Audit Firm Concentration and Competition:

Effects of Consolidation Since 1997

by

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AUDIT FIRM CONCENTRATION AND COMPETITION: EFFECTS OF CONSOLIDATION SINCE 1997

SYNOPSIS: For many years, businesses, government regulators, and the public have expressed concern about the dominance of a few large public accounting firms in the audit market. Recent events have increased concern about the lack of competition in the auditing industry. Using market concentration measures we examine the level of competition among the remaining active audit firms before and after the merger between Price Waterhouse and Coopers & Lybrand and before and after the dissolution of Arthur Andersen. We also segment the audit market by auditor and client size and examine the effects of the consolidating events from these perspectives. We find that concentration did indeed increase after both events but, in most instances, decreased in the years between those two events. However, the remaining Big Four audit firms continue to dominate the market for audits of publicly held companies, particularly audits of large firms. We also find that, while some segments of the audit market are highly concentrated, there are a few segments that are relatively competitive.

Keywords: Audit markets; auditor concentration; audit firm mergers; concentration measures.

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INTRODUCTION

For decades, businesses, government regulators, and the public have expressed concerns about the dominance of a few large public accounting firms in the market for audits. The two most recent consolidating events have increased concerns about the level of competition in the auditing industry. The first event was the merger of Price Waterhouse and Coopers & Lybrand in July of 1998 leaving five large audit firms. Then on August 31, 2002, the firm of Arthur Andersen was dissolved after being convicted on charges related to the Enron accounting scandal. The collapse of one of the "Big" public accounting firms was an unprecedented occurrence. Even though the conviction was later overturned, it was too late to salvage Arthur Andersen. After the dissolution of Andersen, only four "Big" public accounting firms, Ernst & Young, Deloitte & Touche, KPMG Peat Marwick, and PriceWaterhouseCoopers, remained.

When only a few large companies compete for the majority of revenues in an industry, there are a number of potential problems. The dominance of a few large companies in an industry can result in monopolistic pricing. Another issue, which has been exacerbated in the auditing industry by the implementation of the provisions of Sarbanes-Oxley, is the availability of services, especially to certain entities. For example, nonprofit entities, which are generally smaller and often require specialized expertise, have reported difficulty in obtaining audit services at a reasonable cost from a large audit firm.[1] Two other important issues arise from the concentration in the audit industry. The first one is a possible decline in auditor objectivity and independence. For example, when there are only four large audit firms, conflicts of interest, particularly those related to auditing clients that are competitors, are more likely. Additionally, when there are few alternatives available to clients, the threat of losing a client, even a large one, is not as great to an auditor. Consequently, a decline in the quality of audits accompanied by a decrease in the stability of capital markets and in investor confidence may occur.

The other important issue is the potential impact of another large public accounting firm failure. This possibility became more tangible in the years following the dissolution of Andersen. Both KPMG and Ernst & Young were investigated by the Department of Justice for selling schemes to avoid taxes to their clients. Since it was a federal prosecution that led to Andersen's demise, interested parties around the world expressed concern about the potential consequences of another prosecution of a large audit firm (Buck et al. 2005, 1; Financial Times 2005,

[1] Audrey Williams June wrote in the August 12, 2005 issue of *The Chronicle of Higher Education* that colleges and universities were experiencing difficulty in retaining one of the Big Four audit firms and, when they could, they were being charged more for the services provided.

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5). In addition, U.S. regulators raised questions about the knowledge that PriceWaterhouseCoopers had about restatements made by American International Group (AIG), one of its clients (Financial Times 2005, 5). In 2004, Ernst & Young was banned from accepting new audit clients in Japan due to reckless and negligent conduct (The Economist 2006, 16). So it did not take long for what previously was almost unthinkable, the collapse of another large audit firm, to become a fear of many. All three U.S. government reports (GAO 2003, 2008; ACAP 2008) on the auditing industry included a study of the issue of another large audit firm failure.

For decades, it was argued that the competition among the first-tier (Big) auditors was sufficient to maintain auditor independence and quality. Recent events and the current economic and political environment have increased skepticism about the quality of audits and auditors. It is more important than ever that accounting firms perform independent, quality audits and outsiders believe in the integrity of audited financial statements. Evidence of the concern about the audit industry is that the Government Accountability Office (GAO) has conducted two studies in the last six years about consolidation and the level of competition in the public accounting industry. The Department of the Treasury also charged the Advisory Committee on the Auditing Profession (ACAP) with developing recommendations for the auditing profession.

Due to the structural changes in the audit market produced by the recent consolidation events, the potential consequences of these changes, and the important role played by auditing in preserving the integrity of capital markets, we examine the level of competition in the audit market before and after the merger of Price Waterhouse and Coopers & Lybrand and before and after the dissolution of Arthur Andersen. Prior research has found that mergers among the large audit firms have resulted in sharp increases in concentration (Wootton et al. 1994; Wolk et al. 2001; GAO 2003), but most studies have emphasized the largest audit firms and U.S. clients. Therefore, there are two main motivations for our study. First, by examining the changes in concentration in the overall market for audit services we can verify if the results of prior studies hold for the most recent consolidation events. Second, and more importantly, the two most recent consolidating events in the public accounting industry provided opportunities for smaller audit firms to gain market share, particularly in the market for audits of smaller client firms. This perspective has been largely ignored in prior research and provides an opportunity to determine if the smaller firms benefitted from the consolidation events in those markets where they have better opportunities to compete. In addition, the dissolution of Arthur Andersen is a unique event so our examination could provide additional evidence of what might happen if another large public accounting firm would fail.

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We believe that the choice of an auditor is a complex one that is influenced by a number of factors. Furthermore, the emphasis of prior studies on the overall market and on the "Big" audit firms disregards the importance of looking at different market niches. We therefore expand our research question to consider if the competitiveness of the audit market significantly changes after the two most recent consolidation events by disaggregating the audit market according to auditor size into three-tier auditor groups. The question is then re-examined by segmenting the audit market according to the size of the client firm.

