Differential Effects of Market Concentration on Oligopolistic and Atomistic Segments: Evidence of Audit Fees and Audit Quality

Hongkang (H.K.) Xu
Auburn University at Montgomery

This study divides the audit market into the oligopolistic and atomistic segments at MSA level and examine whether the effect of audit market concentration on audit fees and audit quality is the same in these two segments. I find that the market concentration raises the audit fees in the oligopolistic segment. In contrast, the market concentration lowers audit fees, but raises the audit quality in the atomistic segment. My findings reveal that audit market concentration only reduces the competition among oligopolistic segment. In contrast, the atomistic segment becomes more compressed and more competitive in a highly concentrated market.

INTRODUCTION

The purpose of this study is to investigate whether the effect of market concentration on audit fee and audit quality in the oligopolistic segment (specialist auditors) is different from the atomistic segment (non-specialist auditors) at MSA-level.[1] There is a concern among regulators and audit clients that increasingly concentrated audit markets will decrease competition among auditors. In recent years, a number of studies examine the effect of audit market concentration on audit fees and audit quality (e.g. Pearson and Trompeter, 1994; Willekens and Achmadi, 2003; Bandyopadhyay and Kao, 2004; Feldman, 2006; Kallapur et al., 2010; Boone et al., 2012; Numan and Willekens, 2012; Francis et al., 2013; Newton et al., 2013; Newton et al., 2015). Nevertheless, due to the conflicting evidence in those studies, the association between market concentration and competition is still inconclusive.

In theory, market concentration does not necessarily increase or decrease competition in a market in that market concentration only represents the degree to which a small number of audit firms control a large part of audit market. In other words, high market concentration indicates that a small number of audit firms occupy a large part of market share while the others (a great number of audit firms) have to share the remaining small part of the market. Given that the market structure of the audit industry consists of an oligopolistic segment dominated by a few large audit firms and an atomistic segment composed of many small audit firms, market concentration is an indicator of inequality between the oligopolistic segment and atomistic segment.[2]

In this study, I argue that increasing market concentration produce differential effects (reflected on audit quality and audit fees) on oligopolistic (a small number of audit firms represented by specialist auditors) and atomistic segments (a great number of audit firms represented by non-specialist auditors) within an audit market.[3] Specifically, the high audit market concentration does not necessarily reduce the competition among auditors (particularly, within an atomistic segment). For example, in a highly concentrated market, because a large part of market share is occupied by the specialist auditors, the residual market for non-specialist auditors to share is relatively small. Consequently, the high market

concentration could potentially aggravate, rather than reduce, the competition among non-specialist auditors.

I test my hypotheses using U.S. data for the period 2005-2013. By utilizing the Heckman procedure, this study mitigates the sample bias and examines the effect of market concentration on the specialist and non-specialist auditor for the partitioned subsample. I find that audit market concentration increase the audit fees of specialist auditors, suggesting that the market concentration lowers the competition in the oligopolistic segment of audit market at MSA level. On the contrary, I find that more concentrated audit market is associated with higher audit quality and lower audit fees for clients with non-specialist auditors, implying market concentration intensifies competition in the atomistic segment. The association between audit market concentration and audit quality/audit fee is conditional on the auditor's characteristics (i.e., the market share) and position in the market.

My study contributes to the literature in at least two important ways. First, this study is the first study (to my knowledge) to examine the differential effect of market concentration on the separate segments of the audit market. Specifically, I find that market concentration may enlarge the gap between oligopolistic and atomistic segment rather than simply intensify or alleviate the competition among the audit industry.

Second, some studies suggest that concentration measures may not be appropriate to assess competition in the audit market. Dedman and Lennox (2009) argue that, from an empirical perspective, the use of concentration measures assumes that all firms in an industry face the same level of competition, which is often not the case in practice. Recently, by using client restatements to measure low-quality audits, Francis, Michas and Yu (2013) do not find a difference between offices of non-Big 4 firms and all but the very largest Big 4 offices. They suggest the possibility that the well-documented Big 4/non-Big 4 quality differences are driven by a subset of the largest Big 4 Offices. In other words, there might be no significant difference in audit quality between small Big 4 offices and non-Big 4 auditors at MSA level. Given their findings, separating Big 4 and non-Big 4 at MSA level in prior audit concentration literature only suggests the differences between auditor brand rather than audit market segment. Thus, my study separates the local (i.e., MSA level) audit market segments by specialist and non-specialist auditors rather than by Big 4 and non-Big 4, contributing to the current studies by examining the differential effect of market concentration on the oligopolistic market and atomistic market.

The remainder of this paper is organized as follows. In the next section, I briefly review the prior literature relating to specialization and concentration and their effect on audit quality. I develop my hypotheses in section three and present the research design in section four. The descriptive statistics and results are reported in section five. The paper concludes in section six.

BACKGROUND AND LITERATURE REVIEW

In the past decade, policymakers have expressed concern about the risks posed by auditor concentration for audit quality (e.g., GAO 2008). A number of researchers examine the effect of market concentration on both audit fees and audit quality and provide mixed evidence. For example, with respect to the audit fee, Pearson and Trompeter (1994) find that industry concentration is negatively associated with audit fees, suggesting that higher concentration is associated with increased price competition. By the same token, Numan and Willekens (2012) also document the negative association between audit market concentration and audit fee, suggesting that in more concentrated market segments competition is more intense because it may be less costly for customers to search for all available prices when there are few suppliers (Stiglitz 1987). In contrast, Feldman (2006) find that audit fees are positively associated with market concentration, i.e., high concentration reduces the price competition.

