Audit Market Competition and Audit Quality

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Abstract

Policy makers have been interested in the impact of audit market competition (concentration) on audit quality. In this paper we study the relation between audit market competition at the MSA level (Herfindahl index of concentration) and audit quality (measured by discretionary accruals and the Dechow-Dichev (2002) measure of accrual quality). We find that higher audit market competition is associated with lower audit quality. We control for fixed year effects, therefore our results are unlikely to be affected by the decrease in competition due to Andersen's demise contemporaneous with an increase in audit quality because of regulatory measures such as SOX. Our results are robust to several sensitivity tests we perform in an attempt to rule out omitted variables correlated with client firms' MSA location. Our results are also robust to controls for endogeneity between audit market concentration and audit quality.

Keywords: Audit market competition, audit market concentration, audit quality.

Audit Market Competition and Audit Quality

1 Introduction

The effect of audit market competition on audit quality is central to the formulation of public policy regulating auditors and client firms (Hackenbrack, Jensen, and Payne 2000). This issue has received much attention in recent times, as the number of big audit firms has decreased from eight to six in 1989 and to five in 1998 due to mergers, and to four in 2002 after the demise of Arthur Andersen. In response, the Sarbanes Oxley Act of 2002 mandated that the GAO study the implications of consolidation on competition and client choice, audit fees, audit quality, and auditor independence; the GAO Report (Government Accountability Office 2003) concludes that the evidence on the issue is sparse, and the limited research evidence that is available is mixed and inconclusive.

In this paper we examine the link between audit quality (proxied by absolute discretionary accruals and the Dechow and Dichev (2002) measure of accruals quality) and audit market competition (proxied by Herfindahl index of market concentration) at the city (MSA or metropolitan statistical area) level. Although recent work in industrial organization has questioned whether concentration measures competition, the objections relate to inter-industry studies, particularly where the barriers to entry such as advertising and R&D that determine concentration are endogenous. It is generally accepted that concentration is a valid measure of competition across different geographical markets within the same industry (Sutton 2007, 2307). Our research design presupposes that audit market competition occurs at a local (city office) level rather than at the national level; previous audit research (Penno and Walther 1996; Francis, Stokes, and Anderson 1999) supports this notion. Our results show that higher competition is associated with lower audit quality, after controlling for the determinants of audit quality documented by previous studies.

A potential threat to the validity of our finding could be that audit market concentration and audit quality are endogenously determined, i.e., if in a particular MSA some audit firms exogenously provide high quality, clients could migrate towards such audit firms, thereby affecting concentration. To address this issue we use an instrumental variables approach with exogenous instruments for audit market concentration, and we continue to find a negative association between competition and audit quality.

Previous empirical papers in auditing have investigated the link between competition and audit quality by focusing on solicitation or bidding restrictions (Jeter and Shaw 1995; Hackenbrack, Jensen, and Payne 2000), with conflicting results. Hackenbrack et al. (2000) find indirect evidence of higher audit quality (clients engaged larger, more specialized, auditors and were more likely to be recognized for reporting excellence) in a regime with restrictions on bidding (low price competition). Jeter and Shaw (1995), on the other hand, find that in the post-solicitation (more competitive) regime auditors were more likely to qualify opinions, which indicates a positive association between competition and audit quality.

Theoretical results both in auditing and other literature have also been ambiguous about whether competition reduces or increases quality. In the audit market, deregulation of advertising and solicitation by auditors increased competition, whose effect is controversial. Supporters of deregulation argue that increased competition allows for better alignment between auditors and clients and reduces audit fees. However, detractors of the increase in competition argue that increased competition reduces the audit quality because auditors do not want to lose clients and hence pander to management.

In formalizing this argument Chaney, Jeter, and Shaw (2003) suggest that the auditor trades off the cost of reporting a fraudulent client against the cost of litigation from not reporting the fraud. The auditor would report truthfully (perform a high quality audit) if the cost of telling the truth is less than the cost from not reporting the breach (perform a low audit quality). Chaney et al. further argue that changes in competition impact the cost to the auditor of reporting a fraudulent client. The cost to the auditor from telling the truth about a fraudulent client consists of the loss of both current and expected future profits from that client, and the loss of profits from other clients who would not want the auditor to report truthfully. This cost depends on two factors, the total profits that can be lost and the probability that the client(s) would switch auditors if the auditor reports the fraud. Increase in competition reduces the profits that can be earned from the client and hence reduces the cost of telling the truth. Increase in competition however also increases the probability of the client switching, and so increases the cost of telling the truth. Thus the overall impact of competition on audit quality is ambiguous.

The effect of competition on product quality more generally (i.e., not specific to auditing) is ambiguous. Some theoretical papers suggest that sellers can sustain high quality in the presence of high prices, despite competition (Klein and Leffler 1981; Shapiro 1983; Allen 1984). Kranton (2003) however, shows that this result depends on an assumption that firms face an elastic demand curve—competition for market share is therefore ruled out by assumption. If firms compete for market share, competition can decrease product quality; and guilds and professional associations can help to maintain product quality by limiting competition and enforcing quality standards.

Our paper also contributes to the relatively sparse empirical literature on competition and quality. Kwoka (1984) shows that advertising (therefore increased competition) decreases optometrist quality. Rose (1990) finds that higher profitability (a result of lower competition) is positively correlated with airline safety. McMaster (1995) finds that quality suffered when competitive bidding was introduced for some health services in the United Kingdom. Considering outcomes more generally, i.e., not focusing on product quality narrowly, our work is also related to Petersen and Rajan (1995) who show that increase in the competition in the banking industry reduces customers' access to credit and George (2007) who shows that concentrated media ownership leads to greater variety in programs offered.