Consistent with prior studies, we measure the competitiveness of the audit market using four-firm concentration ratios and Herfindahl indices constructed with the market shares of the audit firms based on the number of client firms and based on the square root of client revenues, a proxy for audit fees. We include all audit firms that meet our definition of active[2] during the years surrounding the two events (1997, 1999, 2001 and 2003). As we discuss in the next section, one of the primary motives for audit firms to merge is to enhance the merged firm's ability to compete in the provision of global services. We therefore include all U.S. and international client firms.

We find that, for most of our analysis, concentration did indeed increase after the merger and after the dissolution of Arthur Andersen but, in many instances, decreased in the years between those two events[3]. This is important because it is possible that in the future, the impact of the two most recent consolidating events will weaken and competitiveness will increase. We find that, while some segments of the audit market are highly concentrated, there are a few other segments that are not highly concentrated and, therefore, are relatively competitive among the remaining active public accounting firms. This was particularly true for the smallest audit firms and the smallest clients. However, even in the small client segment, the remaining Big Four audit firms continue to dominate the market. A rather surprising result is that the competitiveness in the second-tier audit firms was lower than in the other tiers.

Our findings about the changes in concentration after the two consolidating events in the overall audit market as well as in client size specializations are consistent with prior research. However, our sample of client firms and audit firms is more complete than the sample used most previous studies. While it was reasonable to expect that smaller audit firms might benefit from the merger and dissolution of Andersen, we find very little

[2] As explained in the methodology section an active audit firm is an auditor with at least ten clients in at least two years.

[3] The increase in concentration after the events, measured by the Herfindahl index is not mechanical or obvious. As will be explained throughout our paper the index is sensitive to both the number of firms in the market and also to how the size (market shares) of the remaining firms change (the ability of the remaining firms to absorb the clients of the prior firms).

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evidence that they did. Unless government regulators are willing to aggressively interfere in the market for audit services, it seems unlikely that concentration will decrease, especially in some segments.

Although some of our analyses are similar to the two GAO reports, our study differs from the reports in a number of important ways. First, our detailed assessment of the changes in market shares and concentration after the 1998 merger by segmenting the market by the size of the audit firm and by size of the client is unique to our study. No prior research including the 2003 GAO study provides this perspective. Second, although the GAO 2008 does include a perspective of assessing different segments of the market, our study is more consistent in the computations of the market shares and concentration measures at all levels of analyses. Additionally, we fully report the metrics based on both the number of clients and on the square root of client revenues. This contrasts with the GAO 2008's assessment of the industry, which is less clear in some instances and not consistent with what is normally done in an academic paper in other instances.

The remainder of the paper is organized as follows. The next section summarizes prior research and develops our research questions. The following section describes the methodology used in this study. The third section discusses the results and the last section is concluding remarks.

PRIOR RESEARCH AND RESEARCH QUESTIONS

Effects of Recent Consolidating Events on Overall Competitiveness

Mergers among public accounting firms have been common since the development of auditing as a business. Common reasons for mergers of audit firms include growth through expansion (including outside the U.S.) and diversification. Mergers provide opportunities for returns to scale for the merged firm and specialization in more industries. Until the 1980s, no mergers among the first-tier audit firms had occurred in more than fifty years. In 1986, KPMG merged with Peat Marwick to become the largest accounting firm in the world. The major impetus for this merger was KPMG's desire for a stronger presence in the U.S. The significance of economies of scale was recognized during this time period. There was speculation that some of the smaller remaining "Big" firms would no longer be able to compete effectively with KPMG and Arthur Andersen, which was the second largest accounting firm at the time. The merger of Ernst & Whinney and Arthur Young in 1989 combined firms with complementary strengths, especially geographically. Shortly after this, Deloitte Haskins & Sells merged with Touche Ross for similar reasons.

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The merger of Price Waterhouse and Coopers & Lybrand was similar to the mergers that occurred in the 1980s. According to company officials, the primary reason for the 1998 merger was the ability to provide comprehensive services globally to their clients (Wootton et al. 2003). The increasing demand for consulting and technological services was probably also a factor. Prior to the merger, Price Waterhouse was the smallest of the Big Six firms and some observers speculated that the firm might not survive (Wootton et al. 2003). The sudden dissolution of Arthur Andersen in 2002 was a unique and significant event and left only four large public accounting firms.

Prior studies found that mergers among the large audit firms resulted in a sharp increase in concentration. Wootton et al. (1994) found that auditor concentration measures significantly increased after the 1989 mergers. This study focused on the large client market. Although second-tier and third-tier firms were included, only the top eight audit firms were used in calculating concentration measures. Wolk et al. (2001) found an increasing pattern of concentration in the large client market. The increases were particularly large after the 1989 and 1998 mergers. This study also included only the top eight audit firms in calculations and the data for the 1998 merger was pro-forma.

The GAO has issued two reports related to competition in the audit market. The 2003 report found large increases in the Herfindahl index for the audit industry after the two most recent mergers and the dissolution of Andersen. The report studies the time period between 1988 and 2002 (we use the years before and after the events). The 2003 report used data from *Who Audits America.* The metrics included in the GAO reports are not used consistently throughout the study. For example, the trends in concentration using the Herfindahl index are based only on client revenues and are calculated for the overall market. A brief analysis of the Herfindahl index based on client size is presented, but only for 2002. Market shares and four firm concentration ratios are reported, but only for each of the three years (1988, 1997 and 2002).

The 2008 GAO report uses a different sample and a somewhat different perspective but reaches the same basic conclusions regarding concentration and competition in market for audits of public companies. The results from GAO 2008 apply to 2002-2006. The report used data from *Audit Analytics*, a database that covers U.S. and foreign firms trading their shares in the U.S., however the report is unclear as to the inclusion or exclusion of foreign firms. The concentration measures are based solely on client revenues. It is worth noting that although

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both reports found increases after the two events in our study and a pattern of increasing concentration over time, both concluded that no government action was needed at this time.

There are two other issues of interest covered in prior research. The first issue is that concentration seems to decrease somewhat after the initial increase due to a merger (Wootton et al. 1994; GAO 2003, 2008). The other issue is that there is evidence that mergers among the large audit firms often do not result in increased market shares or growth rates for the merged firms, especially when only large clients and large audit firms are considered (Wootton et al. 1994; Wolk et al. 2001). This suggests that a more balanced audit market among the largest audit firms could actually increase the level of competition.

