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Auditor tenure and audit quality

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AUDITOR TENURE AND AUDIT QUALITY

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DEDICATION

I dedicate this dissertation to five persons who have influenced my life the most. First, I dedicate it to my parents who taught me never to give up. Second, I dedicate this to my wonderful husband who supported me throughout the doctoral program. I would have never made it through without him. Lastly, I dedicate this to my lovely son and daughter whose understanding and support gave me strength to get through the PhD program.

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ABSTRACT

I propose that audit quality is likely to increase with audit firm tenure due to a *Learning Effect* and decrease with audit firm tenure due to a *Bonding Effect*. The net impact of these two countervailing forces over audit firm tenure dictates whether the relationship between audit firm tenure and audit quality is a concave, convex, or linear function of audit firm tenure. When the *Bonding Effect* dominates the *Learning Effect* in the later (earlier) years of tenure, then audit quality is a concave (convex) function of audit firm tenure. Adopting the quadratic model to empirically estimate the audit firm tenure year when audit quality is likely to decline, I first find that the average point when audit quality optimizes is 12 years for a large sample of U.S. firms. Then I investigate how this turning point of audit quality is affected by auditor's incentives to counter the negative impact from the *Bonding Effect*. Consistent with the notion that the *Bonding Effect* is less severe for high quality auditors, I find that the turning point of audit quality is longer for firms with Big N auditors, specialist auditors, and auditors of high client importance. In the additional analyses, I further examine how the turning point of audit quality varies over time and across industries. I find that, since Sarbanes-Oxley Act of 2002 (SOX, hereafter) was enacted, the turning point gets longer, implying that SOX may have mitigated the *Bonding Effect*. Moreover, I find that the deterioration of audit quality for extended auditor tenure *only* exists in low-litigation industries but *not* in high-litigation industries, suggesting that the incentives argument rather than the cognitive bias argument prevails in explaining the *Bonding Effect*. My results have implications for the current debate on whether audit firm rotation should be mandatory for the U.S. companies.

1. INTRODUCTION

Major financial frauds[1] and the recent financial crisis from 2007 to 2009 raised serious doubt about auditor independence - the cornerstone of the audit profession (AICPA 1999; SEC 2000). Even though the Sarbanes-Oxley Act of 2002 (Congress 2002) (SOX, hereafter) implemented rules[2] to strengthen auditor independence, the threat of independence persists (Doty 2011; PCAOB 2011). Mandatory audit firm rotation as a potential solution to further strengthen auditor independence continues to be debated among regulators and other interested parties (Conference Board 2005; IOSCO 2005; Doty 2011; PCAOB 2011; PricewaterhouseCoopers 2002, 2007, 2010).[3] Recently, echoing the call for a reexamination on the pros and cons for mandatory audit firm rotation by the European Commission (EU Green Paper 2010), the Public Company Accounting Oversight Board (PCAOB 2011) seeks comments on whether and how mandatory audit firm rotation can be used to protect investors and enhance audit quality. Important questions are: should we adopt mandatory audit firm rotation? If so, what is the maximum audit firm tenure we should allow? The main goal of this paper is to provide a large sample US evidence to answer these questions.

At the center of the debate over mandatory audit firm rotation is the trade-off between the benefit from enhancing auditor independence and the cost of forgoing auditor expertise. Opponents argue that, beyond the high switching costs for firms and the huge start-up costs for

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[1] For example, the Enron debacle in 2002 in U.S., the Parmalat scandal in 2003 in Italy, and the Satyam fraud in 2009 in India

[2] For instance, these rules include the establishment of PCAOB to oversee the audit profession, strengthening the governance role of the audit committee, tightening partnership rotation from every seven years to every five years, and abolishment of non-audit services.

[3] The Conference Board is a not-for-profit organization. It was formed to address the circumstances, which led to the recent corporate scandals and subsequent decline of confidence in American capital markets.

auditors (GAO 2003), limiting auditor tenure destroys client-specific knowledge essential for an effective and efficient audit, thus increasing audit failures at initial years of audit engagements (PricewaterhouseCoopers 2002, 2007, 2010). Extended tenure, however, increases audit quality over time as the auditor gains a better understanding of the client's system, business and industry environment, and internal controls (AICPA 1978; Dunham 2002; Hills 2002). Proponents, in contrast, believe that audit quality deteriorates after a certain number of years of auditor-client relationship due to lack of independence (Doty 2011; PCAOB 2011). A new audit, however, brings a 'fresh look' to the audit engagement. To emphasize the negative consequences of extended auditor-client relationship, Doty (2011) describes a case where the auditor was willing to raise the materiality threshold to help his client meet or beat earnings targets. During the eight years of inspection work on big public company audits since 2004, the PCAOB has repeatedly noticed instances where auditors with lengthy tenure have a bias toward accepting management's viewpoints without developing an independent view and challenging management's assumptions and assertions (PCAOB 2011).

Despite the regulator's genuine concerns on the negative impact of extended tenure on auditor independence, U.S. empirical studies,[4] however, have failed to find a negative relation between auditor tenure and audit quality except for a few studies employing a quadratic model (Boone et al. 2008; Davis et al. 2009). Nevertheless, the reason why a quadratic model should be used is not very well understood. Consequently, the first purpose of this paper is to provide a rationale for choosing such a quadratic model to examine the relation between audit firm tenure and audit quality.

[4] Prior studies mostly employ a linear model or a piece-wise linear model (Johnson et al. 2002; Carcello and Nagy 2004; Myers et al. 2003; Mansi et al. 2004; Ghosh and Moon 2005) in investigating the relation between auditor tenure and audit quality.

Various parties have suggested a potential term limit for audit firm rotation, such as five years, seven years, ten years or more (Daniels and Booker 2009; GAO 2003; PCAOB 2011).[5] No studies, however, have provided a justification for choosing the appropriate term limit. Given the high cost of mandatory audit firm rotation for both public companies and auditors (AICPA 1978; GAO 2003),[6] the need for objective scientific evidence to guide public policy-making is higher than ever (Bamber and Bamber 2009; DeFond and Francis 2005).

If extended tenure indeed improves audit quality, then it is a deadweight loss to society when the audit firm is forced to be rotated. Even if extended tenure does impair audit quality, it is important to evaluate the appropriate term limit. This is because an extremely long term limit may not enhance independence to a sufficient degree to make the rule worthwhile, whereas an extremely short term limit may cause unnecessary costs and disruption (PCAOB 2011). For instance, a 10-year term limit would cause a deadweight loss to society if audit quality deteriorates at year 15. In contrast, a 10-year term limit may not protect investors in time if audit quality starts to decrease at year 5. Further, if extended tenure only negatively affects a small group of firms, then a one-size-fits-all term limit on audit firm tenure may not benefit investors as intended. Consequently, the second purpose of this paper is to empirically examine the turning point when audit quality tends to decline and how this turning point varies across firms. This turning point may provide insights for regulators, audit committees, and investors in evaluating the appropriateness in setting the term limits on audit firm tenure.

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[5] PCAOB (2011) seeks comment on a ten-year mandatory audit firm rotation requirement.

[6] According to a survey of the public accounting firms and Fortune 1000 public companies (GAO 2003), auditors' initial year audit costs would increase by more than 20 percent over subsequent year costs to acquire the necessary knowledge of the public company, and their marketing costs would also increase by at least more than 1 percent and public companies will incur additional auditor selection costs and auditor support costs totally at least 17% of initial-year audit fees.

DeAngelo (1981b) argues that audit quality is jointly determined by auditor experience (the auditor's ability to detect material misstatements in the client's financial statements) and auditor independence (the auditor's decision to correct or disclose material misstatements detected in the client's financial statements). From the auditor experience perspective, audit quality increases with auditor tenure over time as the auditor gains a better understanding of the client's system, business and industry environment, and internal controls (AICPA 1978; Dunham 2002; Hills 2002) (*Learning Effect*, hereafter). From the auditor independence viewpoint, on the other hand, audit quality decreases with auditor tenure over time as the auditor bonds himself to the client due to either the economic bond or the social bond (*Bonding Effect*, hereafter). The education literature has shown that the learning curve increases with a declining rate up to a flattened curve when there is no more new information to learn (Yelle 1979). Therefore, the *Learning Effect* increases audit quality over time. The *Bonding Effect*, in contrast, erodes audit quality over time since the close personal relationship between the auditor and the client surely and slowly impairs the auditor's judgment over time (Mautz and Sharaf 1961). The developed confidence in the client over time introduces complacency, hinders the auditor's ability to design creative and rigorous audit programs and exercise the required professional skepticism, rendering the auditor less vigilant to subtle anomalies (Hoyle 1978; Carey and Simnett 2006; Arrunada and Paz-Ares 1997) and more susceptible to less persuasive evidence (Doty 2011; PCAOB 2011).

Consequently, the joint impact of the *Learning Effect* and the *Bonding Effect* determines whether the overall relation between auditor tenure and audit quality is a concave, convex, or linear function. *Ceteris paribus*, when the *Bonding Effect* dominates the *Learning Effect* at a later stage of tenure, the relation between auditor tenure and audit quality should be concave - a positive relation at the early stage and a negative relation at the later stage. A convex function is true if the opposite holds. When the marginal increase (decrease) rate of audit quality does not change over time, audit quality is a linear function of auditor tenure with the second-order effect reduces to zero. To the extreme, when the negative force from the *Bonding Effect* cancels out the positive force from the *Learning Effect*, then auditor tenure has no bearing on audit quality. *Ceteris paribus*, the weaker the *Bonding Effect*, the higher audit quality can be and the later audit quality would start to decline, thus leading to a longer turning point. For example, high quality auditors would have higher incentives to deliver a high quality audit and thus it takes longer for the *Bonding Effect* to take over the positive *Learning Effect*, thus the turning point when audit quality deteriorates would be prolonged.

I use the insights from this framework in the empirical tests on two dimensions. First, I examine whether audit quality (as measured by accrual quality) deteriorates in later years of audit tenure and I estimate the average turning point when audit quality reaches its maximum and starts to decline for my sample period from 1988 to 2008. I use accrual quality as a measure of audit quality because auditors need to assess whether the financial statements are free of material misstatements, due to either fraud or error. Second, I examine how auditor type, auditor specialization, and client importance affect the relation between audit firm tenure and audit quality and thus the turning point when audit quality starts to decline.

Consistent with my predictions, my empirical results provide three major findings. First, I find that audit quality is a concave function of auditor tenure, with audit quality increasing in the earlier years of auditor tenure and decreasing in the later years of tenure. The average yearly turning point is 12 years within a 95% confidence interval between 10 years and 14 years. This finding supports the PCAOB's proposal that the appropriate length of the term limit should be 10 years or greater (PCAOB 2011). However, with an average tenure of 9 years in my sample, it also implies that mandatory audit firm rotation may not be necessary. This is because audit quality still remains relatively high for a period of time even after this turning point, as compared to audit quality in initial years. Second, I find that a longer turning point for BigN auditors than non-Big N auditors. This indicates that "Big 4 is Best" is not completely due to bias (European Commission Green Paper 2010). Third, I find that the deterioration of audit quality in the later years is mainly driven by firms audited by non-specialists and high importance clients, even though audit quality is still higher for firms with industry experts and firms with auditors of high client importance.

The non-existence of impairment of audit quality in the later years for auditor specialists not only suggests that auditor specialization is a better proxy for audit quality than auditor type, but also confirms the finding in prior literature that auditor specialization attenuates the negative impact on audit quality of both the earlier years of tenure (Davis at al. 2008) and the later years of tenure (Lim and Tan 2010). The existence of deterioration of audit quality at later years for large firms, on the other hand, supports PCAOB's suggestion to impose mandatory audit firm rotation for big firms only (PCAOB 2011). However, this finding stands in contrast to the finding in prior literature that long tenure has no detrimental effect on audit quality for large firms (Li 2010; Gul et al. 2007). Failure of prior literature to find the negative effect of extended tenure is because the actual turning point of audit quality (14 years) is longer than the arbitrary fixed turning point (5 or 9 years) employed in these studies. Since the turning point of audit quality may vary depending on the net impact of the *Learning Effect* and the *Bonding Effect*, a quadratic model will be able to capture the decline of audit quality at the later stage of auditor tenure even though the point when audit quality deteriorates differs from the fixed turning point of five years or nine years (arbitrary cut-off points in prior literature). Another advantage is that the essence of a linear model remains when the second-order effect reduces to zero (e.g., when there is no *Bonding Effect* at the later stage of audit firm tenure).

In my additional analyses, I first investigate whether SOX has attenuated the negative impact of the *Bonding Effect* associated with extended tenure on audit quality. I find that audit quality not only has a higher starting point but also accelerates faster in the earlier years of auditor tenure and deteriorates slower in the later years of auditor tenure in the Post-SOX period, leading to a longer turning point (from approximately 14 years in the Pre-SOX to around 18 years in the post-SOX). This suggests that SOX has reduced the negative impact from the *Bonding Effect* on auditor independence, consistent with the findings in prior literature that accruals management has decreased in the post-SOX period (Cohen et al. 2008; Davis et al. 2009). This finding further questions the necessity of mandatory audit firm rotation for a 10-year term limit in a post-SOX world.

Next, I examine the variations of the relation between auditor tenure and audit quality across industries. The PCAOB concept release (PCAOB 2011) is interested in whether the mandatory rotation requirement should be limited to certain industries. The *Learning Effect* should be more pronounced in high-technology industries with higher audit complexity where the demand for client-specific knowledge is higher than that in low-technology industries. Likewise, the *Bonding Effect* should be more severe in low-litigation industries where the demand for auditor independence is lower than in high-litigation industries. Not surprisingly, I find that the concavity of audit quality exists for both the high technology and the low technology industries within the low-litigation industries subsample *only*, but not within the high-litigation industries subsample. Specifically, I find that the turning point of audit quality is 12 years for high-technology group and 18 years for low-technology group within the low-litigation industries subsample. The negative impact of the *Bonding Effect* could be incentive-driven due to the economic bond for the future revenue stream or non-incentive-driven due to the psychological or cognitive bias. However, the non-existence of an auditor tenure effect in high litigation industries suggests that the incentives argument (rather than the cognitive bias argument) prevails in explaining the *Bonding Effect*. Since incentives are intentional while cognitive bias is unintentional, one implication is that the negative impact of extended tenure on auditor independence and audit quality can be mitigated by raising auditor legal liability.[7] Another implication is that regulators may mandate audit firm rotation in low-litigation industries *only*.

I also conduct a series of robustness checks to solidify my main findings. I first reconcile my findings with prior literature. Consistent with prior literature, I find that audit quality increases with auditor tenure when I employ the linear model. Similar to Johnston et al. (2002) and Carcello and Nagy (2004), I do not find a negative impact of long tenure on audit quality when I use a piece-wise linear model with 9 years as a cut-off point for long tenure. However, I do find a detrimental effect of long tenure on audit quality when I use 30 years as a cut-off point. This suggests that audit quality remains relatively high for a certain period of time even though it starts to deteriorate at around year 12. In addition, my findings are robust to alternative specifications of auditor tenure and alternative specifications of discretionary accruals models. Furthermore, my results remain qualitatively the same when I control for the endogeneity issue that firms with high earnings quality tend to retain the same auditor for a longer period of time.

[7] This is similar to advocating a stricter, but capped, liability viewpoint advanced by John Coffee (2004) who commented on the necessity of mandatory audit firm rotation in response to the Sarbanes-Oxley Act of 2002.

Moreover, my results still hold when I use an alternative measure of audit quality – going-concern opinion.

My study contributes to the literature in at least several ways. First, this study contributes to the auditor tenure literature by being the first to use a framework as a guide to empirically examine the turning point when audit quality starts to decline and this framework can be used to reconcile the mixed findings in prior literature and guide empirical analyses going forward. For instance, a linear or log-linear model will capture the overall tendency of increasing or decreasing over the length of auditor-client relationship while a piece-wise model can capture the different levels of audit quality at different stages. However, only the quadratic model can capture the point when audit quality reaches its maximum or minimum and provides insights on the changes of audit quality at all stages of tenure. Nevertheless, the existence of deterioration of audit quality at the later stage of audit firm tenure does not by itself lend support for mandatory audit firm rotation. Second, my study is the first to empirically evaluate how the turning point of audit quality varies across firms, over time, and across industries, providing useful insights for regulators on evaluating the appropriateness of the proposed term limits. Third, my finding that the turning point gets longer in the Post-SOX period provides useful evidence for regulators to evaluate the effectiveness of using alternative ways to bolster auditor independence and improve audit quality. Lastly, my study adds to the international debate on the necessity of mandatory audit firm rotation (European Commission Green Paper 2010; PCAOB 2011).

The remainder of the paper proceeds as follows. Section 2 discusses background and literature review. Section 3 presents theory. Section 4 develops testable hypotheses and presents research design. Section 5 delineates data measurement and the sample. Section 6 reports the main empirical results. Section 7 provides additional analyses and sensitivity tests. Section 8 concludes the paper.

2. BACKGROUND AND LITERATURE REVIEW

In this section, I review the literature related to the study. I first introduce the background on the development of mandatory auditor rotation. Then I describe the arguments for and against mandatory auditor rotation. I end this section with empirical evidence for and against mandatory auditor rotation.

2.1 Background

Whenever there is a major financial fraud, critics of the auditing profession would suggest mandatory auditor rotation as a way to counter the impairment of auditor independence and lack of professional skepticism associated with long term auditor-client relationship. Mandatory auditor rotation takes two forms: one is audit partner rotation, and the other is audit firm rotation. Mandatory audit firm rotation has been adopted in some countries, such as Italy (9 years), Brazil (5 years), South Korea (6 years), and India (4 years for banks, insurance companies, and public sector companies). Given the high cost of mandatory audit firm rotation, many other countries, such as the U.S., Canada, Australia, and China, adopt audit partner rotation instead.