Previous literature on audit market concentration has documented trends in auditor concentration (Eichenseher and Danos 1981; Danos and Eichenseher 1986; Hogan and Jeter 1999; Cairney and Young 2006) or the effect of concentration on audit fees (Simunic 1980; Maher et al. 1992; Pearson and Trompeter 1994; V. M. Iyer and G. S. Iyer 1996). Our paper adds to the literature by linking audit market concentration to audit quality, an important public policy issue.

2 Proxies for audit market competition and audit quality

2.1 MSA-level concentration as a measure of audit market competition

We use concentration as a measure of competition, and following Penno and Walther (1996), Wallman (1996), and Francis et al. (1999), we measure it at the local (MSA, i.e., metropolitan statistical area) level. For each MSA and each year, we measure concentration using the Herfindahl Index (*H*), computed as the sum of the squares of the ratios of each audit firm's size to the total size of the audit market:

$$H = \sum_{i=1}^{N} [s_i / S]^2,$$

where, *N* is the total number of audit firms in the MSA; s_i is the size of audit firm *i*; and *S* is the total size of audit market in the MSA. We define size of each audit firm (s_i) as the total audit fees earned from audit clients listed in Audit Analytics Auditor file. Similarly, we calculate the total size of audit market (*S*) as the sum of each audit firm's size. If all audit firms are of equal size then *H* equals 1/*N* and is higher when *N* is small. For a given *N*, *H* is higher when the audit firms' market shares are unequal, i.e., some firms are larger than others.[1] Because concentration is negatively related to competition we multiply it by -1.

The structure-conduct-performance paradigm in industrial organization (Bain 1956) introduced concentration as a proxy for competition. Although the view that inter-industry differences in concentration measure competition has subsequently been discredited (Sutton 1991), the use of intra-industry differences in concentration across different *geographic* markets as a measure of competition is well accepted (Sutton 2007, 2307). Other studies that use concentration as a measure of competition include Petersen and Rajan (1995) in banking; who also measures competition at the local level, as do we.

If the degree of contestability, i.e., threat to incumbents from potential new entrants, differs in different geographical markets, then this could yet pose a threat to the validity of concentration as a measure of competition (Baumol, Panzar, and Willig 1982). We

[1] We also measure concentration using four-firm concentration ratios. Our results are similar to those using *H*, so we do not report them in the tables.

handle this objection empirically by reporting sensitivity tests involving markets in which all Big 5 firms are already present, relying on the belief that non-Big-5 firms are not effective competitors to the Big 5 (Government Accountability Office 2008).

Finally, yet another objection could be that concentration and audit quality are endogenous—if some audit firms in a certain MSA exogenously provide higher quality audits, clients may prefer such firms, increasing concentration and resulting in a negative relation between competition and audit quality.[2] We control for potential endogeneity by using a 2SLS instrumental variables approach, but do not find statistically significant evidence of endogeneity using the Davidson and MacKinnon (1993) test (see section 4.4).

Our ability to obtain variation in competition within a sample of US clients relies on the assumption that audit markets are local. Penno and Walther (1996), Wallman (1996), and Francis et al. (1999) argue that audit markets are indeed local. Choi et al. (2008) show that clients of local auditors (auditors located close to the headquarters of the client firm) report lower discretionary accruals and local Big 4 auditors charge lower fees than do non-local Big 4 auditors, suggesting that competition from non-local auditors is likely to be low, i.e., audit market competition is location-specific. Consistent with this, Choi et al. (2008) report that 82 percent of clients are audited by auditors through their practice offices located in the same MSA, and 91 percent of clients are audited by audit offices located within 150 miles.

[2] Alternatively if some audit firms exogenously offer poor quality and clients prefer such firms, a negative relation could arise between concentration and quality. This possibility is less of a concern because it is the opposite of the result we find.

Even if audit market competition is local, our ability to detect differences in audit quality across local markets depends on audit quality varying across different offices of the same audit firm. Recent research increasingly suggests that incentives (Wallman 1996; Reynolds and Francis 2001), expertise (Francis, Stokes, and Anderson 1999; Francis, Reichelt, and Wang 2005), and reputation (Chaney and Philipich 2002) are indeed local; and that this translates into differences in pricing and quality (G. V. Krishnan 2005; Choi et al. 2007; Choi et al. 2008). Wallman (1996) and Reynolds and Francis (2001) argue that auditor independence is more important at the practice office level rather than at the audit firm (national level). Francis et al. (2005) show that auditors who are industry specialists at both the national and local levels charge a fee premium, suggesting a local component to industry expertise. Chaney and Philipich (2002) find that the disclosure of document shredding by Arthur Andersen affected the stock prices of its Houston office clients more than that of its other clients, suggesting a local component to reputation. Choi, et al. (2007) show that large city offices provide better quality audit services compared with smaller city offices of the same audit firm, suggesting that audit quality is audit-office-specific rather than audit-firm-specific.

