The International Journal of Business and Finance Research
Vol. 12, No. 2, 2018, pp. 117-130
ISSN: 1931-0269 (print)
ISSN: 2157-0698 (online)

IBFR
www.theIBFR.com

AUDIT FIRM INDUSTRY SECTOR LEADER GEOGRAPHIC LOCATION AND ITS ASSOCIATION WITH AUDIT FEES

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ABSTRACT

This study tests whether an association exists between the geographic location of industry sector leaders in an auditing firm and differences in audit pricing for that same auditing firm's industry clients. Using organizational learning theory and human capital theory, we predict that the industry-specific human capital of the audit partner in charge of an industry practice serves as a silo for this knowledge and provides an opportunity to charge a fee premium to their local clients. Using a hand collected dataset of partners overseeing industry-specific audit practices on audit firm websites, we provide evidence that a positive association exists between industry sector leaders' office locations and audit fees for same-industry clients in that city. Building on prior research on the effect of individual audit partners and general human capital on audit quality, this study provides additional insight into the human capital of audit firm industry sector leaders and the dynamics of audit market competition.

JEL: J24, M12, M42

KEYWORDS: Audit Firm Structure; Audit Pricing; Human Capital

INTRODUCTION

Academic research in auditing has tried to identify how, and why, auditing firms can charge a higher price to clients. Since auditing services are arguably a "credence good" for which the consumer is unable to identify service quality or auditor effort (Causholli and Knechel 2012), there is a high degree of variation in audit pricing. Behavioral accounting research supports this notion and identifies elements of business risk associated with audit fee increases, including litigation risk and non-litigation risk such as potential reputational damage (Houston et al. 2005). Prior archival accounting research provides evidence of numerous factors associated with the price of audit services: an auditor's industry specialization (e.g. Francis et al. 2005), office size (e.g. Francis and Yu 2009), and numerous factors tied to the client itself (e.g. Hay et al. 2006). From the archival research cited above, it is notable that many determinants of audit pricing may serve as a proxy for human capital. Organizational learning research suggests that companies potentially use their available knowledge to provide a "better" audit (e.g. Huber 1991). In this study, we presume that human capital of the audit partner in charge of an industry practice serves as a silo for this knowledge and provides an opportunity to charge a fee premium to their local clients. This study builds upon recent research that analyzes the role of geographic proximity to audit clients (e.g. Jensen et al. 2015) and the role of individual partners in enhancing audit quality (e.g. Goodwin et al. 2014; Zimmerman et al. 2018). Using a unique hand collected data set of audit firm industry sector leaders from Public Company Accounting Oversight Board ("PCAOB") annually inspected public accounting firms, this study analyzes the following research question: *is there an association between the geographic location of an*

auditing firm's industry sector leader and the audit fee charged to that same auditing firm's industry clients in that city? Based upon both fiscal year 2016 audit fee and financial data for U.S. public companies, this study provides evidence consistent with a positive association between the location of this industry sector leader and the audit clients in that city. This result is robust to analyzing the data according to the level of geographic concentration in an industry, the degree of auditor dominance in an industry, the overall size of the auditor's office, and the stability of the industry sector leadership over time.

This study contributes to the extant auditing literature by analyzing the role of industry leadership in publicly accounting firms and evaluating whether the geographic concentration of human capital is associated with changes in audit pricing. The rest of the paper is organized as follows. First, we describe the literature review of prior related and relevant studies and provide in-depth background of our study. Second, we describe the data selection process and the empirical research model. Third, we analyze the results of the empirical model as well as considering potential alternative explanations for our findings. Finally, we present the conclusion of the research, which includes the summary and originality value of the study along with the implication of the study.

LITERATURE REVIEW

Audit Pricing Literature

Prior research in audit pricing provides evidence that numerous factors are associated with increased levels of audit pricing. Hay et al. (2006) evaluate and summarize the determinants of audit fees by performing a meta-analysis of studies from 1977-2003. The paper finds that fee drivers have consistent results across different studies, samples and countries. Audit fees also serve different purposes, such as evaluating the competitiveness of audit markets and examining issues of contracting and independence related to audit process. The study depicts that in numerous major academic journals, noting several key client-specific variables, such as total assets, the number of subsidiaries or segments, the level of inventories and receivables relative to total assets, profitability, their debt ratio, and several industry indicator variables have a significant positive association with audit fees. Regarding auditor-specific variables, Hay et al. (2006) note that the auditor's brand name (i.e. "Big 4") and the type of audit opinion have a significant positive association with audit fees.