Even though the U.S. does not require mandatory audit firm rotation, its use as a potential solution to enhance auditor independence and thus to improve audit quality has been debated for more than four decades (AICPA 1978, 1987, 1992; Turner 1999; Turner and Godwin 1999; U.S. Congress 2002; PCAOB 2011). For example, Mautz and Sharaf (1961) states that extended auditor-client relationships could have a detrimental effect on auditor independence because an auditor's objectivity about a client is reduced with the passage of time. The Metcalf Committee criticizes the level of competition in the auditing profession and suggests that "mandatory auditor rotation is a way to bolster auditor independence" (U.S. Senate 1976, 21). In response, AICPA's

Cohen Commission report (AICPA 1978) emphasizes the cost of audit firm rotation (start-up costs and increasing audit and financial reporting failures) and suggests rotation of audit personnel and partners instead. Periodically, the Securities and Exchange Commission (SEC) has expressed concerns about the possible adverse effects from long auditor tenures (SEC 1994, 1999, 2001). For example, in 1994, the Senate Finance Committee considered a bill that would have required rotation for public companies.

The major financial frauds occurring at the beginning of 21th century intensified this debate. Section 207 of SOX required the Comptroller General of the U.S. to conduct a study on the necessity of mandatory audit firm rotation. Based on the survey of public accounting firms and Fortune 1,000 public companies, the General Accounting Office (GAO 2003) made the following conclusion in its report:

> Mandatory audit firm rotation may not be the most efficient way to strengthen auditor independence and improve audit quality considering the additional financial costs and the loss of institutional knowledge of the public company's previous auditor of record.

Thus, Section 203 of the Sarbanes-Oxley Act (SOX) tightens the rotation cycle for the external lead and reviewing audit partners from a previous seven years to five years. Even though audit partner rotation has been in place, both GAO and other regulatory bodies such as the New York Stock Exchange, TIAA-CREF (2003), and the Commission on Public Trust and Private Enterprise (Enterprise 2003) has suggested voluntary auditor rotation to improve audit quality. Other parties, however, advocate mandatory audit firm rotation. For example, the AFL-CIO, in testimony before the U.S. House Financial Services Committee, recommended that the SEC require auditor rotation (Silvers 2002). Similarly, former SEC chairperson Harold Williams recommended that the U.S. Senate mandate auditor rotation to provide assurance regarding auditor independence (Williams 2002).

One potential reason audit partner rotation cannot substitute audit firm rotation is that most CPA firms do not change the senior audit team members and heavily rely on the previous years' working papers. This imposes a great threat to audit objectivity and professional skepticism. Therefore, the *Conceptual Framework for AICPA Independence Standards* recognizes the rotation of senior audit team members as an independence safeguard (AICPA 2006). Therefore, pressures for audit firm rotation continue (Economists 2004) and audit firm rotation remains to be an interest by standard setters (IOSCO 2005). More recently, the Commission on Public Trust and Private Enterprise endorsed the use of mandatory audit firm rotation to improve auditor independence (Conference Board 2005). The financial crisis between 2007 and 2009 further tested the auditors' independence. The PCAOB inspection staff has continuously witnessed instances where auditors failed to exercise sufficient professional skepticism and challenge management's assertions in long-term auditor-client relationships during the eight-year annual inspection work on public company audits since 2004. Hence, the PCAOB (2011) recently issued a concept release seeking comment on using mandatory audit firm rotation to further strengthen auditor independence.

2.2 Arguments for Mandatory Auditor Rotation

Proponents of mandatory auditor rotation base their arguments on auditor independence concerns (either actual or perceived) from the following three aspects: 1) overfamiliarity threat; 2) close personal relationship; 3) reduced investor confidence. The first two reasons would increase the risk for audit failures for long tenure audits. The last reason would have an adverse consequence on investors' efficient capital allocations on the capital markets.

A long-term auditor-client relationship hinders the auditor's ability to develop creative and innovative audit programs due to complacency or overfamiliarity (Carey and Simnett 2006).

Mandatory auditor rotation would decrease the auditor's excessive reliance on prior years' working papers and would reduce their emphasis on doing what is necessary to retain the client (The AFL-CIO 2003).

Close ties to their clients make auditors lose their independence, objectivity, and professional skepticism. For example, the Metcalf Committee Report (U.S. Senate 1976) expressed concerns about the effects of long tenure on auditor judgments. The report noted:

> Long association between a corporation and an accounting firm may lead to such close identification of the accounting firm with the interests of its client's management that truly independent action by the accounting firm becomes difficult. One alternative is mandatory change of accountants after a given period of years. (U.S. Senate 1976, 21)

The Conference Board (2003) argues that mandatory auditor rotation would increase investors' confidence since a new auditor not only brings a 'fresh look' to the client's accounting practices but also provides a check on former auditor's audit work. Knowing that another audit firm would check his work within a specified period would encourage the incumbent auditor to work more diligently and "might be less likely to succumb to management pressure" (GAO 2003). Imhoff (2003) claims that shareholders would be willing to pay a premium for the benefits of mandatory auditor rotation if audit firms raise audit fees in such a regime.

2.3 Arguments against Mandatory Auditor Rotation

Opponents of mandatory auditor rotation, however, stress the costs associated with mandatory auditor rotation. The alleged costs of mandatory auditor rotation are twofold: 1) increased audit failures due to loss of client-specific knowledge; and 2) high start-up costs.

DeAngelo (1981a) identifies a "learning curve" that gives incumbent auditors a comparative quality advantage. Continuity of an audit is said to reduce audit risk due to a familiarity with the client's system and an understanding of risks associated with the client's business/industry environment (Financial Reporting Commission [Ryan Commission Report] 1992; AICPA[Cohen Commission Report] 1978). For example, the AICPA's SEC Practice Section analyzed 406 cases of alleged audit failures and found that such allegations are nearly three times more likely when the auditing firm is conducting its first or second audit of the company. This increased risk in new audits is attributed to the auditors' lack of knowledge of the client and its business that is gained over time. This lack of sufficient knowledge regarding firm-specific risks and the consequent impairment of audit quality could cause a deadweight loss to society. The accounting profession argues that uncertainty regarding characteristics of the client increases the potential for audit failures in earlier auditor-client relationship (PricewaterhouseCoopers 2002, 2007, 2010).

Mandatory auditor rotation increases the start-up costs for both auditors and the clients. It would increase the initial year audit costs by at least 20 percent for the audit firm and it will increase audit selection costs and audit support costs by at least 17 percent for public companies. Auditors will be distracted from their primary task of conducting audits and turn their focus more on seeking potential audit clients.

The AICPA (2004) has also expressed concerns on mandatory auditor rotation because it is likely to increase start-up costs, making it more difficult to perform a timely audit and also increase audit failures. BDO Seidman (2003) contends that mandatory auditor rotation might in fact create a disincentive for audit firms to acquire specialization because they would not be able to target specific client segments any more under mandatory auditor rotation regime. For example, Ronald Hills, a former SEC chairman, states:

> Forcing a change of auditors can only lower the quality of audits and increase their costs. The longer an auditor is with a company the more it learns about its personnel, its business, and its intrinsic values. To change every several years will simply create a merry-go-round of mediocrity. (Hills 2002)

Based on a survey of public accounting firms and Fortune 1,000 public companies, the GAO (2003) makes the following conclusion:

> Mandatory audit firm rotation may not be the most efficient way to strengthen auditor independence and improve audit quality considering the additional financial costs and the loss of institutional knowledge of the public company's previous auditor of record, as well as the current reforms being implemented.

2.4 Empirical Evidence Supporting Mandatory Auditor Rotation

Empirical results supporting mandatory auditor rotation are relatively sparse. Deis and Giroux (1992) document a negative relation between auditor tenure and audit quality, consistent with the argument for mandatory auditor rotation. However, their results may not be generalizable because they only investigate a sample of small CPA firms and the audit clients represent quasi-governmental entities in the public sector.

In an experimental setting, Dopuch et al. (2001) provide evidence that auditors are unwilling to issue a biased report in favor of the management in a mandatory auditor rotation regime, consistent with the prediction that mandatory auditor rotation can improve auditor's independence.

Knapp (1991) examines the perception of the audit committee on audit quality and find that auditor tenure is positively related to audit quality in the earlier years of the audit engagement and negatively associated with audit quality in later years of the engagement. Knapp's result suggests that audit committee members perceive a learning curve effect improves audit quality in the earlier years and a complacency effect erodes audit quality over time at later years. Daniels and Booker (2009) provide evidence concerning another user group's perceptions of independence in a rotation regime. They find that loan officers perceive auditors to be independent when rotation is mandatory.

Using Australia data, Carey and Simnett (2006) find that longer audit partner tenure is associated with a lower propensity to issue a going-concern opinion and a higher probability to just beat earnings benchmarks.

Blouin et al. (2005) examine differences in earnings management behavior between former AA clients that followed their former AA audit teams to a new audit firm and those that did not followed. They find that switching costs are lower for "follow" firms and agency costs are lower for "non-follow" firms and that discretionary accruals are on average higher for "follow" firms. This indicates that incumbent auditors are more likely to allow a greater degree of earnings management than incoming new auditors, suggesting lack of independence is a concern for continuing auditor-client relationship.

More recently, Davis et al. (2009), applying a quadratic model, find that the propensity of using discretionary accruals to meet or beat analysts' earnings forecasts decreases with tenure at the earlier years and then increases with tenure at the later years across 19 years from 1988 to 2006. Their results are consistent with regulators' concerns that auditors are involved in the 'number's game' with managers in manipulating earnings numbers to meet consensus forecasts (Levitt 1998), supporting the call for mandatory auditor rotation.

Boone et al. (2008) find that the ex-ante equity risk premium decreases in the earlier years of tenure and increases with additional years of tenure for the period of 1993 to 2001, suggesting that long tenure is detrimental for perceived audit quality.

2.5 Empirical Evidence Opposing Mandatory Auditor Rotation

Using various proxies for audit quality, the majority of prior studies have provided evidence that short tenure decreases audit quality and long tenure increases audit quality, inconsistent with the argument that long tenure erodes auditor independence and impairs audit quality. These proxies include failure to issue a going-concern opinion (Geiger and Raghunandan 2002), auditor litigation and fraud (Palmrose 1987, 1991; Stice 1991; Carcello and Nagy 2004), various abnormal accruals measures (Meyers et al. 2003, Johnson et al. 2002), cost of debt (Mansi et al. 2004), stock and debt rankings (Ghosh and Moon 2005), earnings response coefficients (Ghosh and Moon 2005), and financial restatements (Stanley and DeZoort 2007).

Earlier studies concentrate on more extreme cases such as audit failures and auditor litigations. For example, Geiger and Raghunandan (2002) find that auditors are less likely to issue going-concern opinions in the year immediately before bankruptcy in the initial years of audit engagements. Palmrose (1987, 1991) and Stice (1991) show that auditors face higher litigation risk in the earlier years of auditor-client relationship. The AICPA's Quality Inquiry Committee of the SEC Practice Section finds that allegations of audit failure occur more frequently when the auditor-client relationship is at an early stage (AICPA 1992). Carcello and Nagy (2004) examine the audit tenure effect among companies with fraudulent financial reporting identified in SEC Accounting and Auditing Enforcement Releases (AAERs). They find that the likelihood of fraudulent financial reporting is greater in the initial three years of audit tenure. Alternatively, they do not find that long tenure is associated with increased likelihood of fraud.

Since regulators are interested in how auditor tenure affects auditor independence and thus audit quality in more subtle ways, recent studies focus on how auditor tenure affects earnings quality and financial reporting quality. Using absolute unexpected accruals and the persistence of current accruals as proxies for earnings quality, Johnson, Khurana, and Reynolds (2002) show that short tenures are associated with lower earnings quality than medium tenures. Similarly, Chung and Kallapur (2003) find that the length of the auditor-client relationship was negatively related to abnormal accruals. Using the magnitudes of both discretionary and current accruals as proxies for earning quality, Myers et al. (2003) document that earnings quality is positively related to auditor tenure. Stanley and DeZoort (2007) find that auditor tenure is negatively associated with the likelihood of financial restatements.

Other recent studies extend the literature by the perceived audit quality based on market-based measures. Mansi et al. (2004) provide evidence the cost of debt decreases as auditor tenure increases. Similarly, Ghosh and Moon (2005) document that the impact of reported earnings on (1) stock returns; (2) stock rankings; and (3) analysts' one-year-ahead earnings forecasts is positively related to auditor tenure.

2.6 Plausible Explanations for the Mixed Findings in the Literature

The mixed findings in the literature can be explained by different methodologies employed. For example, prior studies either apply a linear model (e.g., Deis and Giroux 1992; Myers et al. 2003; Mansi et al. 2004; Ghosh and Moon 2005; Chen, Lin, and Lin 2008), a piece-wise linear model (Carcello and Nagy 2004; Carey and Simnett 2006; Johnson et al. 2002; Lim and Tan 2010), or a log function (Gul et al. 2009; Geiger and Raghunandan 2002) to examine the relationship between auditor tenure and audit quality. These studies provide evidence that audit quality increases with auditor tenure. Some recent studies, however, use a quadratic model to examine the relationship between auditor tenure and audit quality (Chi and Huang 2005; Davis et al. 2009; Boone et al. 2008). They find that both short and long tenure are associated with low audit quality, suggesting audit quality first increases with auditor tenure in the earlier years and then decreases with auditor tenure in the later years.

One advantage of using a quadratic model is that it relaxes the monotonic increasing function assumption in the linear model, the fixed turning point of audit quality (at either five years or nine years) assumption in the piece-wise linear model, and the indefinitely approaching a certain level of audit quality assumption in the log function model. The second advantage of using a quadratic model is that it will be able to capture the decline of audit quality at a later stage of auditor tenure even though the point at which audit quality deteriorates may vary across firms or change across years. The third advantage of using a quadratic model is that the essence of a linear model remains when the second-order effect reduces to zero. In spite of the beauty of a quadratic model in capturing the change of the relation between auditor tenure and audit quality, no theory has been provided to explain why audit quality is likely to increase with auditor tenure at an earlier stage and is likely to decrease with auditor tenure at a later stage. Hence, I provide such a theory in the following section.

3. THEORY AND EMPIRICAL IMPLICATIONS

3.1 Audit Quality

I start my investigation with some theoretical considerations. The goal is to provide a simple framework that formalizes the preceding motivations and link them to the empirical analysis that follows. My analysis of the relation between auditor tenure and auditor quality relies on the well-accepted theory by DeAngelo (1981b), who defines audit quality as the joint probability for an auditor to discover a breach (competence) and report the breach discovered (independence). The competence to discover a breach depends on the auditor's experience on the client's system and business and industry environment and this auditor experience (*AE*, hereafter) is an increasing function of auditor tenure (*T*, hereafter), as suggested by the argument against mandatory auditor rotation. Whether the auditor has the independence to report the detected material misstatements hinges on the auditor's resistance to the economic incentives to earn potential future quasi-rents and his incentives to protect his reputation over time. Therefore, auditor independence (*AI*, hereafter) is a decreasing function of *T*, as indicated by the argument for mandatory auditor rotation. Consequently, *T* affects audit quality (*AQ*, hereafter) through both *AI* and *AE*, as illustrated by Figure 1 in the next page.

