



Audit tenure, auditor specialization and audit report lag

Mai Dao

Department of Accounting, University of Toledo, Toledo, Ohio, USA, and

Trung Pham

Department of Accounting and Information Systems, Michigan State University, East Lansing, Michigan, USA

490

Abstract

Purpose – This paper aims to examine the association between audit firm tenure and audit report lag (ARL) and the impact of auditor industry specialization on the association between audit firm tenure and ARL.

Design/Methodology/Approach – Using Habib and Bhuiyan's (2011) method of measuring auditor industry specialization, the authors examine the sample of 7,291 firm-year observations from 2008 to 2010.

Findings – The authors find that auditor industry specialization (regardless of city-level, national-level and joint city- and national-level industry specialization) weakens the positive association between ARL and short audit firm tenure, suggesting that auditor industry specialization complements the negative effect of short audit firm tenure on ARL.

Originality/value – First, the authors add to the literature by answering the question of whether hiring industry auditor specialists is an effective way to shorten ARL created by short audit tenure. The authors provide some evidence that the concern of short audit tenure leading to longer ARL is reduced by hiring an industry-specialized auditor. Prior research mainly focuses on identifying the determinants of ARL without going further to find out which are the effective ways to reduce the audit delay. Second, their findings can somehow resolve the debate on whether audit firm rotation should be mandatory. A new auditor's lack of knowledge of clients' business operations during the early years of audit engagements results in longer ARL, which eventually influences the clients' financial performance. The authors' result suggests the firms can reduce this adverse consequence by hiring an industry-specialized auditor. Finally, their findings may provide helpful information to firms in selecting external auditors, public accounting firms in selecting a differentiation strategy and regulators in mandating audit firm rotation.

Keywords Audit firm tenure, Audit report lag, Auditor industry specialization

Paper type Research paper

1. Introduction

The impact of audit report lag (ARL) on the timeliness of financial accounting information and the sensitivity of the market to the release of such accounting information has attracted the attention of both academics and practitioners. The timeliness of financial accounting information release may influence the level of



uncertainty in decision making. This will then affect market behaviors surrounding the release of the accounting information (Chambers and Penman, 1984; Ashton *et al.*, 1987). For example, Chambers and Penman (1984) find that investors perceive firms not reporting on time to be a signal of bad news and that firms releasing financial reports later than expected receive negative abnormal returns.

Prior literature on ARL has mainly concentrated on identifying determinants of ARL (Ashton *et al.*, 1989; Bamber *et al.*, 1993; Knechel and Payne, 2001; Behn *et al.*, 2006). Previous studies show that the length of ARL depends on firm-related factors (e.g. firm size, industry, the presence of extraordinary items and so on) (Ashton *et al.*, 1989) and auditor-related factors (e.g. the extent of audit work, audit staff experience, auditors' incentive to provide timely report, audit firm tenure and so on) (Bamber *et al.*, 1993). However, previous studies provide limited evidence on whether there is any way firms can reduce ARL. Given the importance of ARL on the timeliness of financial reporting information and firms' financial performance, it is vital to examine how firms can reduce ARL. In this study, we focus on the impact of audit firm tenure on ARL and whether choosing an industry-specialized auditor can be an effective way to influence the relation between audit firm tenure and ARL.

There have been various discussions surrounding the issue of mandatory audit firm rotation. The opponents of audit firm rotation are concerned about the costs of auditor change. They believe that changing auditors may influence audit quality because the auditors lack adequate knowledge of their clients and the industry during the early years of audit engagements (Lim and Tan, 2010). Meanwhile, others assert that long-tenured auditors may be less objective and lack professional skepticism, which also influences audit quality. As mentioned earlier, in addition to the potential costs and the possible decrease in audit quality related to audit firm rotation, ARL may be longer in the early years of the audit-client relationship. In other words, ARL is expected to be longer when audit firm tenure is short. Short audit tenure may create a delay in information provided to the market due to the auditors' unfamiliarity with firms' operations (Habib and Bhuiyan, 2011). This will eventually lead to an increase in costs and informational inefficiencies (Lee *et al.*, 2009). Briefly, prior research provides evidence on short audit tenure leading to longer audit delay. The question of how a firm changing their auditor can reduce the impact of short audit firm tenure and enhance the influence of long audit tenure on the timeliness of financial reporting remains unanswered. Accordingly, we attempt to address this question in the current study.

Empirical evidence also shows a relationship between audit firm tenure and auditors' effectiveness and efficiency. Lee *et al.* (2009), for instance, show that firms with long audit firm tenure have shorter ARL, a proxy for auditors' effectiveness and efficiency. Habib and Bhuiyan (2011) also find that ARL is longer for firms with short audit tenure. Lai and Cheuk (2005), however, do not find any evidence on longer ARL resulting from audit firm rotation. In this paper, we attempt to extend prior research and provide further evidence on the relation between audit firm tenure and ARL. In addition, this examination is a preliminary step for the second part, investigating whether hiring an industry-specialized auditor has any effect on the association between audit firm tenure and ARL.

Although researchers have recently paid much attention to the issue of audit firm industry specialization, to our knowledge, there has not been any study on whether hiring an industry-specialized auditor can be an effective solution to reduce the effect of short audit tenure on ARL or enhance the impact of long audit tenure on audit delay. Specifically, we

investigate the moderating effect of auditor industry specialization on the association between audit firm tenure and ARL. Prior research indicates that ARL is shorter in firms being audited by an industry-specialized auditor because the industry-specific knowledge and expertise enable the auditor to quickly familiarize with the clients' operations (Habib and Bhuiyan, 2011). Therefore, we expect that auditor industry specialization weakens the positive relation between short audit firm tenure and ARL and strengthens the negative association between long audit firm tenure and ARL.

Using Habib and Bhuiyan's (2011) method to measure auditor industry specialization, we find that short audit firm tenure is associated with longer ARL. The result supports the reasoning that audit firms having short auditor-client relationship need more time to understand the clients' operations and industry. We also find that auditor industry specialization (regardless of city-level, national-level and joint city- and national-level industry specialization) weakens the positive association between ARL and short audit firm tenure, suggesting that auditor industry specialization mitigates the negative effect of short audit firm tenure on ARL.

Our study makes several contributions. First, we add to the literature by answering the question of whether hiring industry-specialized auditors is an effective way to shorten ARL created by short audit tenure. While prior research mainly focuses on identifying the determinants of ARL without going further to find out the effective way(s) to reduce the audit delay, our study provides some evidence that the concern of short audit tenure leading to longer ARL may be reduced by hiring an industry-specialized auditor. Second, our findings can help resolve the debate on whether audit firm rotation should be mandatory. If audit firm rotation is mandatory, a new auditor's lack of knowledge of clients' business operations during the early years of audit engagements results in longer ARL, which eventually influences the clients' financial performance. Our result suggests that firms may be able to mitigate this adverse consequence by hiring an industry-specialized auditor.

Finally, the current study has several implications for practice. It is important to advance our understanding of the role of auditor industry specialization in moderating the relationship between audit tenure and ARL. As such, our findings can be beneficial in the following ways:

- the study's findings are helpful for firms selecting external auditors;
- the study also provides public accounting firms some information on how to differentiate themselves from competitors in the market; and
- regulators may reconsider their intention to request firms to rotate external auditors.

Specifically, if ARL is one of the significant determinants of auditor selection, firms are suggested to select industry-specialized auditors so that the audit delay in the first few years of the audit engagements is minimized. Our study also suggests that public accounting firms can differentiate themselves in the market by investing financial, technological and personnel resources to build up and/or enhance their expertise. Because specialization can mitigate the adverse effect of short audit tenure on ARL, investment in specialization can strengthen the audit firms' ability to shorten ARL and help position those accounting firms as providers of timely financial information. This position would be even more prominent for firms to maintain competition if the mandatory rotation of audit firms is required. Our results also have an implication for

regulators who are considering whether audit firm rotation should be mandatory. In 2011, the Public Company Accounting Oversight Board (PCAOB or the Board) raised the issue of audit firm mandatory rotation and stated in its concept release that:

[...] the Board continues to find instances in which it appears that auditors did not approach some aspects of the audit with the required independence, objectivity, and professional skepticism [...] it is considering whether other approaches could foster a more fundamental shift in the way the auditor views its relationship with its audit client [...] one possible approach that might promote such a shift is mandatory audit firm rotation [...] (PCAOB, 2011).

The results of our study that audit firm industry specialization may be able to mitigate the effect of short audit tenure on ARL may be helpful for regulators and those who are concerned about the costly consequences of audit firm mandatory rotation.

Our study is different from the similar study conducted by [Habib and Bhuiyan \(2011\)](#) as follows. First, [Habib and Bhuiyan \(2011\)](#) examine the relationship between audit firm industry specialization on ARL. They find that firms being audited by industry-specialized auditors have shorter ARL. Our study, however, attempts to investigate whether this influence of auditor industry specialization still holds during the first few years of audit. We find that even though short-tenured auditors lack knowledge of clients' business operations and need more time to familiarize themselves with clients' business, these disadvantages can be reduced if firms hire industry-specialized auditors. Second, [Habib and Bhuiyan \(2011\)](#) use the sample of the New Zealand stock exchange-listed firms during 2004-2008, while our study examines the US firms from 2008 to 2010. Third, [Habib and Bhuiyan \(2011\)](#) only measure audit industry specialization at national level as compared to our study's national level, city level and joint national- and city-level audit industry specialization.

