AUDIT QUALITY EXAMINED ONE LARGE CPA FIRM AT A TIME: MID-1990'S EMPIRICAL EVIDENCE OF A PRECURSOR OF ARTHUR ANDERSEN'S COLLAPSE*

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1. Introduction

The assumption that each of the largest CPA firms perform the best audits, compared to the non-Big Six CPA firms, has been a premise of empirical research in accounting and auditing. The construct "audit quality" or "credibility of disclosures" has routinely been measured by the presence of a Big Six auditor (Bushman and Smith 2003). However, notwithstanding the centrality of this premise, it has only been examined in the aggregate. In other words, empirical research has examined whether the Big Six, in the aggregate, are quality-differentiated auditors. Conversely, there has been little examination of audit quality, one individual large CPA firm at a time. The Enron, Waste Management (SEC 2001a), and Sunbeam (SEC 2001b) controversies, and the exit of Arthur Andersen from the public companyauditing services market, as well as new empirical research, together suggest that an empirical study of audit quality, examining one large CPA firm at a time, is needed. Audit quality affects users of audited financial statements and, less directly, users of other financial information, because it influences the credibility that outsiders attach to the financial information emanating from the reported-on entity. In turn, this influences outsiders' investing, lending, underwriting and other decisions. Entity management, board members and audit committee members are also affected by audit quality. Their beliefs concerning the audit quality that is provided by a given CPA firm influence whether to engage that CPA firm to perform audits, and how much to be willing to pay.

This study examines auditor outcomes, within the context of 480 private securities class actions filed January 19, 1996 through November 3, 1998. This period comprises a single legal regime, after the Private Securities Litigation Reform Act ("PSLRA") became effective and before the Securities Litigation Uniform Standards Act ("SLUSA") became effective. The theoretical framework for the classification of the outcomes is based on the corporate misconduct literature, as well as the suit and settlement (legal process) economics literature. The outcomes of each of the Big Six were separately compared with the outcomes of the non-Big Six. The results suggest, consistent with the hypotheses, that Coopers & Lybrand, Deloitte & Touche, Ernst & Young, KPMG and Price Waterhouse were each, individually, higher quality auditors, compared to the non-Big Six. Conversely, the results do not suggest the same with regard to Arthur Andersen. Finally, the results suggest, though less formally and strongly, that Price Waterhouse was the highest quality auditor. The following section discusses the theory underpinning the empirical research. The third section describes the research design. The fourth section discusses the research results. The fifth section presents the conclusions and implications.

2. Theory

The theoretical issues that motivated this research and the methods used to execute it, are discussed in this section of the paper. First, I discuss why it has been the generally held belief, among empirical researchers, that Big Six CPA firms are believed to be high quality auditors. I also discuss what the term "high quality auditor" has come to mean, and the reasons why. Second, I discuss the reasons why I theorize that only Coopers & Lybrand, Deloitte & Touche, Ernst & Young, KPMG and Price Waterhouse can be theoretically justified as having been high quality auditors during the period of the study.

2.1 The belief that big six CPA firms are high quality auditors

Several rationales have been advanced to justify the belief that the Big Six CPA firms are high quality auditors. Also, several different attributes of audit quality have been proposed. The existence of multiple rationales is probably inevitable, since a prerequisite of making an informed judgment of audit quality is to read the audit working papers and to interview the key personnel involved in the audit (Moizer 1997). Erickson, et al. (2000), using the auditors' depositions and working papers, evaluated the audit procedures that were applied and the information used, in the Lincoln Savings and Loan case. However, theirs was a case study, not a large sample study, and the generalizability of their conclusions is unclear. The quality of any service is partly a function of the competence of the service provider. DeAngelo (1981) added a second component: independence of the auditor. In auditing, independence has long been a concern because the payment of the fee to the auditor has always been controlled by the corporation's management. DeAngelo (1981) argued that this concern is why the largest (subsequently interpreted as the Big Six) auditors are superior quality auditors compared to the other auditors. Big Six auditors are more independent. Any one particular client is economically trivial to a Big Six auditor, compared to the economic importance of maintaining a reputation for strong independence and thus audit quality. This, conversely, is not the case with small CPA firms.

The theory of DeAngelo (1981) is compelling, but only if a CPA firm is strictly assumed to be a single actor. In addition, competing paradigms (e.g. behavioral, ethical or cultural) must be dismissed in favor of neoclassical economics. Rigidly viewing a CPA firm as a single actor is problematic because, inter alia, the firms willingly scapegoat individuals (e.g. David Duncan) whenever the existence of the entire CPA firm is threatened. The strongest, most consistent finding of the audit fee studies is that the Big Six CPA firms have been paid a higher fee to perform an audit than the other CPA firms. Less strongly and consistently, Price Waterhouse has been paid a still higher fee to perform an audit than the other Big Six CPA firms (Moizer 1997). These studies reveal audit quality differences, assuming that a CPA firm that is paid more performs higher quality audits. There are alternative, nonexclusive, explanations for audit fee differences: reputation sans substance, tacit oligopoly, and the insurance hypothesis (deep pockets if subsequently things go badly and investors decide to litigate against the auditor).