Prior research found that concentration in the audit industry has been increasing over time with sharp increases after consolidating events such as mergers. Most prior research has emphasized the largest audit firms and U.S. client firms. We first examine the effects of the two consolidating events on competitiveness of the whole sample. The first research question is:

> RQ1: Did competitiveness in the overall audit market significantly change after the two most recent consolidating events?

Based on prior research, we expect the concentration to increase leading to a decrease in the level of competitiveness after each event.

Competitiveness within the Top Three Tiers of Audit Firms

In the late 1970s and early 1980s, several second-tier firms tried to increase market share through mergers but most of those attempts were unsuccessful (Wootton et al., 2003). Geographic coverage, particularly outside of the U.S., was a major motivation for mergers and acquisitions. Of the five firms we classify as second-tier, two were the result of mergers and acquisitions after this time. Grant Thornton became the ninth largest public accounting firm after mergers in 1980 and 1985. In 1999, McGladrey & Pullen became a subsidiary of H&R Block, Inc. One of the second-tier firms, Moore Stephens, originated in the United Kingdom. Pannell Kerr Forster (now known as PKF) was created in 1969 from four firms in Australia, Canada, the U.K. and the U.S.

There were several mergers and acquisitions among the firms we classify as third-tier during the years of our study. In view of the history of the development of the first-tier firms, it is possible that another "Big" firm will emerge partially as a response to the opportunities presented by the consolidating events. However, the two most recent consolidating events offered opportunities immediately for some of the smaller audit firms, particularly the

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second-tier firms, to increase market share. Most prior research has focused on the first-tier audit firms. One study that did examine second-tier audit firms separately was Wootton et al. (1994) and they found that the differences between the market shares of the first-tier and second-tier audit firms were greater after the 1989 mergers. The 2008 GAO report also includes separate analysis of the smaller audit firms. The second-tier audit firms are classified based on number of clients, while our approach based on geographic location is consistent with prior research. The 2008 report found that market shares decreased for the largest firms and slightly increased for the midsize and smaller firms from 2002 to 2006.

Assuming that the firms in each tier compete for many of the same clients, we examine the top three tiers separately. We compare concentration before and after the two consolidating events and search for other evidence that second-tier and third-tier firms benefitted from the consolidating events. The second research question is:

RQ2: Did competitiveness in the three tiers of audit firms significantly change after the two most recent consolidating events?

Due to a lack of prior research related to this question, we did not have expectations about the concentration measures. However, we did expect to find some increases in market shares for the second-tier and third-tier firms.

Competition for Different Sized Client Firms

Prior research has shown that the largest audit firms dominate the market for audits of the largest client firms. The largest audit firms have the resources such as personnel and geographical coverage necessary to perform audits of large companies. The 2003 GAO report found that the Big Four audited 78% of all public companies and 99% of all revenues of public companies. The 2008 GAO report examined differently sized companies separately and found that the market for audits of companies with revenues greater than $1 billion was highly concentrated in 2006 but decreased as the size of the client companies decreased. The concentration level for audits of companies with revenues less than $100 million was classified as “Unconcentrated” (a Herfindahl index of less than 0.1000).

We segment the client firms into quartiles according to their revenues and examine the concentration levels in the quartiles separately before and after the consolidating events. Thus the third research question is

RQ3: Did competitiveness among the auditors of the smaller client firms significantly change after the two most recent consolidating events?

We did expect to find some evidence that there was more competition for smaller client firms.

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METHODOLOGY

Sample

We gathered data for all available publicly held companies in the *Compustat Research Insight* and *Global Vantage* databases for the years 1997 and 1999 (the years before and after the merger of Price Waterhouse and Coopers & Lybrand) and the years 2001 and 2003 (the years before and after the dissolution of Arthur Andersen). The data items needed were company name, primary SIC code, location, auditor, sales, and total assets. Originally there were 23,012 companies in 1997, 24,395 companies in 1999, 23,017 companies in 2001, and 20,105 companies in 2003. We deleted international firms that were listed in both databases with the same auditor. We also deleted 25 firms that had zero values for both sales and assets in all four of the years examined. We did not include any observations that had zero values for both sales and assets in any of the four years. We also did not include observations with an auditor coded as "Other" by *Compustat* after we manually checked all of those observations for the audit firm on the appropriate 10-K. The final sample is composed of 14,756 firms in 1997 (7,939 U.S. and 6,816 international), 15,340 firms in 1999 (7,685 U.S. and 7,653 international), 13,893 firms in 2001 (6,650 U.S. and 7,242 international), and 11,999 firms in 2003 (5,822 U.S. and 6,175 international).

We included U.S. firms in the *Compustat* database as well as foreign firms from the *Global Vantage* database.[4] By including international firms, not only is the global reach of the largest U.S. public accounting firms reflected in our analysis, but the resulting sample is larger than that used in prior studies.[5] We also added auditor codes for firms that are active in the audits of publicly held companies but are classified as "Other" in the *Compustat* database. Our definition of an active audit firm is an auditor with at least ten client firms in at least two years of the sample period.

Concentration Measures

We used two of the most common measures of concentration from industrial economics, the four-firm concentration ratio and the Herfindahl index. The metrics reflect important characteristics of the market structure such as the number of firms and their relative size. Both of these factors are important in competition as they can affect the coordination of prices as well as the leadership behavior of the firms in a market (Mueller and Hamm,

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[4] We repeated the analysis excluding foreign firms and our results are nearly the same.

[5] The 2003 GAO report cites the February 2003 edition of the *Public Accounting Report* and information provided by foreign regulators that suggests that the market for audits of large companies tend to be as highly concentrated as in the U.S. For example, the Big 4 audited 80 per cent of all public companies in Japan and virtually all major companies in the United Kingdom.