More recently, there has been an increased focus on auditor-specific determinants of audit pricing. For example, auditor industry specialization has been a topic of intense research. While there is no formal consensus on how to measure industry specialization (e.g. Neal and Riley 2004), a commonly used definition is that of Francis et al. (2005), which conceptually defines industry specialization as having the leading market share of client audit fees relative to other public accounting firms. Research normally evaluates audit markets geographically using either the full national market or a localized area such as a city. Generally, industry specialization is positively associated with greater audit fees ("fee premium") when the auditor is both the market leader nationally and locally (Francis et al. 2005). The study indicates that national and city-specific industry leadership both affect auditor reputation and pricing. Inferred from the previous study result is that human capital may both have a local effect (especially given findings that audit pricing varies by the size of the office – e.g. Francis et al. 2009; Choi et al. 2010) and a national effect. Francis et al. (2009) study and validate the predication that larger offices of Big 4 auditors have higher quality audits. Furthermore, larger offices are more likely to issue going-concern audit reports and clients in larger offices show less aggressive earnings management behaviors. Additionally, Choi et al. (2010) use a large sample of U.S. audit client firms from 2000 to 2005 and provide evidence that the size of a local practice office within an audit firm has significantly positive relationship with both audit quality and audit fees even when national-level audit firm size and office-level industry expertise variables are controlled.

Finally, Fung et al. (2012) examine the effect of industry specialization and scale economies on auditing prices in U.S. at the city-level rather than national-level since the Big N firms have large and comparable national operations. The studies used a sample of Big N clients from 2000 to 2007. The study finds that there is a significant city-industry specialization premium and scale discounts throughout the sample period. Taken together, these studies support the perspective that large offices provide higher-quality audits compared to small local offices, which leads to differences in pricing for the audit services that consider quality as a base.

Geographic Organization of Audit Firms

More recent research has focused on the relative differences in the size of the local office and its' effect on audit pricing. One inference from these studies is that there is greater human capital in these larger offices (e.g. Danos et al. 1989) and audit personnel likely access that information to a greater degree in these offices. Industry-specific knowledge is the primary input factor in producing an audit, as specialized knowledge is more valuable in regulated industries than nonregulated industries. Local office personnel are far more likely to provide consultation than other practice office or national office personnel. Further evaluating industry-specific knowledge, Numan and Willekens (2012) examine the effects of competition through differentiation on audit pricing. Using U.S. data on Big 4 audit fees and client characteristics of relatively larger public companies for 2005 and 2006, the authors provide evidence that clients are willing to pay a premium for auditors that are more specialized towards their characteristics (e.g. auditor-client industry alignment; auditor industry market share dominance). Two recent studies explain in more detail the relationship of geographic location along with information communication and the performance of financial institutions. On the one hand, Petersen and Rajan (2002) provide evidence that electronic communication between small businesses and their lenders has not resulted in a degradation in loan defaults due to higher quality credit modeling made possible through the increased usage of information technology tools. On the other hand, Coval and Moskowitz (2001) provide evidence that there is a strong geographic link between mutual fund investment and performance as fund managers exploit informational advantages in their selections of nearby stocks. This finding suggests that human capital may play a significant role in service quality.

Organizational Learning and Firm-Specific Human Capital

In the psychology and strategic management research literature, resource-based theory suggests that human capital contains knowledge, skills, and abilities held in people and groups (e.g. Crook et al. 2011). Human capital can be either general in nature (e.g. industry experience) or specific to the company itself. Using a meta-analysis of studies of resource-based theory, Crook et al. (2011) provide evidence that specific-human capital (but not general human capital) is associated with improved corporate performance. The study took a further step towards better understanding how human capital shapes performance. It is important to realize that human capital appears essential to firm's viability and success. Similarly, organizational learning focuses on a more holistic understanding of human capital by analyzing how companies acquire, retain, and use knowledge. Huber (1991) conceptually defines organizational learning with several constructs: knowledge acquisition, information distribution, information interpretation, and organizational memory. Knowledge acquisition can be gained via experience, vicariously from others, or by hiring experienced personnel. However, while knowledge is important, it has relatively little usefulness without active implementation within the organization. Knowledge transfer refers to the situation in which knowledge developed for one task will assist an individual's judgment performance in another task

Additionally, some studies consider the effect of knowledge sharing in audit firms. In particular, audit firms can share information either through conversations between individuals (e.g. Starbuck 1992) or through a knowledge repository (e.g. internal database) per Vera-Muñoz et al. (2006). Starbuck (1992) emphasizes the importance of knowledge sharing at Knowledge-Intensive Firms ("KIFs"). The study finds

that KIFs learn by hiring, training and dismissing personnel and convert ideas into physical capital, routines, organizational culture and social capital. To further study knowledge sharing in public accounting firms, Vera-Muñoz et al. (2006) examine the role of three factors: information technology ("IT"), formal and informal interactions among auditors and reward systems in encouraging knowledge sharing. The paper points out the difficulty in documenting the time and extra effort individual auditors need to sort through appropriate databases and collect relevant information since IT-based expert knowledge systems are not universally embraced within public accounting firms. Therefore, since knowledge sharing is performed at the organizational level, it is an organizational concept and not just a technological process. Indeed, it requires public accounting firms to be more willing to share knowledge through informational interpersonal interactions (Vera-Muñoz et al. 2006).