The results of the initial public offering ("IPO") studies are less strong and consistent than the audit fee studies. However, they tend to show results similar to the audit fee studies.

The Big Six CPA firms were generally associated with lower IPO underpricing (the difference between an IPO's offer price and its first open market bid price), the use of higher reputation underwriters, and lower underwriting fees.

There have been a number of studies of the stock market reaction to auditor changes. The results of these studies are less strong and consistent than the IPO studies. However, changes from a non-Big Six auditor to a Big Six auditor were often viewed neutrally or positively by the stock market. Conversely, changes from a Big Six auditor to a non-Big Six auditor were often viewed negatively by the stock market (Moizer 1997).

Teoh and Wong (1993) investigated the earnings response coefficient ("ERC"). The ERC is a measure of the extent to which new earnings information is capitalized (because it is believed to be credible) in the stock price. Teoh and Wong (1993) found that the ERC's of Big Six auditees were higher than those of the non-Big Six. This suggests, assuming that the ERC is an accurate measure of the extent to which new earnings information is capitalized in the stock price, that the Big Six were higher quality auditors.

Earnings management research provides some evidence that Big Six auditees are less likely to engage in earnings management than non-Big Six auditees. DeFond and Jiambalvo (1991) found, in univariate but not multivariate analysis, that the Big Six were less likely to be the auditors of a company that restated its audited annual financial statements. However, Palmrose and Scholz (2000) did not find that Big Six auditors of restated financial statements (whether examining all restatements or solely the annual) were less likely to be associated with the occurrence of concomitant auditor litigation. Becker, et al. (1998) found that income-increasing discretionary accruals are larger for non-Big Six auditees, as a percent of total assets, than for Big Six auditees. Francis, et al. (1999) also found that earnings management, as reflected in discretionary accruals, was greater among non-Big Six auditees than Big Six auditees. Frankel, et al. (2002) found, in univariate but not multivariate analysis, that the Big Six were less likely to be the auditors of a company that engaged in earnings management. They found this result using a discretionary accruals approach, as well as a just barely meeting analysts' forecasts approach.

Big Six auditors were sued at a lower frequency per estimated audit performed than other auditors (Palmrose 1988). To the extent that this is due to higher audit quality, it suggests that the Big Six were higher quality auditors. In some private securities class action lawsuits, the auditor is named a defendant. Big Six auditors were named defendants proportionately less than other auditors (Fuerman 2000).

The above studies analyzed the Big Six in the aggregate, generally because their experimental designs lacked sufficient statistical power or otherwise did not permit one large CPA firm at a time analyses. Also, audit quality was not studied in the abstract, as it would not have been possible to obtain meaningful results. Instead, it was studied by comparing the Big

Six (hypothesized higher quality) to other (hypothesized lower quality) auditors. In the aggregate, empirical evidence suggests that the Big Six were higher quality auditors.

2.2 The exception to the general rule that the big six were higher quality auditors

Stocks of Arthur Andersen auditees reacted negatively to the January 10, 2002, announcement of the document shredding (Chaney and Philipich 2002), as well as the March 14, 2002, announcement of the indictment (Krishnamurthy et al. 2003). These reactions may have been due to the market's downgrading of its assessment of Arthur Andersen's audit quality. An alternative explanation is the Menon and Williams (1994) insurance hypothesis. The negative reactions may have been due to the market's assessment that Arthur Andersen's continued existence as a going concern was less likely.

Krishnamurthy et al. (2003) found that the negative reaction to the indictment was greater for stocks of Arthur Andersen auditees that purchased a larger proportion of non-audit services (proxy for perceived problematic independence/audit quality). Conversely, there was no significance on the stock loss (over the year prior to the indictment) variables used by Menon and Williams (1994) to proxy for perceived greater concern for potential loss in insurance value. This suggests that the negative market reaction was more due to downgrading of the assessment of Arthur Andersen's audit quality than its potential insurance value (Krishnamurthy et al. 2003).

The popular business press asserts that the Enron affair was not an isolated case, but the last embarrassment of a CPA firm that had been in decline for years (Jorion 2003; Squires et al. 2003; Toffler 2003). However, there is no empirical research supporting this assertion. Also, scant rationale has been articulated as to why specifically Arthur Andersen, and not some other Big Five CPA firm collapsed. For example, Squires et al. (2003), in part, attributed the fall of Andersen to the decentralization and democratization (which permitted some partners to stray from the firm's traditional value of responsibility to the public) that occurred after dictatorial Arthur E. Andersen's death in 1947. However, the firm's reputation for moral rectitude and insistence on strict accounting and auditing was unsurpassed during successor Leonard Spacek's tenure, which continued until 1970. Also, Leicester (2003) asserted that Arthur Andersen, based on his information, appeared to be the least decentralized of the Big Five CPA firms.

