Smith. 1991. Discussion of the financial and market effects of the SEC Accounting and Auditing Enforcement Releases. *Journal of Accounting Research* (Supplement): 143-148.
- Elitzur, R., and H. Falk. 1996. Planned audit quality. *Journal of Accounting and Public Policy* (Autumn): 247-269.
- Erickson, M., M. Hanlon, and E. Maydew. 2003. Is there a link between executive compensation and accounting fraud? Working paper, University of Michigan.
- Geiger, M. A., and K. Raghunandan. 2002. Auditor tenure and audit reporting failures. *Auditing: A Journal of Practice & Theory* (March): 67-78.
- General Accounting Office (GAO). 2003. *Public Accounting Firms Required Study on the Potential Effects of Mandatory Audit Firm Rotation*. Washington, D.C.
- Ghosh, A., and D. C. Moon. 2003. Does auditor tenure impair audit quality? Working paper, Office of Economic Analysis, Securities and Exchange Commission.
- Gujarati, D. N. 1995. *Basic Econometrics*. 3rd edition. New York, NY: McGraw-Hill.

- Hair, J. F., Jr., R. E. Anderson, and R. L. Tatham. 1987. *Multivariate Data Analysis*. 2nd edition. New York, NY: Macmillan.
- Hills, R. M. 2002. *Oversight Hearing on “Accounting and Investor Protection Issues Raised by Enron and Other Public Companies.”* Senate Committee on Banking, Housing, and Urban Affairs. 107th Cong., 2nd sess. 12 February.
- Hosmer, D., and S. Lemeshow. 2000. *Applied Logistic Regression*. 2nd edition. New York, NY: John Wiley & Sons.
- Jensen, M. C. 1993. The modern industrial revolution, exit, and the failure of internal control systems. *Journal of Finance* (July): 831-880.
- Johnson, V. E., I. K. Khurana, and J. K. Reynolds. 2002. Audit-firm tenure and the quality of financial reports. *Contemporary Accounting Research* (Winter): 637-660.
- Maletta, M., and A. Wright. 1996. Audit evidence planning: An examination of industry error characteristics. *Auditing: A Journal of Practice & Theory* (Spring): 71-86.
- Messier, W. F., Jr. 2003. *Auditing and Assurance Services: A Systematic Approach*. 3rd edn. Burr Ridge, IL: McGraw Hill.
- Moolgavkar, S., Lustbader, E., and D. J. Venzon. 1985. Assessing the adequacy of the logistic regression model for matched case-control studies. *Statistics in Medicine* vol. 4: 425-435.
- Myers, J. N., L. A. Myers, and T. C. Omer. 2003. Exploring the term of the auditor-client relationship and the quality of earnings: A case for mandatory auditor rotation? *The Accounting Review* (July): 779-799.
- New York Stock Exchange. 2003. *Final NYSE Corporate Governance Rules*. Available at <http://www.nyse.com/pdfs/finalcorpgovrules.pdf>.
- O'Malley, S. 2002. *Oversight Hearing on “Accounting and Investor Protection Issues Raised by Enron and Other Public Companies.”* Senate Committee on Banking, Housing, and Urban Affairs. 107th Cong., 2nd sess. 6 March.
- Palmrose, Z-V. 1988. An analysis of auditor litigation and audit service quality. *The Accounting Review* (January): 55-73.
- Pregibon, D. 1984. Data analytic methods for matched case-control studies. *Biometrics* vol. 40: 639-651.