Analyzing the knowledge repository mode of dissemination, Banker et al. (2002) provide evidence that large public accounting firms are more efficient with greater IT capabilities. IT implementation has a positive impact on public accounting firms' productivity. This finding proves the importance of the value of audit automation and knowledge-sharing applications in public accounting firms. Regarding interpersonal interactions, Chow et al. (2008) provide survey evidence that tight audit time budgets and the possibility of professionals losing future promotions by helping their colleagues hamper interpersonal interactions. Nevertheless, we suspect that knowledge sharing by an industry sector leader (or through their leadership team) is more likely than under alternative knowledge sharing mechanisms. Since they are senior managing partners in the public accounting firms, these individuals likely have the greatest industry knowledge and a vested interest in enhancing the audit firm's reputation and market share in that industry. Further, PCAOB Auditing Standard No. 1110 and Quality Control Standard No. 20 mandate that audit teams refer to these personnel when complex accounting and auditing issues arise. As a result, audit firm partners will likely follow the guidance of their industry sector leader and involve them as appropriate

Prior Research on Individual Audit Partner Human Capital and Audit Pricing Hypothesis

Building upon the previous studies reporting audit fee premium for auditor industry expertise measured at the office level, Goodwin et al. (2014) extend the research measured at the partner level. The study used Australian Big 4 audit clients' data from 2003 to 2010 and provide evidence that neither firm-level nor office-level industry leadership are necessary or sufficient for auditors to earn a fee premium. Rather, individual partner-level specialization is a sufficient condition for a fee premium. This suggests that it is more important that firms develop audit partners with strong industry knowledge in order to increase the profitability of their services. Similarly, Zimmerman et al. (2018) provides evidence that human capital of audit partners is associated with audit fee premiums. Using LinkedIn data of self-reported auditor experience at the partner level among non-Big 4 firms, the study provides evidence that partners with prior Big 4 experience charge higher audit fees. Therefore, non-Big 4 offices with a greater number of partners with Big 4 experience arguably have a higher reputation level that eventually leads to higher audit fees. A potential inference from this study is that these partners with greater reputation may also have greater industry-specific capital. Beck et al. (2018) more directly capture human capital by examining two city-specific labor characteristics as proxies for a city's human capital: average educational attainment and the number of accountants in a city. The research provides evidence that human capital also appears to affect the supply and quality of public company audits. The study finds that there is a positive association between audit quality and average education level in the city where the lead engagement office is located. Additionally, a public company is more likely to choose a non-Big 4 auditor when the education level of human capital in the audit office is high.

Finally, Argote and Ingram (2000) theorize that organizations that develop knowledge internally gain a significant comparative advantage when this knowledge is difficult for competitors to replicate. In other words, audit firm leaders have an incentive to share their knowledge with audit teams since it may help

enhance audit pricing. Therefore, hypothesis one predicts that firms with greater human capital in their local offices will be able to transfer this knowledge to their client engagements.

H1: *There will be a positive association between the geographic location of the audit sector leader and audit fees for clients located in the same geographic location.*

DATA AND METHODOLOGY

Research Model

From the conceptual level, this study considers the following research question: *is there an association between the geographic location of an auditing firm's industry sector leader and the audit fee charged to that same auditing firm's industry clients in that city?* We can think of the dependent variable as the economic value of a service and the independent variable as human capital. At an operational level, this study tests whether the location of an industry sector leader (proxy for local concentration of human capital) is associated with audit fees. As described in detail in the next paragraph, the dependent variable is audit fees and the independent variables are auditor industry, leading partner and geographic location. Control variables are auditor industry specialization, auditor city size, client accounting quality and client organizational complexity. Appendix A provides a visual depiction of the conceptual and operational summary of hypotheses in this study. In this study, ordinary least squares regression is used following prior audit pricing research and controls for key determinants of audit fees in non-financial industries (e.g. Hay et al. 2006). Our dependent variable is the log transformation of audit fees following prior literature (e.g. Francis et al. 2005). Our variable of interest in this study is *LeaderMSA*, which captures whether the auditor-client observation is geographically located in the same city as the audit firm's industry sector leader for the company's industry. For example, Deloitte's industry sector leader for the energy industry (Fama-French industry code 4) is located in Houston, Texas. Auditor-client observations in the energy industry for Deloitte in Houston are coded as one and any Deloitte audit clients in the energy industry located in other cities are coded as zero. Similar to previous audit pricing studies, all financial industry observations (Fama-French industry code 11) are dropped from the study. Equation 1 provides the OLS regression model for this study:

$$\begin{aligned} Log(Audit\ Fee) = {} & \beta_0 + \beta_1 LeaderMSA + \beta_2 Big4 + \beta_3 JOINTLEADER + \beta_4 NATIONALONLY + \beta_5 CITYONLY \\ & + \beta_6 OfficeSize + \beta_7 Influence + \beta_8 Log(Assets) + \beta_9 DebtRatio + \beta_{10} ROI \\ & + \beta_{11} Opinion + \beta_{12} IC\_Opinion + \beta_{13} InvRec + \beta_{14} Log(Business\_Segments) \\ & + \beta_{15} HighLitigation + \epsilon \end{aligned} \quad (1)$$