3.2 Auditor Tenure and Auditor Experience

As mentioned previously, the auditor's competence to discover a breach depends on his experience with the client's system, business, and industry environment. Hence, *AE* increases with *T* ($T\uparrow AE$), as suggested by the argument against mandatory auditor rotation. This increased *AE* increases the auditor's ability to detect both intentional and unintentional material misstatements in the financial statements, thus improving audit quality. I refer to this positive force related to *AE* as the *Learning Effect*, which increases *AQ* but the incremental effect is

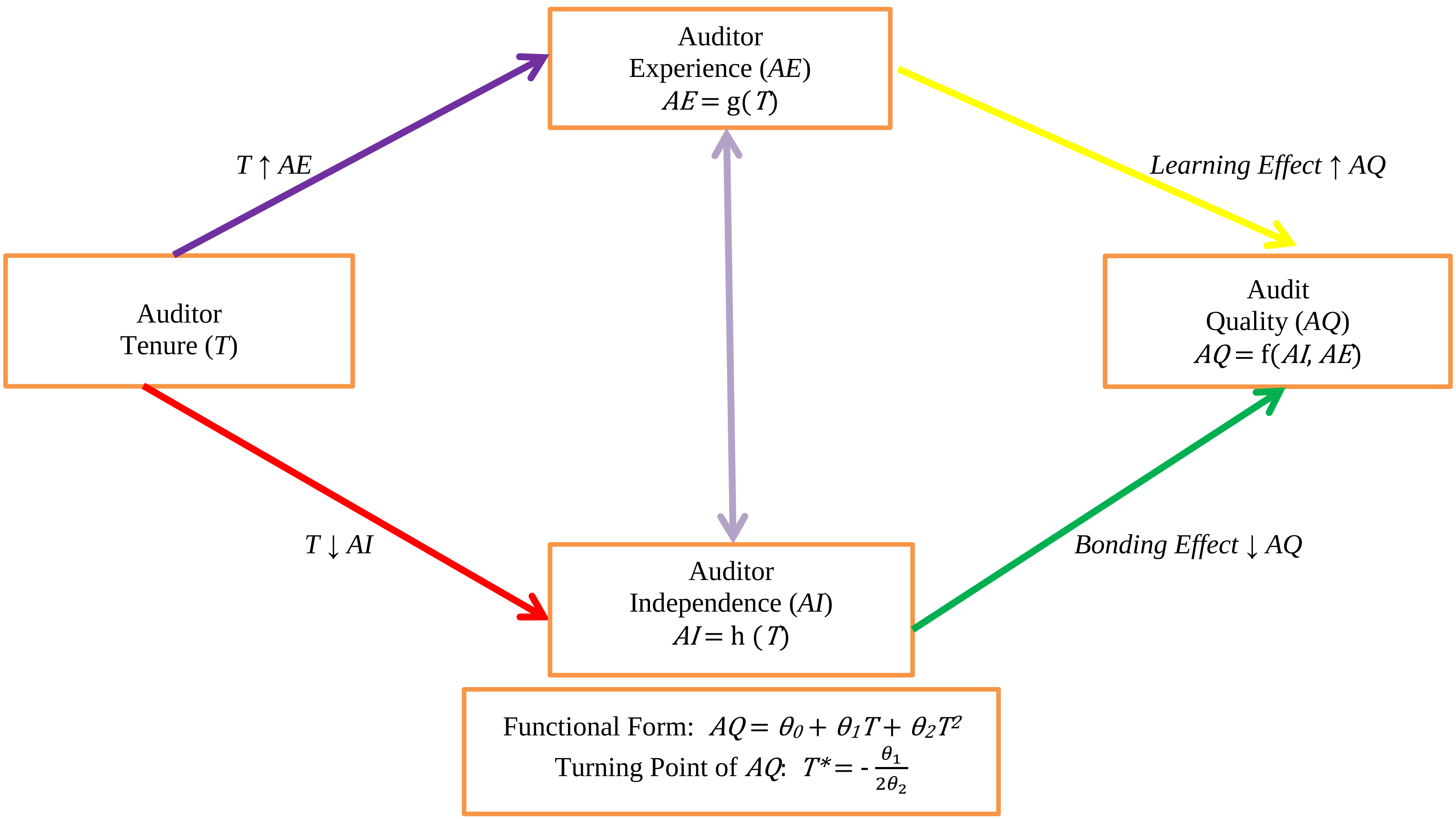

Figure 1
Relation between Auditor Tenure and Audit Quality

decreasing over time (*Learning Effect* ↑ *AQ*). This is consistent with the "learning curve" that gives the incumbent auditor a competitive advantage (DeAngelo 1981; Chen and Manes 1985). The learning curve was initially introduced by a German psychologist Hermann Ebbinghaus in 1885. A more detailed description of learning curves was provided by psychologist Arthur Bills in 1934. Learning is most difficult for the initial years, and the increase of new information is sharpest after initial familiarity and gradually evens out in later years, suggesting that each successive audit engagement contains less new information. Consequently, the relation between auditor tenure and audit quality can be approximated as a concave increasing function of tenure with a flattened curve after it reaches its maximum point.

3.3 Auditor Tenure and Auditor Independence

However, whether the auditor has the independence to report the detected material misstatements hinges on the trade-off between the auditor's incentives to please the client for potential future quasi-rents and his incentives to protect his reputation and avoid litigation costs over time. Therefore, *AI* is a decreasing function of *T* (*T*↓*AI*), as indicated by the argument for mandatory auditor rotation. Mautz and Sharaf (1961, p. 231) state that the auditor "must be aware of the various pressures, some obvious some subtle, which tend to influence [their] attitude and thereby erode slowly but surely [their] independence". In most cases "the greatest threat to [their] independence is a slow, gradual, almost casual erosion of [their] honest disinterestedness" (Mautz and Sharaf 1961, p. 208). On the other hand, from a sociological perspective, Moore et al. (2006) introduce the term ‘‘moral seduction" to describe how, over time, clients exert a ‘‘gradual accumulation of pressures" to ‘‘encourage complacency among practitioners" such that auditors will be more likely to ‘‘slant their conclusions" (Moore et al., 2006, 11). Bamber and Iyer (2007) provide evidence consistent with this concern on an individual auditor basis. The extended personal relationships to the extent of developing bonds of loyalty or emotional relationships will consciously or subconsciously impact the auditor's independence and objectivity, causing the auditor to fail to maintain an attitude of objectivity and professional skepticism (Carey and Simnett 2006; Hoyle 1978). I term this negative force associated with *AI* as the *Bonding Effect*, which decreases *AQ* over time (*Bonding Effect*↓*AQ*). However, like the learning curve, the decrease of auditor independence cannot go on indefinitely since the auditor's reputation concern, professional standards, quality control systems, and the potential litigation threat force the auditor to maintain a minimum level of auditor independence and objectivity. Therefore, the *Bonding Effect* indicates that *AI* is initially high and then gradually decreases, but the decrease of *AI* eventually evens out at a later stage. Thus, the relation between auditor tenure and audit quality can be approximated by a convex decreasing function with a flattened curve (the decreasing speed of *AI* decelerates until reaching its dip) or a concave decreasing function with a flattened curve (if the decreasing speed of *AI* accelerates until reaching its climax).

3.4 Auditor Tenure and Audit Quality

The *Learning Effect* associated with auditor experience and the *Bonding Effect* related to auditor independence jointly determines audit quality throughout the length of the auditor-client relationship. Consequently, *AQ* is a function of *AI* and *AE* ($AQ = f(AI, AE)$), both of which are a function of *T* ($AE = g(T)$ and $AI = h(T)$). Therefore, the overall relationship between auditor tenure and audit quality can be approximated by the following general form (as shown in Figure 1):

$$AQ = \theta_0 + \theta_1 T + \theta_2 T^2 \qquad (3.1)$$

Note that θ_0 is the overall initial status of *AQ*. I take the position that the auditor always strives to be perfectly independent but can never be totally independent. Bazerman et al. (1997) argue that it is psychologically impossible for the auditor to be objective due to his self-serving bias. The auditor may arrive at marginal decisions in favor of his client because he is unable to overcome cognitive or psychological biases (Messick and Sentis 1979). Mautz and Sharaf (1961) describe the auditor's financial dependence on clients as a built-in anti-independence factor, and the Cohen Commission (AICPA 1978) observes that complete independence is a practical impossibility since the auditor is hired and paid by the client. Therefore, I expect θ_0 to be negative.

The sign of θ_1 on T determines whether audit quality is an increasing (when $\theta_1 > 0$) function or decreasing (when $\theta_1 < 0$) function of auditor tenure, or has no relation ($\theta_1 = 0$) with auditor tenure, whereas the sign of θ_2 on T^2 dictates the shape (that is, whether audit quality is a concave function, a convex function, or a linear function of auditor tenure). Specifically, when the *Bonding Effect* dominates the *Learning Effect* at the later stage of auditor tenure only, then the overall relationship between audit quality and auditor tenure should be a concave function. A convex function is true if the bonding Effect dominates the *Learning Effect* at the earlier stage of auditor tenure only. When the marginal increasing rate or the marginal decreasing rate of audit quality does not change, then audit quality is a linear function of auditor tenure, with a second-order effect that reduces to zero. To the extreme, when the negative force exactly offsets the positive force at all stages, then auditor tenure has no bearing on audit quality. Appendix A details the prediction for the shape on the relation between auditor tenure and audit quality.

3.5 The Point of Time When Audit Quality Reaches Its Maximum (Minimum)

Therefore, the point in time when T maximizes (minimizes) AQ is determined by the negative ratio of θ_1 and θ_2 as follows (as shown in Figure 1):[8]

$$T^* = -\frac{\theta_1}{2\theta_2} \tag{3.2}$$

Appendix B delineates a detailed example on the relation between θ_2 and θ_1, the negative ratio of θ_1 to θ_2, and the matching point of time when AQ reaches its maximum or minimum. For example, as the magnitude of θ_2 relative to negative θ_1 increases from 0.01 to 0.50 (or the negative ratio of θ_1 to θ_2 drops from 100 to 2), the turning point drops from 50 years to 1 year. This suggests that the deterioration of audit quality can be mitigated by either increasing the *Learning Effect* or decreasing the *Bonding Effect* or increasing the *Learning Effect* and decreasing the *Bonding Effect* simultaneously.

3.6 Differential Audit Quality among Auditors

Thus far I assume all auditors provide a uniform level of audit quality and the relation between auditor tenure and audit quality is homogeneous among all the auditors. However, this assumption is not descriptive in a world where auditors deliver differentiated quality of audit services to their clients. Thus, in this subsection I analyze the relation between auditor tenure and audit quality and the turning point in respect to two groups of auditors: one is high quality auditors (denoted as H) and the other is low quality auditors (denoted as L). I restate equation

[8] I take the first derivative of equation (2.1) as follows:

$$\frac{\partial AQ}{\partial T} = \theta_1 + 2\theta_2 T$$

Set above equation to zero to solve for the 'optimal tenure' (denoted T^*, the point in time when audit quality reaches its maximum (minimum) and starts to decline (increase) afterwards.

(3.1) for the relation between auditor tenure and audit quality and equation (3.2) for 'optimal tenure' between high quality auditors and low quality auditors as follows:

$$AQ^H = \theta_0^H + \theta_1^H T + \theta_2^H T^2 \quad (3.3a)$$

$$AQ^L = \theta_0^L + \theta_1^L T + \theta_2^L T^2 \quad (3.3b)$$

$$T*^H = -\frac{\theta_1^H}{2\theta_2^H} \quad (3.3c)$$

$$T*^L = -\frac{\theta_1^L}{2\theta_2^L} \quad (3.3d)$$

Prior literature has documented extensively that high quality auditors provide higher level of audit quality in general due to their better ability and higher concerns over reputation damage and litigation costs. Therefore, I expect $|\theta_0^H| > |\theta_0^L|$, meaning that high quality auditors have a higher starting point of audit quality. Since high quality auditors possess better audit technologies and thus have higher competence in learning relative to low quality auditors, I expect high quality auditors to learn faster and therefore get over the learning hurdle for a new engagement earlier. The faster learning speed of high quality auditors than low quality auditors indicates that audit quality is increasing faster over time for high quality auditors than low quality auditors due to a greater *Learning Effect*. On the other hand, high quality auditors have more economic incentives to remain independent as they have a reputation capital at stake and more to lose if caught "cheating" (DeAngelo 1981b). Thus, less incentive to succumb to managers' pressures to forgone adjusting material errors in financial statements indicates a lower magnitude of the *Bonding Effect*. In addition, high quality auditors have better abilities to create more innovative audit programs and thus introduce less overfamiliarity effect. The combined higher *Learning Effect* and the lower *Bonding Effect* for high quality auditors indicate that the increasing speed of audit quality is larger than that of low quality auditors ($|\theta_1^H| > |\theta_1^L|$) and the decreasing speed of audit quality is smaller for high quality auditors relative to low quality auditors ($|\theta_2^H| < |\theta_2^L|$). Consequently, the increase of the numerator and the decrease of the denominator in the 'optimal tenure' formula (3.2) naturally lead to a longer turning point for high quality auditors relative to low quality auditors (that is, $T*^H > T*^L$), as illustrated in Figure 2 below.

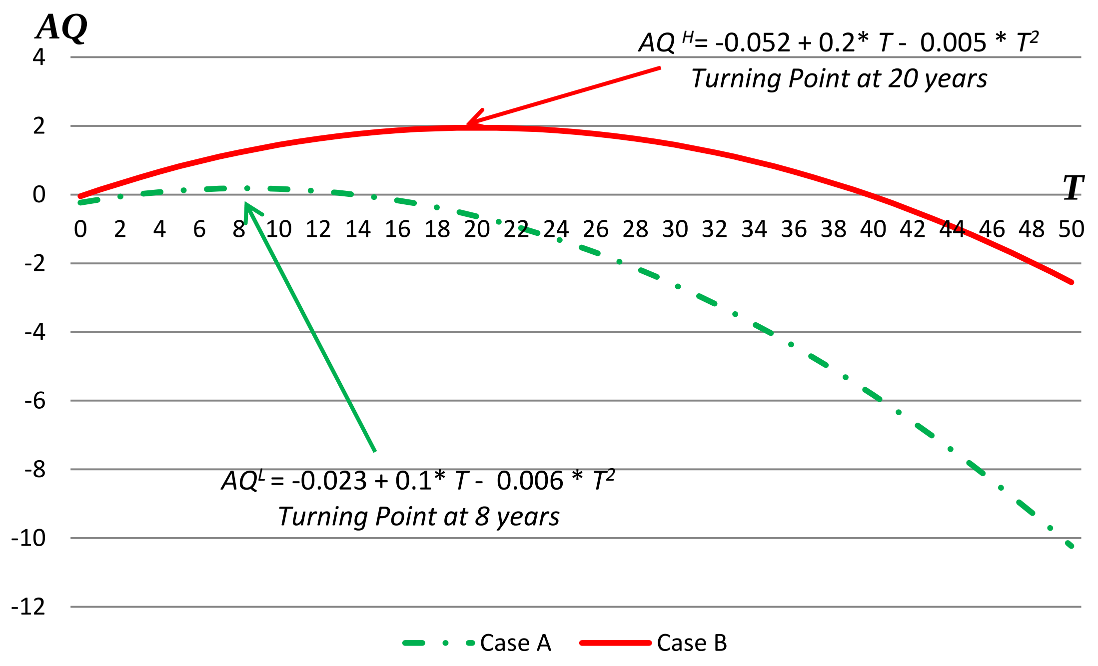

Figure 2 Turning Point of Audit Quality across Auditors

3.7 Variation of Audit Quality across Firms

In the previous subsection I assume that *AQ* only differs among auditors and that auditors' incentives to remain independent do not vary by client size. Hence, in this subsection, I analyze the relationship between auditor tenure and audit quality and the turning point with respect to two groups of firms: one is big firms (denoted as *B*) and the other is small firms (denoted as *S*). I restate equation (2.1) for the relation between auditor tenure and audit quality and equation (2.2) for 'optimal tenure' between big firms and small firms as follows:

$$AQ^B = \theta_0^B + \theta_1^B T + \theta_2^B T^2 \quad (3.4a)$$

$$AQ^S = \theta_0^S + \theta_1^S T + \theta_2^S T^2 \quad (3.4b)$$

$$T*^B = -\frac{\theta_1^B}{2\theta_2^B} \quad (3.4c)$$

$$T*^S = -\frac{\theta_1^S}{2\theta_2^S} \quad (3.4d)$$

Prior literature argues that auditors of large firms are more likely to remain independent because of client visibility and reputation protection (e.g., Reynolds and Francis 2000; Larcker and Richardson 2004; Barton 2005). Therefore, auditors' incentives to deliver a high quality audit are greater for big clients, because auditors will face higher reputation damage and greater litigation risk if the auditors fail to do their jobs right. Hence, I expect that $\theta_0^B > \theta_0^S$, suggesting that large firms have a higher audit quality at the starting point. However, whether the turning point of audit quality is longer or shorter for large firms relative to small firms is less clear. If the greater economic incentives of reputation damage or litigation costs slows the deterioration of audit quality and the *Learning Effect* dominates the *Bonding Effect* for a longer period of time but evens out before the *Bonding Effect* disappears, then the turning point of audit quality should be longer for large firms relative to small firms (that is, $T*^B > T*^S$). On the other hand, if larger clients create greater economic incentives for the auditors to retain the clients due to future quasi rents and the deterioration of audit quality reaches the lowest level before the *Learning Effect* evens out, then the turning point of audit quality should be shorter for large firms (where the approximation of the shape would be a convex function) relative to small firms (that is,

$T*^B < T*^S$). The former case is demonstrated in Figure 3A while the latter case is illustrated in Figure 3B below.