The remainder of the paper is organized as follows. The next section reviews related studies and presents our hypotheses. It is followed by the descriptions of the research design and sample selection. We, then, report regression results and provide conclusions.

2. Related literature and hypothesis development

2.1 *Effects and determinants of ARL*

ARL is considered to be an important factor for firms, investors, regulators and external auditors. It is believed that ARL influences the timeliness of financial reporting, which, in turn, affects the uncertainty of accounting information and market reactions to the release of accounting information ([Givoly and Palmon, 1982](#); [Chambers and Penman, 1984](#); [Ashton *et al.*, 1987](#)). [Givoly and Palmon \(1982\)](#), for instance, concluded that the increase in reporting lag leads to a reduction in the information content. [Chambers and Penman \(1984\)](#) found some evidence on the positive relationship between the timely reporting lag of small firms bearing good news and price reactions.

Given the important role of ARL, various studies have been conducted in an attempt to determine factors influencing ARL ([Ashton *et al.*, 1989](#); [Bamber *et al.*, 1993](#); [Knechel and Payne, 2001](#); [Behn *et al.*, 2006](#)). With 465 firms listed on the Toronto Stock Exchange for 1977-1982, [Ashton *et al.* \(1989\)](#) examined influential factors on audit delay. They found that ARL is longer in smaller firms, firms in financial services industry and firms having extraordinary items. [Bamber *et al.* \(1993\)](#) concluded that the extent of audit work, auditors' incentives of providing timely reports and audit firm structure are the main determinants of audit delay. Specifically, ARL increases with the increase in the extent of audit work. The extent of audit work is influenced by auditor business risk, audit complexity and other work-related factors including extraordinary items, net losses and

qualified audit opinions. Also, the increase in firms' incentives to provide timely reports leads to shorter audit delay. Structured audit firms are found to be associated with longer ARL.

Using the data from an internal survey of an international public accounting firm, [Knechel and Payne \(2001\)](#) indicated that factors such as incremental audit effort, presence of contentious tax issues and less experienced audit staff result in longer ARL. They added that the combination between advisory services and audit services may reduce ARL. [Behn et al. \(2006\)](#) conducted a survey with the participation of US assurance partners and found that ARL cannot be significantly reduced because of the lack of sufficient personnel resources. They believed that to significantly reduce ARL, there should be a change in the mindsets of both clients and auditors, an improvement in auditors' skill set and an increase in flexibility of scheduling process.

With a sample of 18,473 firm-year observations from 2000 to 2005, [Lee et al. \(2009\)](#) found that longer auditor tenure is associated with shorter ARL. The provision of non-audit services (i.e. consulting services)[1] enhances audit learning, which, in turn, leads to shorter audit delay. Audit firm industry specialization is another factor found in the literature to be associated with ARL. [Habib and Bhuiyan \(2011\)](#), for example, found that firms being audited by industry specialist auditors have shorter audit delay. While prior studies find the associations between audit firm tenure and ARL and between audit firm tenure and auditor industry specialization, respectively, those studies have not studied how the three factors (ARL, audit firm tenure and auditor industry specialization) interact. In this study, we attempt to fill this gap in the literature.

2.2 Effects of auditor industry specialization

After a series of accounting scandals in the early 2000s and some evidence on the reduction in audit quality, there has been increasing demand for high-quality auditors ([Dunn and Mayhew, 2004](#)) and significant scrutiny of audit quality from the public ([Balsam et al., 2003](#)). The high demand for quality auditors results from the added benefits such as lower audit fees, enhancement in audit quality and the need for signaling investors on the improvement in financial reporting quality. Audit firms also attempt to restructure their divisions with more designated industry specialists, with the aim to improve audit efficiency and audit quality, which, in turn, enables audit firms to differentiate themselves from competitors ([Green, 2008](#)).

Prior research provides limited evidence that audit firm industry specialization may influence firms' audit delay ([Habib and Bhuiyan, 2011](#)). Specifically, [Habib and Bhuiyan \(2011\)](#) employed two measures of audit firm industry specialization and found that firms being audited by industry specialists have shorter ARL. The study also showed that all firms (except for those being audited by industry specialists) experienced an increase in ARL following the firms' adoption of the International Financial Reporting Standards (IFRS).

In summary, there has been limited research examining the impact of audit firm industry specialization on audit delay. Also, there is no prior work exploring whether auditor industry specialization has any influence on the association between audit firm tenure and ARL. In the current study, we attempt to fill this gap in the literature.

2.3 Hypothesis development

As discussed above, prior studies document that ARL is determined by firm- and auditor-related factors such as firm size, audit effort, audit firm structure and so on.

Audit firm tenure is one of the factors found to influence auditors' effectiveness. In fact, empirical evidence shows that audit firms work more effectively (i.e. shorter ARL) when there is a long auditor–client relationship (Lee *et al.*, 2009). The reason is that it takes time for audit firms to be familiar with their clients' operations; therefore, initial audit engagement is less efficient than later years' audit engagements.

Various discussions have taken place on the topic of whether firms should hire auditors for a long time or there should be a mandatory auditor rotation. On the one hand, it is believed that auditors will not have adequate knowledge of their clients and the industry in early years of the auditor–client relationship (Carcello and Nagy, 2004) and that auditors climb a steep learning curve to have a better understanding of the client and its industry (Lim and Tan, 2010). On the other hand, long audit firm tenure may lead to the auditors' lack of objectivity and professional skepticism, which may also result in lower audit quality (Carcello and Nagy, 2004). After conducting a study on audit firm tenure, the General Accounting Office states that:

[...] pressures faced by the incumbent auditor to retain the audit client coupled with the auditor's comfort level with management developed over time can adversely affect the auditor's actions to appropriately deal with financial reporting issues that materially affect the company's financial statements (GAO, 2003) and that mandatory audit firm rotation may not be the most efficient way to strengthen auditor independence and improve audit quality (GAO, 2003, 2011; PCAOB, 2011).

As mentioned above, prior research finds that audit lag is shorter when audit firm tenure is long (Lee *et al.*, 2009). Given the findings from prior studies on audit firm tenure and earnings quality and the empirical results from Lee *et al.* (2009), we first reexamine the association between audit firm tenure and ARL before examining the impact of auditor industry specialization. We predict a negative association between audit firm tenure and ARL. This leads to our first hypothesis:

H1. Audit firm tenure is negatively related to ARL.

A second hypothesis concerns the impact of auditor industry specialization on the association between audit firm tenure and ARL. Prior research document that industry-specialized auditors have more expertise and experience in detecting errors within their specialization (Owhoso *et al.*, 2002). In addition, industry-specialized auditors have more access to technologies, physical facilities, personnel and organizational control systems, which result in high audit efficiency and audit quality (Kwon *et al.*, 2007). It is also found that auditor industry specialization is related to higher audit efficiency (i.e. shorter ARL) (Habib and Bhuiyan, 2011). Meanwhile, short audit tenure is predicted to lead to longer audit delay, and long audit tenure is predicted to result in shorter audit delay. Given prior research on the impact of audit firm industry specialization, it is reasonable to believe that audit firm industry specialization can shorten the audit delay resulting from short-tenured auditors not having expertise in auditing clients and that long-tenured auditors with industry specialization can conduct the audit more quickly. As such, auditor industry specialization is expected to moderate the negative association between audit firm tenure and ARL; in other words, auditor industry specialization reduces the negative effect of short tenure on ARL. The prediction relating to this issue suggests a second hypothesis:

H2. Auditor industry specialization weakens the relationship between audit firm tenure and ARL.

3. Research method

3.1 Regression model

Based on prior research (Ettredge *et al.*, 2006; Habib and Bhuiyan, 2011), we use the following regression model to test the relation between audit firm tenure and ARL and the moderating effect of auditor specialization on this association:

496

$$\begin{aligned}
 ARL = & \alpha_0 + \alpha_1 * STEN + \alpha_2 * LTEN9 + \alpha_3 * SPEC + \alpha_4 * SPEC * STEN \\
 & + \alpha_5 * SPEC * LTEN9 + \alpha_6 * ROA + \alpha_7 * LEVERAGE + \alpha_8 * SEGNUM \\
 & + \alpha_9 * LOSS + \alpha_{10} * GC + \alpha_{11} * YEND + \alpha_{12} * BIG4 + \alpha_{13} * SIZE \\
 & + \alpha_{14} * MWIC + \alpha_{15} * RESTATE + \alpha_{16} * AFEE + \alpha_{17} * NASRATIO \\
 & + \alpha_{18} * AUDCHG + \alpha_{19} * IndustryDummies + \alpha_{20} * YearDummies + \varepsilon
 \end{aligned}$$