- Raghunandan, K., and K. R. Subramanyam. 2003. Market information and predictive accuracy of the going concern opinion. Working paper, Florida International University and the University of Southern California.
- Sarbanes-Oxley Act of 2002, Public Law 107-204, 107th Cong., 2nd sess. 24 July.
- Silvers, D. 2003. Comment letter on the SEC's proposed rules on auditor independence (File No. S7-49-02). 13 January.
- St. Pierre, K., and J. A. Anderson. 1984. An analysis of factors associated with lawsuits against public accountants. *The Accounting Review* (April): 242-263.
- TIAA-CREF. 2004. *Policy Statement on Corporate Governance*. New York, NY.
- Teoh, S. H., and T. J. Wong. 1993. Perceived auditor quality and the earnings response coefficient. *The Accounting Review* (April): 346-366.
- Turner, L. E. 2002. *Oversight Hearing on "Accounting and Investor Protection Issues Raised by Enron and Other Public Companies: Oversight of the Accounting Profession, Audit Quality and Independence, and Formulation of Accounting Principles."* Senate Committee on Banking, Housing, and Urban Affairs. 107th Cong., 2nd sess. 26 February.
- Wall Street Journal*. 2003. Freddie Mac agrees to pay civil fine of \$125 million. December 10. Available at http://online.wsj.com/article_print/0,,SB107106680095083900,00.html.
- Warfield, T. D., J. J. Wild, and K. L. Wild. 1995. Managerial ownership, accounting choices, and informativeness of earnings. *Journal of Accounting & Economics* (July): 61-91.
- Wild, J. J. 1996. The audit committee and earnings quality. *Journal of Accounting, Auditing & Finance* (Spring): 247-276.
- Zmijewski, M. E. 1984. Methodological issues related to the estimation of financial distress prediction models. *Journal of Accounting Research* (Supplement): 59-82.

TABLE 1
Sample Descriptions

	<u>Matched Pairs Analysis^b</u>	<u>Full Population Analysis^c</u>
Initial sample ^a	267	267
Financial statement information unavailable and unable to determine auditor tenure	(39)	(39)
Proxy statement information unavailable	(28)	NA
AAERs affecting banks or insurance firms	(27)	(27)
First reporting year is a fraud year (no clean year)	(25)	(25)
Financial statement information unavailable	(19)	(19)
Unable to match	(15)	NA
Unable to determine first fraud year per AAER	(6)	(6)
Unable to determine auditor tenure	(3)	(3)
No audit opinion issued for sample year	(1)	(1)
Final sample	<u>104</u>	<u>147</u>

^a The initial sample is determined from the Accounting and Auditing Enforcement Releases issued by the SEC between 1990 and 2001 alleging violation of Section 10(b)-5 and where the first year of the alleged fraud is after 1987.

^b For the matched pairs analysis, each fraud observation is matched with a non-fraud observation by year, industry and total assets. Corporate governance variables are included as control variables in the conditional logistic regression model.

^c The full population analysis includes the fraud observations and all other non-fraud observations between 1988 and 2000 (corporate governance variables are not included due to the hand-collected nature of these variables). The number of non-fraud observations used to estimate the logistic regression model is 68,195.

TABLE 2
Descriptive Statistics
Mean (Median)
[Standard Deviation]

<i>Variable^a</i>	<i>Predicted Relation</i>	<i>Matched Pairs Analysis</i>			<i>Full Population Analysis</i>		
		<i>Fraud (n=104)</i>	<i>Non Fraud (n=104)</i>	<i>Difference (F- NF)^b</i>	<i>Fraud (n=147)</i>	<i>Non Fraud (n=68,195)</i>	<i>Difference (F- NF)^b</i>
SHORT	none	0.45 (0.00) [0.50]	0.20 (0.00) [0.40]	0.25*** (0.00)*** ^c	0.52 (1.00) [0.50]	0.25 (0.00) [0.43]	0.27*** (1.00)***
LONG	none	0.20 (0.00) [0.48]	0.37 (0.00) [0.40]	-0.17*** (0.00)*** ^c	0.17 (0.00) [0.38]	0.37 (0.00) [0.48]	-0.20*** (0.00)*** ^c
SIZE	-	3.61 (3.75) [2.08]	3.60 (3.73) [2.05]	0.01 0.02	3.27 (3.10) [2.15]	4.43 (4.27) [2.27]	-1.16*** (-1.17)***
ZFC	+	-2.77 (-3.05) [1.83]	-2.75 (-3.18) [2.19]	-0.02 (0.13)	-3.58 (-4.24) [1.97]	-3.81 (-4.28) [1.69]	0.23* (0.04)*
YRSPUB	-	8.06 (5.50) [8.01]	12.25 (8.00) [10.89]	-4.19*** (-2.50)***	6.07 (4.00) [5.43]	10.59 (9.00) [6.98]	-4.52*** (-5.00)***
MKTBK	+	4.41 (2.63) [7.44]	3.93 (2.11) [6.73]	0.48 (0.52)	4.18 (2.65) [8.45]	3.09 (1.86) [6.06]	1.09** (0.79)***
CPA	-	0.70 (1.00) [0.46]	0.89 (1.00) [0.31]	-0.19*** (0.00)*** ^c	0.63 (1.00) [0.48]	0.83 (1.00) [0.38]	-0.20*** (0.00)*** ^c
BDOU	-	0.57 (0.60) [0.23]	0.66 (0.71) [0.21]	-0.09*** (-0.11)***	NA	NA	
BDSIZE	+	6.30 (6.00) [2.57]	6.43 (6.00) [2.29]	-0.13 (0.00)	NA	NA	
BOSS	+	0.80 (1.00) [0.40]	0.61 (1.00) [0.49]	0.19*** (0.00)*** ^c	NA	NA	