Similarly, prior literature provides competing views as to the effect of audit market concentration on audit quality. On the one hand, audit market concentration could decrease audit quality in that the market concentration limits large companies' choice of auditors, resulting in a more lenient approach to audits and lower quality (GAO 2008). Boone, Khurana, and Raman (2012) find higher city level concentration associated with the propensity to meet-or-beat analyst consensus forecast through the use of discretionary accruals. Their finding implies that greater concentration is associated with lower audit quality. Consistent

with Boone et al. (2012), Francis et al. (2013) provide a notable exception to the city level studies by looking at concentration and quality across 42 countries. They also find that Big4 concentration within countries results in lower quality of financial reporting.

On the other hand, audit market concentration could increase the audit quality in that auditor concentration lowers the cost to the auditor of reporting truthfully due to the reduced probability of the client switching auditors (Boone et al., 2012 pp 1171). In other words, market concentration enables the auditor to maintain independence (i.e., improve audit quality) by reducing auditor's fear of being replaced. Kallapur et al. (2010) find that city level concentration is associated with higher quality accruals. Newton et al. (2013) find fewer restatements in more concentrated city markets. Both studies suggest higher audit quality in more concentrated markets. Recently, Newton et al. (2015) examine the association between market competition and auditor dismissals. They find that auditor dismissal tends to be more likely when the audit market concentration is low, suggesting clients should be more willing to change auditors when substitutes are readily available. Given the limited number of studies and the mixed findings, Defond and Zhang (2014) call for additional research in the area of audit market concentration and its effect on the auditor.

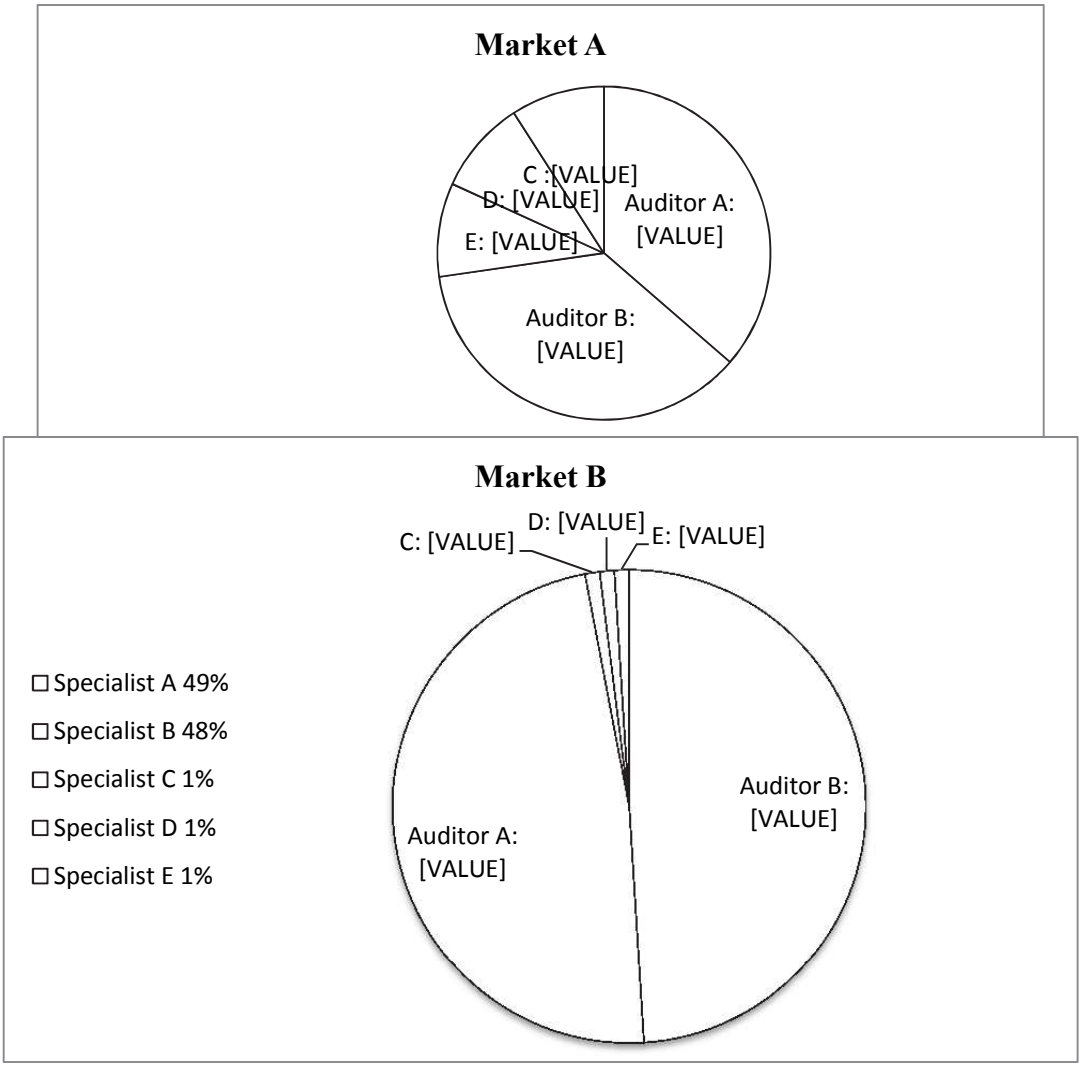
By analyzing the change in Big N audit fee premium over the Big 6, Big 5, and Big 4 periods, and across different client segments in Australia, Carson et al. (2012) suggest that not all segments of the market (i.e., client segments) are uniformly affected by the reduction in the number of the largest audit firms. However, the limitation of their study is that the reduction of Big N may not necessarily change the market concentration at local level. Further, by using a two-stage selection model, their findings may only indicate the effect of Big N reduction on the Big N premium rather than the different segments of audit market.