Where,

<i>ARL</i>	= number of calendar days from fiscal year-end to the date of the auditor's report;
<i>STEN</i>	= 1, if the length of the auditor–client relationship is three years or less and 0 otherwise;
<i>LTEN9</i>	= 1, if the length of the auditor–client relationship is nine years or longer and 0 otherwise;
<i>SPEC</i>	= auditor industry specialization measured at city level, national level and joint city and national level as follows;
<i>CLLeader</i>	= city-level audit firm industry specialization using two measures used in Habib and Bhuiyan (2011);
<i>NLLLeader</i>	= national-level audit firm industry specialization using two measures used in Habib and Bhuiyan (2011);
<i>CLNLLLeader</i>	= both city and national level audit firm industry specialization using two measures used in Habib and Bhuiyan (2011);
<i>SPEC*STEN</i>	= interaction term between audit firm industry specialization measures and short audit tenure;
<i>SPEC*LTEN9</i>	= interaction term between audit firm industry specialization measures and long audit firm tenure;
<i>ROA</i>	= net earnings divided by total asset;
<i>LEVERAGE</i>	= total debt divided by total assets;
<i>SEGNUM</i>	= reportable segments of a client;
<i>LOSS</i>	= 1, if a firm reports negative earnings and 0 otherwise;
<i>GC</i>	= 1, if the firm received a going concern opinion and 0 otherwise;
<i>YEND</i>	= 1, if a firm's fiscal year ends in December and 0 otherwise;
<i>BIG4</i>	= 1, if the auditor is one of the Big 4 auditing firms and 0 otherwise;
<i>SIZE</i>	= natural log of total assets;
<i>MWIC</i>	= 1, if a firm has material weakness in internal control and 0 otherwise;
<i>RESTATE</i>	= 1, if the client restated its financial reports in the current year and 0 otherwise;
<i>AFEE</i>	= total audit fees divided by total assets;

<i>NASRatio</i>	= ratio of nonaudit fees to total fees;
<i>AUDCHG</i>	= 1, if the client firm changed auditor during the current year and 0 otherwise;
<i>IndustryDummies</i>	= industry dummies;
<i>YearDummies</i>	= year dummies.

3.1.1 Dependent and test variables. The dependent variable is ARL (*ARL*), which is calculated as the number of calendar days from fiscal year-end to the date of the auditor's report. Our test variables are city-level audit firm industry specialization (*CLLeader*), national-level audit firm industry specialization (*NLLLeader*), joint city- and national-level audit firm industry specialization (*CLNLLLeader*) and the interaction terms between each of auditor industry specialization measures and short audit firm tenure (*SPEC*STEN*) and long audit firm tenure (*SPEC*LTEN9*). Because short-tenured audit firms may require more time to become familiar with a company's operation, the coefficient on *STEN* is expected to be positive and the coefficient on *LTEN9* is expected to be negative. The moderating effect of auditor industry specialization is captured by the interaction terms between auditor industry specialization measures and *STEN* and *LTEN9*.

3.1.2 Auditor industry specialization. Following [Habib and Bhuiyan \(2011\)](#), we use two measures of auditor industry specialization and classify auditor industry specialization into city-level, national-level and both city- and national-level industry specialization. According to the first measure of audit firm industry specialization, an auditor is classified as a national (city) industry specialist, *NLLLeader1* (*CLLeader1*), if:

- the auditor has the largest market share in respective industries; and
- if the audit firm's market share is at least ten percentage points greater than the second largest industry leader at national level (city) level.

Under the second measure of audit firm industry specialization, a national (city) industry-specialized auditor, *NLLLeader2* (*CLLeader2*), has a market share > 30 per cent in respective industries. Industry market share refers to the percentage of total audit fees of all clients of an audit firm in a given two-digit standard industrial classification (SIC) industry group to the total audit fees of all audit firms' clients in the same two-digit SIC industry group in a national (city) audit market.

3.1.3 Other control variables. Consistent with prior research ([Ashton et al., 1989](#); [Bamber et al., 1993](#); [Ettredge et al., 2006](#); [Lee et al., 2009](#); [Habib and Bhuiyan, 2011](#)), we control for firm- and auditor-related factors likely to affect ARL. ARL is expected to be higher in firms with higher level of leverage (*LEVERAGE*) ([Ettredge et al., 2006](#)); having negative earnings (*LOSS*) ([Bamber et al., 1993](#); [Ettredge et al., 2006](#)); having more complex operations (*SEGNUM*) ([Ettredge et al., 2006](#); [Lee et al., 2009](#)); receiving going concern opinion (*GC*) ([Ettredge et al., 2006](#); [Lee et al., 2009](#)); having fiscal year ending in December (*YEND*) ([Lee et al., 2009](#); [Habib and Bhuiyan, 2011](#)); having material weakness in internal control (*MWIC*) ([Ettredge et al., 2006](#)); having financial restatements (*RESTATE*) ([Ettredge et al., 2006](#)); having large *AFEE* ([Ettredge et al., 2006](#)); having high ratio of nonaudit fees to total fees ([Habib and Bhuiyan, 2011](#)); and changing auditor during the fiscal year (*AUDCHG*) ([Ettredge et al., 2006](#)). ARL is expected to be shorter in large firms (*SIZE*) ([Ettredge et al., 2006](#); [Habib and Bhuiyan, 2011](#)) and firms being audited by one of the Big 4 accounting firms (*BIG4*) ([Lee et al., 2009](#)).

Specifically, firms are more likely to have longer ARL when they have weak financial performance (Lee *et al.*, 2009). We expect that higher leverage (*LEVERAGE*), and negative earnings (*LOSS*) result in longer ARL. Lee *et al.* (2009) find that more audit work needs to be performed if clients' operations are complex; thus, we include *SEGNUM* as a control variable and expect a positive association between *ARL* and *SEGNUM*. Consistent with Lee *et al.* (2009), we expect *YEND* to be positively related to *ARL*. Ettredge *et al.* (2006) find that *GC* is positively associated with *ARL*. We, therefore, add *GC* to the model and expect a positive relation. Ashton *et al.* (1989) find longer *ARL* for smaller firms. Habib and Bhuiyan (2011) also find that *ARL* tends to be shorter in large firms because of the auditors' higher pressure from the large clients to have timely reporting and large clients' strong internal control, reducing the auditor's time spent on doing the audit. Thus, we predict the coefficient on *SIZE* to be negative. Following Ettredge *et al.* (2006) and Habib and Bhuiyan (2011), we also include *MWIC* and *RESTATE*, *AFEE*, *NASRatio* and *AUDCHG* in our model. We expect the coefficients on these variables to be positive.

3.2 Data and sample selection

Our initial sample consists of 12,644 firm-year observations from 2008 to 2010 with available data on *Compustat* and *Audit Analytics* databases to calculate *ARL*. To examine the association between audit firm tenure and *ARL* and the influence of auditor specialization on this relation, we eliminate 95 observations without audit firm tenure data. We obtain financial data from *Compustat* database. Data related to accounting restatements, *MWICs*, audit fees and auditor changes are collected from *Audit Analytics* database. We delete 52 observations without the industry specialization data. The elimination of 5,206 firm-year observations with missing finance-related and other control variable-related data leads to the final sample of 7,291 firm-year observations. The detailed sample selection process is reported in Table I.

4. Results

4.1 Descriptive statistics

Tables II and III presents descriptive statistics for the study variables[2]. Table II reports audit industry specialization by industry. Among the 12 industries, Pricewaterhouse Coopers (PWC) ranks first and is a national-level industry specialist in industry 1 (Consumer Non-Durables), industry 2 (Consumer Durables); industry 4 (Oil, Gas, Coal Extraction and Products); industry 6 (Business Equipment); industry 10 (Health Care, Medical Equipment, and Drugs); and industry 11 (Financial Institutions). Ernst & Young (EY) ranks first and is an audit industry specialist at national level in industry 7 (Telephone and Television Transmission) and the last industry group (Other). Although EY ranks first in industry

Initial sample with available data for audit lag calculation	12,644
<i>Less</i>	
Missing audit tenure data	95
Missing industry specialization data	52
Missing financial and other data	5,206
<i>Final sample</i>	7,291

Table I.
Sample selection

Number	Industry (SICs)	First ranked	NLLLeader1	NLLLeader2
1	Consumer non-durables (0100-0999, 2000-2399, 2700-2749, 2770-2799, 3100-3199, 3940-3989)	PWC	Yes	Yes
2	Consumer durables (2500-2519, 2590-2599, 3630-3659, 3710-3711, 3714-3714, 3716-3716, 3750-3751, 3792-3792, 3900-3939, 3990-3999)	PWC	Yes	Yes
3	Manufacturing (2520-2589, 2600-2699, 2750-2769, 3000-3099, 3200-3569, 3580-3629, 3700-3709, 3712-3713, 3715-3715, 3717-3749, 3752-3791, 3793-3799, 3830-3839, 3860-3899)	EY	No	No
4	Oil, Gas and coal extraction and products (1200-1399, 2900-2999)	PWC	No	Yes
5	Chemicals and allied products (2800-2829, 2840-2899)	Deloitte	No	Yes
6	Business equipment (3570-3579, 3660-3692, 3694-3699, 3810-3829, 7370-7379)	PWC	Yes	Yes
7	Telephone and television transmission (4800-4899)	EY	Yes	Yes
8	Utilities (4900-4949)	Deloitte	Yes	Yes
9	Wholesale, Retail and some services (laundries, repair shops) (5000-5999, 7200-7299, 7600-7699)	Deloitte	No	No
10	Healthcare, medical equipment and drugs (2830-2839, 3693-3693, 3840-3859, 8000-8099)	PWC	Yes	Yes
11	Financial institutions (6000-6999)	PWC	No	Yes
12	Other (remaining SICs)	EY	No	Yes

Auditor
specialization
and audit report
lag

499

Table II.
Descriptive statistics:
audit industry
specialization by industry

3 (Manufacturing), the company does not meet the current study's criteria to be an audit industry specialist in this industry.