Control variables in this study capture both auditor-specific and company-specific determinants of audit fees. As shown in prior literature, an auditor's brand name (*Big4)* and auditor industry specialization (*JOINTLEADER; NATIONALONLY; CITYONLY)* have a positive association with audit fees. Additionally, characteristics of the audit firm office including its size (*OfficeSize)* measured by the number of clients and the relative influence of a large client in that office have been shown to be associated with audit fees. Regarding company-specific variables, firm size (*Log(Assets)),* financial health (*DebtRatio; ROI),* the outcome of the audit (*Opinion; IC_Opinion),* the company's liquid resources (*InvRec)* and its operational complexity (Log (Business_Segments) have a significant association with audit fees in prior literature. Table 1 provides a more detailed description of each of these variables.

Table 1: Variable Definitions

Variable	Definition
LAF	natural log of audit fees in millions of dollars
LeaderMSA	1= auditors who share the same city as their firm's partner in charge of the relevant Fama-French 12 industry sector, 0 = otherwise
Same_LeaderMSA	1 = LeaderMSA (defined above) is in the same location in both 2014 and 2017, 0 = otherwise
Big4	1 = auditor is a Big 4 firm, 0 = otherwise
JOINTLEADER	1 = auditors that are both national industry leaders and city-specific industry leaders where clients are headquartered, 0 = otherwise
NATIONALONLY	1 = auditors that are national industry leaders but not the city-specific industry leaders where clients are headquartered, 0 = otherwise
CITYONLY	1 = auditors that are not national industry leaders but are the city-specific industry leaders where clients are headquartered, 0 = otherwise
OfficeSize	log transformation of the number of public clients the audit firm has in the same city as the audit-client observation
Influence	Ratio of the audit fee for the audit-client observation relative to the total audit fees in the same city as the audit-client observation
Log(Assets)	log transformation of total assets in millions of dollars
DebtRatio	ratio of long-term debt to total assets
ROI	ratio of earnings before interest and tax to total assets
Opinion	indicator variable derived from Compustat, 1 = an unqualified audit report with additional language (e.g. explanatory paragraph) or a non-clean audit opinion, 0 = otherwise
IC_Opinion	indicator variable derived from Compustat, 1 = not unqualified internal controls audit report, 0=otherwise
InvRec	ratio of inventory and receivables divided by total assets
Log(Business_Segments)	log transformation of the number of business segments of the company
HighLitigation	1 = company primarily operates in a high litigation industry SIC per Francis et al. (1994), 0 = otherwise

Empirical Data

The sample of this study covers fiscal year 2016 external audit engagements for all public accounting firms that the PCAOB inspects on an annual basis. These include public company audits performed by the Big 4 public accounting firms as well several other public accounting firms with large public company audit practices (BDO; Cohen & Company; Crowe Horwath; Grant Thornton; MaloneBailey; Marcum; RSM). Due to the frequency of PCAOB inspections and the fact that all of these firms have at least 100 publicly traded clients, each of these firms likely have similar capability to organize its human capital by industry. Audit firm leader demographic data was hand collected during November 2017 from audit firm websites and matched to the closest Fama-French industry group. For instances where no audit leader was listed on an audit firm website (more common outside of the Big 4), it was assumed that the audit firm did not have an audit firm leader and *LeaderMSA* was coded as zero for these industry's observations. Additionally, all observations in Fama-French industry group 12 (i.e. the "other" group) were coded as zero for *LeaderMSA*.

All auditor-specific control variables, as well as the audit fees for the auditor-client observation, are extracted from Audit Analytics. We then match this data with company specific data from Compustat. As a result of this matching protocol, there were 2334 available observations in the population from fiscal year 2016. As a result, there is only one observation per company in the dataset. Of these available observations, 1450 observations were performed by Big 4 public accounting firms and the remaining 834 observations were audits performed by other annually inspected public accounting firms with large public company audit practices named in the previous paragraph.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 2 provides descriptive statistics for each of the variables included in the study. Most notably, roughly eight percent of the observations in the study are for auditor-client observations located in the same city as that firm's industry sector leader. This percentage is somewhat lower than the percentages for the industry

specialization categories for two reasons: (1) some industries are more geographically concentrated (e.g. energy) than others (e.g. manufacturing) and (2) not every public accounting firm has an industry sector leader in every industry. At the median, an observation in the study has a Big 4 auditor, charges just below $1 million in audit fees, and comprises roughly 60 percent of the audit fees earned by public company audits from that office across all industry sectors. Generally, these companies are also relatively large with assets of roughly $400 million, operate three business segments, and receive clean financial statement and internal control audit opinions.