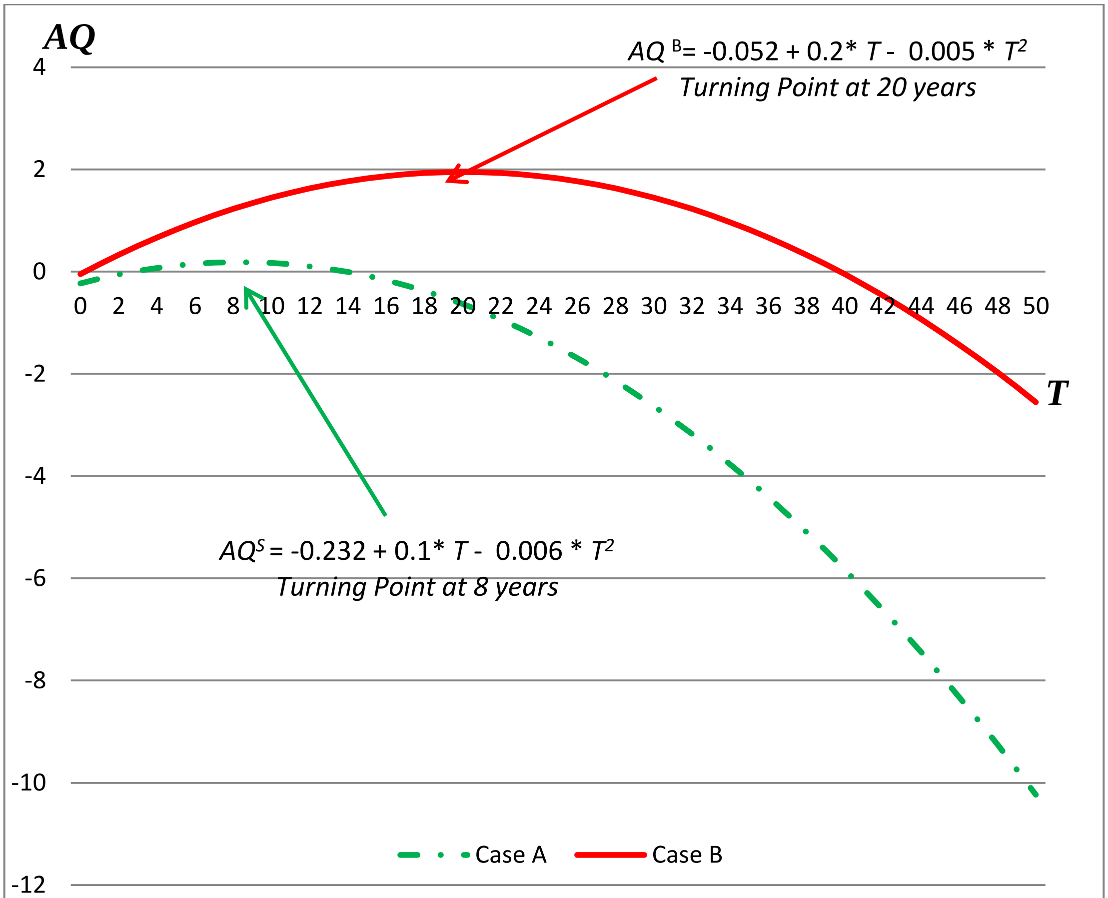

Figure 3A Turning Point of Audit Quality across Firm - AQ as a Concave Function of T

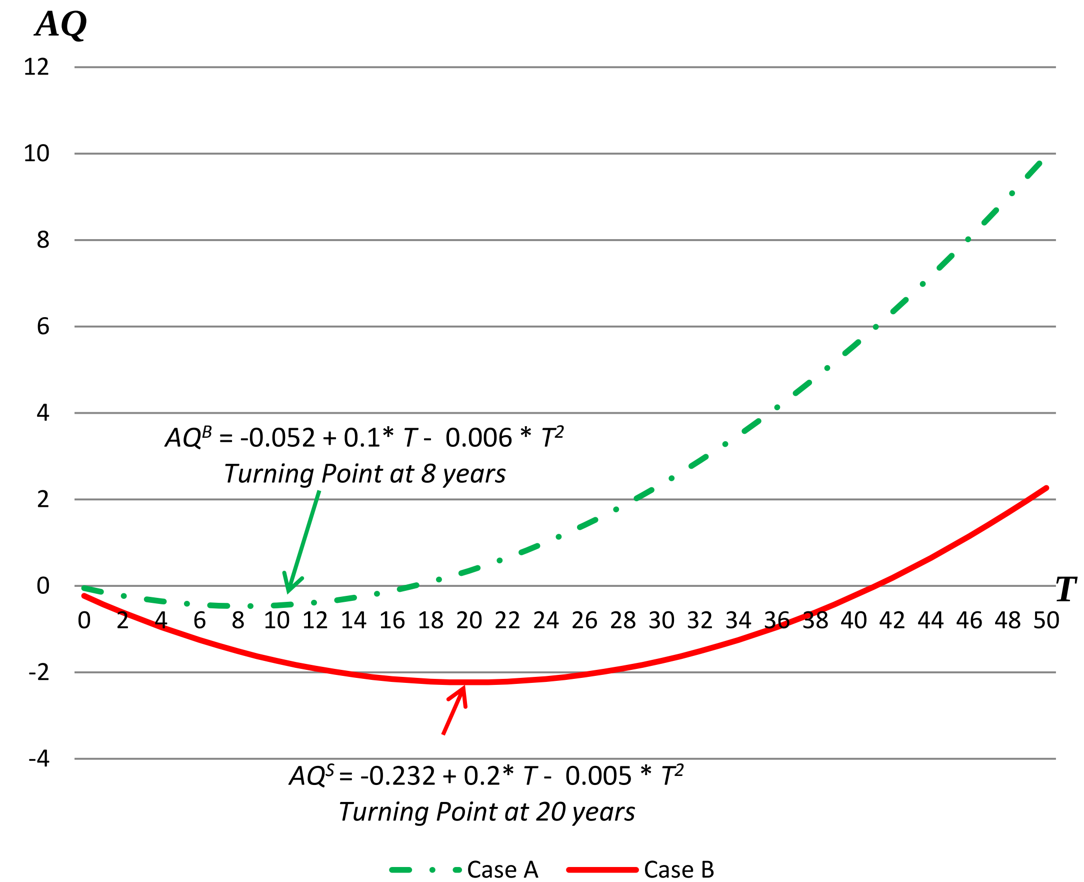

Figure 3B Turning Point of Audit Quality across Firms - AQ as a Convex Function of T

4. TESTABLE HYPOTHESES AND RESEARCH DESIGN

The insights from the above framework provide several important and interesting empirical implications. In this section, I develop my testable hypotheses from these insights.

4.1 The Relation between Auditor Tenure and Audit Quality

Earlier studies stress the negative impact of short tenure on audit quality in initial years of the auditor-client relationship (Geiger and Raghunandan 2002; Johnson et al. 2002). However, the majority of the literature emphasizes the positive impact of long tenure on audit quality (Myers et al. 2003; Mansi et al. 2004; Ghosh and Moon 2005). This is consistent with the *Learning Effect* explanation that audit quality is low in the initial years as it takes time for the auditor to acquire the client-specific knowledge and audit quality increases as the auditor gets familiar with the client's business and information system. However, a few recent studies provide evidence that long tenure has a negative impact on audit quality as well (Carey and Simnett 2006; Davis et al. 2009; Chi and Huang 2005; Boone et al. 2008), consistent with the *Bonding Effect* explanation.

I argue that when an auditor starts a new audit engagement, he would spend more time to learn about the entity's business and its environment (including its internal controls). At the same time, it would take some time for the auditor to develop a close relationship with the client. Hence, the *Learning Effect* is likely to dominate the *Bonding Effect* in the earlier years of the auditor-client relationship. Even though the business environment is dynamic and constantly changing, the incremental information to learn over time tends to decrease and evens out at a certain point. In contrast, as the *Learning Effect* weakens over time, the *Bonding Effect* strengthens over time as the auditor and the client gets close to each other. The *Bonding Effect* would dominate the *Learning Effect* either when the *Learning Effect* reduces to zero or when the negative force from the *Bonding Effect* dominates the positive force from the *Learning Effect*. Therefore, I predict that the *Learning Effect* is likely to dominate in the earlier years and the *Bonding Effect* is likely to dominate in the later years of auditor tenure.

However, the point when audit quality starts to deteriorate is not clear. Chi and Huang (2005) document that audit quality starts to deteriorate at 5 years of audit firm tenure using Taiwan data. However, the *Bonding Effect* should be lower in the U.S. than in the Asian countries with weaker legal systems. Prior literature indicates that the combination of strong liability rules and strict enforcement mechanisms create incentives for auditors to deliver high audit quality from the greater risk of litigation (e.g., Choi et al. 2008; Francis and Wang 2008). Therefore, the stricter legal liability regime and better investor protection laws in U.S should weaken the bonding between the auditor and the client. The weakened *Bonding Effect* should allow the auditor to improve audit quality for a longer period of time and reach a higher level of audit quality, thus leading to a longer turning point. PCAOB (2011) proposes a term limit of 10 years or more for mandatory audit firm rotation for the 100 largest publicly-listed companies, suggesting that the deterioration of audit quality may start for auditor tenure of 10 years or more. Therefore, I expect the turning point of audit quality to be at least 10 years. Thus, I state my first set of hypotheses formally in an alternative form as below:

H1a: Audit quality is likely to increase in the earlier years of auditor tenure due to a *Learning Effect* and is likely to decrease in the later years of auditor tenure due to a *Bonding Effect*.

H1b: The turning point of audit quality is at least 10 years.

To test **H1a**, I run an OLS pooled regression on the following model:

$$AQ = \beta_0 + \beta_1 T + \beta_2 T^2 + \beta_3 Size + \beta_4 Size^2 + \beta_5 OCF + \beta_6 Growth + \beta_7 Lit + \beta_8 AltmanZ +$$

$$\beta_9 Age + \beta_{10} Age^2 + \beta_{11} Export + \beta_{12} SEG + \beta_{13} BigN + \beta_{14} CI + \beta_{15} SPEC +$$

$$\beta_j IndDum + \beta_k YrsDum + \varepsilon \qquad (4.1)$$

where:

AQ	=	accrual quality, measured as (-1)* absolute value of the residual from the Dechow and Dichev (2002) model modified by McNichols (2002) (see equation (5.1) in text).
T	=	The number of consecutive years that a firm has retained the auditor since 1974;
T^2	=	The square of *T*;
Size ($Size^2$)	=	The market value (square of the market value) of equity;
OCF	=	Cash flow from operations scaled by average total assets;
Growth	=	Sales growth, calculated as $(Sales_{i,t} - Sales_{i,t-1})/Sales_{i,t}$;
Lit	=	Indicator variable that takes the value of 1 if the firm operates in a high-litigation industry and 0 otherwise. High-litigation industries are industries with SIC codes 2833-2836, 3570-3577, 3600-3674, 5200-5961, and 7370-7374 (Frankel et al. 2002 and Ashbaugh et al. 2003);
AltmanZ	=	Altman (1983) scores;
Age (Age^2)	=	the number of years (square of the number of years) the company has appeared in Compustat since 1950;
Export	=	the ratio of foreign sales to total sales;
SEG	=	the natural log of the number of the geographical segments;
BigN	=	A dummy variable that equals 1 if the auditor is a Big 4/5/6 auditor, and 0 otherwise;
CI	=	Client importance, calculated as the ratio of a client's total assets to the sum of the total assets of all the clients of an auditor;
SPEC	=	1 if the auditor is the national-level industry specialist (audit firm with the highest annual market share of clients' total assets in a particular two-digit SIC industry group) , and 0 otherwise;

Equation 4.1 includes control variables based on prior literature. Following Myers, Myers and Omer (2003), I control for firm size, operating cash flow, firm growth, auditor type, firm age, and audit complexity. I control for firm size since accruals quality increases with firm size because of greater stability and diversification of portfolio of activities (Dechow and Dichev 2002). I control for *OCF* because firms with higher operating cash flow are more likely to be better performers (Frankel, Johnson and Nelson 2002). *Growth* is included because firm growth is positively related to the accruals (DeFond and Jiambalvo 1994). I include *BigN* because prior

literature suggests that large audit firms tend to limit extreme accruals (DeFond and Subramanyam 1998). *Age* is included because accruals differ with changes in firm life cycle (Anthony and Ramesh 1992; Dechow, Hutton, Meulbroek, and Sloan 2001). I control for industry specialization since industry specialists are associated with higher earnings quality (Krishnan 2003; Reichelt and Wang 2010). Further, I control for client importance because prior literature has shown that earnings quality is higher for firms with auditors with high client importance (Li 2010). Lastly, I control for the squared terms of firm size and age because the squared term of auditor tenure might pick up the effect of squared control variables.

Note that I negate the dependent variable *AQ* so that higher *AQ* indicates higher audit quality. Hence, to test **H1a**, I test whether the coefficient β_1 on *T* is positive, and the coefficient β_2 on T^2 is negative, indicating that audit quality increases in the earlier stage of auditor tenure and decreases in the later stage of auditor tenure. To test **H1b**, I calculate the turning point of audit quality when *AQ* reaches its maximum as in equation (3.2), that is, the turning point $= \beta_1/(-2 * \beta_2)$.

4.2 Differential Auditor Quality among Auditors and across Firms

The insights from 3.4 on the turning point of audit quality dictate that minimizing the *Bonding Effect* is one major solution to combat the negative effect of the long-term auditor-client relationship on audit quality. Prior literature provides evidence that auditor type, auditor specialization, and client importance are proxies for audit quality. Therefore, I develop hypotheses on how these firm characteristics affect the relation between auditor tenure and audit quality, and the turning point of audit quality below.

4.2.1 Auditor Tenure and Audit Quality – The Impact of Auditor Type

Watts and Zimmerman (1981) predict that large audit firms supply a higher quality audit because of greater monitoring ability. BigN auditors possess higher ability because they have more auditing and industrial expertise, better training programs, and more resources invested in audit technologies. Hence, their ability to acquire client-specific knowledge should be faster. The BigN auditors' better ability to learn faster indicates that the *Learning Effect* at the early stage of auditor tenure should be stronger compared to that of the Non-BigN auditors. On the other hand, DeAngelo (DeAngelo 1981b) argues that larger audit firms provide higher quality audits because they have "more to lose" if they fail to report breaches in a client's records. In other words, apart from their better ability to provide a higher quality audit since no single client is important to a large auditor, BigN auditors have more incentives to do so (Dye 1993). The higher incentives to enforce higher audit quality stem from two sources: one is to protect their established brand name reputations from legal exposure (Francis and Wilson 1988); the other is because they have more wealth at risk from litigation due to their "deeper pockets". BigN auditors are more prone to litigation and thus have more to fear from large damage awards than damage to their reputation (Lennox 1999). Therefore, BigN auditors are perceived to have better ability and greater incentives to deliver higher quality audits. The greater incentives to be independent, in turn, indicate that the *Bonding Effect* at the later stage of auditor tenure would be lower for BigN auditors compared to non-BigN auditors. The combined higher *Learning Effect* and the lower *Bonding Effect* associated with BigN auditors relative to Non-BigN auditors lead to my second set of hypotheses stated as follows:

H2a: The increasing speed of *AQ* is higher and the decreasing speed of *AQ* is lower for firms audited by BigN auditors than for firms audited by non-BigN auditors.

H2b: The turning point of *AQ* is longer for firms audited by BigN auditors than for firms audited by Non-BigN auditors.

To test **H2a** and **H2b**, I estimate equation 2, partitioned by BigN and non-BigN auditors, and test whether the 'optimal tenure' is longer for BigN auditors than that for the non-BigN auditors. Following prior literature, I define BigN auditors as Big 4/6/8 auditors. Since I use BigN indicator variable to partition the sample, the control variable BigN would be dropped from equation (4.1) in this test.

4.2.2 Auditor Tenure and Audit Quality – The Impact of Auditor Specialization

Extant literature has documented that auditor industry specialists provide superior audit quality due to two reasons: 1) they possess in-depth industry knowledge, and hence better ability to provide quality audits; 2) they have incentives to do so due to higher reputation capital. Their better ability comes from their industry experience and sharing best practices across the industry (Dunn and Mayhew 2004), thus they can better learn client-specific knowledge, and better understand the client's business (Kwon 1996). Similarly, PricewaterhouseCoopers (2002) argue that auditors with industry expertise are more likely to detect misrepresentations and irregularities than auditors without industry expertise, especially in the early years of the audit. Their greater concern for reputation stems from a greater potential loss from audit failures (DeAngelo 1981a). This is because industry specialists invest more in technologies, physical facilities, personnel, and organization control systems that improve the quality of audits in the firms' focal industries (Simunic and Stein 1987). Gul et al. (2009) find that the association between shorter auditor tenure and discretionary accruals is weaker for firms audited by industry specialists than for non-specialists, suggesting that audit quality is higher in initial years for industry specialists. However, it is unclear whether it is due to a lower *Bonding Effect* or a higher

Learning Effect. On the other hand, Lim and Tan (2010) document that industry specialists moderate the negative effect of economic bonding on audit quality for long tenure, indicating that the *Bonding Effect* is less severe for industry specialists. Therefore, I expect that the marginal increase in audit quality in the early years relative to the marginal decrease of audit quality in the later years is greater for industry specialists relative to non-industry specialists, thus leading to a longer turning point:

H3a: *AQ* decreases at a slower speed at the later stage for firms audited by auditor experts than for firms audited by non-experts.

H3b: The turning point of *AQ* is longer for firms audited by auditor experts than for firms audited by non-experts.

To test **H3a,** and **H3b** I estimate equation 4.1 separately for the auditor specialists group and the auditor non-specialists group and test differences between two subgroups and whether the turning point is longer for one group of auditors than that for the other group of auditors.

4.2.3 Auditor Tenure and Audit Quality – The Impact of Client Importance

Economic theory of auditor independence (DeAngelo 1981b) suggests that the auditor's incentives to compromise his independence are related to client importance, i.e., the ratio of the quasi rents of a specific client to total quasi rents of all the clients of the auditor. The Arthur Anderson audit failure of Enron also suggests that client importance has a negative effect on auditor independence. However, prior literature argues that auditors of large firms are more likely to remain independent because of client visibility and reputation protection (e.g., Reynolds and Francis 2001; Larcker and Richardson 2004; Barton 2005). Therefore, the auditor's incentives to deliver a high quality audit are greater for big clients due to higher reputation damage and greater litigation risk if the auditor fails to do his job right.

Empirical evidence thus far is mixed as to whether client importance negatively affects the relation between auditor tenure and audit quality. Some studies document a positive effect of client importance on audit quality, since larger clients create economic incentives for the auditor to be independent (DeAngelo 1981b; Reynolds and Francis 2000). To support this view, Lim and Tan (2010) find that audit fees negatively moderate the positive effect of industry specialists on audit quality for long tenure, suggesting that economic bonding has a negative effect on audit quality in the later years for high client importance firms. However, Gul, Jaggi, and Krishnan (2007) focus on the increasing discretionary accruals (proxy for earnings management) and conclude that the economic bonding outweighs the reputation cost for only relatively small firms with short auditor tenure. This suggests that the *Bonding Effect* dominates in the earlier years for small firms. In contrast, Stanley and DeZoort (2007) report that audit fees are associated with a lower likelihood of restatement for firms with short auditor tenure, suggesting that high client importance enhances auditor independence in the earlier years of tenure. Similarly, Li (2010) finds that a positive association exists between conservatism and auditor tenure, but only for large firms, suggesting that the long-term auditor–client relationship imposes a greater threat to auditor independence only for smaller clients.