Table III indicates that the average audit report delay is about 62 days, which is consistent with the results of recent studies on ARL (Lee *et al.*, 2009; Habib and Bhuiyan, 2011). Under the first measure of auditor industry specialization, 76 per cent of the firms are audited by city-level industry specialists (*CLLeader1*). Meanwhile, 15 per cent of the firms hire national industry specialists (*NLLLeader1*) and 13 per cent of the firms are audited by both city and national level industry leaders (*CLNLLLeader1*). With audit firm industry specialization estimated using Habib and Bhuiyan's (2011) method, on average, 85, 31 and 21 per cent of the full sample use city-level, national-level and both city- and national-level audit firm industry specialization, respectively. The mean (median) auditor tenure is 11.25 (9) years. About 12 per cent of the sample firms are audited by short-tenured auditors (*STEN*), while about 51 per cent are audited by long-tenured auditors (*LTEN9*). The mean value of return on assets (*ROA*) is -0.02 . The mean and median values of *LEVERAGE* are 0.29 and 0.26, respectively. On average, each firm has at least two business segments. About 32 per cent of the sample firms experienced negative earnings during the study years. Three per cent of the study firms received a *GC* while 75 per cent of those firms have fiscal year ending in December. The majority (85 per cent) of the sample firms are audited by one of the Big 4 accounting firms. The average value of total assets for our sample is \$10,476 million. Among the

Variable	Mean	SD	25th percentile	Median	75th percentile	Minimum	Maximum
<i>ARL (days)</i>	61.95	13.93	55.00	59.00	70.00	35.00	181.00
<i>CLLeader1</i>	0.76	0.43	1.00	1.00	1.00	0.00	1.00
<i>NLLLeader1</i>	0.15	0.36	0.00	0.00	0.00	0.00	1.00
<i>CLNLLLeader1</i>	0.13	0.34	0.00	0.00	0.00	0.00	1.00
<i>CLLeader2</i>	0.85	0.36	1.00	1.00	1.00	0.00	1.00
<i>NLLLeader2</i>	0.31	0.46	0.00	0.00	1.00	0.00	1.00
<i>CLNLLLeader2</i>	0.21	0.41	0.00	0.00	0.00	0.00	1.00
<i>AudTenure (years)</i>	11.25	8.57	5.00	9.00	15.00	1.00	37.00
<i>STEN</i>	0.12	0.33	0.00	0.00	0.00	0.00	1.00
<i>LTEN9</i>	0.51	0.50	0.00	1.00	1.00	0.00	1.00
<i>ROA</i>	-0.02	0.20	-0.02	0.03	0.06	-1.08	0.27
<i>LEVERAGE</i>	0.29	0.24	0.10	0.26	0.42	0.00	1.11
<i>SEGNUM</i>	2.33	1.82	1.00	1.00	4.00	0.00	10.00
<i>LOSS</i>	0.32	0.47	0.00	0.00	1.00	0.00	1.00
<i>GC</i>	0.03	0.16	0.00	0.00	0.00	0.00	1.00
<i>YEND</i>	0.75	0.43	1.00	1.00	1.00	0.00	1.00
<i>BIG4</i>	0.85	0.35	1.00	1.00	1.00	0.00	1.00
<i>AT (\$ millions)</i>	10,475.91	76,715.32	374.44	1,250.33	4,193.32	0.27	3,221,972.00
<i>SIZE</i>	21.00	1.78	19.74	20.95	22.16	16.93	25.63
<i>MWIC</i>	0.03	0.17	0.00	0.00	0.00	0.00	1.00
<i>RESTATE</i>	0.05	0.22	0.00	0.00	0.00	0.00	1.00
<i>AFEE</i>	0.002	0.003	0.000	0.001	0.002	0.00	0.02
<i>NASRatio</i>	0.21	0.26	0.04	0.13	0.29	0.00	2.93
<i>AUDCHG</i>	0.04	0.19	0.00	0.00	0.00	0.00	1.00

Notes: Variables are defined as follows: *ARL* = number of calendar days from fiscal year-end to the date of the auditor's report; *SPEC* = auditor industry specialization measures; *CLLeader1*, *NLLLeader1*, *CLNLLLeader1* are city-level, national-level and joint city- and national-level audit firm industry specialists using the first audit firm specialization measure of [Habib and Bhuiyan \(2011\)](#); *CLLeader2*, *NLLLeader2*, *CLNLLLeader2* are city-level, national-level and joint city- and national-level audit firm industry specialists using the second-audit firm industry specialization measure of [Habib and Bhuiyan \(2011\)](#); *AudTenure* the length of the auditor–client relationship (in years); *STEN* = 1 if the length of the auditor–client relationship is three years or less and 0 otherwise; *LTEN9* = 1 if the length of the auditor–client relationship is nine years or longer and 0 otherwise; *ROA* = net earnings divided by total asset; *LEVERAGE* = total debt divided by total assets; *SEGNUM* = reportable segments of a client; *LOSS* = 1 if a firm reports negative earnings 0 otherwise; *GC* = 1 if the firm received a going concern opinion 0 otherwise; *YEND* = 1 if a firm's fiscal year ends in December and 0 otherwise; *BIG4* = 1 if an auditor is one of the Big 4 auditing firms and 0 otherwise; *SIZE* = natural log of total assets; *AT* = Total assets; *MWIC* = 1 if a firm has material weakness in internal control and 0 otherwise; *RESTATE* = 1 if the client restated its financial reports in the current year, 0 otherwise; *AFEE* = total audit fees divided by total assets; *NASRatio* = ratio of nonaudit fees to audit fees; and *AUDCHG* = 1 if the client firm changed auditor during the current year, 0 otherwise

Table III.
Descriptive statistics

sample firms, 3, 5 and 4 per cent of the sample firms disclosed *MWIC*, restated their financial statements and changed their auditors during the fiscal year, respectively. Finally, the average values of the ratios of *AFEE* and nonaudit to audit fees (*NASRatio*) are 0.002 and 0.21, respectively.

Table IV and **V** provides Pearson and Spearman pair-wise correlations between the study variables. Consistent with our prediction, the correlation results reveal that *ARL* is negatively associated with all measures of audit firm industry specialization. The

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>ARL (1)</i>	1.00	-0.05***	-0.07***	-0.06***	-0.05***	-0.07***	-0.06***	0.08***	-0.08***	-0.17***	0.03**
<i>CLLeader1 (2)</i>	-0.08***	0.10***	0.10***	0.22***	0.75***	0.14***	0.29***	-0.12***	0.11***	0.07***	0.00
<i>NLLLeader1 (3)</i>	-0.12***	0.10***	0.22***	0.92***	0.11***	0.62***	0.50***	-0.06***	0.10***	0.08***	0.06***
<i>CLNLLLeader1 (4)</i>	-0.12***	0.22***	0.92***	0.16***	0.16***	0.57***	0.57***	-0.06***	0.10***	0.08***	0.05***
<i>CLLeader2 (5)</i>	-0.09***	0.75***	0.11***	0.16***	0.14***	0.14***	0.22***	-0.12***	0.12***	0.07***	0.03**
<i>NLLLeader2 (6)</i>	-0.12***	0.14***	0.62***	0.57***	0.14***	0.76***	0.76***	-0.08***	0.13***	0.07***	0.04***
<i>CLNLLLeader2 (7)</i>	-0.11***	0.29***	0.50***	0.57***	0.22***	0.76***	0.76***	-0.09***	0.13***	0.08***	0.00
<i>STEN (8)</i>	0.14***	-0.12***	-0.06***	-0.06***	-0.12***	-0.08***	-0.09***	-0.38***	-0.38***	-0.06***	0.04***
<i>LLEN9 (9)</i>	-0.21***	0.11***	0.10***	0.10***	0.12***	0.13***	0.13***	-0.38***	0.10***	0.10***	-0.07***
<i>ROA (10)</i>	-0.31***	0.07***	0.02*	0.02**	0.06***	0.04***	0.06***	-0.08***	0.12***	0.10***	-0.14***
<i>LEVERAGE (11)</i>	-0.03**	0.01	0.08***	0.07***	0.04***	0.06***	0.03**	0.02*	-0.05***	-0.19***	-0.01
<i>SEGNUM (12)</i>	-0.08***	0.07***	0.05***	0.06***	0.07***	0.03***	0.04***	-0.03***	0.08***	0.05***	0.08***
<i>LOSS (13)</i>	0.30***	-0.07***	-0.08**	-0.08***	-0.08***	-0.06***	-0.08***	0.07***	-0.12***	-0.81***	0.10***
<i>GC (14)</i>	0.19***	-0.04***	-0.04***	-0.05***	-0.05***	-0.05***	-0.06***	0.01	-0.03**	-0.22***	0.08***
<i>YEND (15)</i>	0.02*	-0.06***	0.01	0.00	-0.04***	-0.03**	-0.07***	0.02	-0.05	-0.10***	0.15***
<i>BIG4 (16)</i>	-0.29***	0.13***	0.17***	0.16***	0.18***	0.28***	0.21***	-0.17***	0.27***	0.10***	0.08***
<i>SIZE (17)</i>	-0.55***	0.09***	0.21***	0.21***	0.13***	0.19***	0.15***	-0.13***	0.23***	0.20***	0.26***
<i>MWIC (18)</i>	0.19***	-0.03**	-0.02	-0.02*	-0.02	-0.04***	-0.04***	0.10***	-0.06***	-0.12***	0.00
<i>RESTATE (19)</i>	0.11***	-0.01	-0.01	-0.01	0.00	-0.02*	-0.02	0.06***	-0.03***	-0.07***	0.00
<i>AFEE (20)</i>	0.45***	-0.05***	-0.21***	-0.19***	-0.07***	-0.14***	-0.10***	0.10***	-0.16***	-0.18***	-0.29***
<i>NASRatio (21)</i>	-0.14***	0.04***	0.03**	0.03***	0.03***	0.05***	0.05***	-0.08***	0.11***	0.11***	0.04***
<i>AUDCHG (22)</i>	0.12***	-0.12***	-0.02**	-0.03**	-0.10***	-0.04***	-0.06***	0.35***	-0.14***	-0.08***	0.00