HYPOTHESIS DEVELOPMENT

The Differential Effect of Audit Market Concentration on Specialist and Non-specialist Auditors

As discussed previously, I expect the effect of audit market concentration on the specialist and non-specialist auditor to be different. Specifically, the oligopolistic dominance due to increased concentration can foster complacency only among specialist auditors (i.e., the auditor with large market share), rather than non-specialist auditor (i.e., the auditor with small market share). In contrast, the competition among non-specialist auditors (i.e., small auditors) could be even more intense in a highly concentrated market because the residual market share available for them to share is small. Figure 1 presents two different audit markets – Market A and Market B (See Figure 1). Although the market concentration of Market B is higher than Market A, the competition of Market B may not be lower than Market A (especially, the competition among non-specialist auditors (i.e., auditor C, D, and E)). Therefore, the increased market concentration could potentially decrease the competition among specialist auditors, but increase the competition among non-specialist auditors. For this reason, the effect of market concentration on non-specialist auditors may be opposite to the effect on specialist auditors.[4]

FIGURE 1
MARKET CONCENTRATION AND COMPETITION IN THE ATOMISTIC MARKET SEGMENT



Alternatively, by using a customer search model, Stiglitz (1987) demonstrates that competition is more intense in a more concentrated market segment because it may cost less for customers to search for all available prices when there are few suppliers. By the same token, GAO (2008) recognizes that: "…competition in an oligopoly can also be intense and result in a market with competitive prices, innovation, and high-quality products." Stated differently, the market concentration could potentially increase the competition in oligopolistic as well as atomistic audit market segments.

Due to the above competing views, I state my first hypothesis in the null form as follows:

Hypothesis 1a. *Ceteris paribus, at MSA level, the effect of audit market concentration in an industry on the audit quality provided by the specialist auditor and the non-specialist auditor is not different.*

Hypothesis 1b. *Ceteris paribus,at MSA level, the effect of audit market concentration in an industry on the audit fee charged by the specialist auditor and the non-specialist auditor is not different.*

RESEARCH DESIGN

Correction for Potential Self-selection Bias

The systematical difference between oligopolistic and atomistic clients could create a potential omitted variable problem in the regression estimation, which can bias the coefficient estimates of the explanatory variables. To address this issue, I conduct the Heckman (1979) two-step procedure to correct for the potential self-selection bias in the main tests. In the first step, I estimate a selection model using all the sample firms and obtain the inverse Mills Ratio (*IMR*). In the second step, I include *IMR* in the main test on the subsample as a control variable to correct for potential selection bias. The following probit model is used in the Heckman first step to explain the selection of Big 4 auditor firms:

$$Probability\ (SPECIALIST = 1) = \alpha_0 + \alpha_1 SIZE_{i,t} + \alpha_2 ATURN_{i,t} + \alpha_3 ACCEL\_FILER_{i,t} + \alpha_4 LITIGATION_{i,t} + \alpha_5 INVREC_{i,t} + YEAR\_INDICATOR + IND\_INDICATOR + \varepsilon_{i,t} \quad (1)$$

The dependent variable SPECIALIST equals 1 if the client has an industry specialist auditor and 0 otherwise. I define *SPECIALIST* based on prior studies (e.g., Reichelt and Wang, 2010; Numan and Willekens, 2012; Minutti-Meza, 2013).[5] The proxy for auditor industry specialization used in this study is:

SPECIALIST: An auditor is defined as an industry specialist if it has the largest annual market share in an industry (i.e., based on the two-digit SIC code) at MSA level, and its annual market share is at least 10 percentage points greater than its closest competitor in the MSA audit market.

I select the independent variables based on prior studies, such as Chaney et al. (2004), Fan and Wong (2005), Lawrence et al. (2011), and Minutti-Meza (2013). My independent variables are as follows: *SIZE* is the natural logarithm of total assets of the client at the end of the year; *ATURN* (current year sales scaled by last year's total assets); *ACCEL_FILER* (1 if the firm is an accelerated filer and 0 otherwise); *LITIGATION* (1 if the firm operates in the risk-of-litigation industries); *INVREC* (The sum of inventories and receivables divided by total assets).