However, failure to find any detrimental effect on long-term auditor tenure may derive from the research design employed in prior literature. For example, Gul, Jaggi, and Krishnan (2007) use a piece-wise linear model (where short tenure is defined as 2 to 3 years and long tenure as greater than 8 years) (# of years since 1984) while Li (2010) employs a linear model (# of years of auditor tenure since 1980). Since auditors have greater economic incentives to remain independent and deliver a higher audit quality for large clients, I conjecture that auditors of large clients should provide a higher level of audit quality than auditors of small clients, and the higher positive impact from the *Learning Effect* indicates that *AQ* increases at a faster speed and lower negative impact from the *Bonding Effect* suggests that *AQ* decreases in a slower speed, thus introducing a longer 'optimal tenure' for big firms than for small firms. The above discussion leads to my third set of hypotheses as follows (stated in alternative form):

H4a: The increase in *AQ* is more pronounced in the earlier stage and the decrease of *AQ* is more severe for high importance clients than for low importance clients.

H4b: The turning point of *AQ* is longer for high importance clients than for low importance clients.

To test **H4a** and **H4b**, I estimate equation (4.1) partitioned by firms at the median *CI* and test for differences in these two groups and whether the turning point is longer for higher *CI* firms than for lower *CI* firms.

5. DATA MEASUREMENT AND SAMPLE DESCRIPTION

5.1 Variable Measurement

This section provides details of the measurement of my interest variables and additional control variables.

5.1.1 Accrual Quality

I first estimate accruals quality as a proxy of audit quality. Since audit quality is not observable, prior literature has generally used accruals quality to proxy for audit quality. Discretionary accruals models, such as the Jones's (1991) model and variations (e.g., Kothari, Leone and Wasley 2005), have been used to measure accruals quality (Ashbaugh, LaFond and Mayhew 2003; Balsam, Krishnan and Yang 2003; Johnson, Khurana and Reynolds 2002; Myers, Myers and Omer 2003). However, accruals quality is not only related to management's intentional bias of accrual estimates but it is also related to unintentional errors of accrual estimates. For this reason, I measure accruals quality using the cross-sectional regression model employed by Dechow and Dichev's (2002) and modified by McNichols (2002).[9] Since this model maps current accruals into past, current, and future cash flows, therefore this measure of audit quality better captures whether accruals are intentionally or unintentionally misstated. For robustness purposes, I use alternative discretionary accruals models in the sensitivity tests. Following McNichols (2002), I measure accrual quality by estimating the following equation cross-sectionally by 2-digit SIC code (a minimum of 20 observations in each 2-digit SIC code) :

[9] Jones, Krishnan, and Melendrez (2008) investigate the association between a comprehensive set of accruals models and fraudulent financial reporting and non-fraudulent restatements of financial statements. Using the size of the downward earnings restatement following the discovery of the fraud to proxy for the degree of discretion exercised to perpetrate the fraud, they find that the accrual estimation errors model, Dechow and Dichev (2002) as modified by McNichols (2002), exhibits the strongest association with the existence and the magnitude of fraud and non-fraud restatements.

$$CA_{i,t} = \alpha_0 + \alpha_1 OCF_{i,t-1} + \alpha_2 OCF_{i,t} + \alpha_3 OCF_{i,t+1} + \alpha_4 \Delta REV_{i,t} + \alpha_5 PPE_{i,t} + \varepsilon_{i,t} \quad (5.1)$$

Where

CA	=	Current accrual, measured as net income before extraordinary items plus depreciation and amortization minus operating cash flows (*IBC*+*DPC*-*OANCF*), scaled by average total assets (*AT*);
OCF	=	Operating cash flows (*OANCF*-*XIDOC*) for year *t-1*, year *t*, and year *t+1*, scaled by average total assets (*AT*);
ΔREV	=	Change in revenues (*SALE*) from year *t-1* to year *t*, scaled by average total assets (*AT*);
PPE	=	Gross value of property, plant, and equipment (*PPEGT*), scaled by average total assets (*AT*);
ε	=	Error term;

I measure accruals quality as the residual from equation (5.1).[10] The coefficients α_1, α_2, and α_3 denote the associations of current accruals with the cash flows in the previous, current, and subsequent years, respectively. I negate the absolute value of the residual from estimating equation (1) as *AQ*. Therefore, a higher value of *AQ* indicates higher accruals quality. In other words, the less negative is *AQ*, the higher is the accruals quality.

5.1.2 Auditor Tenure

Following Myers et al. (2003), I measure auditor tenure as the number of consecutive years the firm has retained the auditor since 1974 (*T*). Auditor identification became available in Compustat since 1974. This may introduce measurement error since the auditor may have already audited the client before 1974. However, the fact that my main analyses start from 1988 allows enough variation on auditor tenure may mitigate this measurement error. In addition, in my sensitivity tests, I also use alternative measures of auditor tenure to test the robustness of my results.

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10 Although the standard accrual quality measure takes the standard deviation of the residuals, Dechow and Dichev (2002) suggests an alternative measure for firm-level accrual quality is the absolute value of the residual for that year (note6).

I expect the relationship between *T* and *AQ* to be positive, and the relationship between T^2 (squared term of auditor tenure *T*) and *AQ* to be negative, indicating that audit quality increases in the earlier stage of auditor tenure and decreases in the later stage of auditor tenure.

5.1.3 Auditor Type

I define Big N auditors as Big 4/5/6 auditors (BigN). Here N refers to the number of big audit firms. The largest firms are the Big 5 after the merger between Coopers and Lybrand and Price Waterhouse in 1998, and Big 4 after the demise of Arthur Andersen in 2002.

5.1.4 Auditor Industry Specialization

Following prior literature (Krishnan 2003; Balsam, Krishnan, and Yang 2003; Dunn and Mayhew 2004; Lim and Tan 2008), I define auditor industry specialization as follows:

$$Auditor\_MarketShare_{ik,t} = \frac{\sum_{j=1}^{J_{ik}} SALES_{ijk,t}}{\sum_{i=1}^{I_k} \sum_{j=1}^{J_{ik}} SALES_{ijk,t}}$$

The variable $SALES_{ijk,t}$ denotes the auditor *i*'s sales revenue of firm *j* in industry *k* at year *t*. The numerator $\sum_{j=1}^{J_{ik}} SALES_{ijk,t}$ refers to the sum of the sales of all J_{ik} clients (as reported in Compustat) of auditor *i* in industry *k* at year *t*. The denominator is the sum of all I_k audit firms' (including both BigN auditors and other non-BigN auditors in industry *k*) sales of all J_{ik} clients in industry *k* at year *t*. To estimate the industry market share for auditor *i* in industry *k* at year *t*, I require a minimum of 20 clients in a particular two-digit SIC industry classification.

Consistent with prior literature (Lys and Watts 1994; Chung and Kallapur 2003; Lim and Tan 2008), I define the auditor with the largest industry market share as the industry specialist (*SPEC*). [11]

[11] Alternatively, I also follow Gul et al. (2009) to define the largest market share based on clients' total assets in an industry group. The results are qualitatively similar.

5.1.5 Client Importance

Since the quasi rents are not observable. DeAngelo (1981b) argues that the ratio of fees from a client divided by all the fees from all the clients of an auditor can be a good proxy for the quasi rent ratio. Previous studies such as Stice (1991) and Lys and Watts (1994) use this ratio as a proxy for client importance (*CI*). Client importance captures the economic bonding between the auditor and the client by the relative significance of a client's total fees to the fee revenue received by the auditor (Chung and Kallapur 2003).[12] As audit fees were not disclosed before 2000, therefore, I follow Chen, Sun, and Wu (2010), and define the importance of client i to auditor j as:

$$CI_{i,t} = \frac{TotalAssets_{i,t}}{\sum_{i=1}^{N} TotalAssets_{j,t}}$$

Where $TotalAssets_{i,t}$ is the total asssets of client i and $\sum_{i=1}^{N} TotalAssets_{i}$ is the sum of the total assets of N clients audited by auditor j in a particular year t. To minimize the potential measurement error in $CI_{i,t}$, I use the entire universe of public listed companies in Compustat (which is somewhat larger than the sample used in this study) in order to compute the base for $TotalAssets_{j,t}$.

To partition the sample into High-Client Importance firms and Low-Client Importance firms, I rank the observations into quintiles of *CI* per year. Then I classify the top two quintiles of *CI* as High-Client Importance group and the bottom two quintiles of *CI* as Low-Client Importance group.

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12 Francis et al. (1999) suggest the use of city-level markets (i.e., offices), rather than firms, as a unit of analysis in audit research. Consistent with this suggestion, Reynolds and Francis (2000) and Craswell et al. (2002) argue that client importance is better analyzed at the local office level because the economic impact of a larger client is more important to any particular local office than to the firm as a whole. Other studies following this approach include Chung and Kallapur (2003), Krishnan (2005), and Gaver and Paterson (2007). However, auditor fees data were not required to be disclosed before 2000.

5.1.6 Controls

I include control variables based on prior literature. Following Myers, Myers and Omer (2003) , I control for firm size, operating cash flow, firm growth, auditor type, and firm age. Consistent with Gul et al. (2009), I also control for audit risk and audit complexity.

I control for firm size (*Size*) since accruals quality increases with firm size because of greater stability and diversification of portfolio of activities (Dechow and Dichev 2002). Firm size is measured as the market value of equity for firm *i* at year *t*. I expect *Size* to be positively related to *AQ*.

I control for operating cash flow (*OCF)* because firms with higher operating cash flow are more likely to be better performers (Frankel, Johnson and Nelson 2002). I measure *OCF* as cash flow from operations scaled by average total assets for firm *i* at year *t*. I expect *OCF* to have a positive relationship with *AQ*.

Firm growth *(Growth)* is included because firm growth is positively related to the accruals (DeFond and Jiambalvo 1994). I measure this firm-specific *Growth* as the percentage change of sales revenue for firm *i* from year *t-1* to year *t* over sales revenue for firm *i* at year *t-1*. I expect *Growth* to have a negative relationship with *AQ*.

Firm age *(Age)* is included because accruals differ with changes in firm life cycle (Anthony and Ramesh 1992; Dechow, Hutton, Meulbroek and Sloan 2001). *Age* is measured as the number of consecutive years firm *i* has appeared in Compustat since 1950 at year *t*. I expect *Age* to be positively related with *AQ*.

I include auditor type (*BigN)* because prior literature suggests that large audit firms tend to limit extreme accruals (DeFond and Subramanyam 1998). *BigN* is a dummy variable when an auditor is a big 4/5/6 auditor. I expect *BigN* to have a positive relation with *AQ*.

I control for audit risk proxied by litigation risk (*Lit*) and financial distress based on Altman bankruptcy model (*AltmanZ*). I measure *Lit* as the firm operating in highly litigious industries with SIC codes of 2833-2836, 3570-3577, 3600-3674, 5200-596, and 7370-7370 (Ashbaugh et al. 2003). I measure *AltmanZ* as Altman's (1983) scores. Consistent with prior literature (Reichelt and Wang 2010), I expect *Lit* and *AltmanZ* to be negatively associated with *AQ*.

Two control variables to proxy for audit complexity are: the number of client operating segments (*SEG*) and the ratio of client's foreign sales to total sales (*Foreign*). If no segment data is reported in Compustat for a given observation, then I assign a value of 1. If no foreign sales are reported in Compustat for a given observation, then I assign a value of 0. I expect *Foreign* to be negatively related to *AQ*. But I do not make a prediction on the sign of *SEG*, because while the higher the number of *SEG* the more difficult it is to audit, it is also possible that the participation of multiple offices may increase audit quality (Francis and Yu 2009).

Further, I include client importance (*CI*) to control for the explicit economic bonding because prior literature has shown that earnings quality is higher for firms with auditors with high client importance (Li 2010). I measure *CI* as the ratio of client *i*'s total assets to the sum of the total assets of all the clients of an auditor at year *t*. I expect *CI* to be positively related to *AQ*.

I also include industry specialist (*SPEC*) to control for the explicit learning differentiation between industry specialists and non-industry specialists because prior literature has shown that industry specialists are associated with higher earnings quality (Balsam et al. 2003; Krishnan 2003; Reichelt and Wang 2010) and industry specialists moderate the negative effect of auditor tenure on audit quality (Gul et al. 2009). I measure industry specialist as the auditor who has the largest market share based on sales revenues in a particular industry *k* at a particular year *t*.

Moreover, I control for the squared term of firm size (*$Size^2$*) and the squared term of firm age (*Age^2*) because the squared term of auditor tenure might simply pick up the effect of squared firm characteristics that have nothing to do with auditor tenure. I expect both *$Size^2$ and Age^2* to be negatively related to *AQ*.

Lastly, I include industry dummy (*IndustryDummies*) and year dummy (*YearDummies*) variables to control for potential omitted variables that are related to industry- and year-invariant fixed effects. Industry dummies are created based on a two-digit SIC classification and year dummies are the dummies for the fiscal year. For brevity, I do not report the coefficients on the industry and year dummy variables in any of the tables.

5.2 Sample Description

Accounting data come from the COMPUSTAT database. Audit fee data come from the Audit Analytics database. The sample contains observations from 1988 to 2008[13]. Table 1 delineates the detailed sample selection procedures.

The initial sample consists of 203,314 firm-years for public firms from 1988 to 2008, with sufficient data available on Compustat to estimate accrual quality. I employ the following sample selection criteria: 1) I remove 30,348 observations with negative book value; [14]2) I drop 33,211 observations with merger and acquisition activities because accruals for firms undergoing these activities tend to be larger for reasons unrelated to earnings management (Ashbaugh et al. 2003); [15]3) I exclude 20,904 observations for firms in the financial sector (2-digit SIC code between 60 and 69) since financial institutions have fundamentally different operating characteristics; 4) I

[13] Cash flow statement data is available from COMPUSTAT starting with 1987 fiscal years. We need a total of seven years of data to compute the standard deviation, so the first usable year is 1993.
[14] In a sensitivity test, I keep the firms with negative book value but my main results (untabulated) remain qualitatively the same.
[15] In a sensitivity test, I include M&A firms in our sample and add an indicator for M&A in our multivariate analyses. Results (untabulated) show that the coefficient on M&A indicator is significantly positive and my main results still hold.

remove 18,240 observations with unidentified auditors (auditor coded as 0 and 9); 5) I also drop 16,643 observations with auditor tenure less than five years to ensure that any abnormal accrual behavior associated with start-up firms (Teoh, Welch and Wong 1998; Teoh, Wong and Rao 1998) is not attributed to short-tenure auditors, following Myers et al. (2003); 6) I omit 28,485 firm-year observations for the first year audits to eliminate the possibility that the relation between accrual quality and auditor tenure for short-tenure firms differs systematically from those with long-term tenure;[16] and 7) I exclude 2,993 firm-year observations in the top and bottom 0.5% of the interest variables and studentized residual greater than 3 to remove the undue influence of outliers. This leaves the final sample with 52,490 firm-year observations.

Table 1

Sample Selection

Criteria	Number of Observations
Firm-year observations for public firms from Compustat between fiscal year 1988 and 2008	*203,314*
Less observations:	
Negative book value	*(30,348)*
Merger and Acquisitions	*(33,211)*
Financial firms	*(20,904)*
Unidentified auditors	*(18,240)*
Auditor tenure less than five years	*(16,643)*
Auditor changes	*(28,485)*
With extreme outliner in the top and bottom 1% of the variables and studentized residuals of greater than 3	*(2,993)*
Final Sample	*52,490*

[16] We measure auditor tenure as the number of years that the firm has retained the auditor, with auditor changes due to audit-firm mergers as a continuation of the prior auditor.

Table 2 presents descriptive statistics for accrual quality and other variables used in this study. The mean (median) of *AQ* is -0.04 (-0.027), indicating accrual quality is right-skewed. The average tenure (*T*) is 9 years with a minimum of 1 year and a maximum of 35 years whereas the minimum and maximum values of the natural log of auditor tenure (*logT*) are 0 and 3.555, respectively. The mean (median) of *Size* of the firm is 0.153 (0.016). The mean (median) of the operating cash flow (*OCF*) is 0.055 (0.076), consistent with prior literature (Gul et al. 2009). The average firm *Growth* is 13.6%. The mean (median) value of *Age* of the firms is 17 (12) years. On average, 93.3% of the sample firms are audited by Big N auditors and 21.9% are audited by an industry leader (*SPEC)*. The average foreign sales to total sales ratio (*Export)* is 4% while the average log of the number of segments is 0.676. The average client importance (*CI*) is 0.002, indicating that a given client has around 0.2% of the market share of all the clients audited by a given auditor.