Table 2: Univariate Statistics

Variable	N	Min	Mean	Median	Max	Std Dev
LAF	2334	8.92	13.59	13.69	18.22	1.44
LeaderMSA	2334	0	0.08	0	1	0.27
Big4	2334	0	0.62	1	1	0.49
JOINTLEADER	2334	0	0.15	0	1.00	0.36
NATIONALONLY	2334	0	0.07	0.00	1.00	0.25
CITYONLY	2334	0	0.21	0.00	1.00	0.41
OfficeSize	2334	1.79	3.91	4.19	4.50	0.61
Influence	2334	0	0.60	0.63	1	0.40
Log(Assets)	2334	0	5.91	5.96	12.81	2.48
DebtRatio	2334	0	0.25	0.17	31.99	0.75
ROI	2334	-6.94	-0.15	0.03	43.45	1.07
Opinion	2334	0	0.20	0	1.00	0.40
IC_Opinion	2334	0	0.04	0	1.00	0.20
InvRec	2334	0	0.20	0.14	1.00	0.19
Log(Business_Segments)	2334	0	1.02	1.10	3.50	0.92
HighLitigation	2334	0	0.42	0	1.00	0.49

Variables are defined previously in Table 1.

Table 3 provides a univariate correlation table to display the relationships among different variables for the main variables and the auditor-specific control variables in this study. Pearson correlation statistics are included above the diagonal line and Spearman correlation statistics are included below the diagonal line. Coefficients with three stars are statistically significant at the 1% level. Reviewing the dependent variable (Log(Audit Fees)), there is a positive association with the variable of interest (*LeaderMSA)* providing initial univariate support for the study's hypothesis. Most notably, there is no evidence of heteroscedasticity between *LeaderMSA* and any of the other control variables as the largest correlation is -0.28. Among the remaining control variables, there are several strong positive associations with Log(Audit Fees) consistent with prior literature.

Table 3: Univariate Correlations

No.	Variable	1	2	3	4	5	6	7	8
1	LAF		0.12 ***	0.66 ***	0.31 ***	0.10 ***	0.24 ***	-0.05 ***	-0.15 ***
2	LeaderMSA	0.12 ***		0.12 ***	0.01	-0.05	-0.07 ***	0.00	-0.27 ***
3	Big4	0.68 ***	0.12		0.33 ***	0.21 ***	0.23 ***	-0.01	-0.37 ***
4	JOINTLEADER	0.31 ***	0.01	0.33 ***		-0.11 ***	-0.22 ***	-0.08 ***	-0.17 ***
5	NATIONALONLY	0.11 ***	-0.05	0.21 ***	-0.11 ***		-0.14 ***	0.02	-0.03
6	CITYONLY	0.24 ***	-0.07 ***	0.23 ***	-0.22 ***	-0.14 ***		-0.07 ***	-0.05 ***
7	OfficeSize	-0.08 ***	-0.01	0.02	-0.04	0.01	-0.08 ***		-0.24 ***
8	Influence	-0.15 ***	-0.28 ***	-0.38 ***	-0.18 ***	-0.03	-0.06 ***	-0.29	

Variables are defined previously in Table 1.

Empirical Results

In this study, there is a hypothesized positive association between the location of the audit firm's industry sector leader and audit fees. This is due to the fact that the individual serving as the industry sector leader

is likely to be among the most experienced audit partners in the firm in that industry and these individuals likely proxy for strong human capital in that industry for which companies are willing to pay a fee premium to access. While most significance tests in the tables are two-tailed, the hypothesized relationship is tested as a one-tailed test given the structure of hypothesis one predicting a positive association between human capital and audit fees.

Table 4: Multivariate OLS Regression of Auditor and Company characteristics on Audit Fees

	Dep. Var. = Log (Audit Fee)				
Parameter	**Pred.**	**Est.**	**Std. Err.**	**t Value**	**Pr > |t|**
Intercept		10.155	0.135	75.030	<.0001 ***
Variable of Interest					
LeaderMSA	?	0.182	0.046	3.940	<.0001 ***
Audit Firm Control Variables					
Big4		0.511	0.044	11.720	<.0001 ***
JOINTLEADER		0.145	0.045	3.250	0.001 ***
NATIONALONLY		0.030	0.054	0.550	0.582
CITYONLY		0.171	0.035	4.950	<.0001 ***
OfficeSize		0.004	0.031	0.130	0.893
Influence		0.061	0.043	1.420	0.155
Company Control Variables					
Log(Assets)		0.454	0.011	42.530	<.0001 ***
DebtRatio		0.032	0.019	1.720	0.086 *
ROI		-0.023	0.041	-0.570	0.571
Opinion		0.112	0.037	3.000	0.003 ***
IC_Opinion		0.244	0.083	2.940	0.003 ***
InvRec		0.499	0.096	5.180	<.0001 ***
Log(Business_Segments)		0.065	0.018	3.650	0.000 ***
HighLitigation		-0.006	0.040	-0.140	0.887
Fama-French 12 Group Dummies		Yes			
White Heteroscedasticity Correction		Yes			
Number of Observations		2,334			
R-squared		0.811			
Adjusted R-squared		0.809			
Root Mean Square Error		0.629			