The Differential Effect of Audit Market Concentration on Audit Quality and Audit Fees

Discretionary Accruals

Consistent with prior literature (Kallapur et al., 2010; Francis et al., 2013), I use the performance-matched discretionary accruals as audit-quality proxy. I calculate discretionary accruals based on the modified Jones model of expected accruals with control for firm performance (Dechow et al., 1995; Kothari et al., 2005). Discretionary accruals are estimated as a function of the changes in sales and receivables, the level of property, plant and equipment (PPE), and the level of return on assets as follows:

$$TACC_{i,t}/TA_{i,t-1} = \gamma_0 + \gamma_1[1/TA_{i,t-1}] + \gamma_2[(\Delta REV_{i,t} - \Delta REC_{i,t})/TA_{i,t-1}] + \gamma_3[PPE_{i,t}/TA_{i,t-1}] + \gamma_4[ROA_{i,t}] + \varepsilon_{i,t} \quad (2)$$

where, for client *i* and fiscal year-end *t*: *TACC* is total accruals, defined as the difference between income before extraordinary items minus cash flow from operation, deflated by lagged total assets $TA_{i,t-1}$. ΔREV is the change in net sales and ΔREC is the change in net receivables, deflated by lagged total assets. *PPE* is the level of gross property, plant, and equipment for each year deflated by total assets and *ROA* is the end-of-year return on assets, estimated using net income over total assets. The error term from equation (2) is the estimated discretionary accruals.

As noted in Kothari et al. (2005), the inclusion of a constant term in the Jones (1991) model provides an additional control for heteroskedasticity not achieved merely by deflating the variables with total assets. Including a constant term also mitigates problems arising from omitted size variables and produces a discretionary accrual measure that is more symmetric, making the power of the test comparisons better specified. Moreover, the performance matching approach based on *ROA* and the Jones (1991) model

produces a more relevant measure of discretionary accruals in that the means and medians in the performance related subsamples are closest to zero more often than other measures.

The regression model used to examine the association between discretionary accruals and auditor market share, consistent with the one proposed by Reichelt and Wang (2010) and Minutti-Meza (2013), is as follows:

$$DACC_{i,t} = \alpha + \beta_1 HERF_{i,t} + \beta_2 IMR_{i,t} + \beta_3 DISTANCE_{i,t} + \beta_4 LMV_{i,t} + \beta_5 LEV_{i,t} + \beta_6 ROAL_{i,t} + \beta_7 LOSS_{i,t} + \beta_8 CFO_{i,t} + \beta_9 BTM_{i,t} + \beta_{10} ABS(TACCL)_{i,t} + \beta_{11} GROWTH_{i,t} + \beta_{12} ZSCORE_{i,t} + \beta_{13} STDEARN_{i,t} + \beta_{14} OFFICE\_SIZE_{i,t} + \beta_{15} TENURE_{i,t} + \beta_{16} BIG4_{i,t} + YEAR\_INDICATOR + \varepsilon_{i,t} \quad (3)$$

where for client *i* and fiscal year-end *t*: *DACC* is the value of discretionary accruals estimated from equation (2). Higher quality audits are expected to reduce managerial discretion and result in smaller discretionary accruals in audited earnings (Becker et al. 1998; Frankel et al. 2002). Consistent with Numan and Willekens (2012), for each MSA, industry, and year, the index (*HERF*) is calculated by summing (across all audit firms within the MSA and industry) the squared fractional market share of each audit firm. Specifically, $HERF = \sum_{i=1}^{N} [s_i/S]^2$, where N is the total number of all audit firms in the MSA-industry, s is the size of the audit firm local office as measured by total audit fees earned, and *S* is the size of the total audit market for the MSA. The value of *HERF* is lower when the market shares of all the audit firms in the MSA are of equal size, and higher (with a maximum value of one) when the audit firms' market shares are unequal. The higher the metric, the higher the auditor concentration in the MSA (Boone et al. 2012). A positive (negative) coefficient on the test variable *HERF* would suggest that the high audit market concentration lowers (improves) the audit quality provided by the auditors in the subsample.

IMR is as defined before. Following Numan and Willekens (2012), I also control the competitive pressure from the closest competitor (*DISTANCE*), which equals negative one times the small absolute market share difference between the incumbent auditor and its closest competitor. *LMV* is the natural logarithm of the market value. Reynolds and Francis (2000) provide evidence that the tendency to manage earnings increases with leverage and DeFond and Jiambalvo (1994) show that accruals are related to debt covenant breaches. In addition, debt may serve as a monitoring mechanism that constrains earnings management. To control for the effect that high debt levels may have on accruals, I include the variable *LEV* which is (total liabilities)/average total assets. Discretionary accruals are impacted by financial performance (Kothari et al., 2005). Accordingly, I include *ROAL*, income before extraordinary items divided by the average total assets in the previous year. *LOSS* is "1" if net income is negative and "0" otherwise. Operating cash flows are a component of earnings and their levels correspond inversely with accruals. In addition, the level of cash flow may affect the ability and/or need to use accruals, causing firms with higher (lower) operating cash flows to report lower (higher) discretionary accruals (Becker et al., 1998). I control for these effects by including *CFO* which is (cash flow from operations)/average total assets. *BTM* is (book value of equity)/market value of equity. *ABS(TACCL)* is the absolute value of total accruals deflated by the total assets. *GROWTH* is sales growth. The probability of bankruptcy (*ZSCORE*) has also been included to provide an additional control for financial distress. *ZSCORE* is the probability of bankruptcy score from the Zmijewski (1984) study, where higher values indicate a higher probability of bankruptcy. Given the costs associated with bankruptcy and the incentives firms have to engage in earnings management in order to avoid bankruptcy, this study expects a positive coefficient on the variable *ZSCORE*. *STDEARN* is the standard deviation of income before extraordinary items in the past four years; Recent studies (e.g., Francis and Yu, 2009; Choi et al., 2010) have found that audit quality is associated with engagement office size, thus I include the control variable *OFFICE_SIZE*, which is calculated as the log of total audit fees charged by the office during year t. *TENURE* is "1" if the client has kept the same auditor for three or more fiscal years, and "0" otherwise. Finally, I add year indicator to control for the year effect.[6]