Toffler (2003) asserted that Arthur Andersen was the least democratic of the Big Six, and that following orders and making money6 were overemphasized. Managers almost never questioned the orders of partners, believing that their primary responsibility was not to the management of the corporations they audited, nor to the investors, but to the partners. Arthur Andersen's consulting partners sold elaborate, expensive ethics programs to other businesses to meet the Federal Sentencing Guidelines for Organizations, yet Arthur Andersen had no such internal ethics program (Coopers & Lybrand had an internal ethics program). The hubristic leadership of the firm was mesmerized by the Andersen mystique and felt no need for such an internal ethics program. Arthur Andersen made money by overbilling, overleveraging (using entry level staff to perform an excessively large proportion of the work), and by its auditors acquiescing in auditees' overly aggressive accounting (Toffler 2003).

Unlike the analogous national office within each of the other Big Six CPA firms, the accounting interpretations of Andersen's Professional Standards Group could be overridden by the local audit engagement partner, according to McNamee, et al. (2002) and Coffee (2002). However, Shanes (2002) argued that this assertion is misleading, because an appeals process was used to resolve disputes between members of the Professional Standards Group and audit engagement partners. Also, the collapse of the telecommunications, utilities, energy and air transportation sectors in 2001 disproportionately affected Arthur Andersen, since its audit practice was unluckily concentrated in these industry sectors. Any of the Big Five CPA firms with a similar audit practice industry concentration would have faced a significantly increased risk of audit related claims.

There are theoretical arguments in favor of the proposition that the Andersen collapse was a gradual, firm-wide deterioration unique to Andersen. However, there are also arguments that can be made that the Andersen debacle was not idiosyncratic and could have happened to any of the other Big Five CPA firms. As a starting point to gain insight into these issues, the main research question of this paper is to determine whether there is empirical evidence of a mid-1990's precursor of the 2002 collapse of Andersen. If yes, this would support the assertions of Jorion (2003), Squires et al. (2003) and Toffler (2003) that the Enron affair was not a sudden, isolated case, but the last chapter of a CPA firm that had been in dangerous decline for years.

2.3 The hypotheses

One-sided hypothesis testing was performed, since there is no empirical support for the assertion that non-Big Six CPA firms were higher quality auditors than the Big Six CPA firms. Conversely, except for Arthur Andersen, there is substantial support for the assertion that the Big Six were higher quality auditors than the non-Big Six. Five hypotheses are stated in the alternative form:

H1: The audit quality of Coopers & Lybrand was higher than that of the non-Big Six.

H2: The audit quality of Deloitte & Touche was higher than that of the non-Big Six.

H3: The audit quality of Ernst & Young was higher than that of the non-Big Six.
H4: The audit quality of KPMG was higher than that of the non-Big Six.
H5: The audit quality of Price Waterhouse was higher than that of the non-Big Six.

3. Research design

The Erickson, et al. (2000) case study discussed above used auditors' depositions and working papers to evaluate the audit procedures and information used, in the Lincoln Savings and Loan audit. Exact replication of their procedures in a large sample study is not possible. However, when a private securities class action is filed, the attorneys evaluate the audit procedures and information used, to decide the action they will take against the auditor. To the extent that the decision of the plaintiff's attorney is based on audit quality, analysis of a large sample of private securities class actions to determine the identity of the CPA firm that performed the audit and whether it was named a defendant is therefore informative.

In this paper, in addition to determining whether the auditor was named a defendant, I also analyzed the subsequent outcome of the case for the auditor. I considered whether, if the auditor was named a defendant in the private securities class action, it had to pay the plaintiffs to end its involvement. The resolution of the private securities class action involves at least two additional decision makers. First, the judge decides whether to dismiss (terminate the involvement of) the auditor in a pre-trial motion to dismiss or motion for summary judgment. Second, the auditor and the plaintiff's attorney jointly decide to settle or proceed to trial. Finally, the decision as to whether government prosecution will occur involves at least two additional decision makers. The SEC and the auditor decide on whether a fraud or nonfraud enforcement action will occur and negotiate whether it will be consensual or contested, administrated or litigated. The United States Attorney and the auditor decide on whether a criminal prosecution will occur, and negotiate whether the auditor will plead guilty or litigate.

This paper analyzes the decisions of a variety of decision makers. This is preferable to reliance on a single, potentially biased, category of decision maker. It provides a more comprehensive and reliable basis for assuming that the decisions, in the aggregate, were substantially based on audit quality. This also provides an opportunity for analyzing the auditor outcome in each case in terms of its severity. This is important, for it allows a more informed, nuanced analysis than simply determining whether the plaintiff's attorney did or did not name the auditor a defendant in the private securities class action. The determination of the auditor outcome severity per case (there are 480 cases in which the CPA firm was the auditor of a company that experienced a financial disclosure-related private securities class action) is the crux of this research. The development of the outcome taxonomy began with the corporate misconduct literature. This literature considers, among other things, when business misconduct is the catalyst for private litigation, criminal prosecution, or (the middle ground) civil action by a governmental agency.