LeaderMSA is 1= auditors who share the same city as their firm's partner in charge of the relevant Fama-French 12 industry sector, 0 = otherwise.
Big4 is 1 = auditor is a Big 4 firm, 0 = otherwise.
JOINTLEADER is 1 = auditors that are both national industry leaders and city-specific industry leaders where clients are headquartered, 0 = otherwise.
NATIONALONLY is 1 = auditors that are national industry leaders but not the city-specific industry leaders where clients are headquartered, 0 = otherwise
CITYONLY is 1 = auditors that are not national industry leaders but are the city-specific industry leaders where clients are headquartered, 0 = otherwise.
OfficeSize is the log transformation of the number of public clients the audit firm has in the same city as the audit-client observation.
Influence is the ratio of the audit fee for the audit-client observation relative to the total audit fees in the same city as the audit-client observation.
Log(Assets) is the log transformation of total assets in millions of dollars.
DebtRatio is the ratio of long-term debt to total assets.
ROI is the ratio of earnings before interest and tax to total assets.
Opinion is 1 = an unqualified audit report with additional language (e.g. explanatory paragraph) or a non-clean audit opinion, 0 = otherwise.
IC_Opinion is 1 = not unqualified internal controls audit report, 0=otherwise
InvRec is the ratio of inventory and receivables divided by total assets.
Log(Business_Segments) is the log transformation of the number of business segments of the company.
HighLitigation is 1 = company primarily operates in a high litigation industry SIC per Francis et al. (1994), 0 = otherwise.

Table 4 provides the results of the OLS regression shown in equation 1. Consistent with prior audit pricing research, this regression has a relatively high R^2 value ($R^2 = 0.81$) and corrects for heteroscedasticity since audit fee models typically have more predictive power for larger companies. As shown in Table 4, there is a positive association between *LeaderMSA* and the dependent variable (*coefficient = 0.18, t<.0001*) providing support for hypothesis one. In other words, companies are more willing to pay a fee premium

when the audit firm's industry sector leader works in the same city. This result holds while controlling for factors shown to have significant associations with audit fees: auditor brand name (*Big4),* auditor industry specialization (*JOINTLEADER; CITYONLY)*, company size (*Log(Assets)),* less than optimal audit opinion outcomes (*Opinion; IC_Opinion)*, more liquid company resources (*InvRec),* and greater operational complexity (*Log(Business_Segments))*. In an untabulated regression, we split the full sample into two subsamples based upon auditor brand name (Big 4 – 1450 observations; non-Big4 – 834 observations) to verify whether this positive association is consistent across the full sample. Repeating the same empirical model, while there is a positive association between *LeaderMSA* and audit fees in both subsamples, it is only statistically significant in the Big 4 subsample *(coefficient = 0.21, t<.0001).* Overall, these results suggest that human capital is an important factor when considering the pricing of audit services. More specifically, it is likely that knowledge sharing is more likely to occur in local offices (e.g. Vera-Muñoz et al. (2006)) as its barriers are relatively lower despite the interconnected nature of the modern business environment.

Sensitivity Analysis - Variation in Industry Geographic Concentration

One potential confounding factor for the main result is that certain industries are naturally more concentrated geographically (e.g. energy industry). Within these industries, it is feasible that the geographic location of the audit industry sector leader is not primarily tied to human capital but rather selected based upon economic or competitive necessity. Among the ten Fama-French 12 industry groups used in the study, the energy industry has a geographic center in Houston (MSA 26420). Additionally, three other industries have at least three public accounting firms with their industry sector leader in the same city: consumer nondurable goods (Fama-French code 1) in New York City (MSA 35620), manufacturing (Fama-French code 3) in Chicago (MSA 16980), and wholesale retail (Fama-French code 9) in New York City (MSA 35620). To address this potential concern, the main test is repeated in an untabulated regression by splitting the main data into highly concentrated (n=1167) and low concentration (n=1167) subsamples. In both groups, while the result is stronger in the highly concentrated subsample, there is a positive and statistically significant association between *LeaderMSA* and the audit fee charged to clients in both subsamples. This result provides evidence that the degree of industry geographic concentration does not appear to be the primary driver of the main result.