Notes: ***, **, * Significant at 0.01, 0.05 and 0.10 levels, respectively; Pearson correlations are above the diagonal and Spearman correlations are below the diagonal; Variables are defined in Tables II and III

Table IV.
Correlation matrix
(N = 7,291): correlation
matrix for variables from
ARL to *LEVERAGE*

Table V.
Correlation matrix
($N = 7,291$): correlation
table for variables from
SEGNUM to AUDCHG

	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
<i>ARL (1)</i>	-0.04***	0.17***	0.16***	-0.01	-0.13***	-0.24***	0.26***	0.11***	0.25***	-0.05***	0.07***
<i>CLLeader1 (2)</i>	0.08***	-0.07***	-0.04***	-0.06***	0.13***	0.10***	-0.03***	-0.01	-0.06***	0.02	-0.12***
<i>NLLLeader1 (3)</i>	0.06***	-0.08***	-0.04***	0.01	0.17***	0.21***	-0.02	-0.01	-0.15***	0.03**	-0.02**
<i>CLNLLLeader1 (4)</i>	0.07***	-0.08***	-0.05***	0.00	0.16***	0.21***	-0.02*	-0.01	-0.14***	0.03**	-0.03**
<i>CLLeader2 (5)</i>	0.07***	-0.08***	-0.05***	-0.04***	0.18***	0.13	-0.02	0.00	-0.08***	0.002	-0.10***
<i>NLLLeader2 (6)</i>	0.04***	-0.06***	-0.05***	-0.03***	0.28***	0.20***	-0.04***	-0.02*	-0.11***	0.02	-0.04***
<i>CLNLLLeader2 (7)</i>	0.04***	-0.08***	-0.06***	-0.07***	0.21***	0.14***	-0.04***	-0.02	-0.10***	0.02	-0.06***
<i>STEN (8)</i>	-0.04***	0.07***	0.01	0.02	-0.17***	-0.13***	0.10***	0.06**	0.10***	-0.04***	0.35***
<i>LLEN9 (9)</i>	0.09***	-0.12***	-0.03***	-0.05***	0.27***	0.22***	-0.06***	-0.03***	-0.11***	0.07***	-0.14***
<i>ROA (10)</i>	0.10***	-0.61***	-0.35***	-0.05***	0.13***	0.36***	-0.10***	-0.04***	-0.52***	0.07***	-0.07***
<i>LEVERAGE (11)</i>	-0.03***	0.14***	0.13***	0.15***	0.05***	0.17***	0.01	0.01	-0.13***	0.06***	0.01
<i>SEGNUM (12)</i>	-0.09***	-0.10***	-0.04***	0.01	0.09***	0.26***	0.00	-0.01	-0.14***	0.04***	-0.03**
<i>LOSS (13)</i>	-0.04***	0.21***	0.21***	0.05***	-0.10***	-0.28***	0.11***	0.06***	0.32***	-0.07***	0.06***
<i>GC (14)</i>	0.01	0.05***	0.04***	0.04***	0.01	-0.17***	0.14***	0.02	0.27	-0.03***	0.05***
<i>YEND (15)</i>	0.07***	-0.10***	-0.10***	0.01	0.38***	0.07***	-0.06***	-0.01	-0.06***	-0.01	0.00
<i>BIG4 (16)</i>	0.20***	-0.27***	-0.15***	0.08***	0.38***	-0.10***	-0.10***	-0.03***	-0.21***	0.09***	-0.11***
<i>SIZE (17)</i>	0.00	0.11***	0.14***	-0.06***	-0.10***	-0.10***	-0.09***	-0.07***	-0.67***	0.13***	-0.10***
<i>MWIC (18)</i>	0.00	0.06***	0.02	-0.01	-0.03**	-0.07***	0.18***	0.17***	0.07***	-0.02	0.11***
<i>RESTATE (19)</i>	-0.10***	0.27***	0.14***	-0.12***	-0.22***	-0.84***	0.13***	0.08**	0.07***	-0.01	0.07***
<i>AFFE (20)</i>	0.06***	-0.09***	-0.05***	-0.008	0.15***	0.20***	-0.04***	-0.02	-0.18***	-0.13***	0.06***
<i>NASRatio (21)</i>	-0.02*	0.06***	0.05***	0.00	-0.11***	-0.10***	0.11***	0.07***	0.06***	-0.05***	-0.03**
<i>AUDCHG (22)</i>											

Notes: ***, **, * Significant at 0.01, 0.05 and 0.10 levels, respectively; Pearson correlations are above the diagonal and Spearman correlations are below the diagonal; Variables are defined in Tables II and III

bivariate correlations also show a positive association between ARL and short audit firm tenure and a negative relation between ARL and long audit firm tenure. The results suggest that long audit firm tenure and auditor industry specialization are related to shorter ARL. Moreover, we find that ARL is negatively related to *ROA*, the number of business segments, Big 4 auditor, *SIZE* and *NASRatio* and positively related to the remaining variables. The correlation matrix shows high correlations between *NLLeader1* and *CLNLLLeader1* (correlation coefficient = 0.92), between *CLLeader1* and *CLLeader2* (correlation coefficient = 0.75), between *NLLeader1* and *NLLeader2* (correlation coefficient = 0.62), between *CLNLLLeader1* and *NLLeader2* (correlation coefficient = 0.57), between *NLLeader1* and *CLNLLLeader2* (correlation coefficient = 0.50) and between *CLNLLLeader1* and *CLNLLLeader2* (correlation coefficient = 0.57). These high pair-wise correlations indicate that the two measurement methods of audit firm industry specialization are closely related. However, these results should be interpreted with caution because these do not control for other determinants of ARL[3].

4.2 Multiple regression results

The multiple regression results are reported in Table VI, in which it shows the results for regression models using the first measurement method and Table VII presents the results for regression models using the second measurement method of audit firm industry specialization for city level, and national level and both city and national level. With the full sample, we examine whether audit firm tenure is associated with ARL and whether this relation is influenced by auditor industry specialization. To avoid multicollinearity problem, we examine each level of audit firm industry specialization separately. The results show that variance inflation factor (VIF) scores of all variables used in all models are < 10 , which suggests that there is no multicollinearity problem in our models. As shown in Tables VI and VII, all of the six models are significant (F -statistics = 39.18, 39.42, 39.36, 39.32, 39.33 and 39.21 for Models I, II, III, IV, V and VI, respectively; $p < 0.001$) and the variables used in these analyses explain about 13.79, 14.04, 14.02, 14.01, 14.01 and 13.98 per cent of the cross-sectional variations in firms' ARLs in the Models I, II, III, IV, V, and VI, respectively.