Following Penno and Walther (1996) and Francis et al. (2005), we define each metropolitan area, identified using the U.S. Census Bureau definition of metropolitan statistical areas (MSA), as a local market.[3]

We examined whether audit fees depend on concentration (untabulated), which should be the case if competition affected prices. We do not find a significant relationship between fees and concentration. A possible explanation is that audit firm costs are high in

[3] When multiple offices from the same audit firm exist in certain MSAs, we assume that they share audit resources and that competition among them is minimal, and thus treat them as the same audit firm.

cities where concentration is low. Panel C of Table 1 shows that concentration is indeed lower in large cities. We do not explore this matter further because of the difficulty of obtaining audit firm costs in different locations, and the strong support for the concentration-price relationship across geographical markets documented by other studies (Schmalensee 1989, 987).

2.2 Audit quality

Following previous studies (Becker et al. 1998; Francis and J. Krishnan 1999; Francis, Maydew, and Sparks 1999), we use accruals-based proxies for earnings, and hence audit, quality.[4] We measure earnings quality using (a) the Jones (1991) model as modified by Ball and Shivakumar (2006) to allow for a piecewise-linear relation between cash flows and accruals, and (b) quality of accruals (Dechow and Dichev 2002).

Some previous studies also use auditors' propensity to issue going-concern qualified audit opinions as a proxy for audit quality. Our focus in this study is on audit quality for a broad cross-section of firms, rather than audit quality in specialized situations such as distress; accruals-based proxies are therefore more appropriate as Myers, Myers, and Omer (2003) point out.

2.2.1 Discretionary accruals

Ball and Shivakumar (2006) augment the Jones model and control for the role of accounting conservatism on managers' discretion in reporting earnings by including three

[4] Prior studies find that higher accruals levels are positively associated with auditor litigation (Heninger 2001), the issuance of qualified audit opinions (Bartov, Gul, and Tsui 2000), and audit failures (Geiger and Raghunandan 2002).

additional variables, namely CFO_{jt}/TA_{jt-1}, $DCFO_{jt}$, and $(CFO_{jt}/TA_{jt-1})*DCFO_{jt}$, as follows:

$$\begin{aligned} ACCR_{jt}/TA_{jt-1} &= \beta_1[1/TA_{jt-1}] + \beta_2[(\Delta REV_{jt} - \Delta REC)/TA_{jt-1}] + \beta_3[PPE_{jt}/TA_{jt-1}] \\ &+ \beta_4[CFO_{jt}/TA_{jt-1}] + \beta_5 DCFO_{jt} + \beta_6[(CFO_{jt}/TA_{jt-1}) * DCFO_{jt}] + \varepsilon_{jt}, \end{aligned} \tag{1}$$

where, for firm *j* and in year *t* (or *t - 1*),

ACCR = total accruals equal to income before extraordinary items minus cash flow from operations (Compustat #123- Compustat #308);

TA = total assets (Compustat #6);

ΔREV = changes in net sales (Compustat #12);

ΔREC = changes in receivables (Compustat #2);

PPE = gross property, plant and equipment (Compustat #7);

CFO = cash flows from operations (Compustat #308);

DCFO = dummy variable equal to 1 if CFO is negative and 0 otherwise; and

ε = error term.

Ball and Shivakumar (2006) argue that accounting accruals incorporate economic losses in a timelier manner than they do economic gains; they incorporate this asymmetry by modeling accruals as a piecewise linear function of current-period cash flows from operations. The dependent variable, total accruals (ACCR), is deflated by beginning total assets. Equation (1) is estimated for each two-digit SIC code industry within each year, provided there are at least 10 observations. Our measure of discretionary accruals DA is the difference between actual total accruals and the fitted values from Equation (1). Because audit quality is high when absolute DA is low, we use absolute DA multiplied by -1 as our proxy for audit quality.

As sensitivity, we also estimate performance-adjusted discretionary accruals using the model suggested by Kothari et al. (2005); where performance is adjusted by matching with another firm from the same two-digit SIC code industry that has similar ROA in the previous year. Our results using this measure are similar; for brevity we do not report them in our tables.

2.2.2 Accrual Quality

Dechow and Dichev (2002) model earnings quality as accruals quality--accruals are of high quality if they map into past, current, and future cash flows effectively. Specifically the metric is the time series standard deviation of residuals from a cross sectional regression estimated from the following equation:

$$\Delta WCA_t = \alpha_0 + \alpha_1 * CFO_{t-1} + \alpha_2 * CFO_t + \alpha_3 * CFO_{t+1} + \upsilon_t \quad (2)$$

Where,

ΔWCA_t is the change in working capital, defined as $-(\Delta AR_t + \Delta INV_t + \Delta AP_t + \Delta TAX_t + \Delta OTH_t)$;
ΔAR_t is the change in receivables (Compustat #302);
ΔINV_t is the change in inventory (Compustat #303);
ΔAP_t is the change in payables (Compustat #304);
ΔTAX_t is the change in tax payable (Compustat #305);
ΔOTH_t is the change in other current assets (Compustat #307); and
CFO_t is the cash flow from operations (Compustat #308).

All the variables above are deflated by average total assets. Equation (2) is estimated for each two-digit SIC code industry with at least 10 observations in a given year. Then we calculate the standard deviation of residuals υ_t, termed $\sigma(\upsilon)$, for each firm over the years t-4 to t. The larger the standard deviation of residuals the greater is the noise in earnings and the lower is the quality of earning, hence the lower is the audit quality. Our proxy for audit quality is therefore $\sigma(\upsilon)$ multiplied by -1. For this measure we restrict the sample to all firms that have data on assets, cash from operations, accruals, and components of accruals in each of the five years t to t-4 (Dechow and Dichev 2002); this results in a fewer number of observations for tests using this measure as compared to tests using the discretionary accruals measure.