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1974, White 2002). The concentration ratios provide information about the relative distribution of market shares between the *largest* firms and the remaining firms indicating in this way the extent of market power and competitiveness of an industry. Concentration ratios are often used for their simplicity. The Herfindahl index is considered by many (e.g., Minyard and Tabor 1991) to be a better measure of concentration than concentration ratios. As shown in our discussion below, the metric is constructed with the market shares of *all* active firms within a market and is sensitive to both the number of active firms, but also to their relative size (their dispersion in terms of market shares) within an industry. We include the two metrics in our analysis as they have both been widely used in prior audit markets studies (Wootton et al. 1994; Wolk et al. 2001). A rule used by many economists is that a four-firm concentration ratio above 0.6000 is indicative of oligopoly (Brux and Cowen 2002). The Herfindahl index has been used by government agencies to assess post-merger competitiveness in an industry. The commonly used guidelines are that a Herfindahl index of less than 0.1000 in an industry indicates a relatively competitive market. An index of above 0.1800 indicates that the industry is highly concentrated and that there is potential for significant market power for the dominant companies in the industry.

Consistent with prior studies, we used market shares based on the number of client firms and based on the square root of client revenues, a proxy for audit fees. Although both, the number of clients and our proxy for audit fees will produce consistent trends in concentration, our proxy for audit fees will display higher values, highlighting the dominance of the Big Four audit firms in the market for audit services. Market shares *(X)* were calculated by dividing the number of firms (or the total square roots of client revenues) audited by a firm by the total number of firms (or total square roots of client revenues) audited by all active audit firms. Concentration ratios were calculated by adding the market shares of the top four firms (CR_4). Herfindahl indices (*HI*) were calculated as follows:

$$HI_x = \sum_{i=1}^{i=n} X_i^2$$

where X is the market share of the ith audit firm and n is the number of active audit firms.[6]

[6] In an earlier version of the paper the Herfindahl Index Base was calculated by dividing one by the number of active audit firms. The difference between Herfindahl Index and Herfindahl Index Base was calculated (Minyard and Tabor called this difference an adjustment). The difference represents the relative distance from a perfectly competitive market in which all active audit firms have exactly the same market shares. The assumption is that a market or market segment is competitive if the market shares of all participants are roughly equal. In such a market, power is not concentrated in one firm or small group of firms.

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Empirical Analysis

We initially calculated our two concentration measures CR_4 and *HI* for the overall audit market (RQ1). We then calculated separate concentration measures for each of the three tier audit groups (RQ2). The first-tier firms are the six largest international audit firms in 1997, which merged into the Big Five in 1998, and which later become the Big Four after Andersen's dissolution. Consistent with prior research (Francis and Simon 1987; Geiger and Rama 2006), the second-tier firms were defined as the national firms (based on office locations) as: BDO Seidman, Grant Thornton, McGladrey & Pullen, Moore Stephens and Pannel Kerr Forster.[7] The third-tier firms are the regional firms and include all the remaining active audit firms identified in our study that did not fit our definition of second-tier auditors. We initially considered performing a difference in proportions statistical test to compare our concentration measures before and after the consolidation events, but our data did not comply with the assumptions of the test (Daniel 1990, 58).

RESULTS

Results for RQ1 Changes in the Competiveness of the Overall Audit Market

The market shares of all active audit firms, based on the total number of client firms (Panel A) and the square root of client revenues (Panel B), appear in Table 1. The market shares are displayed for the individual audit firms, and for the audit firms classified according to their size in three-tier groups. The table also reports concentration measures for the overall sample and for the three tier groups separately. The differences in market shares based on the number of clients and on the square root of client revenues are more pronounced for first-tier audit firms. The totals for number of client firms and for square root of client revenues do not include those companies that have the auditor code "Other".[8] However, the percentage of companies in the databases that list the auditor as "Other" has increased from 1997 to 2003.[9]

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[7] We searched the websites of the largest audit firms not included among the first-tier and verified the geographical location of their offices. The firms classified as second-tier had offices in most regions of the country whereas the third-tier group had offices concentrated in one or two regions.

[8] This category includes companies (mostly international) that have not been assigned a specific auditor code in the *Compustat* or *Global Vantage* databases or that are not among the additional sixteen audit firms that we coded ourselves with information from approximately 2,500 SEC filings.

[9] The percentage increased from 32.48 percent in 1997 to 36.24 percent in 2003. The percentages when measured by our proxy for audit fees, square root of client revenues, actually decreased from 31.42 percent in 1997 to 30.84 percent in 2003.

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TABLE 1

Audit Firm Market Shares and Concentration Measures
All U. S. and International Clients

Panel A: Number of Client Firms				
Audit Firm	**1997**	**1999**	**2001**	**2003**
Arthur Andersen	16.30%	16.77%	14.80%	0.00%
Coopers & Lybrand	12.92%	NA	NA	NA
Ernst & Young	19.22%	19.65%	20.98%	26.82%
Deloitte & Touche	13.95%	14.07%	15.14%	19.91%
KPMG Peat Marwick	18.06%	17.75%	17.81%	19.43%
Price Waterhouse (Coopers)	13.38%	24.99%	23.28%	24.88%
SUBTOTAL-First-Tier Firms	13,845	14,302	12,784	10,923
Percentage of Total Client Firms	93.83%	93.23%	92.02%	91.03%
CR_4	0.7197	0.8491	0.8392	1.0000
HI	0.1706	0.2077	0.2064	0.2548
BDO Seidman	2.04%	2.11%	2.20%	2.41%
Grant Thornton	1.99%	2.20%	2.68%	2.93%
McGladrey & Pullen	0.35%	0.29%	0.31%	0.30%
Moore Stephens	0.30%	0.25%	0.32%	0.54%
Pannell Kerr Forster	0.26%	0.30%	0.27%	0.24%
SUBTOTAL-Second-Tier Firms	729	790	802	770
Percentage of Total Client Firms	4.94%	5.15%	5.77%	6.42%
CR_4	0.9465	0.9506	0.9539	0.9623
HI	0.3436	0.3592	0.3690	0.3594
Crowe Chizek	0.03%	0.03%	0.07%	0.08%
J H Cohn	0.04%	0.07%	0.06%	0.16%
Moss Adams	0.07%	0.10%	0.15%	0.10%
Richard A. Eisner	0.26%	0.28%	0.24%	0.29%
Feldman, Sherb & Co.	0.09%	0.10%	0.17%	NA
Ehrhardt Keefe Steiner & Hottman	0.09%	0.11%	0.12%	0.16%
Goldstein Golub Kessler	0.08%	0.12%	0.15%	0.16%
Hansen, Barnett & Maxwell	0.01%	0.05%	0.07%	0.10%
Hein & Associates	0.23%	0.18%	0.19%	0.27%
HJ & Associates	0.03%	0.11%	0.14%	0.15%
Lazar Levine & Felix	0.05%	0.08%	0.08%	0.09%
Malone & Bailey	0.01%	0.02%	0.08%	0.16%
Rosenberg Rich Baker Berman & Co.	0.01%	0.03%	0.06%	0.08%
Singer Lewak Greenbaum & Goldstein	0.07%	0.08%	0.12%	0.14%
Stonefield Josephson Inc.	0.02%	0.05%	0.08%	0.13%
Tanner & Co.	0.07%	0.11%	0.13%	0.13%
Virchow, Krause & Company	0.01%	0.01%	0.09%	0.15%
Weinberg & Company	0.00%	0.02%	0.09%	0.07%
William & Webster, P.S.	0.00%	0.01%	0.05%	0.08%
Wiss & Company LLP	0.05%	0.07%	0.06%	0.07%
SUBTOTAL-Third-Tier Firms	182	248	307	306
Percentage of Total Client Firms	1.23%	1.62%	2.21%	2.55%
CR_4	0.5495	0.4234	0.3420	0.3431
HI	0.1126	0.0800	0.0602	0.0631
TOTAL (Number of Client Firms)	14,756	15,340	13,893	11,999
CR_4	0.6753	0.7917	0.7722	0.9103
HI	0.1510	0.1815	0.1760	0.2127