In terms of our test variables, the coefficients on short audit tenure, *STEN*, are positive and marginally significant in Models II (coefficient = 1.537, $p = 0.054$), III (coefficient = 1.606, $p = 0.045$), IV (coefficient = 4.208, $p = 0.011$) and V (coefficient = 1.802, $p = 0.078$). We do not find significant results for the coefficients on long auditor tenure (*LTEN9*) and *ARL*. The results suggest that ARL is longer when audit firm tenure is short. The results support *H1* and are consistent with the reasoning that it takes longer for short-tenured auditors to issue audit report due to the extra time spent on familiarizing themselves to clients' operations (Habib and Bhuiyan, 2011). Four out of six models in Tables VI and VII also show that the coefficients on the interaction terms between short audit tenure and audit firm industry specialization at city level, national level and both city and national level are negative and significant. Specifically, we find negative and significant relations between *ARL* and *NLLeader1_STEN* (coefficient = -5.556 , $p = 0.014$), between *ARL* and *CLNLLLeader1_STEN* (coefficient = -6.908 , $p = 0.013$), between *ARL* and *CLLeader2_STEN* (coefficient = -4.123 , $p = 0.022$) and between *ARL* and *NLLeader2_STEN* (coefficient = -3.595 , $p = 0.082$). The results indicate that city-level, national-level and joint city- and national-level audit firm

Table VI.
Regression results—full
sample: *CLLeader1*,
NLLLeader1 and
CLNLLLeader1 are
industry specialization
measures

$$\begin{aligned}
 ARL = & \alpha_0 + \alpha_1 * STEN + \alpha_2 * LTEN9 + \alpha_3 * SPEC + \alpha_4 * SPEC * STEN + \alpha_5 * SPEC * LTEN9 + \alpha_6 * ROA + \alpha_7 * LEVERAGE + \alpha_8 * SEGNUM \\
 & + \alpha_9 * LOSS + \alpha_{10} * GC + \alpha_{11} * YEND + \alpha_{12} * BIG4 + \alpha_{13} * SIZE + \alpha_{14} * MWIC + \alpha_{15} * RESTATE + \alpha_{16} * AFEE \\
 & + \alpha_{17} * AUDCHG + \alpha_{18} * IndustryDummies + \alpha_{19} * YearDummies + \epsilon
 \end{aligned}$$

Variable	Model I: <i>CL Leader1</i>		Model II: <i>NL Leader1</i>		Model III: <i>CLNLL Leader1</i>	
	Coefficient	<i>p</i>	Coefficient	<i>p</i>	Coefficient	<i>p</i>
<i>Intercept</i>	96.196	< 0.0001	95.931	< 0.0001	96.292	< .0001
<i>STEN</i>	1.730	0.129	1.537	0.054	1.606	0.045
<i>LTEN9</i>	0.538	0.329	-0.037	0.478	0.005	0.497
<i>CLLeader1</i>	0.247	0.403				
<i>CLLeader1_STEN</i>	-1.080	0.278				
<i>CLLeader1_LTEN9</i>	-0.837	0.270				
<i>NLLLeader1</i>			-0.663	0.157		
<i>NLLLeader1_STEN</i>			-5.556	0.014		
<i>NLLLeader1_LTEN9</i>			-0.526	0.187		
<i>CLNLLLeader1</i>					0.727	0.310
<i>CLNLLLeader1_STEN</i>					-6.908	0.013
<i>CLNLLLeader1_LTEN9</i>					-1.164	0.253
<i>ROA</i>	4.389	0.010	4.456	0.009	4.438	0.010
<i>LEVERAGE</i>	4.915	< 0.0001	4.904	< 0.0001	4.901	< .0001
<i>SEGNUM</i>	0.355	0.010	0.357	0.010	0.363	0.009
<i>LOSS</i>	3.882	< 0.0001	3.886	< 0.0001	3.888	< .0001
<i>GC</i>	10.592	< 0.0001	10.640	< 0.0001	10.631	< .0001
<i>YEND</i>	0.629	0.169	0.615	0.175	0.624	0.171
<i>BIG4</i>	-1.539	0.033	-1.291	0.063	-1.420	0.045
<i>SIZE</i>	-1.999	< 0.0001	-1.979	< 0.0001	-2.001	< .0001
<i>MWIC</i>	28.384	< 0.0001	28.426	< 0.0001	28.359	< .0001
<i>RESTATE</i>	5.057	< 0.0001	5.006	< 0.0001	5.003	< .0001
<i>AFEE</i>	801.774	< 0.0001	808.231	< 0.0001	801.208	< .0001

(continued)

Variable	Model I: <i>CL Leader1</i>		Model II: <i>NL Leader1</i>		Model III: <i>CLNL Leader1</i>	
	Coefficient	<i>p</i>	Coefficient	<i>p</i>	Coefficient	<i>p</i>
<i>NASRatio</i>	-0.911	0.189	-0.905	0.190	-0.932	0.183
<i>AUDCHG</i>	1.856	0.101	1.947	0.089	1.876	0.097
<i>Industry Dummies</i>		Controlled		Controlled		Controlled
<i>Year Dummies</i>		Controlled		Controlled		Controlled
Adjusted R ²		13.79 per cent		14.04 per cent		14.02 per cent
F-statistic		39.18		39.42		39.36
<i>p</i>		< 0.001		< 0.001		< .001
N		7,291		7,291		7,291

Notes: The *p*-values are one-tailed. Variables are defined as follows: Dependent variable is *ARL* which is the number of calendar days from fiscal year-end to the date of the auditor's report; *SPEC* = auditor industry specialization measures; *CLLeader1*, *NLLeader1*, *CLNLLeader1* are city-level, national-level and joint city- and national-level audit firm industry specializations using the first audit firm specialization measure of Habib and Bhuiyan (2011); *CLLeader2*, *NLLeader2*, *CLNLLeader2* are city-level, national-level and joint city- and national-level audit firm industry specialization using the second audit firm industry specialization measure of Habib and Bhuiyan (2011); *AudTenure* = the length of the auditor-client relationship (in years); *STEN* = 1 if the length of the auditor-client relationship is three years or less and 0 otherwise; *LTEN9* = 1 if the length of the auditor-client relationship is nine years or longer and 0 otherwise; *ROA* = net earnings divided by total asset; *LEVERAGE* = total debt divided by total assets; *SEGNUM* = number of reportable segments of a client; *LOSS* = 1 if a firm reports negative earnings and 0 otherwise; *GC* = 1 if the firm received a going concern opinion and 0 otherwise; *YEND* = 1 if a firm's fiscal year ends in December and 0 otherwise; *BIG4* = 1 if an auditor is one of the Big 4 accounting firms and 0 otherwise; *SIZE* = natural log of total assets; *MWIC* = 1 if a firm has material weakness in internal control and 0 otherwise; *RESTATE* = 1 if the client restated its financial reports in the current year and 0 otherwise; *AFEE* = total audit fees divided by total assets; *NASRatio* = ratio of nonaudit fees to audit fees; *AUDCHG* = 1 if the client firm changed auditor during the current year and 0 otherwise; *IndustryDummies* = industry dummies; and *YearDummies* = year dummies

Table VI.

Table VII.
Regression results—full
sample: *CLLeader2*,
NLLLeader2 and
CLNLLLeader2 are
industry specialization
measures

$$\begin{aligned}
 ARL = & \alpha_0 + \alpha_1 * STEN + \alpha_2 * L TEN9 + \alpha_3 * SPEC + \alpha_4 * SPEC * STEN + \alpha_5 * SPEC * L TEN9 + \alpha_6 * ROA + \alpha_7 * LEVERAGE + \alpha_8 * SEGNUM \\
 & + \alpha_9 * LOSS + \alpha_{10} * GC + \alpha_{11} * YEND + \alpha_{12} * BIG4 + \alpha_{13} * SIZE + \alpha_{14} * MWIC + \alpha_{15} * RESTATE + \alpha_{16} * AFEE \\
 & + \alpha_{17} * AUDCHG + \alpha_{18} * IndustryDummies + \alpha_{19} * YearDummies + \epsilon
 \end{aligned}$$

Variable	Model IV: <i>CL Leader2</i>			Model V: <i>NL Leader2</i>			Model VI: <i>CLNL Leader2</i>		
	Coefficient	<i>p</i> -value	VIF	Coefficient	<i>p</i> -value	VIF	Coefficient	<i>p</i> -value	VIF
<i>Intercept</i>	95.142	< 0.0001	0.000	95.870	< 0.0001	0.000	96.257	< .0001	0.000
<i>STEN</i>	4.208	0.011	5.348	1.802	0.078	1.668	1.073	0.270	1.504
<i>L TEN9</i>	1.687	0.138	8.755	0.087	0.904	1.906	0.257	0.703	1.660
<i>CLLeader2</i>	1.356	0.125	2.603						
<i>CLLeader2_STEN</i>	-4.123	0.022	5.122						
<i>CLLeader2_L TEN9</i>	-2.103	0.102	9.895						
<i>NLLLeader2</i>				0.005	0.996	3.296			
<i>NLLLeader2_STEN</i>				-3.595	0.082	1.606			
<i>NLLLeader2_L TEN9</i>				-0.717	0.569	3.551			
<i>CLNLLLeader2</i>							0.886	0.451	3.341
<i>CLNLLLeader2_STEN</i>							-0.160	0.952	1.367
<i>CLNLLLeader2_L TEN9</i>							-1.668	0.242	3.418
<i>ROA</i>	4.341	0.011	2.161	4.515	0.017	2.161	4.381	0.021	2.160
<i>LEVERAGE</i>	4.890	< 0.0001	1.224	4.907	< 0.0001	1.223	4.940	< 0.0001	1.224
<i>SEGNUM</i>	0.350	0.011	1.122	0.354	0.020	1.122	0.345	0.024	1.123
<i>LOSS</i>	3.875	< 0.0001	1.694	3.902	< 0.0001	1.693	3.893	< 0.0001	1.693
<i>GC</i>	10.541	< 0.0001	1.195	10.595	< 0.0001	1.195	10.573	< 0.0001	1.195
<i>YEND</i>	0.621	0.173	1.174	0.634	0.335	1.174	0.612	0.353	1.177
<i>BIG4</i>	-1.625	0.026	1.290	-1.257	0.145	1.365	-1.632	0.054	1.316
<i>SIZE</i>	-1.989	< 0.0001	2.315	-1.985	< 0.0001	2.327	-1.996	< 0.0001	2.312
<i>MWIC</i>	28.374	< 0.0001	1.103	28.388	< 0.0001	1.103	28.417	< 0.0001	1.103
<i>RESTATE</i>	5.045	< 0.0001	1.045	5.008	< 0.0001	1.046	5.038	< 0.0001	1.046