3.1 The outcome taxonomy

The outcome that suggests the worst level of audit quality is a criminal prosecution. As Lynch (1997) emphasized, the unique element of the criminal law is its piercing conveyance of society's moral outrage, its stigmatization of the criminal, and its message to others. To others who are in a position to perpetrate similar business misconduct, the message is to remain law-abiding and morally straight. The general public is concomitantly assured that they are being protected. Upon criminal conviction, an accountant or CPA firm is generally expelled from the auditing services market by the SEC using Rule 102(e) and by the state accountancy board as well (Goldwasser and Arnold 2003). If the auditor was criminally prosecuted, the case was coded 1000.

In addition to the criminal law, there is civil law. Civil law can be divided between private civil law (legal action undertaken by private citizens) and governmental civil action. Governmental civil actions can be done in the courts or via administrative proceedings by specialized regulatory agencies. For alleged auditor misconduct involving the securities of public companies, the relevant agency is usually the Securities and Exchange Commission ("SEC").

Sutherland (1940), conceived of "white collar crime" as including much of the corporate misconduct typically dealt with by administrative remedies. He argued that all of white collar crime was as harmful as theft or robbery and only escaped the formal criminal law by reason of the power of the business classes. With regard to the SEC enforcement actions that allege fraud by auditors and/or audit firms, Sutherland (1940) has a point. While SEC fraud actions, usually in an Accounting and Auditing Enforcement Release ("AAER") do not convey society's moral outrage to the extent of a formal criminal prosecution, they are the next most onerous punishment. They send an ominous warning to the offending auditor or audit firm. If the SEC alleged in an enforcement action that the auditor and/or audit firm committed fraud, the case was coded 800.

Nonfraud SEC enforcement actions against an auditor and/or audit firm usually allege negligence. They normally are via AAER administrative proceedings pursuant to SEC Rule 102(e). Auditors and/or audit firms can be censured and/or fined. Also, their privilege to be the auditor of financial statements filed with the SEC can be temporarily or permanently suspended.

Nonfraud SEC enforcement actions against an auditor and/or audit firm signify the next less severe outcome. Because of limited resources, the SEC pursues very few enforcement actions against auditors or audit firms. If the SEC undertook a nonfraud enforcement action against the auditor and/or audit firm, the case was coded 600.

Private securities class actions are a form of civil action undertaken by private sector attorneys on behalf of classes of plaintiff investors who allege legally deficient financial reporting and (sometimes) auditing. Although there is a deterrence byproduct, the motivation in filing a private securities class action is economic self-interest. If the investors win a judgment (rarely) or settlement (usually) they get money (or other assets) from the defendants. The plaintiff attorneys typically get 20% to 30% of the judgment or settlement, if any.

Private securities class actions are controversial. Proponents assert that they are a necessary prerequisite of high quality financial reporting and auditing. Critics dispute this assertion and disparage private securities class actions as frivolous. Congress, in passing the PSLRA, intended to eliminate most aspects of the prior private securities class action system that critics asserted were unfair to the defendants (Phillips and Miller 1996). Johnson, et al. (2002) found evidence suggesting that Congress' goal of discouraging frivolous private securities class actions was met. To avoid confounding that could result from analyzing two different legal regimes, this study is based entirely on private securities class actions filed after the PSLRA became effective.

Since economic self-interest motivates private civil litigation, economic analysis has long been applied to understand it (for example, Landes 1971 and Posner 1973). Legal process is a sequence of stages (Cooter and Ulen 2004). In the first stage relevant to this research, the auditor is named a defendant if the expected value to the plaintiffs exceeds the expected costs from doing so. In making this cost/benefit analysis the plaintiffs consider both the likely probabilities of future events, as well as the likely amount of money, net of their costs, that will be obtained, via judgment or settlement.

In subsequent stages, both the plaintiffs and the defendant auditor make a similar analysis, also known as a litigation decision tree, to determine their negotiations with each other. For example, BDO Seidman used a litigation decision tree in In re Health Management Inc.

Only money is at stake, so the worst possible outcome for an auditor in a private securities class action is payment of money to the plaintiffs. If the auditor paid the plaintiffs, the case was coded 400. If the auditor was named a defendant but avoided payment of any money to the plaintiffs, the case was coded 200. If the auditor was not named a defendant in the private securities class action, the case was coded 0. Thus, there are six outcome categories. They range from zero (least severe) to 1000 (most severe), as shown in Table 1.