3 Sample selection, research design, and results

3.1 Sample selection

We begin sample selection with all client firms having data about auditor identity, audit engagement office, and audit fee from the Audit Analytics database for the six-year period from 2000 to 2005. We remove observations where auditors are not located in one of 280 MSAs defined in the U.S. 2000 census because we calculate concentration measures at the MSA level, as discussed earlier.

We start with 52,788 unique observations located in 179 MSAs. We match these observations with Compustat and remove financial institutions and utility firms (SIC codes 6000-6999 and 4900-4999) because the Jones-model abnormal accruals may not be meaningfully estimated for these firms. After matching with Compustat for control variables, we are left with 25,021 observations. For the model where accrual quality $\sigma(\upsilon)$, is our dependent variable, we are left with a sample of 12,216 observations. We use all available observations in the Audit Analytics database to calculate the Herfindahl index; this ensures that the Herfindahl index calculation is unaffected by observations deleted due to non-matching with Compustat.

Panel A of Table 1 provides descriptive statistics on the regression variables. It shows that the median value of absolute discretionary accruals is 5.3 percent of total assets, and the mean is much larger at 13.6 percent. $\sigma(\upsilon)$ is less skewed, the median and mean are 0.040 and 0.056 respectively. Median concentration is 0.253, and is similar to the value reported in Table 9 of the GAO report (Government Accountability Office 2008). Because few recent studies have used concentration, we report further descriptive statistics about concentration in Panels B and C of Table 1. Panel B classifies MSAs according to the number of Big 5 audit firms located in them. The distribution of MSAs by the number of Big 5 audit firms is U-shaped (we count the maximum number of Big 5 audit firms present in an MSA during the sample period; therefore Andersen is counted in a particular MSA if it was in that MSA before its demise): there are only five MSAs with three Big 5 firms present, and the number of MSA's having fewer as well as higher number of Big 5 firms is greater. Thirty six of the 136 MSAs in our sample have no Big 5 firms present, and 40 have all Big 5 firms. These 40 MSAs account for the overwhelming majority of our sample (22,567 of 25,021 client firm year observations). Median concentration in MSAs with zero Big 5 firms is 1, i.e., each of a majority of the 36 MSAs that have zero Big 5 audit firms has only one non-Big-5 audit firm that has clients in our sample. Mean concentration across MSAs decreases monotonically with the number of Big 5 audit firms: the mean concentration for MSAs with zero Big 5 firms is 0.861 whereas the mean concentration in MSAs with all the Big 5 firms present is only 0.259. For the sub-sample of 40 MSAs with all Big 5 audit firms present, Panel C shows that audit market concentration decreases with MSA population. The mean concentration in low-population MSAs is 0.28, in high-population MSAs it is 0.237. This suggests that audit market competition is higher in the more populous MSAs.

Table 2 shows the correlation between the variables of interest in our study. We find that the correlation between the two measures of audit quality is around 40% which suggests that these two measures are complementary and pick up different aspects of audit quality. Further, we find that concentration is negatively correlated with absolute discretionary accruals and $\sigma(\upsilon)$ ($r = -0.04$ and -0.08 respectively). This suggests that audit quality is lower when competition is higher. The correlations between the other variables are not high enough to suggest that multicollinearity is a problem in our data.

3.2 Relation between competition and audit quality

To examine the relation between concentration and audit quality, we estimate the following equation:

$$\begin{aligned} AUDQUAL = {} & \beta_0 + \beta_1\, COMP + \beta_2\, SIZE + \beta_3 * Tenure + \beta_4\, Sales\ change \\ & + \beta_5\, Book\ to\ market + \beta_6\, Loss + \beta_7\, Leverage + \beta_8\, Issue \\ & + \beta_9\, Cash\ from\ operations + \beta_{10}\, Big5 + \beta_{11}\, Industry\ specialist\text{-}national\ + \\ & \beta_{12}\, Industry\ specialist\text{-}MSA + \Sigma\, \gamma_j IND + \Sigma\, \theta_t YEAR + \omega \qquad (3) \end{aligned}$$

Where

AUDQUAL = audit quality, proxied by either negative absolute value of DA, or $-\sigma(\upsilon)$.

DA = the difference between actual total accruals and the fitted values from regression equation (1) estimated for each two-digit SIC-code industry each year. Because high absolute DA indicates low audit quality, we multiply it by -1 and use negative absolute value to proxy for audit quality.

$\sigma(\upsilon)$ = standard deviation of residuals υ_t, estimated from regression equation (2). It is estimated for each two-digit SIC code industry with at least 10 observations in a given year. Then we calculate the standard deviation of residuals υ_t, termed $\sigma(\upsilon)$, for each firm over the years t-4 to t. Because high $\sigma(\upsilon)$ indicates low audit quality, we multiply it by -1.

COMP = local audit market competition, i.e., concentration of audit market by MSA, measured by the Herfindahl index, multiplied by -1.