(continued)

Variable	Model IV: <i>CLLeader2</i>		Model V: <i>NLLeader2</i>		Model VI: <i>CLNLLeader2</i>	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
<i>AFEE</i>	811.161	< 0.0001	804.609	< 0.0001	799.282	< 0.0001
<i>NASRatio</i>	-0.875	0.199	-0.958	0.353	-0.934	0.365
<i>AUDCHG</i>	1.758	0.113	1.959	0.175	1.967	0.174
<i>YEAR08</i>		Controlled		Controlled		Controlled
<i>YEAR09</i>		Controlled		Controlled		Controlled
Adjusted R ²		14.01 per cent		14.01 per cent		13.98 per cent
F statistic		39.32		39.33		39.21
<i>p</i>		< 0.0001		< 0.0001		< 0.0001
<i>N</i>		7,291		7,291		7,291

Notes: The *p*-values are one-tailed. Variables are defined as follows: Dependent variable is *ARL* which is the number of calendar days from fiscal year-end to the date of the auditor's report; *SPEC* = auditor industry specialization measures; *CLLeader1*, *NLLeader1*, *CLNLLeader1* are city-level, national-level and joint city- and national-level audit firm industry specializations using the first audit firm specialization measure of Habib and Bhuiyan (2011); *CLLeader2*, *NLLeader2*, *CLNLLeader2* are city-level, national-level and joint city- and national-level audit firm industry specialization using the second audit firm industry specialization measure of Habib and Bhuiyan (2011); *AudTenure* = the length of the auditor-client relationship (in years); *STEN* = 1 if the length of the auditor-client relationship is three years or less and 0 otherwise; *LTEN9* = 1 if the length of the auditor-client relationship is nine years or longer and 0 otherwise; *ROA* = net earnings divided by total asset; *LEVERAGE* = total debt divided by total assets; *SEGNUM* = number of reportable segments of a client; *LOSS* = 1 if a firm reports negative earnings and 0 otherwise; *GC* = 1 if the firm received a going concern opinion and 0 otherwise; *YEND* = 1 if a firm's fiscal year ends in December and 0 otherwise; *BIG4* = 1 if an auditor is one of the Big 4 accounting firms and 0 otherwise; *SIZE* = natural log of total assets; *MWIC* = 1 if a firm has material weakness in internal control and 0 otherwise; *RESTATE* = 1 if the client restated its financial reports in the current year and 0 otherwise; *AFEE* = total audit fees divided by total assets; *NASRatio* = ratio of nonaudit fees to audit fees; *AUDCHG* = 1 if the client firm changed auditor during the current year and 0 otherwise; *IndustryDummies* = industry dummies; and *YearDummies* = year dummies

Table VII.

industry specializations moderate the positive association between ARL and short audit tenure, thus supporting *H2*.

Most of the control variables in all six models of [Tables VI and VII](#) are significant in the expected direction ($p < 0.10$). Specifically, we find that firms with high *ROA* and high leverage (*LEVERAGE*) are more likely to have longer ARL. A more complicated operation (greater *SEGNUM*) is found to be associated with longer ARL. We also find a positive relation between *LOSS* and *ARL*, indicating that it will take longer to issue audited financial statements when a firm has negative earnings. Moreover, audit report delay appears to be longer when a firm receives *GC*, has *MWIC*, restates their financial statements, pays high audit fees and changes their auditors during the fiscal year.

4.3 Additional analyses and sensitivity tests

4.3.1 *Self-selection bias*. Self-selection problem may arise because “clients self-select their auditors” ([Chaney et al., 2004](#); [Habib and Bhuiyan, 2011](#)). This fact results in bias in the results of ordinary least squares (OLS) regression models. To control for self-selection bias, we follow [Heckman’s \(1979\)](#) and [Chaney et al.’s \(2004\)](#) method that uses two-stage least-squares regression (2SLS). In the first stage, we obtain estimates from a probit regression model of *SPEC* to compute the inverse Mills ratios. We construct the following first stage model:

$$SPEC = \beta_0 + \beta_1 * SIZE + \beta_2 * Aturn + \beta_3 * DA + \beta_4 * Curr + \beta_5 * Quick + \beta_6 * ROA + \beta_7 * ROA * LOSS + \beta_8 * Export + \varepsilon$$

Where,

- Aturn* = asset turnover, calculated as sales divided by total assets;
- DA* = long-term debt divided by total assets;
- Curr* = current assets divided by total assets;
- Quick* = current assets minus inventory divided by current liabilities;
- Export* = foreign sales divided by total sales.

The remaining variables (*SPEC*, *SIZE* and *ROA*) are as defined earlier.

In the second stage, the inverse Mills ratios are then added to the primary OLS regression models. The untabulated results show consistent results with our reported findings. We find that a positive association between short audit firm tenure and ARL, and this association is moderated by city-, national- and joint city- and national-level audit industry specialization. The sign and significance of the remaining variables in the second-stage regression models attain the similar level of statistical significance as those in our primary models. The explanatory power of the second-stage regression models, however, is higher than that of the primary OLS regression models (adjusted R^2 s = 15.03, 24.49 and 21.70 per cent for the models using the first measure of city-level, national-level and both city- and national-level industry specialization, respectively; and adjusted R^2 s = 16.15 per cent; 16.54 per cent and 29.82 per cent for the models using the second measure of city-level, national-level and both city- and national-level industry specialization, respectively).

4.3.2 *Replacement of ROA and LEVERAGE with Z-score*. In our primary regression model, we use *ROA* and *LEVERAGE* to proxy for firms’ financial condition. We test the sensitivity of our results to the replacement of *ROA* and *LEVERAGE* with another

measure of financial condition (*Z-score*) that is the [Zmijewski's \(1984\)](#) financial condition index. Our test variables are still significant in the new regression model. Also, the results for control variables are similar to the reported results.

4.3.3 Clients of Big 4 auditors. According to [Gul et al. \(2009\)](#), industry auditor specialists are normally among big accounting firms. Hence, as a sensitivity test, we run the regression model (including all variables except for *Big4* variable) for the sample of only Big 4 clients. The untabulated results are similar to those in [Tables VI and VII](#) and [VIII](#).

4.3.4 Industry effect. Prior research shows that audit delay may be different across industries. [Ettredge et al. \(2006\)](#), for example, find some evidence that financial companies have longer ARL due to the complexity of financial instruments. To address this issue, we eliminate firms in financial industries and re-estimate the regression model for the new sample. We find consistent results with the results in the primary regression models.

4.3.5 Alternative measure of ARL. In the primary models, we use ARL, which is the number of calendar days from fiscal year-end to the date of the auditor's report. As one of the sensitivity tests, we replace ARL with the alternative measure of ARL (abnormal ARL). Consistent with [Habib and Bhuiyan \(2011\)](#), abnormal ARL refers to the difference between a firm's current ARL and the client's median ARL. The untabulated results show similar results to the reported results.

5. Discussion and conclusion

In this paper, we reexamine whether audit firm tenure has any effect on ARL and whether auditor industry specialization influences this relationship. The paper is motivated by the recent concern regarding the impact of ARL on the timeliness of financial information, the debate on audit firm rotation and the increasing demand for high quality auditors. We posit that audit firm tenure is negatively associated with ARL. We also conjecture that auditor industry specialization moderates the relationship between audit firm tenure and ARL.

Using the sample of 7,291 firm-year observations from 2008 to 2010, we find some evidence that short audit firm tenure is related to longer ARL. We, however, do not find any evidence on the association between long audit firm tenure and ARL. The result suggests that short audit firm tenure is associated with longer ARL. The findings confirm prior research's results ([Lee et al., 2009](#)) and are consistent with our expectation that auditors need more time to understand clients and the industry during the first few years of audit engagement, resulting in longer ARL.

There has been a high demand for high-quality external auditors, especially after the accounting scandals in early 2002. Therefore, we investigate the impact of auditor industry specialization on the association between audit firm tenure and ARL. We find auditor industry specialization at city level, national level and joint city and national level weakens the association between short audit firm tenure and ARL. The results indicate that industry-specialized auditors (regardless of city-level, national-level and joint city- and national-level industry specialization), with their knowledge of client industries, are able to reduce the negative effect of the auditors' lack of knowledge about client operations; thus, ARL during the first few years of audit engagement is shorter for industry-specialized auditors.

In the second part of our paper, we divide the full sample into a group of firms with short tenured auditors and a group of firms with long-tenured auditors. We find that in both groups, ARL is shorter for firms being audited by national level industry specialists. We also find that firms being audited by short-tenured city-level industry-specialized auditors have shorter ARL.