3.2 The sample

Economic self-interest motivates the filing of a private securities class action. Thus, collection of a sample of private securities class actions provides the most economically significant litigation data for studying financial reporting and auditing. The sample of 480 financial disclosure-related private securities class actions, filed January 19, 1996 through November 3, 1998, was collected, first, from Securities Class Action Alert. Other sources were used to determine the outcome for the auditor. These included Public Access to Court Electronic Records ("PACER").18 The outcome data is more recent. For example, on May 22, 2003, with regard to the SmarTalk Teleservices case, the SEC suspended the audit engagement partner for a year. Also, PricewaterhouseCoopers was censured and fined $1,000,000 (SEC 2003b). The private securities class action, in which Price Waterhouse was named a defendant on September 21, 1998, was filed on July 23, 1998.

Other than privately held Bennett Funding Group, all of the cases involve publicly held, for-profit companies. A case is defined as a company/auditor combination. For example, since Arthur Andersen and Mahoney, Cohen and Company were both named defendants in Bennett Funding Group, it constitutes two cases. Most companies have United States principal executive offices and incorporation domiciles. In terms of principal executive offices, there are 16 Canadian companies, two each from the British Virgin Islands, Israel, the Netherlands, and the United Kingdom. There are one each from the Cayman Islands, China, France and Ireland. The respective incorporation domiciles are similar.

4. Research results

Figures 1 through 7 are the outcome histograms of Arthur Andersen, Coopers & Lybrand, Deloitte & Touche, Ernst & Young, KPMG, Price Waterhouse, and the non-Big Six auditors, respectively. The data are skewed. Thus, hypothesis testing using a statistical method that assumes a normal distribution would be unreliable. Overall (not depicted), in 384/480 cases (80.0%), the auditor was not named a defendant in the private securities class action. Conversely (also not depicted), in only 11/480 cases (2.3%), did the government take any action against the auditor. If the government acted, the auditor usually also paid money to the plaintiffs in the private securities class action. However, in the sole criminal prosecution, the auditor did not pay any money. Merle S. Finkel pled guilty to criminal fraud, but died before sentencing. He issued an audit report two days after he was retained to examine the Systems of Excellence financial statements (SEC 1997).

Only Figure 7, for the non-Big Six auditors, stands out among the seven outcome histograms. The government took more action against the non-Big Six auditors. Also, their outcome data are less skewed. Panel A of Table 2 shows the rankings of each of the Big Six, as well as (in the aggregate) the non-Big Six. The Panel A rankings are constructed using the theoretically based outcome taxonomy described in Section 3.1. For example, the sum of Price Waterhouse outcomes, 1800, divided by 45 observations, yields a quotient of 40. Price Waterhouse is ranked first and the non-Big Six are ranked last.

Panel B of Table 2 ranks the CPA firms by the percent of the observations in which the best outcome (0 - not a defendant in the private securities class action) was achieved. For example, Price Waterhouse achieved the best outcome in 40/45 of its cases (88.9%). Again, Price Waterhouse is ranked first and the non-Big Six are ranked last.

Panel C of Table 2 ranks the CPA firms by the percent of the observations in which the best or next best outcome (0 or 200) was achieved. For example, Price Waterhouse achieved the best or next best outcome in 42/45 of its cases (93.3%). Again, Price Waterhouse is ranked first and the non-Big Six are ranked last.

Panel D of Table 2 ranks the CPA firms by the percent of the observations in which they avoided government action. Coopers & Lybrand and KPMG tied for first, since they avoided government action in all of their observations (100%). The non-Big Six are ranked last.

4.1 The hypothesis testing

The hypothesis testing addressed the data skewness by computing Wilcoxon scores (rank sums) exact probability values (p-values), as shown in Table 3. In Table 3, there is a separate Panel (A for Arthur Andersen, B for Coopers & Lybrand, etc.) for each CPA firm. The normal approximation p-values are also shown for comparison. The hypothesis testing also addressed the different sample sizes, which causes greater statistical power for Ernst & Young (n=108) and Arthur Andersen (n=80) and lesser statistical power for Price Waterhouse (n=45) and Coopers & Lybrand (n=46). Thus, as an example, to reject the null hypothesis of no difference between the outcomes of KPMG and the non-Big Six, requires $p<.05$ both on KPMG's 77 total observations (139 when combined with the 62 non-Big Six observations) and also the median result of seven random samples of 45 KPMG observations (107 when combined with the 62 non-Big Six observations).

4.1.1 Coopers & Lybrand (Table 3, Panel B)

The null hypothesis of no difference between Coopers & Lybrand and the non-Big Six was rejected at $p<.05$. The exact p-value is .0188 for all observations (n=108), and .0220 for the median result using random sampling (n=107). The results, in Panel B of Table 3, support the first alternative hypothesis, that the audit quality of Coopers & Lybrand was higher than that of the non-Big Six.