Size = log of total assets (Compustat #6),

Tenure = number of years the auditor has audited the client,

Sales change = Changes in net sales [Compustat #12 – Lag(Compustat #12)] deflated by lagged total assets;

Book to Market = Ratio of book value (Compustat #60) to market value (Compustat #199 times Compustat #25), winsorized at 0 and 4;

Loss = dummy variable equal to 1 if reported net income (Compustat #172) is less than zero, and 0 otherwise;

Leverage = Ratio of total liabilities (Compustat #181) to total assets,

Issue = dummy variable equal to 1 if the sum of the debt issued (Compustat #111) and equity issued (Compustat #108) during the past 3 years is more than 5% of the total assets, and 0 otherwise;

Cash flow from operations (Compustat #308) deflated by lagged total assets,

Big 5 = dummy variable equal to 1 if the auditor is one of PWC, KPMG, AA, EY, DT, and zero otherwise,

Industry specialist – national = dummy variable equal to 1 if the auditor is an industry specialist at the national level, and zero otherwise. Following Francis et al. (2005), the auditor with the highest total audit fees from clients in a two-digit SIC code industry is designated as the specialist for that industry.

Industry specialist - MSA = dummy variable equal to 1 if the auditor is an industry specialist at the MSA level, and zero otherwise. The definition follows Francis et al. (2005) and is similar to the definition of the national industry specialist.

IND = Industry dummies based on industry classification by Barth et al. (1998).

YEAR = year dummies from 2001 to 2005. We omit FY 2000, which is therefore captured in the intercept.

The variable of interest is COMP. A negative relation between COMP and audit quality (AUDQUAL) suggests that audit quality is lower in more competitive audit markets.

We include a set of control variables that are shown by prior literature to affect discretionary accruals. Size (log of total assets) is included because larger firms tend to have lower accrual estimation errors and lower discretionary accruals and therefore higher accruals quality (Dechow and Dichev 2002). Auditor tenure is included because Myers, Myers, and Omer (2003) show that firms with longer auditor-client relationships have lower discretionary accruals (higher audit quality). A dummy variable for loss-reporting firms is included because such firms have a greater incentive to take a big bath. We include two variables to proxy for firm growth, the book to market ratio and sales change, because McNichols (2000) suggests that firms with higher growth tend to record a greater amount of discretionary accruals (lower audit quality). We expect book-to-market ratio to be positively related to audit quality, and sales change to be negatively related to audit quality. A dummy variable for equity- or debt-issuance (Issue) is included because firms raising capital tend to manage earnings more aggressively (Teoh, Welch, and Wong 1998). We include leverage because Becker et al. (1998) suggest that firms with higher leverage have incentives to manipulate earnings to keep from breaching their debt covenants. Following Ashbaugh et al. (2003) we include cash flow from operations to control for correlation between accruals and cash flow performance. Industry and year dummies are included to control for differences across industries and changes over time in discretionary accruals and accruals quality.

Because auditor industry specialization, at least at the MSA level, is determined by the market share of the largest auditor, concentrated audit markets are likely to have a greater number of clients audited by industry specialist auditors. To ensure that we do not attribute to audit market concentration the results that are instead attributable to the previously documented influence of industry specialist auditors, we control for national-level auditor industry specialization (Balsam, Jagan Krishnan, and Yang 2003), and MSA-level industry specialization.

We present the results of estimating equation (3) in Table 3. When audit quality is proxied by negative absolute discretionary accruals, the coefficient on COMP is negative and significant (coefficient = -0.033, t-value = -4.39, p-value < 0.01) suggesting that high competition is associated with low audit quality.[5]

Similar to findings in Myers, Myers, and Omer (2003) we find that large firms (Size), better performing firms (high Cash from operations), firms with longer client-auditor tenure (Tenure), and higher quality auditors (Big 5) have higher audit quality proxied by absolute discretionary accruals. Further, similar to McNichols (2000) we find that firms with higher growth options (low Book to Market and high Sales Change) have lower audit quality. The coefficients on dummy variables for FY2001-FY2005 are positive and increasing, and this could be because increased regulatory monitoring arising from SOX has curtailed earnings management. Given that our results hold after controlling for the fixed year effects, it is unlikely that our results are attributable to the decrease in competition arising from Arthur Andersen's demise and the contemporaneous increase in audit quality because of regulatory measures such as SOX.

Columns 3 and 4 of Table 3 show the results of estimating equation (3) with accrual quality, i.e., the negative standard deviation of accrual estimation errors ($-\sigma(\upsilon)$), as the proxy for audit quality. We find that the coefficient on COMP is negative (coefficient = -0.015, t-value = -5.41, p-value < 0.01), which suggests that higher audit market competition is associated with lower accrual quality. In sum, audit quality proxied by

[5] The number of observations in the regression of discretionary accruals decreases by eight and of accrual quality decreases by three compared to Table 1. This is because we drop observations with extreme values of the Belsley, Kuh, and Welch (1980) DFBETAS statistic. Our results and inferences are all similar if we do not drop these observations.

each of the two variables, absolute discretionary accruals and accrual quality, is negatively associated with competition in the MSA-level audit market.

As Panels B and C of Table 1 show, audit market concentration depends on the number of Big 5 firms present in an MSA and on MSA population. We perform several tests to check whether some omitted variable associated with MSA size drives our results.

First, large MSAs may have greater number of large firms. Previous research (Chung and Kallapur 2003) argues that auditors' incentives to compromise their independence could differ for different-sized firms because of differences in the probability of audit failure detection and the consequences of detection. Therefore, in addition to controlling for firm size in the results reported above, as a further test we separately estimate Equation (3) for client firms in the top and bottom half partitioned by firm size. We find that the negative relation between competition and audit quality holds for both large and small clients. For large clients based on clients total assets the coefficient = -0.016, p-value = 0.047, and for small clients the coefficient = -0.048, p-value = 0.001, when audit quality is proxied by the negative absolute value of discretionary accruals. Similarly, when audit quality is proxied by accrual quality, the coefficient on competition for large firms is -0.01, p-value = 0.003, and the coefficient for small firms is -0.025, p-value = 0.001. The negative relation between audit quality and competition is robust to splitting the sample into large and small firms based on asset size.