Table 2

Descriptive Statistics

Variables	N	MEAN	STD	MIN	Q1	MEDIAN	Q3	MAX
AQ	52,490	-0.041	0.043	-0.314	-0.055	-0.027	-0.012	0.000
T	52,490	9	7	1	4	7	13	35
logT	52,490	1.921	0.819	0.000	1.386	1.946	2.565	3.555
Size	52,490	0.153	0.528	0.000	0.004	0.016	0.078	21.559
OCF	52,490	0.055	0.155	-0.927	0.011	0.076	0.135	0.874
Growth	52,490	0.136	0.416	-1.102	-0.025	0.076	0.212	7.037
Lit	52,490	0.259	0.438	0.000	0.000	0.000	1.000	1.000
AltmanZ	52,490	4.225	6.272	-84.907	1.399	2.968	5.123	117.019
Age	52,490	17	14	1	7	12	25	59
BigN	52,490	0.928	0.258	0.000	1.000	1.000	1.000	1.000
Export	52,490	0.040	0.115	-0.157	0.000	0.000	0.000	1.792
SEG	52,490	0.676	0.514	0.000	0.000	0.693	0.693	3.526
CI	52,490	0.002	0.021	0.000	0.000	0.000	0.000	1.000
SPEC	52,490	0.219	0.414	0.000	0.000	0.000	0.000	1.000
TECH	52,490	0.553	0.497	0.000	0.000	1.000	1.000	1.000

Refer to Appendix B for all variable definitions.

Table 3 reports the correlations among the variables in the regression. Notably, *AQ* is positively correlated with auditor tenure *T* and the natural log of auditor tenure *logT*, suggesting that longer tenure is associated with higher audit quality, consistent with prior literature. Similarly, firm size, cash flows, firm age, BigN auditors, segments, client importance, and industry leader are positively correlated with audit quality, while firm-level growth, litigation risk and AltmanZ score are negatively correlated with audit quality. It is not surprising that auditor tenure and firm age are highly correlated (0.618 Spearman/0.605 Pearson), so are the natural log of auditor tenure and firm age (0.509 Spearman /0.605 Pearson). The significant results in later regression analyses indicate that the multi-collinearity between auditor tenure and firm age is not a problem.

Table 3

Correlation Matrix

Variable	*AQ*	*T*	*logT*	*Size*	*OCF*	*Growth*	*Lit*	*AltmanZ*	*Age*	*BigN*	*Export*	*SEG*	*CI*	*SPEC*
AQ		**0.130**	**0.130**	**0.229**	**0.142**	**-0.040**	**-0.073**	**-0.032**	**0.196**	**0.073**	**-0.062**	**0.010**	**0.251**	**0.044**
T	**0.139**		**1.000**	**0.229**	**0.103**	**-0.138**	**-0.042**	**-0.011**	**0.605**	**0.158**	**-0.012**	**0.071**	**0.150**	**0.024**
logT	**0.133**	**0.911**		**0.229**	**0.103**	**-0.138**	**-0.042**	**-0.011**	**0.605**	**0.158**	**-0.012**	**0.071**	**0.150**	**0.024**
Size	**0.094**	**0.193**	**0.143**		**0.308**	**0.154**	**-0.011**	**0.140**	**0.275**	**0.208**	**-0.084**	**0.193**	**0.612**	**0.137**
OCF	**0.195**	**0.125**	**0.110**	**0.127**		**0.125**	**-0.073**	**0.265**	**0.142**	**0.050**	**-0.012**	**0.044**	**0.210**	**0.023**
growth	**-0.066**	**-0.126**	**-0.139**	0.001	**-0.031**		**0.040**	**0.216**	**-0.195**	**0.011**	**0.009**	**-0.008**	-0.006	0.000
Lit	**-0.069**	**-0.058**	**-0.039**	0.006	**-0.122**	**0.044**		**0.112**	**-0.118**	**0.007**	**0.045**	**-0.039**	**-0.113**	**-0.014**
AltmanZ	-0.002	**-0.058**	**-0.070**	**0.013**	**0.091**	**0.182**	**0.110**		**-0.040**	-0.002	**0.076**	**0.043**	**-0.054**	**-0.040**
Age	**0.200**	**0.618**	**0.509**	**0.233**	**0.157**	**-0.151**	**-0.136**	**-0.107**		**0.008**	**-0.031**	**0.068**	**0.337**	**0.030**
BigN	**0.079**	**0.151**	**0.161**	**0.070**	**0.042**	0.004	**0.007**	0.007	**0.039**		**-0.011**	**0.082**	**-0.354**	**0.147**
Export	**-0.068**	**-0.043**	**-0.035**	**-0.054**	**-0.020**	**0.011**	**0.067**	**0.090**	**-0.074**	0.003		**0.009**	**-0.055**	**-0.031**
SEG	**0.026**	**0.093**	**0.068**	**0.154**	**0.068**	**-0.026**	**-0.034**	0.003	**0.077**	**0.079**	**0.020**		**0.173**	**0.023**
CI	0.006	**-0.024**	**-0.025**	**0.017**	**0.012**	-0.004	**-0.015**	-0.004	**0.006**	**-0.216**	**-0.009**	**-0.004**		**0.013**
SPEC	**0.038**	**0.030**	**0.026**	**0.096**	**0.027**	-0.002	**-0.014**	**-0.018**	**0.050**	**0.147**	**-0.031**	**0.027**	**-0.028**	

All coefficients in bold are significant at 5% level. Left lower corner of the table reports average Spearman correlation coefficients, upper right corner reports average Pearson correlation coefficients. Refer to Appendix B for all variable definitions.

6. EMPIRICAL ANALYSIS

This section discusses the results from the tests of my hypotheses presented in section 4. I first present the results of the nonlinear relation between auditor tenure and audit quality. Next, I discuss the results on the impact of auditor type on the relationship between auditor tenure and audit quality. Then I present the results on the impact of auditor specialization on the relationship on auditor tenure and audit quality. I end this section with the results on the impact of client importance on the relation between auditor tenure and audit quality.

6.1 The Relation between Auditor Tenure and Audit Quality – 'Optimal' Time Limit

Table 4 presents the pooled regression results in the first column and the Fama-Macbeth regression results in the second column. I discuss the pooled regression results first. The positive relation between *T* and *AQ* (the coefficient on *T* is 0.049) indicates that accrual quality improves as tenure lengthens. As predicted, the coefficient on T^2 is negative (-0.001). The statistically significant positive sign on *T* and negative sign on T^2 support **H1a**, suggesting that accrual quality initially increases with tenure at the early stage but later decreases with tenure at the later stage. The turning point *OT* in the pooled regression is around 16 years, supporting **H1b**. Consistent with prior literature, we find a positive relation between *AQ* and *OCF*, *Size*, *Age*, *BigN*, and *CI* and a negative relation between *AQ* and *Growth*, *Lit*, and *Export*. $Size^2$ and Age^2 are both negative and significant, following the same pattern as T^2. This indicates that the nonlinear relation between *T* and *AQ* is not spurious and not just captures the effects of the squared terms of firm size and firm age.

The Fama-Macbeth regression results are similar to the pooled regression results. Specifically, the average coefficient on *T* (0.0259) is positive and significant with a 95%

confidence interval between 0.0081 and 0.0437, whereas the average coefficient on T^2 (-0.0038) is negative and significant with a 95% confidence interval between -0.0059 and -0.0018. The average turning point of audit quality is around 12 years with a lower bound of 10 years and

Table 4
Regression Analysis – The Impact of Auditor Tenure on Audit Quality

Variable	Pooled Regression Coefficient		Fama-MacBeth Regression Mean	tValue	Probt	LowCL	UpCL
Intercept	*-0.061*	***	*-0.0526*	*-28.36*	*<.0001*	*-0.0565*	*-0.0488*
T	***0.049***	***	***0.0259***	***3.04***	***0.0065***	***0.0081***	***0.0437***
T^2	***-0.001***	***	***-0.0038***	***-3.93***	***0.0008***	***-0.0059***	***-0.0018***
Size	*0.005*	***	*0.0175*	*3.47*	*0.0024*	*0.0070*	*0.0280*
$Size^2$	*-0.046*	***	*-0.0163*	*-3.43*	*0.0026*	*-0.0262*	*-0.0064*
OCF	*0.036*	***	*0.0360*	*11.32*	*<.0001*	*0.0294*	*0.0427*
Growth	*-0.004*	***	*-0.0052*	*-2.84*	*0.0101*	*-0.0090*	*-0.0014*
Lit	*-0.005*	***	*-0.0060*	*-1.31*	*0.2034*	*-0.0155*	*0.0035*
AltmanZ	*0.022*	***	*0.0010*	*0.19*	*0.8526*	*-0.0105*	*0.0126*
Age	*0.053*	***	*0.0312*	*4.81*	*0.0001*	*0.0176*	*0.0447*
Age^2	*-0.005*	***	*-0.0007*	*-0.64*	*0.5296*	*-0.0029*	*0.0016*
BigN	*0.009*	***	*0.0077*	*8.39*	*<.0001*	*0.0058*	*0.0096*
Export	*-0.007*	***	*-0.0183*	*-5.81*	*<.0001*	*-0.0249*	*-0.0118*
SEG	*0.003*	***	*-0.0032*	*-0.91*	*0.3761*	*-0.0105*	*0.0041*
CI	*0.027*	***	*0.0405*	*3.44*	*0.0026*	*0.0160*	*0.0650*
SPEC	*0.059*	***	*-0.0013*	*-0.19*	*0.8507*	*-0.0151*	*0.0126*
OT	***16.201***		***12.4630***	***13.02***	***<.0001***	***10.4660***	***14.4601***
Year& Industry Fixed Effects	*YES*		*NA*	*NA*	*NA*	*NA*	*NA*
N(N/Year)	*52,490*		*2,446*	*14.60*	*<.0001*	*2,096*	*2,795*
AdjRSq	*8.96%*		*8.96%*	*11.29*	*<.0001*	*7.30%*	*10.61%*

The sample size is 52,490 firm-years for 21 years from 1988 to 2008. The dependent variable is *AQ*. The LowCL and UpCL refer to the lower bound and upper bound of the estimates at the 95% confidence level. All tests are two-tailed, unless otherwise indicated. *OT* is calculated as the negative ratio of coefficient on *T* to 2*coefficient on T^2 ($-\frac{\text{coefficient on } T}{2*\text{coefficient on } T^2}$), estimated by year and averaged across all years. Refer to Appendix C for all variable definitions.

upper bound of 14 years. Figure 4 graphs the concave shape of accrual quality over the length of auditor tenure, reiterating the point that the increase (decrease) in audit quality is a gradual and slow process rather than a monotonic one. The fact that the mean curve (the middle curve) lies within the upper bound (upper curve) and the lower bound (lower curve) suggests that the concave function of audit quality is rather stable over the years and the results are robust to the consideration on the correlations of the error term across years. The 95% confidence interval starts with a narrow band at the early years and gradually increases to a larger band at the later years, indicating the estimation error on the relationship between auditor and audit quality is smaller for shorter tenure than for longer tenure.

6.2 The Impact of Auditor Type on the Optimal Time Limit

H2a predicts that *AQ* increases (decreases) faster (slower) for firms with BigN auditors due to their better ability to learn and less incentives to lose independence while **H2b** predicts a longer 'optimal tenure' for BigN auditors. Table 5 presents the results for BigN auditors, Non-BigN auditors, and their differences. Notably, the nonlinear relationship between auditor tenure and audit quality are evident and significant in both groups, although the increase of *AQ* at the earlier stage is more salient for BigN auditors whereas the decrease of *AQ* at the later stage is more severe for Non-BigN auditors. Specifically, BigN auditors group not only provides a higher basis for audit quality (the coefficient on Intercept is less negative and the difference is significant), but also improves audit quality faster (coefficient on T is more positive and the difference is significant at 1% level) and decreases audit quality slower (coefficient on T^2 is less negative and the difference is significant at 1% level), supporting **H2a**. The higher magnitude of coefficient on T and lower magnitude of coefficient on T^2 naturally lead to a longer 'optimal tenure' for BigN auditors group (around 16 years) relative to Non-BigN auditors group (around 9 years). The difference of 8 years in 'optimal tenure' between these two groups is significant at 1% level, supporting **H2b**. [17]

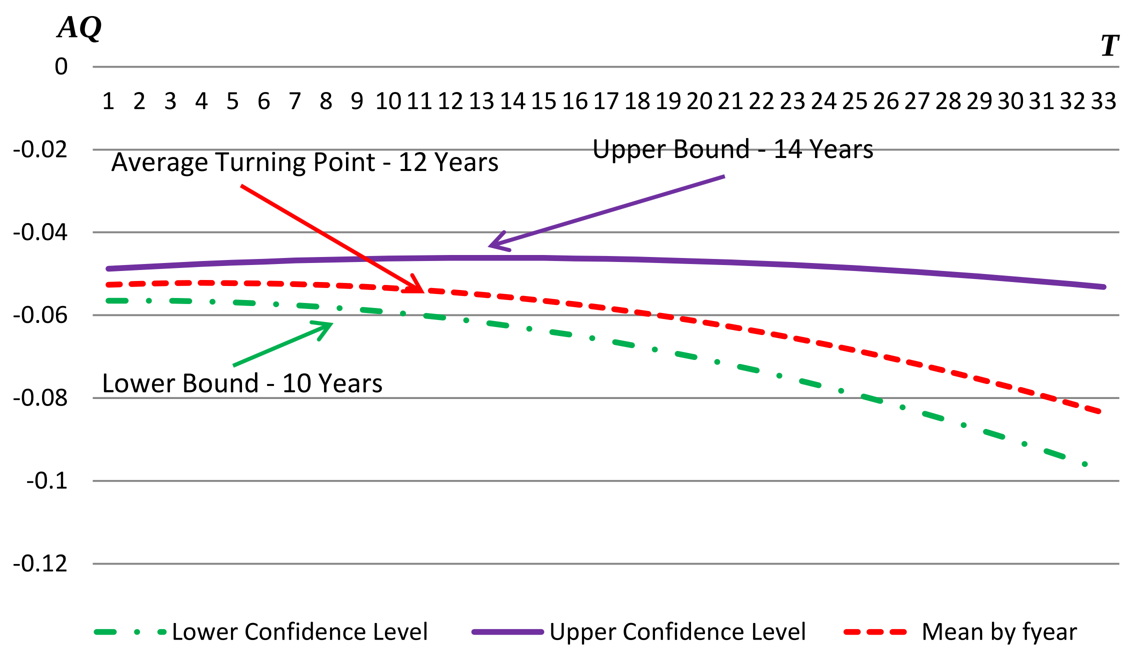

Figure 4 Turning Point of Audit Quality - Averaged By Year (at 95% Confidence Interval)

This pattern is illustrated in Figure 5. Note that BigN auditors start with a higher audit quality and sustain the increasing audit quality for a longer time before the turning point when audit quality starts to decline. To ensure that the results are not driven by company size, I form a matched sample based on 2-digit SIC code and company size for each company audited by a

[17] To ensure that the results are not driven by company size, I form a matched sample based on 2-digit SIC code and company size. for each company audited by a small auditor, I identify a matched company that is in the same 2-digit SIC industry, has total assets as close as possible, and is audited by a BigN auditor. I then re-estimate the model using this new sample. The results (untabulated) are qualitatively similar.

small auditor, I identify a matched company that is in the same 2-digit SIC industry, has total assets as close as possible, and is audited by a BigN auditor. I then re-estimate the model using this new sample. The results (untabulated) are qualitatively similar. The decreasing speed for the BigN group is more gradual, opposite to the faster declining speed at the later stage for the Non-BigN group.

Table 5
Regression Analysis - The Impact of Auditor Tenure on Audit Quality - BigN versus Non-BigN

Variable	BigN		Non-BigN		BigN vs Non-BigN	
N	*48,715*		*3,774*		*44,941*	
AdjRSq	*13.10%*		*10.10%*		*3.00%*	
Intercept	*-0.051*	***	*-0.232*	***	*0.180*	***
T	***0.045***	***	***0.002***	***	***0.043***	***
T^2	***-0.001***	***	***-0.011***	**	***0.010***	***
Size	*0.005*	***	*0.010*		*-0.005*	***
$Size^2$	*-0.045*	***	*-0.006*		*-0.039*	***
OCF	*0.035*	***	*0.039*	***	*-0.004*	***
Growth	*-0.004*	***	*-0.004*	**	*0.000*	***
Lit	*-0.006*	***	*0.004*		*-0.010*	***
AltmanZ	*0.023*	***	*0.004*		*0.020*	***
Age	*0.055*	***	*0.038*		*0.017*	***
Age^2	*-0.005*	***	*-0.002*		*-0.003*	***
Export	*-0.008*	***	*0.009*		*-0.017*	***
SEG	*0.003*	***	*0.007*	***	*-0.004*	***
CI	*0.112*	***	*0.022*	*	*0.090*	***
SPEC	*0.059*		*0.010*		*0.049*	
OT	***16.467***	***	***9.163***	***	***7.305***	***
Year and Industry Effects	*YES*		*YES*		*YES*	

***, **, * indicates that the coefficient is statistically different from zero at the 1%, 5%, 10% level of significance. White's adjusted t-statistics are presented in parentheses. The dependent variable is *AQ*. The partition variable is BigN. *OT* is calculated as the negative ratio of coefficient on *T* to 2*coefficient on T^2 ($-\frac{\text{coefficient on } T}{2 * \text{coefficient on } T^2}$). Refer to Appendix C for variable definitions.