4.1.2 Deloitte & Touche (Table 3, Panel C)

The null hypothesis of no difference between Deloitte & Touche and the non-Big Six was rejected at $p<.05$. The exact p-value is .0162 for all observations (n=124), and .0132 for the median result using random sampling (n=107).

The results, in Panel C of Table 3, support the second alternative hypothesis, that the audit quality of Deloitte & Touche was higher than that of the non-Big Six.

4.1.3 Ernst & Young (Table 3, Panel D)

The null hypothesis of no difference between Ernst & Young and the non-Big Six was rejected at $p<.05$. The exact p-value is .0036 for all observations (n=170), and .0065 for the median result using random sampling (n=107).

The results, in Panel D of Table 3, support the third alternative hypothesis, that the audit quality of Ernst & Young was higher than that of the non-Big Six.

4.1.4 KPMG (Table 3, Panel E)

The null hypothesis of no difference between KPMG and the non-Big Six was rejected at $p<.05$. The exact p-value is .0176 for all observations (n=139), and .0355 for the median result using random sampling (n=107). The results, in Panel E of Table 3, support the fourth alternative hypothesis, that the audit quality of KPMG was higher than that of the non-Big Six.

4.1.5 Price Waterhouse (Table 3, Panel F)

The null hypothesis of no difference between Price Waterhouse and the non-Big Six was rejected at $p<.05$. The exact p-value is .0019 (n=107). The results, in Panel F of Table 3, support the fifth alternative hypothesis, that the audit quality of Price Waterhouse was higher than that of the non-Big Six.20

4.1.6 Arthur Andersen (Table 3, Panel A)

Ex ante I did not hypothesize a difference between Arthur Andersen and the non-Big Six. The exact p-value is .0085 for all observations (n=142), but only .0558 for the median result using random sampling (n=107).

At a five percent level of significance, the results, in Panel A of Table 3, therefore do not consistently support the proposition that the audit quality of Arthur Andersen was higher than that of the non-Big Six.

5. Conclusions and implications

The results of this research suggest the following. Each of the Big Six CPA firms, except Arthur Andersen, was individually a higher quality auditor, compared to the non-Big Six CPA firms. The evidence also suggests, though less formally and strongly, that Price Waterhouse was the highest quality auditor. In Panels A (most important because it is theoretically grounded), B and C of Table 2, Price Waterhouse achieved the highest ranking. Thus, in three out of the four ranking methods shown in Table 2, Price Waterhouse was the number one auditor. The findings of this study help to put the Arthur Andersen saga into perspective. The collapse of Arthur Andersen was not entirely caused by Enron, though Enron was the catalyst. Instead, the obstruction of justice conviction was the culmination of a process of systemic deterioration that began as early as the 1995-1997 period. This paper is the first to provide empirical evidence of this systemic decline, a precursor of the firm's failure.

The results of this study suggest that the DeAngelo (1981) audit quality theory is reductionist, partly due to its sole reliance on neoclassical economics. Audit quality is not merely a function of audit firm size. A more complex theory of audit quality is needed, utilizing behavioral, ethical and cultural paradigms. There appears to be, with regard to audit quality, only a tendency for increasing returns to audit firm size. One could extrapolate that the audit quality of the Big Five or even the Big Four approximates the results reported in this paper. However, it is an empirical question as to whether this is appropriate. In July 1998, Price Waterhouse and Coopers & Lybrand merged to form PricewaterhouseCoopers. The Securities Litigation Uniform Standards Act ("SLUSA") became law in November 1998. Arthur Andersen exited the public company auditing services market in August 2002. Now there are only the Big Four. Given the likely social, political, legal, economic and financial importance of these events, further research is necessary to investigate the audit quality of the Big Five, as well as the audit quality of today's Big Four CPA firms.

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Appendices

Table 1: Scaling and Description of Auditor's Outcome in Securities Litigation

Scaling	Description of Auditor's Outcome in Securities Litigation
0	Auditor is not a defendant in the private securities class action lawsuit
200	Auditor is a defendant in the private securities class action lawsuit
400	Auditor pays to settle the private securities class action lawsuit
600	Auditor is a defendant or respondent in related SEC AAER nonfraud civil lawsuit or administrative proceeding
800	Auditor is a defendant in an SEC AAER civil lawsuit alleging violation of antifraud provisions of Securities Act of 1933 or Securities Exchange Act of 1934
1000	Auditor is a defendant in a criminal indictment, information or complaint

Table 2: Descriptive Statistics

Panel A: Ranking Based on Auditor's Mean Outcome

Auditor	Mean Outcome	Number of Observations
Price Waterhouse	40	45
Ernst & Young	54	108
Coopers & Lybrand	61	46
KPMG	64	77
Deloitte & Touche	68	62
Arthur Andersen	70	80
Mean - all 36 NB6 auditors	142	62