Second, clients from certain industries may cluster in different MSAs. Moreover, the market share of industry specialist auditors may differ in different industries. As mentioned above, we control for industry fixed effects as well as for industry specialization of auditors. From Table 3 we see that COMP is associated with audit quality even after controlling for industry fixed effects and MSA-level industry specialization of auditors. As sensitivity we also test for interaction between MSA-level industry specialization and COMP by estimating regression Equation (3) separately for clients of MSA-level industry-specialist auditors and non-specialist auditors. We find that the relation between competition and audit quality (proxied by negative absolute value of discretionary accruals) remains significantly negative for both sets of firms (industry-specialist-audited clients, coefficient = -0.025, p-value = 0.001; and non industry-specialist-audited clients, coefficient = -0.053, p-value = 0.034).[6] When audit quality is proxied by accrual quality the results are similar; the coefficient on competition (COMP) for industry specialist auditors is -0.01 (p-value 0.0001), and for non industry-specialist audited clients, it is -0.03 (p-value 0.002). This suggests that the negative relation between competition and audit quality is not driven by the interaction of auditor industry specialization with competition.

Third, we also control for MSA size by introducing two dummy variables for large and small MSA's as independent variables, and our results continue to hold. The coefficient on competition (COMP) is -0.035 (-0.014) when the audit quality is measured as the negative of the absolute value of discretionary accruals (negative accrual quality or $-\sigma(\upsilon)$), both of which are significant at the 1% level. Although correlated omitted variables can never be completely ruled out, our results are robust to some of the obvious possibilities that we test for above.

Lastly, when we include controls for the operating cycle and volatility of sales and cash flows in our regression, we find that our results are unchanged. Dechow and Dichev

[6] We drop four observations which have high values of the Belsley, Kuh, and Welch (1980) DFBETAS measure.

(2002) show that accruals quality depends on the length of the operating cycle and volatility of sales and cash flows. Hribar and Nichols (2007) also show that absolute discretionary accruals depend on volatility. Thus, we try to add these additional control variables to our regression model but find that our results are stay qualitatively similar. For example, when the dependent variable is negative absolute value of DA, the coefficient on COMP is -0.01 with t-value=-3.81 (p-value=0.001).[7]

4 Sensitivity tests

4.1 Weighted regression

Since MSAs differ in the number of client-year observations, we weight the regression with (inverse of) the number of clients. The coefficient on competition is significantly negative (coefficient = -0.034, p-value=0.0001) when audit quality is proxied by negative absolute value of discretionary accruals. When audit quality is proxied by accrual quality, the coefficient on competition is -0.01, and p-value is 0.0001. This sensitivity test suggests that our results are not impacted by different MSAs having different number of clients.

4.2 Clustering by MSA

It is possible that there is dependence in error terms across observations in the same MSA. We correct for this by estimating robust standard errors after clustering them on by MSA. Our results are robust to this methodology and the relation between competition and audit quality is significantly negative for both the measures of audit quality. The coefficient on COMP is -0.033 (-0.0153) when audit quality is measured as negative

[7] We report results in Table 3 excluding these variables because the requirement of these additional variables substantially lowers our sample size. For example, the requirement of cost of goods sold that is necessary for calculation of the operating cycle reduces our sample by 2,939 observations.

absolute discretionary accruals (negative accrual quality) and is significant at the 1% level.

4.3 Results for income increasing and decreasing accruals separately

Note that we estimate equation (3) using the absolute value of discretionary accruals as a dependent variable. To further examine whether the association and competiton and discretionary accruals differs systematically between clients with income-increasing abnormal accruals and income-decreasing abnormal accruals, we separate the full sample into two sub-samples with positive and negative discretionary accruals. Estimating each sub-sample as a truncated regression, we find that the relation between competition and audit quality is negative and significant for both income-increasing and income-decreasing discretionary accruals sub-samples. The coefficient on COMP for positive (negative) discretionary accruals sub-sample is -0.026 (-0.037) both of which are significant at the 1% level. When we further estimate each sub-sample by OLS, the results are also similar. These results suggest that local audit market competition has a negative effect in constraining both income-increasing and income-decreasing accruals. Our other audit quality measure, accrual quality, is always negative, which eliminates the need for this sensitivity test.

4.4 Endogenous relation between concentration and audit quality.

Concentration could be endogenous because it is possible that an auditor gains market share by performing a higher-quality audit. We use a two-stage instrumental variables approach to address this concern. Our arguably exogenous instruments for concentration are measures of the costs of operating in that MSA and the attractiveness of the MSA in terms of market size and growth.[8] For these we use geographic size of MSA area, the number of business establishments at the beginning of the year, and the number of businesses added during the year, for which data is available from the U.S Census Bureau URL: http://www.census.gov/csd/susb/. This data is available for 3 years 2001 to 2003.[9] Hence the number of observations that we use to estimate the 2SLS is smaller than the full sample (N=13,523 and 7,962 when audit quality is proxied by discretionary accruals and accruals quality respectively).