In the discretionary accruals model, lower discretionary accruals are expected for clients of the specialist auditor, and clients with larger market value (*LMV*), higher operating cash flow (*CFO*), higher leverage (*LEV*), and longer tenure (*TENURE*). Higher discretionary accruals are expected for clients with

higher growth (*GROWTH* and *BTM*), losses (*LOSS*), extreme performance (*ROAL*), high-income volatility (*STDEARN*), high probability of bankruptcy (*ZSCORE*), and higher total accruals in the prior year (*ABS(ACCRL)*). Equation (3) will be estimated separately for the specialist and non-specialist subsamples. The difference of the coefficients on the variable *HERF* will be examined to test hypothesis 1a. Table 1 provides the variables and their definitions that are used for this study.

TABLE 1
VARIABLE DEFINITIONS

Variable	Definition
Main Variables	
LAFEE	Natural logarithm of audit fees.
DACC	Absolute discretionary accruals calculated using the modified Jones model (DeFond and Jiambalvo, 1994) controlling for concurrent performance based on 2-digit SIC code and year (Kothari et al., 2005), deflated by beginning of fiscal year total assets. I use the difference between net income and cash from operations as my measure of total accruals (Hribar and Collins, 2002).
HERF	Herfindahl index for the metropolitan statistical area (MSA) of the audit firm's local practice office, calculated by summing (over all audit firms within the MSA) the squared fractional market share of each audit firm within the industry. The higher the metric, the higher the auditor concentration.
Control Variables	
ACCEL_FILER	An indicator variable equal to 1 if the firm is an accelerated filer.
ABS(TACCL)	Absolute value of (total accruals$_{t-1}$) / average total assets$_{t-1}$
ATURN	Current year sales scaled by last year's total assets.
BIG4	A dummy variable equals 1 if the client has a Big 4 auditor and 0 otherwise.
BTM	(book value of equity) / market value of equity.
CFO	(cash flow from operations) / average total assets
DISTANCE	Smallest absolute market share difference between the incumbent auditor and his closest competitor. An auditor market is defined as a two-digit SIC industry in a U.S. Metropolitan Statistical Area (MSA, U.S. Census Bureau definition).
FRGN	Ratio of foreign sales to total sales.
GROWTH	Sales growth calculated as (sales – sales$_{t-1}$) / sales$_{t-1}$
IMR	Inverse Mills ratio (from choice model).
INVREC	The sum of inventories and receivables divided by total assets.
LEV	Total liabilities deflated by average total assets
LITIGATION	An indicator variable equal to 1 if the firm operates in the following risk-of-litigation industries (by SIC code): 2833-2836, 3570-3577, 3600-3674, 5200-5961, or 7370.
LMV	Natural logarithm of market value.
LOSS	Indicator variable equal to 1 if net income is negative and 0 otherwise.

OFFICE_SIZE	The log of total audit fees charged to all audit clients within an auditor office in year t.
PPE	The level of gross property, plant, and equipment
ΔREC	The change in net receivables
ΔREV	The change in net sales
ROA	Net income deflated by average total assets
ROAL	(net income$_{t-1}$)/average total assets$_{t-1}$
SEG	Number of reportable segments.
SIZE	The natural logarithm of total assets of the client at the end of the year.
STDEARN	Standard deviation of income before extraordinary items in the past four years.
SPECIALIST	1 if the client has an industry specialist auditor and 0 otherwise.
SWITCH	Indicator variable is equal to 1 if a client changed its auditor in a year, 0 otherwise.
TA	Total assets.
TACC	Total accruals, defined as the difference between income before extraordinary items minus cash flow from operation
TENURE	"1" if the client kept the same auditor for three or more years, and "0" otherwise.
ZSCORE	The financial distress score from Zmijewski (1984).