Sensitivity Analysis - Variation in Auditor Market Leadership Dominance and Office Size

Within the main regression in Table 3, two of the three variables corresponding to auditor industry specialization (*JOINTLEADER; CITYONLY)* were positively associated with audit fees. Neither of these coefficients were significantly correlated with our test variable *LeaderMSA* and, in an untabulated regression, there was no statistically significant interaction effect associated with audit fees between any of the industry specialist variables and *LeaderMSA.* Nevertheless, prior literature on auditor industry specialization notes that audit firms with a dominant market leadership position may have incentives to lower audit fees to maintain their leadership (e.g. Cahan et al. 2008; Bills et al. 2015). To address this potential concern, we split the full sample into two subsamples based upon whether there is a dominant market leader in the Fama-French industry grouping used for identifying the audit firm industry sector leader (i.e. greater than 10%). Six industries had such a leader: consumer nondurables (code 1), consumer durables (code 2), energy (code 4), chemicals (code 5), telecommunications (code 7), and utilities (code 8). Repeating the main table regression for these two subsamples, the main result of a positive association between *LeaderMSA* and audit fees holds in both subgroups.

Additionally, as noted in the literature review section, recent prior literature on auditor industry specialization has paid particular attention to the role of auditor office size in moderating the effect between auditor industry specialization and audit fees. While there was no association between auditor office size and audit fees in the main regression, it is feasible that larger audit offices may be more likely to have an

audit firm industry sector leader and the joint effects could confound the main result. Running a regression splitting the main sample into subsamples based upon auditor office size using both the mean and median office size, in each case the main result holds in both the large office size subsample and the small office subsample.

Sensitivity Analysis - Consistency of Auditor Industry Market Leader Geographic Location over Time

As noted in the empirical data section, auditor industry sector leader data is hand collected from the websites of the annually inspected auditing firms. While this data should have high construct validity since clients may make financial decisions using this information, individuals serve as a sector leader for various lengths of time and frequent turnover in this role may be associated with a corresponding diminishment of human capital.

Table 5: Multivariate OLS Regression of Auditor and Company characteristics on Big 4 Firm Audit Fees

	Dep. Var. = Log (Audit Fee) Big 4 Subsample				
Parameter	**Pred.**	**Est.**	**Std. Err.**	**t Value**	**Pr > |t|**
Intercept		10.435	0.177	59.070	<.0001 ***
Variable of Interest					
Same_LeaderMSA	?	0.206	0.057	3.580	0.000 ***
Audit Firm Control Variables					
JOINTLEADER		0.177	0.046	3.880	0.000 ***
NATIONALONLY		0.011	0.054	0.200	0.842
CITYONLY		0.158	0.039	4.090	<.0001 ***
OfficeSize		0.078	0.040	1.970	0.049 **
Influence		0.176	0.051	3.420	0.001 ***
Company Control Variables					
Log(Assets)		0.434	0.012	36.040	<.0001 ***
DebtRatio		0.172	0.054	3.200	0.001 ***
ROI		0.008	0.018	0.460	0.647
Opinion		0.077	0.047	1.620	0.105
IC_Opinion		0.232	0.106	2.180	0.030 **
InvRec		0.698	0.161	4.330	<.0001 ***
Log(Business_Segments)		0.060	0.021	2.800	0.005 ***
HighLitigation		-0.071	0.052	-1.350	0.176
Fama-French 12 Group Dummies		Yes			
White Heteroscedasticity Correction		Yes			
Number of Observations		1,450			
R-squared		0.697			
Adjusted R-squared		0.691			
Root Mean Squared Error		0.591			

Same_LeaderMSA is 1=LeaderMSA (auditors who share the same city as the their firm's partner in charge of the relevant Fama-French 12 industry sector) is in the same location in both 2014 and 2017, 0 = otherwise

JOINTLEADER is 1 = auditors that are both national industry leaders and city-specific industry leaders where clients are headquartered, 0 = otherwise.

NATIONALONLY is 1 = auditors that are national industry leaders but not the city-specific industry leaders where clients are headquartered, 0 = otherwise

CITYONLY is 1 = auditors that are not national industry leaders but are the city-specific industry leaders where clients are headquartered, 0 = otherwise.

OfficeSize is the log transformation of the number of public clients the audit firm has in the same city as the audit-client observation.

Influence is the ratio of the audit fee for the audit-client observation relative to the total audit fees in the same city as the audit-client observation.

Log(Assets) is the log transformation of total assets in millions of dollars.

DebtRatio is the ratio of long-term debt to total assets.

ROI is the ratio of earnings before interest and tax to total assets.

Opinion is 1 = an unqualified audit report with additional language (e.g. explanatory paragraph) or a non-clean audit opinion, 0 = otherwise.

IC_Opinion is 1 = not unqualified internal controls audit report, 0=otherwise

InvRec is the ratio of inventory and receivables divided by total assets.

Log(Business_Segments) is the log transformation of the number of business segments of the company.

HighLitigation is 1 = company primarily operates in a high litigation industry SIC per Francis et al. (1994), 0 = otherwise.