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TABLE 1 (continued)

Panel B: Square Root of Client Revenues				
Audit Firm	**1997**	**1999**	**2001**	**2003**
Arthur Andersen	16.40%	17.10%	15.83%	0.00%
Coopers & Lybrand	15.11%	NA	NA	NA
Ernst & Young	18.14%	17.75%	19.24%	24.23%
Deloitte & Touche	14.40%	14.91%	16.38%	22.44%
KPMG Peat Marwick	18.57%	18.78%	17.97%	20.45%
Price Waterhouse (Coopers)	15.05%	28.96%	27.63%	29.91%
SUBTOTAL – First-Tier Firms	$288,146,238	$298,353,254	$288,079,739	$281,557,041
Percentage of Total Square Root of Client Revenues	97.67%	97.50%	97.05%	97.03%
CR_4	0.7197	0.8491	0.8392	1.0000
HI	0.1683	0.2126	0.2097	0.2553
BDO Seidman	0.91%	0.96%	1.27%	1.07%
Grant Thornton	0.90%	1.01%	1.14%	1.23%
McGladrey & Pullen	0.11%	0.09%	0.09%	0.07%
Moore Stephens	0.09%	0.07%	0.07%	0.17%
Pannell Kerr Forster	0.11%	0.13%	0.06%	0.05%
SUBTOTAL-Second-Tier Firms	$6,260,132	$6,896,840	$7,784,540	$7,546,395
Percentage of Total Square Root of Client Revenues	2.12%	2.25%	2.62%	2.60%
CR_4	0.9590	0.9709	0.9756	0.9800
HI	0.3720	0.3852	0.4228	0.4003
Crowe Chizek	0.02%	0.01%	0.03%	0.04%
J H Cohn	0.01%	0.01%	0.01%	0.01%
Moss Adams	0.02%	0.02%	0.03%	0.03%
Richard A. Eisner	0.05%	0.05%	0.05%	0.05%
Feldman, Sherb & Co.	0.02%	0.01%	0.02%	0.00%
Ehrhardt Keefe Steiner & Hottman	0.02%	0.01%	0.01%	0.02%
Goldstein Golub Kessler	0.01%	0.03%	0.03%	0.03%
Hansen, Barnett & Maxwell	0.00%	0.00%	0.01%	0.01%
Hein & Associates	0.03%	0.03%	0.03%	0.04%
HJ & Associates	0.00%	0.01%	0.01%	0.02%
Lazar Levine & Felix	0.01%	0.02%	0.02%	0.02%
Malone & Bailey	0.00%	0.00%	0.00%	0.01%
Rosenberg Rich Baker Berman & Co.	0.00%	0.00%	0.01%	0.01%
Singer Lewak Greenbaum & Goldstein	0.01%	0.01%	0.01%	0.02%
Stonefield Josephson Inc.	0.01%	0.01%	0.01%	0.02%
Tanner & Co.	0.01%	0.01%	0.02%	0.01%
Virchow, Krause & Company	0.00%	0.00%	0.01%	0.02%
Weinberg & Company	0.00%	0.00%	0.01%	0.01%
William & Webster, P.S.	0.00%	0.00%	0.00%	0.00%
Wiss & Company LLP	0.00%	0.01%	0.01%	0.00%
SUBTOTAL-Third-Tier Firms	$613,083	$752,182	958,067	$1,065,566
Percentage of Total Square Root of Client Revenues	0.21%	0.25%	0.32%	0.37%
CR_4	0.5537	0.4947	0.4428	0.4309
HI	0.1142	0.0942	0.0781	0.0756
TOTAL	$295,019,453	$306,002,278	$296,822,346	$290,169,002
CR_4	0.6822	0.8259	0.8123	0.9703
HI	0.1607	0.2023	0.1978	0.2406

Market Shares (X) = the number of client firms (or audit fees) audited by a firm during the fiscal year divided by the total number of client firms (or total audit fees) audited by all active audit firms in that fiscal year. Four-firm concentration ration (CR_4) = the sum of the market shares of the largest four active audit firms. Herfindahl Index (HI) = the sum of the square of the market shares of all active audit firms in a fiscal year. Variables were calculated before (1997) and after (1999) the consolidation of Price Waterhouse with Coopers & Lybrand and before (2001) and after (2003) the dissolution of Arthur Andersen. Firms and time subscripts have been omitted for convenience.

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The four-firm (CR_4) concentration ratios and the Herfindahl indices (HI) for the entire sample appear for all years at the bottom of Table 1 (Panels A and B). CR_4 increased from 0.6753 (0.6822, measured by square root of client revenues) in 1997 to 0.9103 (0.9703 measured square root of client revenues) in 2003. A pattern emerges here that is seen throughout our study. CR_4 increased in 1999 after the merger of Coopers & Lybrand and Price Waterhouse in 1998. In 2001 CR_4 decreased somewhat. However, in 2003, after the demise of Andersen, CR_4 increased again. All of these concentration ratios are above the rule of thumb of 0.6000, indicating the oligopolistic nature of the audit market structure and the position of the Big audit firms as the market leaders.