*, **, and *** indicate significance at $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively (based on one-tailed tests where relation is predicted).

^a Variable definitions:

- SHORT = 1 when the length of the auditor-client relationship is short (three years or less), else 0.
- LONG = 1 when the length of the auditor-client relationship is long (nine years or longer), else 0.
- SIZE = natural log of total assets.
- ZFC = Zmijewski's (1984) financial condition index.
- YRSPUB = number of years the firm's stock has traded on a national stock exchange.
- MKTBK = fiscal year-end price to book ratio.
- CPA = 1 if the auditor is a Big 6 (Big 8) audit firm, else 0.
- BDOU = percentage of the board members who are non-employee directors.
- BDSIZE = number of directors on the board.
- BOSS = 1 if the chairperson of the board holds the position CEO or president, else 0.

^b Tests for differences in the means are based on t-statistics (z-statistics) for continuous variables (proportions).

Nonparametric tests for differences in location are based on the Wilcoxon rank sum test.

^c The Wilcoxon rank sum test does not test whether the medians for the two groups are different. Instead, the test identifies a difference in location, specifically, whether the observations in the two groups are from populations with different medians. Thus, the test indicates a significant difference even though the medians for the two groups are the same.

TABLE 3
Logistic Regression of Fraud on Auditor Tenure and Control Variables

$$FRAUD = b_0 + b_1 SHORT + b_2 LONG + b_3 SIZE + b_4 ZFC + b_5 YRSPUB + b_6 MKTBK + b_7 CPA + b_8 BDOUT + b_9 BDSIZE + b_{10} BOSS + \varepsilon$$

<i>Variable^a</i>	<u>Matched Pairs Analysis</u>			<u>Full Population Analysis^b</u>	
	<i>Predicted Relation</i>	<i>Estimated Coefficients</i>	<i>Wald Chi-Square</i>	<i>Estimated Coefficients</i>	<i>Wald Chi-Square</i>
Intercept	none	NA		-6.281	154.27***
SHORT	none	2.446	13.13***	0.709	13.59***
LONG	none	0.581	0.82	0.466	2.30
SIZE	-	2.330	2.46	-0.026	0.22
ZFC	+	-0.004	0.01	-0.004	0.01
YRSPUB	-	-0.071	6.25***	-0.118	25.59***
MKTBK	+	0.107	7.51***	0.010	0.73
CPA	-	-1.989	6.56***	-0.783	15.83***
BDOUT	-	-2.720	5.70***	NA	NA
BDSIZE	+	0.219	3.19**	NA	NA
BOSS	+	1.736	10.52***	NA	NA

Number of Observations:	104	68,342
Chi-Square for Model:	61.95	265.14
p-value	(.0001)	(.0001)
Pseudo R ²	0.43	0.13
Hosmer-Lemeshow Statistic:	NA	8.63
p-value	NA	(0.37)

*, **, and *** indicate significance at $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively (based on one-tailed tests where relation is predicted).

^a Variable definitions:

- FRAUD = 1 if the company and/or its officers were charged by the SEC with a violation of Rule 10(b)-5 of the 1934 Securities Exchange Act in an Accounting and Auditing Enforcement Release (AAER) issued between 1990 and 2001 (and where the first year of the alleged fraud is post-1987), else 0.
- SHORT = 1 when the length of the auditor-client relationship is short (three years or less), else 0.
- LONG = 1 when the length of the auditor-client relationship is long (nine years or longer), else 0.
- SIZE = natural log of total assets.
- ZFC = Zmijewski's (1984) financial condition index.
- YRSPUB = number of years the firm's stock has traded on a national stock exchange.
- MKTBK = fiscal year-end price to book ratio.
- BDOUT = percentage of the board members who are non-employee directors.
- BDSIZE = number of directors on the board.
- BOSS = 1 if the chairperson of the board holds the position CEO or president, else 0.
- CPA = 1 if the auditor is a Big 6 (Big 8) audit firm, else 0.