While this study cannot eliminate the risk that human capital may be lost, we attempt to address this concern by developing a longer time series of hand collected data dating back to 2014 using data hand collected Big 4 firm websites during a preliminary phase of data collection. For these Big 4 firms, we can identify whether the industry sector leader is consistently located in the same city and restrict our human capital proxy to those industries where the sector leader is in the same city both in 2014 and in 2017 (*Same_LeaderMSA)*. Table 5 provides a regression similar to equation one with the exception that we replace *LeaderMSA* with the previously described variable where the industry sector leader location is the same in both periods (*Same_LeaderMSA)*. This data restriction allows for a cleaner test of human capital in the Big 4 subsample where the primary results were strongest. Reviewing Table 5, there is a positive association between our updated human capital proxy (*Same_LeaderMSA)* and audit fees (coefficient = 0.21, t<.01). This result provides additional support for hypothesis 1 that human capital is positively associated with audit fees.

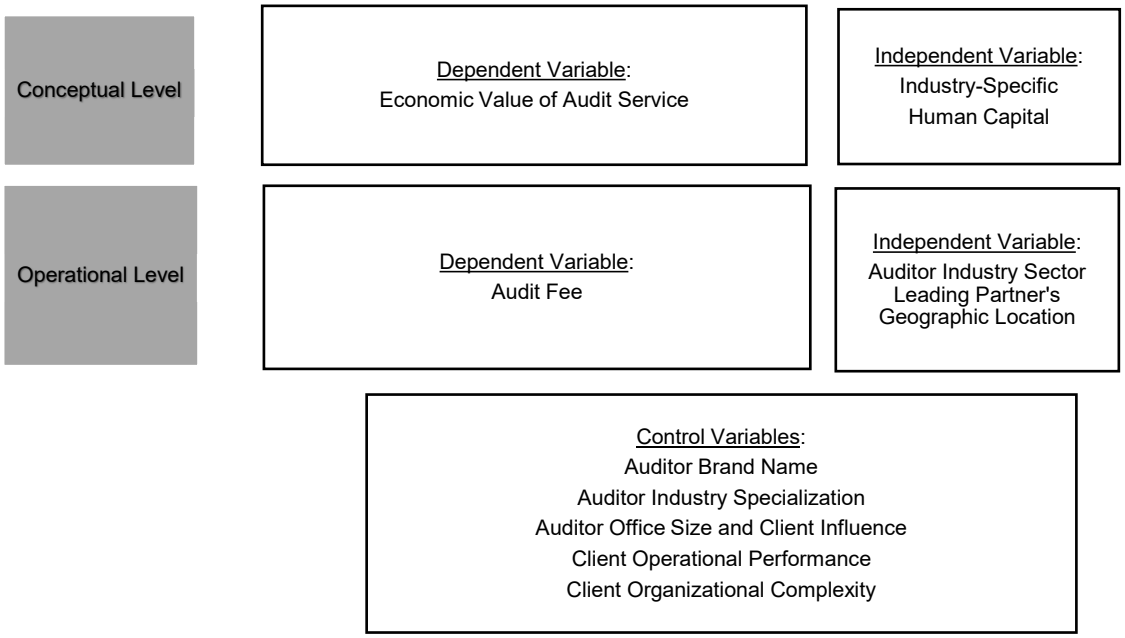
CONCLUDING COMMENTS

The purpose of the study is to examine whether there is an association between the geographic location of industry sector leaders in an auditing firm and audit fees for that same auditing firm's industry clients. Building upon prior research that examines the role of individual partner expertise on audit quality (e.g. Goodwin et al. 2014; Zimmerman et al. 2018) and on human capital and audit quality (e.g. Beck et al. 2018), this study provides evidence that a positive association exists between the geographic location of industry sector leaders (proxy for industry-specific human capital) and audit pricing. This result is robust to alternative explanations, including differences in the geographic concentration of industries, in market dominance and office size of audit firms, and the stability of audit firm industry sector leaders over time.

This study is subject to several limitations. First, there is a limitation for our data collection process. Beyond the Big 4, some annually inspected public accounting firms do not identify industry sector leader information published on the companies' websites for every Fama-French 12 industry subgroup. While this may suggest that these firms wish to focus in specific industries, this nonetheless eliminates a number of auditor-client pairings from empirical analysis. Second, due to the timing of this study, we cannot identify the audit partner signing the audit opinion (and thus responsible for the specific audit engagement – including negotiating audit fees). Given the new requirement under PCAOB Auditing Standard 3101 to disclose the audit partner name on Form AP, future research can disentangle the effect of knowledge transfer by controlling for partner-specific reputation.

Finally, this finding has implications for practicing accountants. Since knowledge sharing and transfer are very important in the auditing industry, interactions among skilled auditors can help the public accounting firms to leverage the skills of the workers and enhance overall audit quality. Nevertheless, we recognize that despite publicized efforts of public accounting firms, knowledge and expertise is likely greater in particular. Human capital is a valuable asset for companies and it is critical that knowledge is utilized in audit practice not only to receive financial benefits in the form of higher audit fees but also in producing high quality audits that protect investors from financial misstatements.

APPENDIX A: Conceptual and Operational Summary of Study



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ACKNOWLEDGEMENTS

We wish to thank Pace University for funding this project through both its Undergraduate Student-Faculty Research program and its Pforzheimer Honors College.

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