HI shows a similar pattern. *HI* increased in 1999 (from 0.1510/0.1607) after the merger of Coopers & Lybrand and Price Waterhouse in 1998 and then decreased in 2001. However, in 2003, after the demise of Andersen, *HI* increased again (to 0.2127/0.2406). Most of the indices are greater than the 0.1800 guideline for highly concentrated markets. Another pattern consistently seen in our data is that the markets are more concentrated when market shares are calculated using the square root of client revenues as a proxy for audit fees. This provides additional evidence that the largest public accounting firms dominate the market for auditing the largest publicly held companies, thereby earning much higher audit fees.

Results for RQ2 Changes in the Competitiveness within the Three Tiers of Audit Firms

The market shares and concentration measures for the first-tier audit firms appear at the top of Table 1 (Panels A and B). The percentage of total client firms audited by the first-tier firms decreased (from 93.83 percent in 1997 to 91.03 percent in 2003). All of the percentages are higher than the 78 percent of all publicly listed firms given in the 2003 GAO report. When market shares are measured by the square root of client revenues (proxy for audit fees), the percentage audited by the first-tier firms shows a smaller decline (97.67 percent in 1997 and 97.03 percent in 2003).

The CR_4 for the first-tier firms examined separately increased in 1999 (from 0.7197/0.6985) after the merger of Coopers & Lybrand and Price Waterhouse in 1998. In 2001 CR_4 decreased. Then, in 2003, after the demise of Andersen, CR_4 increased again to 1.0000 as only four firms remain in the first-tier group. Note that this pattern is similar to the one reported for the full sample analysis and that all of the concentration ratios are above the 0.6000 rule. *HI* increased (from 0.1706/0.1683) in 1999 and then decreased in 2001. Finally, in 2003, *HI* increased (to 0.2548/0.2553) for both the number of clients and the square root of client revenues.

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The results for the second-tier audit firms are less consistent with the above pattern. The market shares of the second-tier firms have increased consistently from 1997 (4.94/2.12 percent) to 2003 (6.42/2.60 percent). These results suggest that the second-tier firms may have befitted from the consolidation events. The CR_4 for the second-tier firms increased (from 0.9465/0.9590) in 1999. In 2001 CR_4 *increased* and then, in 2003, CR_4 increased again (to 0.9623/0.9800). The concentration of the market for the second-tier firms measured by the *HI* increased (from 0.3436/0.3720) in 1999. *HI* then shows an *increase* in 2001. However, in 2003 for this market segment, *HI* *decreased* (to 0.3594/0.4003). One somewhat surprising result from analyzing the three tiers of audit firms separately is that, in most instances, the level of concentration among the second-tier audit firms is higher than the concentration among the first-tier firms. That is primarily due to the second-tier market being dominated by BDO Seidman and Grant Thornton.

The market shares for the third-tier audit firms separately are reported in the second-half of Table 1 (Panels A and B). Similar to the second-tier firms, there has been a consistent increase in market shares from 1997 (1.23/0.21 percent) to 2003 (2.55/0.37 percent). The magnitude however is very small, especially when measured by our proxy for audit fees. For these firms CR_4 *declined* (from 0.5495/0.5537) in 1999. Then in 2001 CR_4 declined again. However, in 2003 the CR_4 increased (to 0.3421/0.4309). The change in *HI* for this market segment during the sample period is consistent with the pattern in the concentration ratios. The *HI decreased* (from 0.1126/0.1142) in 1999 and decreased again in 2001. In 2003 the index increased to 0.0631 based on the number of clients, but *decreased* to 0.0756 based on the square root of clients revenues. Taken together, even with the increase in concentration in 2003 the market for the third-tier audit firms has become more competitive ($CR_4 < 0.6000$ and $HI < 0.1800$) after the two major consolidation events. This result differs from the findings in the two largest audit market segments. Unlike prior research (Tonge and Wootton 1991), we do not find that the market shares of the first-tier firms became more equal in size during this period. We also do not find that the differences between the first-tier firms and others became greater as Wootton et al. (1994) did.

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Results for RQ3 Changes in the Competitiveness for Different Sized Client Firms[10]

The market shares and concentration measures for the audit market segmented according to the size of the client firms appear in Table 2. The market was classified into four size quartiles based on client revenues which were calculated for each of the sample years (Panel A). Panel B reports the market shares and concentration measures based on number of clients. The market shares and concentration measures based on the square root of client revenues appear in Panel C.

The percentage of largest client firms (those with revenues in the top quartile) audited by the first-tier auditors declined very little after the consolidation events (from 98.92/99.03 percent in 1997 to 98.43/98.71 per cent in 2003). During the same period, the second-tier audit firms increased their market shares (from 1.06/0.96 percent to 1.53/1.27 percent). The third-tier firms are barely represented in this market segment. In this segment of the audit market, the concentration measures are highest than in any other segment. CR_4 increased (from 0.6902/0.6871) in 1999. CR_4 decreased in 2001 and increased substantially (to 0.9843/0.9871) in 2003. The trend of *HI* is consistent with this pattern. The *HI* increased (from 0.1645/0.1646) after the 1999 merger. It decreased in 2001 and increased again (to 0.2491/0.2516) in 2003. The increase in *HI* to a level above the 0.1800 guideline indicates a highly concentrated market for the number of client firms and for the square root of client revenues during the period of the sample. Maybe the smaller audit firms just do not have sufficient resources to perform audits on large clients but another possibility is that they are shut out of this market by the larger firms, perhaps because they do not enjoy the same reputation about the quality of their audit work as the large firms do.

[10] An earlier version of the paper provided an analysis of the audit markets segregated by U.S. exchanges. The results revealed a pattern consistent with the one observed throughout our study. The New York Stock Exchange and "Other" exchange (which included leveraged buyouts and subsidiaries) became less competitive ($CR_4 > 0.6000$ and $HI > 0.1800$) while the remaining exchanges remained fairly competitive after the two events.