Audit Fee

Following prior studies (Ghosh and Lustgarten, 2006; Numan and Willekens, 2012), I specify an OLS regression model of audit fees that includes a number of control variables. In addition, I include industry and year indicators. Specifically, the following regression models used to examine the association between the audit market concentration and audit fees:

$$LAFEE_{i,t} = \alpha + \beta_1 HERF_{i,t} + \beta_2 IMR_{i,t} + \beta_3 DISTANCE_{i,t} + \beta_4 BIG4_{i,t} + \beta_5 LMV_{i,t} + \beta_6 LEV_{i,t} + \beta_7 ROAL_{i,t} + \beta_8 LOSS_{i,t} + \beta_9 CFO_{i,t} + \beta_{10} BTM_{i,t} + \beta_{11} ABS(TACCL)_{i,t} + \beta_{12} GROWTH_{i,t} + \beta_{13} ZSCORE_{i,t} + \beta_{14} SEG_{i,t} + \beta_{15} FRGN_{i,t} + \beta_{16} SWITCH_{i,t} + \beta_{17} OFFICE\_SIZE_{i,t} + \beta_{18} TENURE_{i,t} + \beta_{19} BIG4_{i,t} + YEAR\_INDICATOR + IND\_INDICATOR + \varepsilon_{i,t} \quad (4)$$

where for client *i* and fiscal year-end *t*: The dependent variable is the natural logarithm of audit fees; *SWITCH* is an indicator variable equal to 1 if a client changed its auditor during the fiscal year, and 0 otherwise. All the other variables are as previously defined. I estimate equation (4) for specialist and non-specialist subsamples separately and examine the difference of coefficients on the variable *HERF*.

RESULTS

Data and Sample

For years 2005-2013, I acquire panel data for financial statement variables from the Compustat files. Similar to prior accruals studies, I remove all financial services (SIC codes 6000-6999) and regulated (4900-4999) industries. Audit related information is obtained from Audit Analytics. Table 2 shows the composition of my sample. I start with 112,170 observations from Compustat. After merging with Audit Analytics for the period 2005-2013, I am left with a sample of 35,750 client-years. I then exclude financial and regulated firms and missing data on control variables to obtain my final sample of 15,303 observations for main analysis.[7]

TABLE 2
SAMPLE SELECTION

Procedure	Observations Remaining
Data available on Compustat database (2005-2013)	112,170
Firms also available on Audit Analytics file	35,750
Firms not in financial or utility industries	26,342
Firms with Compustat or Audit Analytics needed for my tests	15,303
Final sample (2005-2013)	15,303

Descriptive Statistics

Table 3 provides descriptive statistics for the dependent and explanatory variables in the main analysis (based on the final sample size in Table 2). The average (median) discretionary accrual is 0.0126 (0.0063). The mean of *LAFEE* is 13.7131. During the sample period, 5.57 percent of the total observations switch auditors. The average (median) Herfindahl index is 0.4618 and 0.4155, which is similar to Numan and Willekens (2012).

TABLE 3
DESCRIPTIVE STATISTICS FOR VARIABLES USED IN MY TESTS

Variable	N	Mean	Std	Lower Quartile	Median	Upper Quartile
DACC	15303	0.0126	0.1699	-0.0571	0.0063	0.0748
LAFEE	15303	13.7131	1.3231	12.8240	13.7568	14.6103
SWITCH	15303	0.0557	0.2293	0.0000	0.0000	0.0000
HERF	15303	0.4618	0.1942	0.3154	0.4155	0.5593
SPECIALIST	15303	0.3274	0.4693	0.0000	0.0000	1.0000
ABS(TACCL)	15303	0.1074	0.1209	0.0348	0.0689	0.1297
ACCEL_FILER	15303	0.3439	0.4750	0.0000	0.0000	1.0000
ATURN	15303	1.0557	0.7767	0.5182	0.8968	1.3788
BIG4	15303	0.7054	0.4559	0.0000	1.0000	1.0000
BTM	15303	0.4907	0.6090	0.2315	0.4352	0.7163
CFO	15303	0.0148	0.1120	0.0046	0.0396	0.0681
DISTANCE	15303	0.2060	0.2659	0.0213	0.0837	0.2807
FRGN	15303	0.1593	0.2671	0.0000	0.0000	0.2668
GC	15303	0.0488	0.2155	0.0000	0.0000	0.0000
GROWTH	15303	0.1561	0.5040	-0.0311	0.0801	0.2262

INVREC	15303	0.2379	0.1776	0.0926	0.2043	0.3399
LEV	15303	0.1680	0.2062	0.0000	0.1001	0.2735
LITIGATION	15303	0.3006	0.4585	0.0000	0.0000	1.0000
LMV	15303	6.0884	2.2363	4.5587	6.1912	7.6395
LOSS	15303	0.3534	0.4780	0.0000	0.0000	1.0000
MKS	15303	0.3437	0.2879	0.0917	0.2731	0.5443
MODOP	15303	0.3563	0.4789	0.0000	0.0000	1.0000
OFFICE_SIZE	15303	16.9059	1.8569	15.6970	17.4268	18.3203
REST	15303	0.0687	0.2529	0.0000	0.0000	0.0000
ROAL	15303	-0.0527	0.2970	-0.0533	0.0326	0.0793
SEG	15303	2.2122	1.5309	1.0000	2.0000	3.0000
SIZE	15303	6.0042	2.2716	4.4068	5.9842	7.6311
STDEARN	15303	0.1367	0.2784	0.0205	0.0499	0.1342
TENURE	15303	0.4563	0.4981	0.0000	0.0000	1.0000
ZSCORE	15303	0.0536	0.1931	0.0000	0.0000	0.0012

See Table 1 for variable definitions.