We perform a Davidson and MacKinnon (1993) test of whether endogeneity affects the results and find no evidence that it does. Therefore we do not think our results are affected by endogeneity between audit quality and competition. Moreover, the negative association between audit quality and competition continues to hold when we use the fitted value for concentration from the first stage instead of its actual value.

4.5 Results for MSAs with all Big 5 firms present

As mentioned in Section 2.1, the competition measure could be invalid if the degree of market contestability differs across different MSAs. Given that smaller audit firms cannot effectively compete against the Big 5, we estimate our model for the sub-sample of MSAs in which all Big 5 audit firms are already present. We find that the negative relation between competition and audit quality is significant in this sample too, suggesting that our findings are not driven by market contestability as an omitted variable. The coefficient on competition (COMP) is -0.05 (-0.034) when audit quality is measured

[8] While *firm* growth is related to discretionary accruals, we do not see any reason why a client's headquarters location in a growing MSA should be correlated with its discretionary accruals *after controlling* for its Sales change and Book-to-market ratio.

[9] There is data for total number of business establishments in an MSA for several years before 2001 and after 2003, however, we are interested in the new businesses added and existing businesses which died during the year, for which data is available for only three years 2001 to 2003.

as the negative of the absolute value of discretionary accruals (negative accrual quality or -σ(υ)). The number of firm years with all five Big 5 present is 22,787 and 11,004 respectively for the two measures of audit quality.

5 Conclusions

Theoretical predictions of the impact of product market competition on product quality are mixed. One set of papers suggest that there is no relation between the two (Klein and Leffler 1981; Shapiro 1983; Allen 1984). Kranton (2003) on the other hand suggests that when suppliers compete for market share, increased competition can lead to lower product quality. In the auditing setting the theoretical model presented in Chaney et al. (2003) indicates an ambiguous relationship between competition and audit quality.

We find that competition (measured at a local-MSA level) is associated with lower audit quality proxied by discretionary accruals and accruals quality. Because we control for fixed year effects our results are unlikely to be affected by the decrease in competition due to Andersen's demise contemporaneous with an increase in audit quality because of regulatory measures such as SOX. We also perform several sensitivity tests in an attempt to rule out omitted variables associated with client firms' MSA location. We find our results unchanged after controlling for endogeneity between audit quality and competition.

Our result thus adds to the sparse evidence on the relationship between competition and audit quality. Future research can more fully explore the interaction of prices, competition and quality in audit markets.

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Table 1
Descriptive statistics of variables of interest

Panel A: Variables used in regression analyses (N=25021, except for accruals quality where N = 12216)

Variable	Mean	SD	Q1	Median	Q3
Absolute discretionary accruals	0.136	0.358	0.020	0.053	0.135
σ(υ) = -(Accruals quality)	0.056	0.054	0.023	0.040	0.068
Concentration	0.284	0.116	0.231	0.253	0.294
Size	12.109	2.271	10.537	12.101	13.641
Tenure	1.924	0.754	1.386	1.946	2.485
Sales change	0.132	1.453	-0.029	0.056	0.200
Book To Market	0.602	0.702	0.177	0.413	0.753
Loss	0.437	0.496	0.000	0.000	1.000
Issue	0.460	0.498	0.000	0.000	1.000
Leverage	0.644	2.865	0.285	0.497	0.704
Cash from operations	-0.008	0.419	-0.033	0.065	0.133
Big 5	0.781	0.413	1.000	1.000	1.000
Industry Specialist – National	0.241	0.428	0.000	0.000	0.000
Industry Specialist – Local	0.474	0.499	0.000	0.000	1.000

Panel B: MSA-level audit market concentration by the number of Big 5 firms with office in that MSA

			Concentration				
Number of Big 5 firms with offices in an MSA	Number of MSAs	Number of client firm-year observations	mean	SD	Q1	Median	Q3
0	36	136	0.861	0.205	0.658	1.000	1.000
1	29	302	0.734	0.263	0.439	0.815	0.992
2	12	362	0.601	0.178	0.482	0.511	0.737
3	5	322	0.518	0.157	0.409	0.528	0.630
4	14	1332	0.401	0.150	0.297	0.336	0.485
5	40	22567	0.259	0.054	0.226	0.252	0.278
	136	25021					

Note: The sample spans the demise of Arthur Andersen. We count an auditor office in an MSA if it existed during any sample year.

Panel C: Audit market concentration for MSAs with all Big 5 audit firms, by MSA population

MSA population	Number of client firm-year observations	Concentration				
		mean	SD	Q1	Median	Q3
high	6854	0.237	0.040	0.208	0.242	0.254
middle	8298	0.258	0.044	0.234	0.253	0.283
low	7415	0.280	0.066	0.236	0.264	0.317
	22567					

Absolute discretionary accruals = absolute value of residuals from regression equation (1)

$$ACCR_{jt} / TA_{jt-1} = \beta_1[1/TA_{jt-1}] + \beta_2[(\Delta REV_{jt} - \Delta REC)/TA_{jt-1}] + \beta_3[PPE_{jt} / TA_{jt-1}]$$
$$+ \beta_4[CFO_{jt} / TA_{jt-1}] + \beta_5 DCFO_{jt} + \beta_6[(CFO_{jt} / TA_{jt-1}) * DCFO_{jt}] + \varepsilon_{jt},$$

estimated for each two-digit, SIC-code industry within each year, provided there are at least 10 observations.