Our paper is subject to a number of limitations: First, because our study is conducted for three years, we are unable to examine the changes in ARL for short- and long-tenured auditors for the same firms. Future research may address this through testing the change in ARL from the initial engagements till when auditors are with the firms for a long enough period. Second, we use [Habib and Bhuiyan's \(2011\)](#) method to obtain auditor industry specialization because it is difficult to observe auditors' actual industry specialization. Like other measures of auditor industry specialization, the measure of industry specialization used in this study may not be able to reflect the actual industry specialization.

Notes

1. In [Lee et al.'s \(2009\)](#) study, "non-audit services" refers to consulting services provided by the auditor to its clients. The study, particularly, focuses on analyzing the provision of tax services by auditors. Sarbanes-Oxley Act (SOX) prohibits certain types of audit services such as "bookkeeping or other services related to the accounting records or financial statements of the audit client", "financial information systems design and implementation", "appraisal or valuation services, fairness opinions, or contribution-in-kind reports", "actuarial services", "internal audit outsourcing services", "management functions or human resources", "broker or dealer, investment advisor or investment banking services", "legal services and expert services unrelated to the audit"; and any other services that the Board determines, by regulation, is impermissible"; however, other types of non-audit services including tax services need to have preapproval before engagement. [Lee et al. \(2009\)](#) find that the allowance of certain types of non-audit services such as tax services is beneficial to firms, for example, ARL is shorter in firms having the auditors providing tax services. Other studies ([Ashbaugh et al., 2003](#)) document that the provision of consulting services does not adversely affect audit quality.
2. All continuous variables are winsorized at the 1 percentile.
3. In the multiple regression models, we separately examine city, national and joint city and national audit firm specialization to avoid multicollinearity problems that may occur. We also include VIF scores for each of the study variables in the regression results to check for multicollinearity problems.

References

- Ashbaugh, H., LaFond, R. and Mayhew, B. (2003), "Do nonaudit services compromise auditor independence? further evidence", *The Accounting Review*, Vol. 78 No. 3, pp. 611-639.
- Ashton, R.H., Graul, P.R. and Newton, J.D. (1989), "Audit delay and the timeliness of corporate reporting", *Contemporary Accounting Research*, Vol. 5 No. 2, pp. 657-673.
- Ashton, R.H., Willingham, J.J. and Elliott, R.K. (1987), "An empirical analysis of audit delay", *Journal of Accounting Research*, Vol. 25 No. 2, pp. 275-292.
- Balsam, S., Krishnan, J. and Yang, J.S. (2003), "Auditor industry specialization and earnings quality", *Auditing: A Journal of Practice and Theory*, Vol. 22 No. 2, pp. 71-97.

-
- Bamber, E.M., Bamber, L.S. and Schoderbek, M.P. (1993), "Audit structure and other determinants of audit report lag: an empirical analysis", *Auditing: A Journal of Practice and Theory*, Vol. 12 No. 1, pp. 1-23.
- Behn, B.K., Searcy, D.L. and Woodroof, J.B. (2006), "A within firm analysis of current and expected future audit lag determinants", *Journal of Information Systems*, Vol. 20 No. 1, pp. 65-86.
- Carcello, J.V. and Nagy, A.L. (2004), "Audit firm tenure and fraudulent financial reporting", *Auditing: A Journal of Practice and Theory*, Vol. 23 No. 2, pp. 55-69.
- Chambers, A.E. and Penman, S.H. (1984), "Timeliness of reporting and the stock price reaction to earnings announcements", *Journal of Accounting Research*, Vol. 22 No. 1, pp. 21-47.
- Chaney, P.K., Jeter, D.C. and Shivakumar, L. (2004), "Self-selection of auditors and audit pricing in private firms", *The Accounting Review*, Vol. 79 No. 1, pp. 51-72.
- Dunn, K.A. and Mayhew, B.W. (2004), "Audit firm industry specialization and client disclosure quality", *Review of Accounting Studies*, Vol. 9 No. 1, pp. 35-58.
- Ettredge, M.L., Li, C. and Sun, L. (2006), "The impact of SOX section 404 internal control quality assessment on audit delay in the SOX Era", *Auditing: A Journal of Practice and Theory*, Vol. 25 No. 2, pp. 1-23.
- General Accounting Office (GAO) (2003), *Public Accounting Firms: Required Study on the Potential Effects of Mandatory Audit Firm Rotation*. Report to the Senate Committee on Banking, Housing and Urban Affairs and the House Committee on Financial Services, Washington, DC.
- General Accounting Office (GAO) (2011), *Concept Release on Auditor Independence and Audit Firm Rotation*. PCAOB Release No. 2011-006.
- Givoly, D. and Palmon, D. (1982), "Timeliness of annual earnings announcements: some empirical evidence", *The Accounting Review*, Vol 57 No. 3, pp. 486-508.
- Green, W. (2008), "Are industry specialists more efficient and effective in performing analytical procedures? A multi-stage analysis", *International Journal of Auditing*, Vol. 12 No. 3, pp. 243-260.
- Gul, F.A., Fung, S.Y.K. and Jaggi, B. (2009), "Earnings quality: some evidence on the role of auditor tenure and auditors' industry expertise", *Journal of Accounting and Economics*, Vol 47 No. 3, pp. 265-287.
- Habib, A. and Bhuiyan, M.B.U. (2011), "Audit firm industry specialization and the audit report lag", *Journal of International Accounting, Auditing and Taxation*, Vol 20 No. 1, pp. 32-44.
- Heckman, J. (1979), "Sample selection bias as a specification error", *Econometrica*, Vol 47 No. 1, pp. 153-161.
- Knechel, W.R. and Payne, J.L. (2001), "Additional evidence on audit report lag", *Auditing*, Vol 20 No. 1, pp. 137-146.
- Kwon, S.Y., Lim, C.Y. and Tan, P.M.-S. (2007), "Legal systems and earnings quality: the role of auditor industry specialization", *Auditing: A Journal of Practice and Theory*, Vol. 26 No. 2, pp. 25-55.
- Lai, K.-W. and Cheuk, L.M.C. (2005), "Audit report lag, audit partner rotation and audit firm rotation: evidence from Australia", Working paper, Hong Kong Polytechnic University, Hung Hom, Hong Kong.
- Lee, H.-Y., Mande, V. and Son, M. (2009), "Do lengthy auditor tenure and the provision of non-audit services by the external auditor reduce audit report lags?", *International Journal of Auditing*, Vol. 13 No. 2, pp. 87-104.

-
- Lim, C.-Y. and Tan, H.-T. (2010), "Does auditor tenure improve audit quality? Moderating effects of industry specialization and fee dependence", *Contemporary Accounting Research*, Vol. 27 No. 3, pp. 923-957.
- Owhoso, V.E., Messier, W.F. and Lynch, J.G. (2002), "Error detection by industry-specialized teams during sequential audit review", *Journal of Accounting Research*, Vol. 40 No. 3, pp. 883-900.
- Public Company Accounting Oversight Board (PCAOB) (2011), *Concept Release on Auditor Independence and Audit Firm Rotation*. PCAOB, Washington, DC, No. 2011-3006.
- Zmijewski, M. (1984), "Methodological issues related to the estimation of financial distress prediction models", *Journal of Accounting Research*, Vol. 22 Supplement, pp. 59-82.

Further reading

- Chen, C.-Y., Lin, C.-J. and Lin, Y.-C. (2008), "Audit partner tenure, audit firm tenure and discretionary accruals: does long auditor tenure impair earnings quality?", *Contemporary Accounting Research*, Vol. 25 No. 2, pp. 415-445.
- Knechel, W.R., Naiker, V. and Pacheco, G. (2007), "Does auditor industry specialization matter? Evidence from market reaction to auditor switches", *Auditing: A Journal of Practice and Theory*, Vol. 26 No. 1, pp. 19-45.
- Reichelt, K.J. and Wang, D. (2010), "National and office-specific measures of auditor industry expertise and effects on audit quality", *Journal of Accounting Research*, Vol. 48 No. 3, pp. 647-686.

About the authors

Mai Dao is an Assistant Professor of Accounting at the University of Toledo, USA. She earned a PhD in Accounting from Florida International University, USA. She holds a Master's of Science in Accounting from Maastricht University, The Netherlands. She got a bachelor's of commerce degree in Accounting from Flinders University, Australia. She has publications in following journals: *The Accounting Review*, *European Accounting Review*, *Accounting Horizons* and *Management Decision*. Her research interests are in earnings quality, audit quality and corporate governance. Mai Dao is the corresponding author and can be contacted at: mai.dao@utoledo.edu

Trung Pham received his BA in International Relations from Ankara University, Turkey, and his MA degrees from the International University of Japan, Japan and the American University, USA. Alongside his academic life, he worked for the Foreign Ministry of Foreign Affairs of Vietnam between 2007 and 2009. He has published a book *U.S. – Vietnam Security Relations since Normalization: 1995 – 2008* (Saarbrücken, Germany: VDM Verlag Dr Muller, 2011) and various articles in the field of international affairs on www.VietnamNet.vn. Trung Pham attended the University of Toledo, USA, from 2010 to 2013 with a concentration in accounting. He is currently a student in the MAcc (Master's of Accounting) program at the Michigan State University, USA.