^bYear and industry dummy variables have been suppressed for expositional convenience.

ENDNOTES

¹ Any definition of long auditor tenure is inherently arbitrary. We adopt the definition of long tenure employed by Johnson et al. (2002), but we test the sensitivity of our results to alternate cutoffs later in the paper. In addition, since we test whether fraudulent financial reporting is more likely given *either* short auditor tenure or long auditor tenure (as compared to medium tenure), we use dummy variables to separately test the relation between fraud and short and long auditor tenure.

² Prior to 1988, *Research Insight* (and *Compustat*) listed only nine auditor codes (one for each of the largest eight firms and code 9 for all other firms). Since we include both Big 8 and non-Big 8 firms in our sample and since we use *Research Insight* to determine auditor tenure, it was not practical to include observations prior to 1988 since we would not have been able to track auditor tenure for companies using non-Big 8 auditors.

³ We control for certain characteristics of the full board of directors, rather than characteristics of the audit committee, because Beasley (1996) found that the characteristics of the full board of directors were associated with fraudulent financial reporting, whereas audit committee characteristics were not associated with fraud. We examine the sensitivity of our results to replacing board characteristics with audit committee characteristics later in the paper.

⁴ The three board-related control variables were all measured using the proxy statement filed in the year before the fraud began (i.e., the last clean year) because we want to capture the composition of the board of directors at the time the fraud began.

⁵ Governance characteristics are hand collected by reading proxy statements.

⁶ Of the 104 fraud-related observations, 65 were matched at the 4-digit SIC code level, 14 were matched at the 3-digit level, and 25 were matched at the 2-digit level.

⁷ There was no difference between the mean size of the fraud sample (based on total assets) and the mean size of the non-fraud sample ($p > 0.10$); therefore, we conclude that we successfully matched on size. Although we successfully matched on size, we include size as a control variable in the matched-pairs analysis to be consistent with its inclusion in the full population analysis. Our results are qualitatively unchanged if size is excluded from the matched-pairs analysis.

⁸ We were able to obtain data for approximately 39 percent of our fraud observations (104/267), which is roughly comparable to Beasley (1996) who obtained data on 45 percent of his fraud observations. Unlike Beasley, we had to obtain data on auditor tenure, which served to reduce the number of observations available.

⁹ All variables are winsorized (reset) at the 1 percent and 99 percent levels.

¹⁰ Cram et al. (2003) point out econometric problems with the use of matched-pairs design in accounting research. For example, logistic regression assumes that observations are independent and this assumption does not hold in the case of a matched-pairs design. This problem can be addressed by performing a conditional logistic regression analysis. We used SAS' PHREG procedure in performing our analysis. This SAS procedure produces identical results to running a logistic regression, without an intercept term, on the differences between the observations in the test sample and the control sample.

¹¹ It is not possible to extend the Hosmer-Lemeshow chi-square goodness-of-fit statistic to the 1-1 matched study design (Hosmer and Lemeshow 2000, 236). Therefore, we were unable to compute this statistic for the matched pairs analysis.

¹² We control for fraud year and SIC code in the full population analysis but these coefficients are not included in Table 3 in the interest of brevity.

¹³ Computing the change in the probability of fraud when *SHORT* equals one for the matched-pairs analysis would represent the *difference* between the fraud sample and the non-fraud sample. Given the difficulty of interpretation associated with that computation, we performed a standard logistic regression analysis and computed the percentage change in the likelihood of fraud if auditor tenure is short as compared to tenure being other than short. It is this percentage increase that is reported in the text.

¹⁴ We added change in the market-to-book ratio and change in sales to our model as additional control variables, both of which may proxy for increased incentive to commit fraud. Neither variable was significant ($p > 0.10$), and the results for the *SHORT* and *LONG* variables were qualitatively unchanged.

¹⁵ This analysis assumes, consistent with the Sarbanes-Oxley Act and the *Statements on Auditing Standards*, that the full board of directors performs the activities of an audit committee in the absence of such a committee.