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TABLE 2

Audit Firm Market Shares and Concentration Measures
All U. S. and International Clients by Client Size

Panel A: Client Revenues Quartiles				
	1997	1999	2001	2003
First Quartile	\$529,715,500	\$519,560,000	\$584,468,000	\$797,920,000
Second Quartile	\$128,990,000	\$121,090,000	\$131,421,000	\$179,246,000
Third Quartile	\$32,450,500	\$26,908,000	\$29,104,000	\$38,428,000

Panel B: Number of Clients				
Client Revenues > First Quartile				
	1997	1999	2001	2003
First-Tier Firms	98.92%	98.64%	98.50%	98.43%
Second-Tier Firms	1.06%	1.36%	1.50%	1.53%
Third-Tier Firms	0.03%	0.00%	0.00%	0.00%
Total	3,689	3,835	3,473	2,999
CR_4	0.6902	0.8402	0.8218	0.9843
HI	0.1645	0.2076	0.2044	0.2491
Second Quartile < Client Revenues ≤ First Quartile				
	1997	1999	2001	2003
First-Tier Firms	97.02%	96.77%	96.40%	96.63%
Second-Tier Firms	2.87%	3.02%	3.31%	3.10%
Third-Tier Firms	0.11%	0.21%	0.29%	0.27%
Total	3,688	3,835	3,473	3,000
CR_4	0.6950	0.8190	0.8108	0.9663
HI	0.1604	0.1951	0.1917	0.2370
Third Quartile < Client Revenues ≤ Second Quartile				
	1997	1999	2001	2003
First-Tier Firms	94.15%	92.93%	92.28%	91.20%
Second-Tier Firms	5.26%	6.21%	6.45%	7.63%
Third-Tier Firms	0.60%	0.86%	1.27%	1.17%
Total	3,690	3,835	3,473	3,000
CR_4	0.6867	0.7817	0.7866	0.9120
HI	0.1535	0.1797	0.1779	0.2162
Client Revenues ≤ Third Quartile				
	1997	1999	2001	2003
First-Tier Firms	85.23%	84.59%	80.89%	77.87%
Second-Tier Firms	10.57%	10.01%	11.83%	13.40%
Third-Tier Firms	4.20%	5.40%	7.28%	8.73%
Total	3,689	3,835	3,474	3,000
CR_4	0.6370	0.7257	0.6917	0.7787
HI	0.1311	0.1524	0.1422	0.1697

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TABLE 2 (continued)

Panel B: Square Root of Client Revenues				
	Client Revenues > First Quartile			
	1997	1999	2001	2003
First-tier	99.03%	98.88%	98.46%	98.71%
Second-tier	0.96%	1.02%	1.54%	1.27%
Third-tier	0.01%	0.00%	0.00%	0.00%
Total	$192,778,297,810	$203,415,789,910	$199,611,921,680	$192,834,071,900
CR_4	0.6871	0.8384	0.8256	0.9871
HI	0.1646	0.2118	0.2067	0.2516
	Second Quartile < Client Revenues ≤ First Quartile			
	1997	1999	2001	2003
First-tier	97.14%	96.92%	96.97%	96.96%
Second-tier	2.76%	2.89%	3.08%	2.81%
Third-tier	0.10%	0.19%	0.25%	0.23%
Total	$59,888,923,990	$61,461,051,356	$58,380,767,934	$58,596,655,181
CR_4	0.6948	0.8208	0.8113	0.9696
HI	0.1606	0.1963	0.1926	0.2388
	Third Quartile < Client Revenues ≤ Second Quartile			
	1997	1999	2001	2003
First-tier	94.26%	93.27%	92.64%	91.42%
Second-tier	5.17%	5.96%	6.22%	7.42%
Third-tier	0.58%	0.77%	1.15%	1.16%
Total	$30,581,561,681	$30,081,472,412	$28,381,311,590	$28,329,162,838
CR_4	0.6852	0.7842	0.7881	0.9142
HI	0.1533	0.1807	0.1787	0.2168
	Client Revenues ≤ Third Quartile			
	1997	1999	2001	2003
First-tier	86.96%	86.79%	84.42%	81.58%
Second-tier	10.07%	9.56%	10.93%	12.94%
Third-tier	2.97%	3.65%	4.65%	5.48%
Total	$11,770,669,765	$11,043,964,824	$10,448,344,540	$10,409,112,224
CR_4	0.6518	0.7383	0.7202	0.8158
HI	0.1351	0.1588	0.1532	0.1849

Market Shares (*X*) = the number of client firms (or the total square root of client revenues) audited by a firm during the fiscal year divided by the total number of firms (or total square root of client revenues) audited by all active audit firms in that fiscal year. Four-firm concentration ratio (CR_4) = the sum of the market shares of the largest four active audit firms. Herfindahl Index (*HI*) = the sum of the square of the market shares of all active audit firms in a fiscal year. Variables were calculated before (1997) and after (1999) the consolidation of Price Waterhouse with Coopers & Lybrand and before (2001) and after (2003) the dissolution of Arthur Andersen. Firm and time subscripts have been omitted for convenience.

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The results for the market segment of clients with revenues in the second quartile are reported next (Panels B and C of Table 2). The market shares of the first-tier firms in this market declined after the consolidation event (from 97.02/97.14 percent in 1997 to 96.77/96.92 percent in 1999). The second-tier audit firms were able to increase their small presence in this market after the merger (from 2.872.76 percent in 1997 to 3.02/2.89 percent in 1999) but experienced a decline in their market shares after Anderson's demise (from 3.31/3.08 percent in 2001 to 3.10/2.81 percent in 2003). The pattern of change for the third-tier firms is similar to that of the second-tier auditors although their market shares are still very small ranging from 0.11/0.10 percent in 1997 to 0.27/0.23 percent in 2003. The CR_4 in this segment of the audit market increased (from 0.6950/0.6948) in 1999. CR_4 decreased in 2001 and increased again (to 0.9663/0.9696) in 2003. Likewise, *HI* increased (from 0.1604/0.1533) in 1999. *HI* decreased in 2001 and increased (to 0.2370/0.2388) in 2003. Not surprisingly, in this segment too the largest audit firms dominate the market by auditing 96.63/96.96 percent of the client firms. *HI* increased above the 0.1800 guideline during the same period. The Big Four audit firms have a virtual monopoly in auditing the largest publicly traded client firms.