σ(υ) = standard deviation of residuals from regression equation (2),

$\Delta WCA_t = \alpha_0 + \alpha_1 * CFO_{t-1} + \alpha_2 * CFO_t + \alpha_3 * CFO_{t+1} + \upsilon_t$,
estimated for each two digit SIC with at least 10 observations in year t. WCA = working capital accruals, and CFO = cash from operations. We calculate the standard deviation of residuals υ_t, termed σ(υ), for each firm over the years t-4 to t. σ(υ) measures accruals quality, with high values of σ(υ) indicating low accruals quality.

Concentration = concentration of audit market by MSA, measured by the Herfindahl index of audit fees by auditor office,

Size = log of total assets (Compustat #6),

Tenure = number of years the auditor has audited the client,

Sales changes = [Compustat #12 – Lag(Compustat #12)] deflated by lagged total assets;

Book to market = Ratio of book value (Compustat #60) to market value (Compustat #199 times Compustat #25), winsorized at 0 and 4;

Loss = Indicator variable equal to 1 if reported net income (Compustat #172) is less than zero, and 0 otherwise;

Leverage = Ratio of total liabilities (Compustat #181) to total assets,

Issue = Indicator variable equal to 1 if the sum of the debt issued (Compustat #111) and equity issued (Compustat #108) during the past 3years is more than 5% of the total assets, and 0 otherwise;

Cash from operations = (Compustat #308) deflated by lagged total assets,

Big5 = dummy variable equal to 1 if the auditor is one of PwC, KPMG, AA, EY, DT, and zero otherwise, Industry Specialist – National = dummy variable equal to 1 if the auditor is an industry specialist at the national level, and zero otherwise,

Industry Specialist – MSA = dummy variable equal to 1 if the auditor is an industry specialist at the MSA level, and zero otherwise,

Ind = Industry dummies based on industry classification by Barth et al. (1998).

Table 2
Correlations between variables of interest

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Absolute discretionary accruals	1.00	0.39	-0.04	-0.22	-0.09	0.04	-0.06	0.16	0.09	0.08	-0.33	-0.15	-0.06	-0.10
2. σ(υ) = -(Accruals quality)		1.00	-0.08	-0.47	-0.17	0.02	-0.08	0.24	0.03	0.21	-0.28	-0.24	-0.12	-0.20
3. Concentration			1.00	0.05	0.03	0.00	0.02	-0.09	0.00	0.00	0.06	0.01	0.00	0.23
4. Size				1.00	0.27	0.01	-0.05	-0.36	-0.01	-0.11	0.30	0.54	0.25	0.33
5. Tenure					1.00	-0.02	0.03	-0.16	-0.06	-0.01	0.11	0.27	0.08	0.13
6. Sales change						1.00	-0.05	-0.04	0.04	-0.02	0.27	-0.02	0.00	0.00
7. Book To Market							1.00	0.08	-0.14	-0.06	0.06	-0.02	-0.01	0.00
8. Loss								1.00	0.11	0.05	-0.37	-0.15	-0.08	-0.15
9. Issue									1.00	0.04	-0.19	-0.02	-0.01	0.01
10. Leverage										1.00	-0.05	-0.07	-0.02	-0.02
11. Cash from operations											1.00	0.14	0.08	0.10
12. Big 5												1.00	0.29	0.30
13. Industry Specialist – National													1.00	0.24
14. Industry Specialist – MSA														1.00

N = 25021 for all variables except correlations involving accruals quality, for which N = 12216.
See Table 1 for variable definitions.

Table 3

Relationship between audit quality (-DA and accruals quality) and audit industry concentration.
Coefficient estimates and standard errors of estimating the regression equation:
Absolute discretionary accruals or accruals quality = $\beta_0 + \alpha$*COMP + β_1*Size + β_2*Tenure + β_3*Sales change + β_4*Book to market + β_5*Loss + β_6*Leverage + β_7*Issue + β_8*Cash from operations + β_9*Big5 + β_{10}* Industry specialist-national + β_{11}* Industry specialist-MSA + $\Sigma\, \gamma_j$*Ind + $\Sigma\, \theta_t$*Year + ω

	Predicted sign	AUDQUAL = -Absolute discretionary accruals		AUDQUAL = Accrual Quality= $-\sigma(\upsilon)$	
		Coefficient	T-value	Coefficient	T-value
Comp	-	-0.033	-4.390	-0.015	-5.410
Size	+	0.014	19.740	0.009	38.150
Tenure	+	0.002	1.580	0.002	4.740
Sales change	-	-0.069	-13.300	-0.007	-4.310
Book to Market	+	0.008	4.760	0.006	10.950
Loss	-	-0.011	-3.410	-0.004	-4.370
Leverage	-	-0.042	-11.610	-0.014	-8.750
Issue	-	-0.006	-2.960	-0.001	-0.930
Cash from operations	+	0.134	15.910	0.021	6.400
Big5	+	0.034	9.460	0.001	0.940
Industry specialist – National	+	-0.002	-1.140	0.001	0.690
Industry specialist –MSA	+	0.004	1.690	0.001	1.120
fy2001	?	0.029	6.660	-0.001	-0.870
fy2002	?	0.030	6.820	-0.000	-0.110
fy2003	?	0.046	10.640	0.003	2.230
fy2004	?	0.046	10.600	0.004	3.180
fy2005	?	0.049	10.880		
Intercept	?	-0.369	26.350	0.184	42.550
N =		25,013		12,213	
Adjusted R-Square		0.275	F = 177.46***	0.35	F = 170.37***

Comp = competition = -concentration.

See Table 1 for other variable definitions