Auditor Choice Analysis

In the first step of the Heckman procedure, I estimate the probit model (Equation (1)) to obtain the inverse Mills ratio (IMR) to include in the estimation of the main regression as a control variable to correct for the potential omitted variable problem caused by the non-random sample. Table 4 reports estimation results for the probit model. The coefficients on *SIZE*, *ATURN*, *ACCEL_FILER*, and *LITIGATION* are positive and significant at the 0.01 level. The results indicate that larger and accelerated filer clients are more likely to select Big 4 auditors. Also, the likelihood of choosing Big 4 auditors is positively associated with client's asset turnover ratio and litigation risk.

TABLE 4
PROBIT REGRESSION RESULTS

Full sample (dependent variable: Specialist)			
	Coef.	z-stat	
Intercept	-1.2895	-3.20	***
SIZE	0.2303	38.23	***
ATURN	0.0285	1.42	
ACCEL_FILER	0.1233	5.01	***
LITIGATION	0.0598	2.11	***
INVREC	-0.6521	-7.06	***
N		15,303	
Pseudo R square		11.44%	
Model fit		$p < 0.0001$	
Industry dummies		Included	
Year dummies		Included	

See Table 1 for variable definitions. ***(**)[*] imply two-tailed significance at 1%(5%)[10%] level.

Discretionary Accruals Analysis

I run the regression in the partitioned sample by specialist and non-specialist auditors. I use ordinary least squares regressions with clustered robust errors adjusted for heteroskedasticity in all main tests (Rogers, 1994; Petersen, 2009).

The estimation of the discretionary accruals regression-based equation (3) is presented in table 6. The coefficient on HERF in the specialist column is insignificant while it is negative and significant at 0.01 level in the non-specialist column. All p-values are reported as two-tailed. The results are significantly different in separate regressions based on partitioned sample.

These results indicate that there is not significant association between the market concentration and discretionary accruals if the auditor is industry specialist. In contrast, market concentration is associated with lower discretionary accruals of the clients when their auditor is a non-specialist. The difference in the coefficient of *HERF* is significant at 1% level. Overall, the results in Table 5 indicate that the market concentration affects audit quality of oligopolistic and atomistic segments in different ways.

TABLE 5
ANALYSES ON DISCRETIONARY ACCRUALS

	specialist			non-specialist			Chi-Square for Difference	
DACC	Coef.	t-stat		Coef.	t-stat			
HERF	0.0393	1.51		-0.0381	-3.32	***	7.49	***
IMR	0.0641	5.80	***	0.0402	4.70	***	0.55	
DISTANCE	-0.0408	-2.01	**	-0.0121	-0.44		0.56	
LMV	0.0035	1.96	**	-0.0053	-3.32	***	4.65	**
LEV	0.0859	8.13	***	0.1172	12.73	***	2.79	*
ROAL	-0.1179	-9.41	***	-0.0994	-12.28	***	0.98	
LOSS	-0.1043	-21.12	***	-0.1168	-27.79	***	1.09	
CFO	-0.6815	-22.40	***	-0.6946	-30.67	***	0.31	
BTM	0.0131	3.42	***	-0.0025	-0.85		2.95	*
ABS_TACCL	-0.0410	-2.15	**	0.0485	3.21	***	4.12	**
GROWTH	0.0068	1.72	*	0.0109	3.36	***	0.12	
ZSCORE	-0.1828	-11.91	***	-0.3020	-26.64	***	12.34	***
STDEARN	-0.0443	-4.13	***	-0.0546	-8.08	***	0.12	
OFFICE_SIZE	0.0035	1.97	**	0.0017	1.14		0.65	
TENURE	0.0002	0.05		0.0069	1.84	**	2.67	
BIG4	-0.0321	-3.27	***	-0.0050	-0.82		4.38	**
Intercept	-0.0736	-1.72	*	0.0327	0.97		1.53	
N	5,010			10,293				
F-Value	64.92			103.47				
Adj. R square	23.44%			19.29%				
Model fit	$p < 0.0001$			$p < 0.0001$				
Year dummies	Included			Included				
Industry dummies	Included			Included				

See Table 1 for variable definitions. ***(**)[*] imply two-tailed significance at 1%(5%)[10%] level.

Audit Fee Analysis

Table 7 presents the results of estimating equation (4). All models are significant ($p < 0.0001$), and the adjusted R^2 are over 74%. Most of the control variables are significant at $p < 0.10$. The signs of the control variables are consistent with prior studies discussed earlier. The coefficients of HERF in the two subsamples are both significant at 0.01 level with opposite signs. In the specialist model column, the coefficient on HERF is positive (coefficient = 0.4421), suggesting that market concentration raises the audit fees charged by specialist auditors. On the other hand, in the non-specialist auditor column, the coefficient on HERF is significantly negative ($p < 0.01$). In addition, this difference is significant at 0.01 level, indicating that the effects of market concentration on the audit fee of specialist and non-specialist are significantly different. In sum, the results indicate that the competition among atomistic segment is more intense in a more concentrated market. On the contrary, such concentration alleviates the competition among the oligopolistic segment.

Taken together with the results in table 5 and table 6, my findings suggest that the specialist auditor charges higher audit fees in a more concentrated market. On the other hand, the competition in the atomistic segment increases. That is, the non-specialist auditor has to charge a lower audit fee, despite improving the service quality.