Panel B: Ranking Based on Auditor's Percent of 0 (not a defendant) Outcomes

Auditor	Percent of 0 Outcomes	Number of Observations
Price Waterhouse	88.9%	45
Coopers & Lybrand	82.6%	46
Arthur Andersen	82.5%	80
Deloitte & Touche	82.3%	62
Ernst & Young	81.5%	108
KPMG	79.2%	77
Mean - all 36 NB6 auditors	64.5%	62

Panel C: Ranking Based on Auditor's Percent of 0 (not a defendant) or 200 (no paymen plaintiffs) Outcomes

Auditor	Percent of 0 / 200 Outcomes	Number of Observations
Price Waterhouse	93.3%	45
Ernst & Young	90.7%	108
KPMG	88.3%	77
Arthur Andersen	87.5%	80
Coopers & Lybrand	87.0%	46
Deloitte & Touche	83.9%	62
Mean - all 36 NB6 auditors	75.8%	62

Panel D: Ranking Based on Auditor's Percent of Avoidance of Governmental Action

Auditor	Percent of Avoidance	Number of Observations
Coopers & Lybrand (tie)	100.0%	46
KPMG (tie)	100.0%	77
Ernst & Young	99.1%	108
Deloitte & Touche	98.4%	62
Price Waterhouse	97.8%	45
Arthur Andersen	96.3%	80
Mean - all 36 NB6 auditors	91.9%	62

Table 3: Wilcoxon Rank Sum One-Sided Test Results

Panel A: Outcome Severity of Arthur Andersen compared to Non-Big Six Auditors

	N	S	Asymptotic P-values Normal Approximation	Exact P-values
All observations	**142**	**4878.50**	**.0083**	**.0085**
Random sample 1	107	2088.50	.0024	.0020
Random sample 2	107	2105.00	.0040	.0033
Random sample 3	107	2149.50	.0119	.0110
Random sample 4 (median)	**107**	**2228.50**	**.0564**	**.0558**
Random sample 5	107	2240.00	.0695	.0691
Random sample 6	107	2241.50	.0712	.0705
Random sample 7	107	2272.50	.1126	.1124

Panel B: Outcome Severity of Coopers & Lybrand compared to Non-Big Six Auditors

	N	S	Asymptotic P-values Normal Approximation	Exact P-values
All observations	**108**	**2246.00**	**.0199**	**.0188**
Random sample 1	107	2180	.0232	.0220
Random sample 2	107	2180	.0232	.0220
Random sample 3	107	2180	.0232	.0220
Random sample 4 (median)	**107**	**2180**	**.0232**	**.0220**
Random sample 5	107	2180	.0232	.0220
Random sample 6	107	2180	.0232	.0220
Random sample 7	107	2180	.0232	.0220

Panel C: Outcome Severity of Deloitte & Touche compared to Non-Big Six Auditors

	N	S	Asymptotic P-values Normal Approximation	Exact P-values
All observations	**124**	**4208.00**	**.0162**	**.0162**
Random sample 1	107	2151.50	.0124	.0116
Random sample 2	107	2152.00	.0126	.0117
Random sample 3	107	2157.00	.0139	.0132
Random sample 4 (median)	**107**	**2157.00**	**.0139**	**.0132**
Random sample 5	107	2166.50	.0169	.0160
Random sample 6	107	2199.50	.0332	.0321
Random sample 7	107	2218.00	.0476	.0474

Panel D: Outcome Severity of Ernst & Young compared to Non-Big Six Auditors

	N	S	Asymptotic P-values Normal Approximation	Exact P-values
All observations	**170**	**5938.50**	**.0032**	**.0036**
Random sample 1	107	2080.50	.0019	.0013
Random sample 2	107	2099.50	.0035	.0028
Random sample 3	107	2123.00	.0067	.0058
Random sample 4 (median)	**107**	**2127.50**	**.0074**	**.0065**
Random sample 5	107	2137.00	.0091	.0077
Random sample 6	107	2179.50	.0243	.0234
Random sample 7	107	2179.50	.0243	.0234

Panel E: Outcome Severity of KPMG compared to Non-Big Six Auditors

	N	S	Asymptotic P-values Normal Approximation	Exact P-values
All observations	**139**	**4730.50**	**.0175**	**.0176**
Random sample 1	107	2132.50	.0083	.0071
Random sample 2	107	2165.50	.0178	.0162
Random sample 3	107	2180.00	.0232	.0463
Random sample 4 (median)	**107**	**2203.50**	**.0372**	**.0355**
Random sample 5	107	2227.00	.0568	.0552
Random sample 6	107	2236.00	.0673	.0676
Random sample 7	107	2283.50	.1317	.1304

Panel F: Outcome Severity of Price Waterhouse compared to Non-Big Six Auditors

	N	S	Asymptotic P-values Normal Approximation	Exact P-values
All observations	**107**	**2086.50**	**.0023**	**.0019**