The results for the market segment with revenues in the third quartile show a small but consistent decline in the market shares of the first-tier audit firms (from 94.15/94.26 percent in 1997 to 91.20/91.42 in 2003). In contrast, the second-tier audit firms appear to have benefitted with gains in market shares from the two consolidation events. For example, the second-tier audit firms increased their market shares from 5.26/5.17 percent (in 1997) to 7.63/7.42 percent (in 2003). Although the third-tier audit firms increased their market shares after the consolidation event, (from 0.60/0.58 percent in 19997 to 0.86/0.77 percent in 1999) they experienced a decline (or little change based on client revenues) after the 2003 demise (from 1.27/1.15 percent in 2001 to 1.17/1.16 percent in 2003). In this market segment CR_4 *increased* from 1997 (0.6867/0.6852) to 2003 (0.9120/0.9142). The changes observed in the *HI* are similar in that the index increased (from 0.1535/0.1533) after 1999. They differ from CR_4 by showing a decrease in 2001. In 2003 the *HI* increased again (to 0.2162/0.2168).

The results for the smallest client segment, those having revenues smaller than the lower quartile are displayed at the bottom of Table 2 (Panels B and C). Note that the market shares of the first-tier firms are smallest in this segment while the second- and third-tier firms are better represented. The decreasing trend in market shares of the first-tier audit firms (from 85.23/86.96 percent in 1997 to 77.87/81.58 percent in 2003) is consistent but sharper than the one reported in the previous paragraph. It appears that the largest auditors did not benefit from the

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two consolidation events in this segment of the market. The second-tier audit firms did not make any gains in market shares after the consolidation event (from 10.57/ 10.07 percent in 1997 to 10.01/9.56 percent in 1999). However, they were able to increase their market shares after the 2003 demise (from 11.83/10.93 percent in 1999 to 13.40/12.94 percent in 2003). The third-tier audit firms display their strongest presence in this segment of the audit market. Their market shares increased steadily after the two consolidation events (from 4.20/2.97 percent in 1997 to 8.73/5.48 percent in 2003). In terms of concentration, this market segment is the least concentrated, but still displays concentration ratios consistent with an oligopoly (higher than 0.6000). The CR_4 increased (from 0.6370/0.6518) in 1999. By 2001 CR_4 declined, but it increased again (to 0.7787/0.8158) in 2003. Even though the concentration ratios are indicative of less competitiveness the *HI* reports a relatively competitive market segment (below 0.1800) during the sample years. *HI* increased (from 0.1311/0.1351) in 1999, decreased in 2001 and increased again in 2003(to 0.1697/0.1849).

The results reported in this section suggest the possibility that the second- and third-tier firms might be making inroads into the smaller client segment of the audit market. Our examination of the market shares of the three auditor groups within each size category reveals a decreasing trend in the market shares of the first-tier firms and an increasing trend in the market shares of the second and third-tier groups. However, the analysis of the composition of the top four market leaders even in the smallest client segment indicates that the first-tier auditors are still the dominant firms.[11]

CONCLUDING REMARKS

For decades, many have expressed concern about the large public accounting firms dominating the market for auditing publicly held companies. Between 1997 and 2003, two events resulted in the Big Six becoming the Big Four audit firms. We examined the changes in the competitiveness of the audit market after the two events and provide evidence that, in very few markets, there is some degree of competitiveness among the remaining active public accounting firms.

Based on prior research, we expected the level of concentration to increase after both events. We expected that when the market for audits of publicly held companies is segmented into the auditor size and client size,

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[11] The analysis reported in RQ3 was repeated using the definition for client size from GAO 2008. The report defined as the largest clients those included in the 2006 Fortune 500 list (revenues higher than $1billion). Although the magnitudes of the market shares differ, the trends (unreported) are consistent with those reported in Table 2.

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concentration levels would vary across the different segments. We wondered if the market shares for the non-first-tier audit firms would increase especially after the dissolution of Arthur Andersen. Our results support the expectation that the levels of concentration for the overall audit market increased after the merger of Price Waterhouse and Coopers & Lybrand and after the dissolution of Andersen. The levels of concentration decreased somewhat two years after the merger between Price Waterhouse and Coopers & Lybrand in 1998. It is possible that concentration levels will decrease again after 2003. However, the implementation of Sarbanes-Oxley Act could very well have a significant impact on competitiveness in the audit market.

When the audit market was segmented by auditor size, concentration levels increased after the two events, although not uniformly for all segments. Concentration increased for the first and second-tier audit firms, but decreased for the third-tier firms. One surprising result we found is that the levels of concentration among the second-tier firms were generally higher than those for the first-tier firms, with Grant Thornton and BDO Seidman dominating the competition.

Finally, when the market was disaggregated by client size, concentration levels increased for all market segments after the two events. However, the level of concentration remained at moderate levels for the smallest client segment of the audit market. While these results suggest that the market for audits of the small client segment appears more competitive, there was really little indication that the smaller audit firms significantly improved their market leadership during this period. Taken together, our results are consistent with prior research in that the four remaining large audit firms still dominate the overall market for audits of publicly held companies, especially the audits of large companies. Besides, the measures of concentration we use indicate a moderate to high level of audit firm concentration in most market segments examined. As was noted before, this may have changed since 2003, especially due to the demands of complying with Sarbanes-Oxley.

Limitations to this study include using market shares based only on audits of publicly held firms and not taking into consideration other changes that occurred in the client firm base (for example, mergers of client firms), the audit industry (for example, divestiture of the consulting services by the public accounting firms), and government regulation. Additionally, this study is primarily descriptive in nature and does not address whether the increase in concentration levels is harmful and, if so, in what ways. For example, future research could examine the impact of increased concentration on audit fees, audit quality or auditor reputation. Despite these limitations, we believe that a contribution of our study is that our sample of audited firms is larger than previous studies, as is the

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number of audit firms we include in our analysis. But the major contribution of our study is that it includes the perspective that contracting with an audit firm occurs at different levels and that many factors are considered in the selection. Other papers have measured concentration at the national level and have not analyzed the changes in the competitiveness of the audit market from the perspectives of the different market segments presented in our study.

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