TABLE 6
ANALYSES OF AUDIT FEES

	specialist			non-specialist			Chi-Square for Difference	
LAFEE	Coef.	t-stat		Coef.	t-stat			
HERF	0.4421	3.46	***	-0.3036	-7.58	***	29.91	***
IMR	-1.9559	-28.16	***	-1.4617	-37.21	***	15.73	***
DISTANCE	-0.1875	-1.91	*	0.5080	5.44	***	20.33	***
LMV	0.1843	17.61	***	0.1543	22.83	***	4.88	**
LEV	0.2162	4.05	***	0.2592	7.76	***	0.03	
ROAL	-0.2023	-3.38	***	-0.1297	-4.74	***	0.52	
LOSS	0.0546	2.27	**	0.0868	6.00	***	0.57	
CFO	0.0759	0.52		0.1325	1.71	*	0.00	
BTM	0.0404	2.15	**	-0.0094	-0.92		4.39	**
ABS_TACCL	-0.2898	-3.18	***	-0.1102	-2.20	**	2.66	
GROWTH	-0.1210	-6.43	***	-0.1393	-12.63	***	1.47	
ZSCORE	0.0212	0.29		-0.0393	-1.02		0.11	
SWITCH	0.0113	0.20		-0.0264	-1.18		0.37	
OFFICE_SIZE	0.0855	10.07	***	0.1471	28.36	***	30.84	***
TENURE	-0.0255	-1.41		-0.0055	-0.42		2.28	
BIG4	-0.0538	-1.11		0.0109	0.52		0.36	
SEG	0.0544	9.13	***	0.0623	12.27	***	0.99	
FRGN	0.5877	15.33	***	0.4807	19.35	***	8.57	***
Intercept	12.1984	40.79	***	10.9269	42.98	***	8.94	***
N	5,010			10,293				
F-Value	431.73			1302.3				
Adj. R square	74.51%			81.13%				
Model fit	$p < 0.0001$			$p < 0.0001$				
Industry dummies	Included			Included				
Year dummies	Included			Included				

See Table 1 for variable definitions. ***(**)[*] imply two-tailed significance at 1%(5%)[10%] level.

CONCLUDING REMARKS

Prior research assumes that the market concentration reduces auditor's fear of being switched. As a result, auditors could lower the audit quality as they get more complacent. Alternatively, the audit quality could also increase with market concentration, due to the lower need for auditors to please their clients, thereby, making the auditors more independent. The evidence provided in prior archival studies is contradictory. As a result, the effect of market concentration on the auditor is still unclear. Separately, the audit industry at MSA-level is divided into two segments: oligopolistic segment composed of a few large auditors and atomistic segments composed of several small auditors. Small audit firms face significant barriers to entry into the oligopolistic segment. In this study, I examine the differential effect of market concentration on the oligopolistic and atomistic segment.

My findings suggest that the market concentration increases the audit fees in the oligopolistic segment. With the higher market concentration, small audit firms confront more significant barriers to entry into the oligopolistic segment. As such, the remaining market space for the small auditors is compressed. As a result, the competition in the atomistic segment is more intense, which is reflected not only in the decreased audit fees but also in the improved audit quality. My study offers insights into the influence of market concentration on the audit industry and suggests that the nature of market concentration is enlarging the gap between oligopolistic and atomistic segment rather than simply intensifying or alleviating the competition among the audit industry.

ENDNOTES

1. In prior studies, the terms industry experts and industry specialist are used interchangeably (e.g., Reichelt and Wang, 2010; Krishnan et al., 2013; Minutti-Meza, 2013).

2. At the national level, the oligopoly is defined as Big 4 while the atomistic segment is composed of other non-Big 4 audit firms (U.S. General Accounting Office 2003, 16). However, auditors compete for clients at the local level (rather than at the national level) (e.g., Francis and Yu, 2009). Considering that at a local level the oligopoly may not be composed of Big 4, I partition the local market to oligopolistic and atomistic segments by auditor's market share (i.e., industry specialization).

3. Following Numan and Willekens (2012), I define the audit markets according to 2-digit SIC industry segments per U.S. Metropolitan Statistical Area (MSA).

4. Ghosh and Lustgarten (2006) suggest that differences in client turnover rates between large and small audit firms can be explained by the market structure of the audit industry. However, they only examine the effect of auditor brand (i.e., Big 4 or 5 at national level) on auditor switch and audit fees. They do not examine the differential effect of market structure (specifically, MSA level) on auditor performance in the oligopolistic and atomistic segments.

5. Numan and Willekens (2012) suggest market share-based measures of industry specialization pick up both auditor-client alignment effects as well as market share distance effects. Therefore, by using the market share within MSA-industry, this study connects the market structure and audit specialization and examines the differential effect of concentration on the large (specialist) and non-large (non-specialist) market share auditor.

6. Consistent with prior studies (e.g., Reichelt and Wang, 2010; Minutti-Meza, 2013), the discretionary accruals model does not include industry fixed effects because this audit-quality proxy is estimated by industry. I use ordinary least squares regressions with clustered robust errors in all main tests (Rogers, 1994; Petersen, 2009).

7. Like Francis and Yu (2009) and Numan and Willekens (2012), I require at least two clients per 2-digit SIC industry for each MSA.

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AUTHOR CONTACT:

Dr. Hongkang Xu
School of Accountancy
Auburn University at Montgomery
Clement Hall 315F
P.O. Box 244023
Montgomery, AL 3612