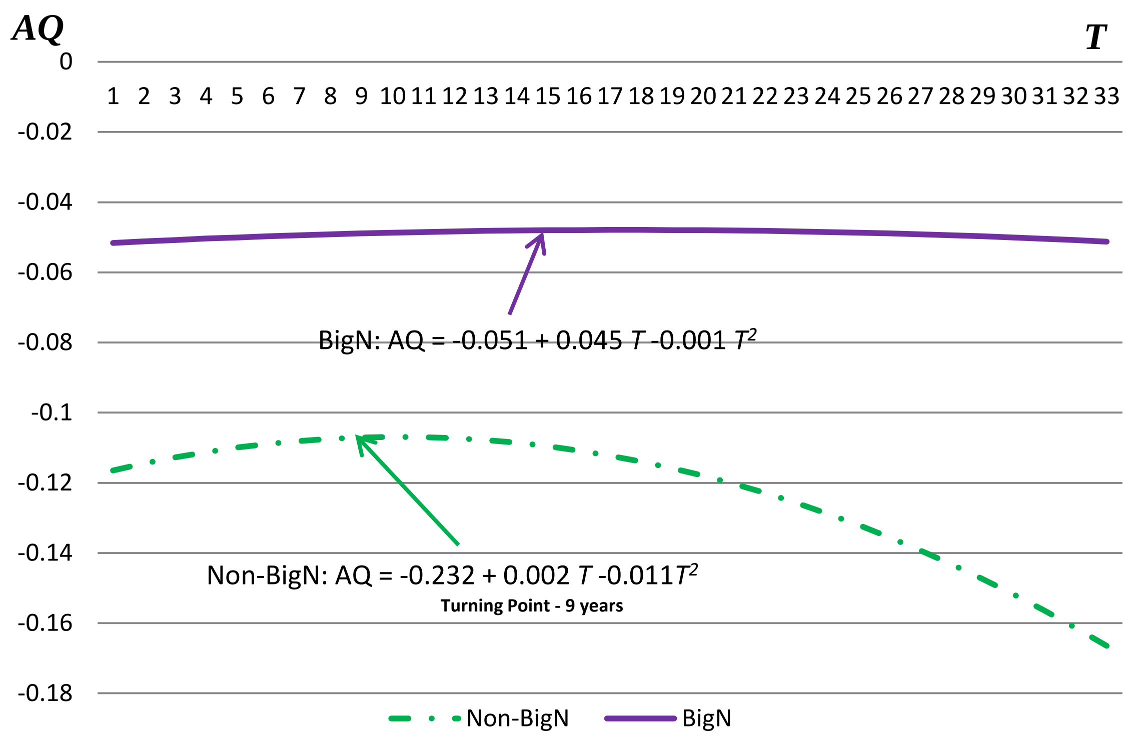

Figure 5 Turning Point of Audit Quality - BigN versus Non-BigN

6.3 The Impact of Auditor Specialization on the Optimal Time Limit

H3a predicts that industry specialists alleviate the negative effect of long tenure on audit quality and thus **H3b** predicts that firms audited by industry specialists should have a longer 'optimal tenure' than firms audited by non-industry specialists. Table 6 presents the results for the industry specialist group, the non-industry specialist group, and the difference between these two groups. Despite the consistent sign on the coefficients of T (positive sign) and T^2 (negative sign) for both groups, only the non-industry specialist group is significant (at the 1% level). In contrast, for the industry specialist group, the coefficient on T (0.040) is significant (at 5% level) but the coefficient on T^2 (-0.001) is not significant, so are the differences of the coefficients on T (-0.033) and T^2 (-0.007) for these two groups. As expected, the turning point for the industry expert group (22 years) is 5 years longer than that of the non-industry group (17 years) and the difference is significant, supporting **H3b**. Not surprisingly, the longer turning point for the industry expert group is due to the greater decreasing speed of audit quality at the later years rather than the greater increasing speed of audit quality at the earlier years. This suggests the slope of the 'learning curve' in earlier years of the audit engagement is less steep but the *Bonding Effect* is less severe at later years for the industry specialist group than that of the non-industry specialist group, supporting **H3a**. Figure 6 illustrates the results in Table 6. Consistent with the notion that the industry specialist group should deliver a higher quality audit than non-industry specialists on average; the industry specialists have a higher starting point and a higher ending point for *AQ* than those of the non-industry specialists. The difference on *AQ* between these two groups narrows surrounding the turning point, but widens again afterwards. The concavity of *AQ* for auditor specialists is less severe than that of non-specialists is not surprising, given the expectation that industry experts have greater incentives and greater ability to stay independent and can better withstand managers' pressure to succumb to their demands to 'push the boundaries of accounting standards'.

6.4 The Impact of Client Importance on the Optimal Time Limit

H4a states that the increase of audit quality is more pronounced in the earlier stage and the decrease of audit quality is more severe for high client importance firms than for low client importance firms and **H4b** states that the turning point of audit quality is longer for firms with auditors of higher client importance than for firms with auditors of lower client importance. Table 7 presents the results for the Full Sample, the High-Client Importance group and Low-Client Importance group, and their differences. Since the top two quintiles of *CI* are classified as the High-Client Importance group and bottom two quintiles of *CI* as the Low-Client

Table 6
Regression Analysis - The Impact of Auditor Tenure on Audit Quality - Specialists versus Non-Specialists

Variable	Specialists		Non-Specialists		Specialists vs Non-Specialists	
N	*11,503*		*40,987*		*-29,484*	
AdjRSq	*15.50%*		*12.20%*		*3.20%*	
Intercept	*-0.048*	***	*-0.056*	***	*0.008*	***
T	***0.040***	**	***0.073***	***	***-0.033***	*
T^2	***-0.001***		***-0.002***	***	***-0.007***	
Size	*0.003*	***	*0.005*	***	*-0.002*	**
$Size^2$	*-0.035*	**	*-0.049*	***	*0.015*	*
OCF	*0.041*	***	*0.035*	***	*0.005*	***
Growth	*-0.004*	***	*-0.004*	***	*0.000*	***
Lit	*-0.006*	***	*-0.004*	***	*-0.001*	***
AltmanZ	*0.022*	***	*0.022*	***	*0.000*	***
Age	*0.063*	***	*0.036*	***	*0.027*	***
Age^2	*-0.008*	***	*-0.001*		*-0.007*	***
Export	*0.001*		*-0.009*	***	*0.010*	
SEG	*0.004*	***	*0.003*	***	*0.001*	***
CI	*0.697*	***	*0.004*		*0.693*	***
OT	***21.808***	***	***17.157***	***	***4.651***	***
Year and Industry Effects	*YES*		*YES*		*YES*	

***, **, * indicates that the coefficient is statistically different from zero at the 1%, 5%, 10% level of significance. White's adjusted t-statistics are presented in parentheses. The dependent variable is *AQ*. The partition variable is *SPEC*. *OT* is calculated as the negative ratio of coefficient on *T* to 2*coefficient on T^2 ($-\frac{\text{coefficient on } T}{2*\text{coefficient on } T^2}$). Refer to Appendix C for all variable definitions.

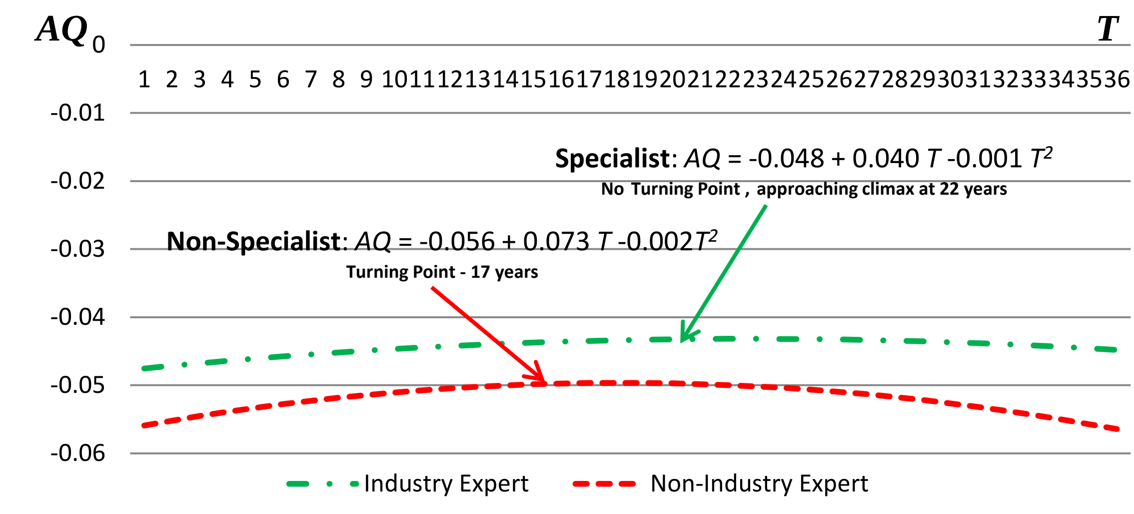

Figure 6 Turning Point of Audit Quality - Specialist versus Non-Specialist

Importance group, I report the results for this restricted full sample in the first major column. The results are almost identical to the main results reported in Table 4. Specifically, the concavity of *AQ* still holds and the turning point is also around 16 years for this sample. It is obvious from Table 7 that the increase of audit quality in the earlier years and the decrease of audit quality in the later years is mainly driven by the High Client Importance subsample, as the concavity is statistically significant at the 1% level for the High Client Importance subsample *only*, supporting **H4a**. This finding stands in contrast to the general belief that longer tenure is associated with higher audit quality for firms audited by auditors with higher client importance (Li 2010). However, consistent with the notion that auditors with clients of higher importance have higher incentives to deliver a higher level of audit quality relative to auditors with clients of lower importance, I find that the intercept (-0.0510) for the High-Client Importance group is

Table 7
Regression Analysis - The Impact of Auditor Tenure on Audit Quality -High Client Importance versus Low Client Importance

Variable	High Client Importance		Low Client Importance		High vs Low Client Importance	
N	*20,994*		*20,992*		*2*	
AdjRSq	*16.09%*		*9.34%*		*6.75%*	
Intercept	*-0.0510*	***	*-0.1052*	***	*0.0542*	***
T	***0.0384***	***	***-0.0058***		***0.0442***	***
T^2	***-0.0014***	***	***0.0053***		***-0.0067***	***
Size	*0.0015*	***	*-0.1967*	***	*0.1982*	**
$Size^2$	*-0.0176*	***	*0.2836*	*	*-0.3011*	**
OCF	*0.0235*	***	*0.0299*	***	*-0.0065*	***
Growth	*-0.0046*	***	*-0.0032*	***	*-0.0015*	***
AltmanZ	*-0.0331*	***	*0.0549*	***	*-0.0880*	***
Age	*0.0372*	***	*0.0668*	***	*-0.0296*	***
Age^2	*-0.0035*	***	*-0.0093*	***	*0.0058*	**
Export	*-0.0043*	*	*-0.0053*	*	*0.0011*	
SEG	*0.0015*	***	*-0.0639*		*0.0654*	**
BigN	*0.0178*	***	*0.0332*	***	*-0.0154*	***
CI	*0.0257*	***	*755.6049*	***	*-755.5790*	***
SPEC	*0.0169*		*0.0245*		*-0.0076*	
OT	***13.5009***	***	***5.5374***		***7.9635***	***
Year and Industry Effects	*YES*		*YES*		*YES*	

***, **, * indicates that the coefficient is statistically different from zero at the 1%, 5%, 10% level of significance. White's adjusted t-statistics are presented in parentheses. The dependent variable is *AQ*. *OT* is calculated as the negative ratio of coefficient on *T* to 2*coefficient on T^2 ($-\frac{\text{coefficient on } T}{2*\text{coefficient on } T^2}$). The partition variable is *CI*. Refer to Appendix B for all variable definitions.

less negative than that of the Low-Client Importance group (-0.1052) and the difference is significant at 1% level. These results are illustrated in Figure 7. As predicted, I find that the 'optimal tenure' for the High Client Importance group approproximates 14 years, about 8 years longer than that of the Low Client Importance group (around 6 years). The difference of the 'optimal tenure' between these two groups is significant at 1% level, supporting **H4b**. The result indicates that the positive impact from the economic incentives to be independent is almost as important as the negative impact of *Bonding Effect* due to cognitive bias associated with lengthy tenure for the High Client Importance group.

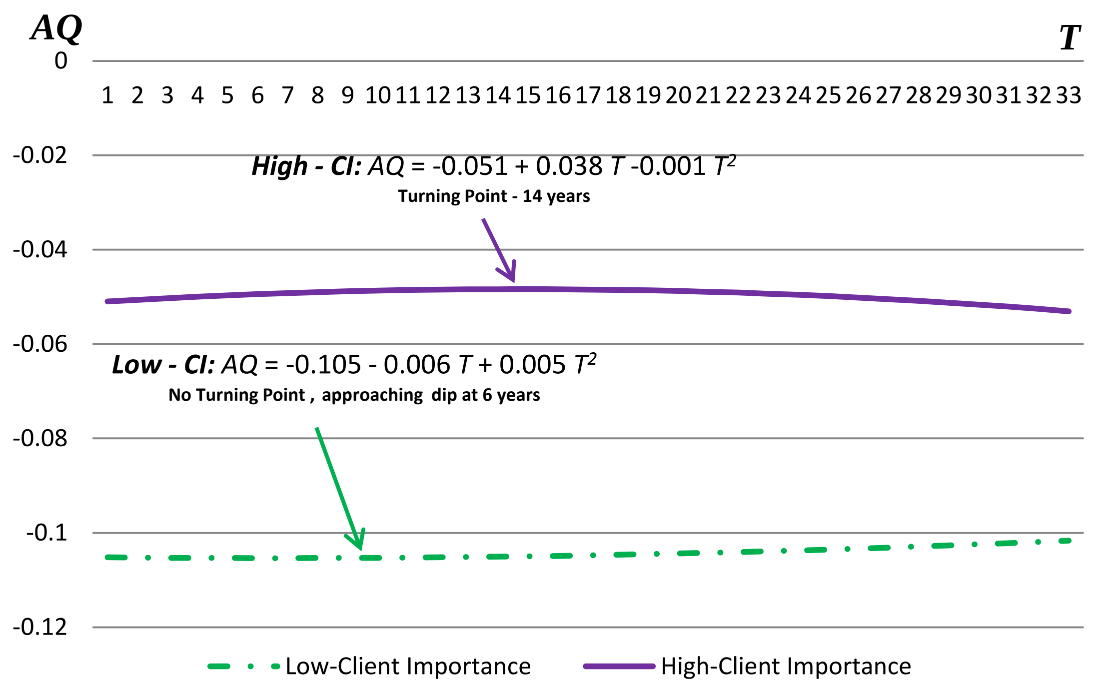

Figure 7 Turning Point of Audit Quality - High-Client Importance versus Low-Client Importance

7. ADDITIONAL ANALYSES AND SENSITIVITY TESTS

7.1 Variation Of Audit Quality Over Time – The Impact of the Regulation Effect

In my main analysis, I assume *AQ* only varies across firms. However, auditors' incentives to be independent are also influenced by external forces such as regulations. Given SOX implemented a variety of rules to enhance auditor independence,[18] GAO's 2003 report left mandatory audit firm rotation as a future option if significant improvement in auditor independence did not materialize. During the eight years of annual inspections of the public firm audits, the PCAOB (2011) has found frequent audit deficiencies resulting from lack of independence, objectivity, and professional skepticism (either intentional or unintentional). Doty (2011) provides anecdotal evidence that some auditors are willing to increase audit materiality to allow the manager to manipulate accounting numbers to meet or beat earnings benchmarks when the audit firm has served the same client for decades. Since the PCAOB chooses the most complex audits, the selection bias may over-extrapolate the negative effect of long tenure on audit quality. Besides, Davis, Soo, and Trompeter (2009) found that increased use of discretionary accruals to meet or beat earnings benchmarks in the early and later years (after 14th year) of tenure did not exist in the post-SOX period. Therefore, it is still an empirical question as to whether the regulator's concerns are supported by a large sample of data and whether Davis et al.'s conclusion extends to accrual quality.

The tightened rules in the post-SOX period and the increased scrutiny from regulators and investors have a chilling effect on the relationship between the auditor and his client, thus

[18] such as eliminating certain non-audit services provided to audit clients, strengthening the audit committee's independence and responsibility, establishing the PCAOB to regulate the audit profession, and tightening mandatory audit partner rotation from every seven years to every five years.

reducing the negative consequences of the *Bonding Effect*. Therefore, we expect the marginal increase of audit quality should be stronger at earlier years and the marginal decrease of audit quality should be weaker at later years of auditor tenure, thus leading to a longer turning point in the Post-SOX period than relative to the Pre-SOX period.