Figure 1: Arthur Andersen Outcome Histogram

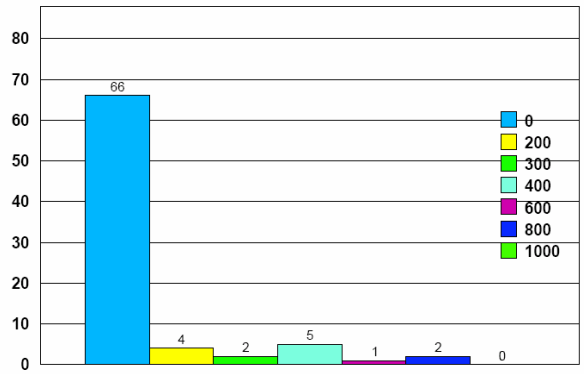

Figure 2: Coopers & Lybrand Outcome Histogram

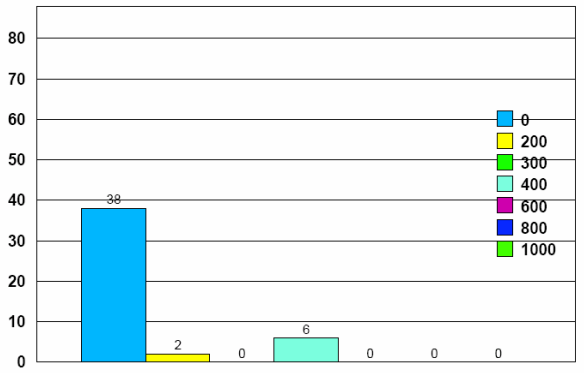

Figure 3: Deloitte & Touche Outcome Histogram

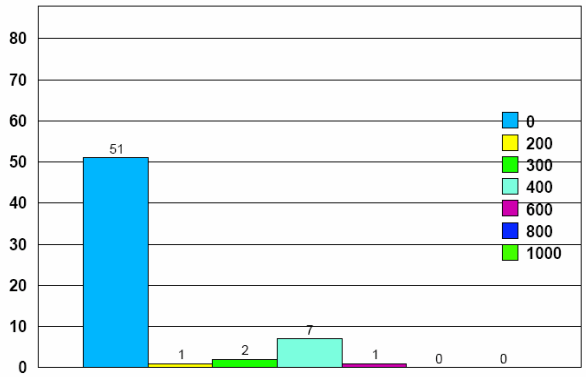

Figure 4: Ernst & Young Outcome Histogram

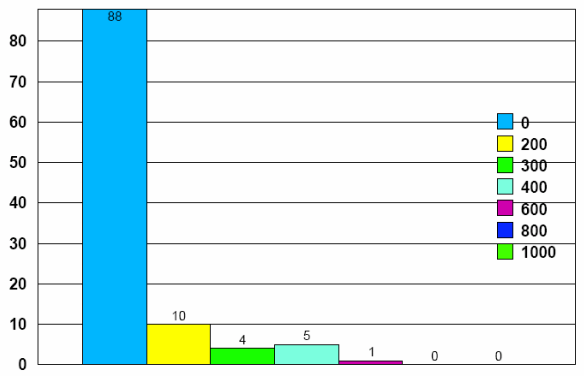

Figure 5: KPMG Outcome Histogram

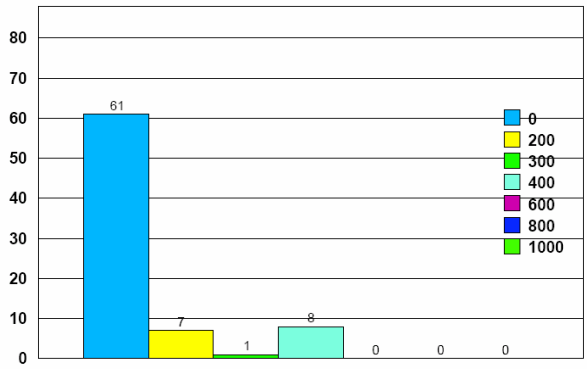

Figure 6: Price Waterhouse Outcome Histogram

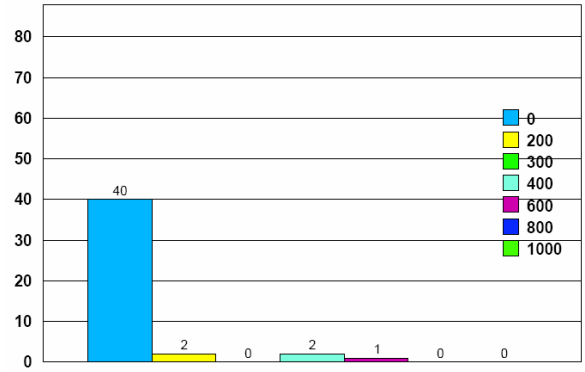

Figure 7: Non Big Six Outcome Histogram