Table 8 presents the analysis of the turning point of audit quality for the Post-SOX period, the Pre-SOX period, and the difference between these two periods. Consistent with my prediction, beyond a higher starting point for *AQ* in the Post-SOX period, we find that the

Table 8

Regression Analysis - The Impact of Auditor Tenure on Audit Quality over Time

Variable	Post-SOX		Pre-SOX		Post-SOX vs. Pre-SOX	
N	*12,023*		*40,467*		*-28,444*	
AdjRSq	*10.77%*		*13.81%*		*-3.04%*	
Intercept	*-0.0527*	***	*-0.0912*	***	*0.0385*	***
T	***0.0484***	*******	***0.0428***	*******	***0.0056***	******
T^2	***-0.0014***	******	***-0.0015***	*******	***0.0001***	******
Size	*0.0043*	***	*0.0061*	***	*-0.0019*	***
$Size^2$	*-0.0452*	***	*-0.0430*	***	*-0.0022*	***
OCF	*0.0262*	***	*0.0390*	***	*-0.0128*	***
Growth	*-0.0071*	***	*-0.0029*	***	*-0.0041*	***
Lit	*-0.0051*	***	*-0.0051*	***	*0.0000*	***
AltmanZ	*0.0377*	***	*0.0211*	***	*0.0166*	***
Age	*0.0348*	***	*0.0572*	***	*-0.0225*	**
Age^2	*-0.0023*		*-0.0047*	***	*0.0024*	
Export	*-0.0042*		*-0.0065*	***	*0.0023*	
SEG	*0.0029*	***	*0.0030*	***	*-0.0001*	***
BigN	*0.0094*	***	*0.0083*	***	*0.0010*	***
CI	*0.0011*		*0.0291*	***	*-0.0280*	
SPEC	*0.0162*		*0.0620*		*-0.0458*	
OT	***17.5374***	*******	***14.3744***	*******	***3.1630***	*******
Industry Fixed Effects	*YES*		*YES*		*YES*	

***, **, * indicates that the coefficient is statistically different from zero at the 1%, 5%, 10% level of significance. White's adjusted t-statistics are presented in parentheses. The dependent variable is *AQ*. *OT* is calculated as the negative ratio of coefficient on *T* to 2*coefficient on T^2 ($-\frac{\text{coefficient on } T}{2*\text{coefficient on } T^2}$). The partition variable *SOX* is 1 when fiscal year ended before July 2002, and 0 otherwise. Refer to Appendix C for all variable definitions.

coefficient on T is also larger and the coefficient on T^2 is smaller in the Post-SOX period relative to the Pre-SOX period. And the differences between these coefficients are all significant at the 1% level. Consequently, the weaker negative impact of the *Bonding Effect* extends the turning point from 14 years in the pre-SOX period to approximately 18 years in the post-SOX period. The 3-year difference in 'optimal tenure' is statistically significant at the 1% level. This positive impact of SOX on the association between auditor tenure and audit quality is vividly portrayed in Figure 8. This highlights the success of SOX initiatives in enhancing auditor independence and improving audit quality. Therefore, this finding indicates that the negative impact of long tenure on audit quality has been attenuated, consistent with the findings of Davis, Soo, and Trompeter (2009). However, the presence of the deterioration of audit quality in later years of auditor tenure supports the PCAOB's view that lack of objectivity and professional skepticism still negatively affect audit quality for extended auditor-client relationship (PCAOB 2011; Doty 2011).

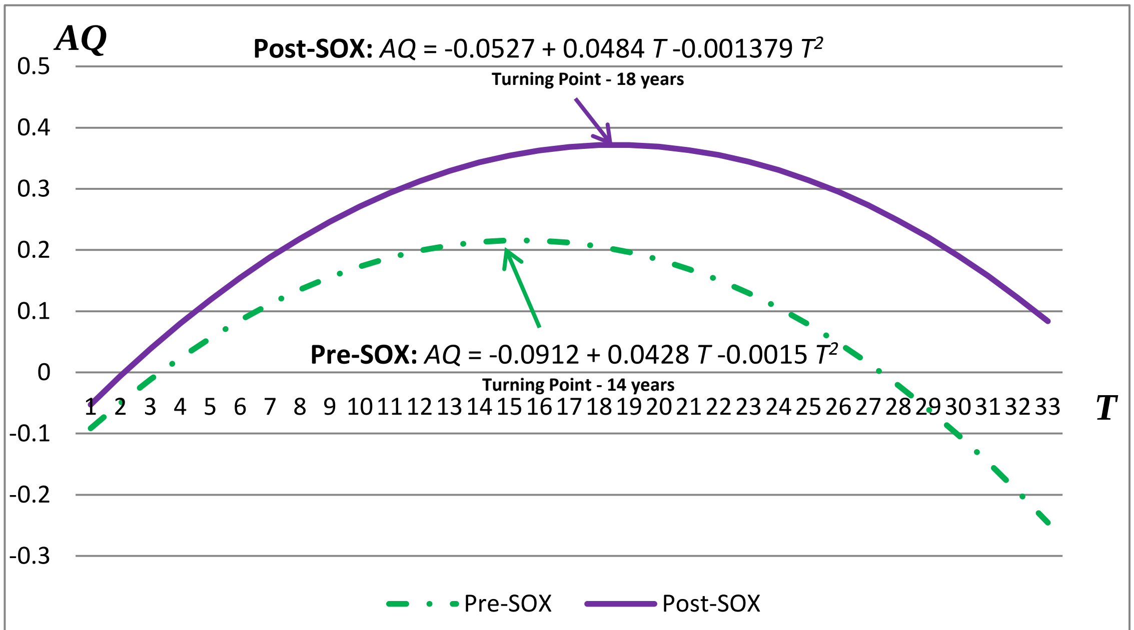

Figure 8 Turning Point of Audit Quality - Post-SOX versus Pre-SOX

7.2 Variation of Audit Quality among Industries

In our main analysis, we assume the relation between auditor tenure and auditor quality is homogenous among industries. However, different industries with various audit complexities affect the extent of the *Learning Effect*. By the same token, different industries with various litigation risks impact the magnitude of the *Bonding Effect*. To attenuate the negative impact of a potential mandate of mandatory audit firm rotation on audit quality, the PCAOB (2011) seeks comment on whether the mandate should be implemented in certain industries.

The major concern for limiting the maximum tenure is that the auditor would not have enough time to learn about the client's business for complex audits.[19] As a result, rotation requirement may impair audit quality, exactly opposite to its very goal to protect the investing public and to restore investor confidence. This unintended negative consequence of limiting auditor tenure should be most pronounced in industries with high audit complexity, where the *Learning Effect* is stronger. The need for mandatory audit firm rotation should be more prominent in industries with low litigation risk, where the *Bonding Effect* is more severe since the auditor has less incentive to be independent due to less reputation damage and litigation costs in these industries.

To simplify my analysis, we use high technology industries to proxy for audit complexity and high litigation industries to proxy for litigation risk. Specifically, we code firms with SIC codes in the 2830s, 3570s, 7370s, 8730s, and between 3825 and 3829 as 1 for High-Technology industries (High-Tech) as 0 otherwise. Following Frankel et al. (2002) and Ashbaugh et al.

[19] It is argued that the complexity and size of most modern businesses simply do not lend themselves to short audit engagements (Knapp 1991; PricewaterhouseCoopers 2002, 2007, 2010). For example, Knapp (1991) states "a company does not need to approach the size of an Exxon or a General Motors to have a complex organizational and financial structure".

Table 9

Regression Analysis – The Impact of Auditor Tenure and Audit Quality Across Industries

Panel A: Full Sample Partitioned by TECH – **Effect of Audit Complexity**

Variable	High TECH		Low TECH		High TECH vs Low TECH	
N	*29,017*		*23,473*		*5,544*	
AdjRSq	*14.61%*		*10.38%*		*4.23%*	
Intercept	*-0.0751*	***	*-0.0462*	***	*-0.0290*	***
T	***0.0580***	***	***0.0393***	***	***0.0187***	***
T^2	***-0.0020***	***	***-0.0010***	**	***-0.0010***	***
OT	***14.5197***	***	***19.3571***	***	***-4.8373***	***

Panel B: Full Sample Partitioned by LIT - **Effect of Litigation Risk**

Variable	High LIT		Low LIT		High LIT vs Low LIT	
N	*13,608*		*38,882*		*-25,274*	
AdjRSq	*8.90%*		*14.29%*		*-5.39%*	
Intercept	*-0.0459*	***	*-0.0622*	***	*0.0163*	***
T	***0.0409***	*	***0.0533***	***	***-0.0123***	*
T^2	***-0.0011***		***-0.0017***	***	***0.0006***	
OT	***17.9973***	***	***16.0030***	***	***2.3501***	***

Panel C: High LIT Subsample - Partitioned by TECH – **Incentives vs. Cognitive Bias**

Variable	High TECH		Low TECH		High TECH vs Low TECH	
N	*9,421*		*4,187*		*5,234*	
AdjRSq	*7.30%*		*6.65%*		*0.65%*	
Intercept	*-0.0474*	***	*-0.0624*	***	*0.0149*	***
T	***0.0393***		***0.0397***		***-0.0004***	
T^2	***-0.0011***		***-0.0010***		***-0.0001***	
OT	-		-		-	

Panel D: Low LIT Subsample - Partitioned by TECH - **Incentives vs. Cognitive Bias**

Variable	High TECH		Low TECH		High TECH vs Low TECH	
N	*19,596*		*19,286*		*310*	
AdjRSq	*10.14%*		*7.44%*		*2.71%*	
Intercept	*-0.0717*	***	*-0.0551*	***	*-0.0165*	***
T	***0.0745***	***	***0.0474***	***	***0.0271***	***
T^2	***-0.0032***	***	***-0.0013***	***	***-0.0020***	***
OT	***11.5027***	***	***18.4794***	***	***-6.9767***	***

***, **, * indicates that the coefficient is statistically different from zero at the 1%, 5%, 10% level of significance. White's adjusted t-statistics are presented in parentheses. The dependent variable is *AQ*. *OT* is calculated as the negative ratio of coefficient on T to 2*coefficient on T^2 $\left(-\frac{\text{coefficient on } T}{2*\text{coefficient on } T^2}\right)$. The partition variable *TECH* in Panel A is an indicator variable equal to 1 when firm *i* in year *t* is in a high-technology industry (SIC code is in the 2830s, 3570s, 7370s, 8730s, and between 3825 and 3829), and 0 otherwise. The partition variable *LIT* in Panel B is an indicator variable equal to 1 when firm *i* in year *t* is in a high-litigation industry, and 0 otherwise. Control variables (same as Table 8) are included in the regression but omitted from this table for brevity. Refer to Appendix C for all variable definitions.

(2003), we define High-litigation industries are industries with SIC codes 2833-2836, 3570-3577, 3600-3674, 5200-5961, and 7370-7374.

Panel A of Table 9 presents the results on the effect of audit complexity on the relation between auditor tenure and audit quality.[20] Consistent with a stronger *Learning Effect* for complex audits, the coefficient on *T* (0.058) in High-Tech industries is greater than the coefficient on *T* (0.040) in Low-Tech industries. Surprisingly, however, I find that the negative impact of *Bonding Effect* dominates earlier for High-Tech industries, leading to a higher coefficient on T^2 (-0.002 vs. -0.001) and a shorter turning point (15 years vs. 19 years) for High-Tech industries than Low-Tech industries. Nevertheless, as indicated by a higher negative and significant intercept (-0.075 vs. -0.046) for High-Tech industries than Low-Tech industries, the overall *AQ* along the length of auditor tenure is lower for High-Tech industries than Low-Tech industries.

Panel B of Table 9 reports the results for the effect of litigation risk on the relation between auditor tenure and audit quality. As expected, *AQ* is generally higher for High-Litigation industries than for Low-Litigation industries, evident from the significant less negative intercept (-0.0459 vs. -0.0622) for the High-LIT industries than the Low-LIT industries. Note that the concavity of audit quality (that is, increasing of audit quality at earlier years and decreasing of audit quality at later years) exists in Low-LIT industries *only*.

To examine the joint effect of audit complexity and litigation risk on the relation between auditor tenure and audit quality, we let audit complexity and litigation risk vary at the same time in panel C and panel D of Table 9. Panel C of Table 9 indicates that auditor tenure has *no* effect

[20] Note that the control variables and fixed effects in the main regressions are also included here, but not presented for brevity.

on audit quality over the length of auditor tenure for both High-Tech and Low-Tech industries within the high litigation subsample, confirming the conclusion in panel B. In contrast, panel D of Table 9 provides evidence that the *Bonding Effect* dominates in both High-Tech industries and Low-Tech industries within the low litigation subsample, reinforcing the results in panel A. These results are depicted in Figure 9. Consistent with a higher *Learning Effect* for more complex audits, audit quality starts at a lower level but increases faster in earlier years in the High-Tech group than in the Low-Tech group. However, a faster decreasing speed in later years for High-Tech group than Low-Tech group suggests that the maximum audit quality can be achieved for more complex audits may be relatively lower than less complex audits. An alternative explanatory is: the *Bonding Effect* associated with extended tenure is more severe for complex audits when auditors are less likely to challenge management's assumptions and estimates (PCAOB 2011). Consequently, the turning point of *AQ* for the High-Tech group (12 years) is shorter than the Low-Tech group (18 years). This raises the question whether an extended tenure would indeed enhance audit quality for complex audits more than non-complex audits. Furthermore, the deterioration of audit quality at later years exists in the low litigation subsample *only* but not in the high litigation subsample implies that the *Bonding Effect* is due to incentive-related reasons rather than due to cognitive bias. Hence, auditor independence can be enhanced by raising auditor legal liability.

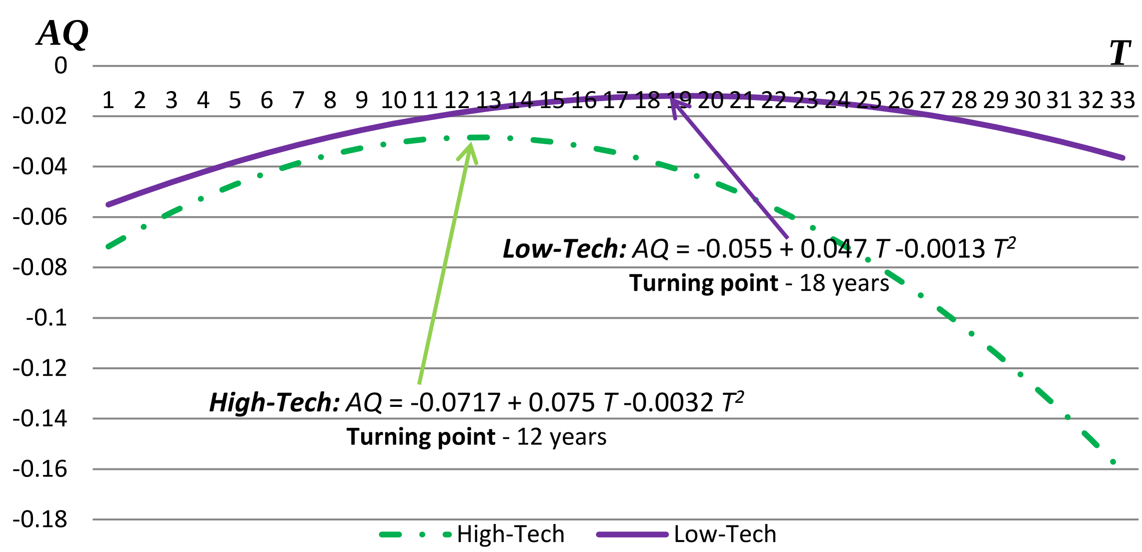

Figure 9 Turning Point of Audit Quality - High-Tech versus Low-Tech within Low-LIT Industries

7.3 Reconciliation with Prior Literature

To reconcile my empirical results with the findings in prior literature, I replicate the results from prior literature using a linear or a piece-wise linear model of auditor tenure in Table 10. Consistent with prior literature (Myers et al. 2003; Mansi et al. 2004; Ghosh and Moon 2005; Gu et al. 2009), I find *T* (*logT*) is significant and positively related to *AQ* with a coefficient of 0.008 (0.001) in Model 1 (Model 2), suggesting that audit quality increases with auditor tenure. Next, Model 3 column presents the results with dummy variables for short tenure (less than 3 years) and long tenure (greater than 8 years). I find that only short tenure is negatively related to audit quality, as evidenced by a significant negative coefficient on *Short* (coefficient= -0.002) and an insignificant negative coefficient on *Long* (coefficient=0.039). This is in line with the findings in Carcello and Nagy (2004) and Johnston et al. (2002) that short tenure is associated with low audit quality while long tenure is not. However, when I redefine long tenure as auditor tenure more than 30 years, I observe that the coefficients on *Short* and *Long* are both negative and significant (coefficient = -0.002 for *Short* and coefficient = -1.158 for *Long*). This result indicates that both short tenure and long tenure are detrimental to audit quality, echoing the findings in Carey and Simnet (2006), Davis et al. (2009), and Boone et al. (2008). Therefore, this

Table 10

Auditor Tenure and Audit Quality - Reconciliation with Prior Literature

Variable	Model1		Model2		Model3		Model4	
N	*52,490*		*52,490*		*52,490*		*52,490*	
AdjRSq	*12.80%*		*12.80%*		*13.10%*		*13.10%*	
Intercept	*-0.054*	***	*-0.055*	***	*-0.058*	***	*-0.059*	***
T	*0.008*	**						
T^2								
logT			*0.001*	***				
Short					*-0.002*	***	*-0.002*	***
Long					*0.039*		*-1.158*	**
Growth	*-0.004*	***	*-0.004*	***	*-0.004*	***	*-0.004*	***
OCF	*0.037*	***	*0.037*	***	*0.037*	***	*0.037*	***
Size	*0.005*	***	*0.005*	***	*0.005*	***	*0.005*	***
Lit								
AltmanZ	*0.020*	***	*0.02*	***	*0.021*	***	*0.021*	***
Age	*0.064*	***	*0.058*	***	*0.058*	***	*0.059*	***
Size2	*-0.045*	***	*-0.045*	***	*-0.045*	***	*-0.045*	***
Age2	*-0.007*	***	*-0.006*	***	*-0.005*	***	*-0.006*	***
Export	*-0.007*	***	*-0.007*	***	*-0.007*	***	*-0.007*	***
SEG	*0.003*	***	*0.003*	***	*0.003*	***	*0.003*	***
BigN	*0.009*	***	*0.009*	***	*0.009*	***	*0.009*	
CI	*0.028*	***	*0.028*	***	*0.028*	***	*0.028*	
SPEC	*0.069*		*0.070*		*0.058*		*0.058*	
Year and Industry Effects	*Yes*		*Yes*		*Yes*		*Yes*	

***, **, * indicates that the coefficient is statistically different from zero at the 1%, 5%, 10% level of significance. White's adjusted t-statistics are presented in parentheses. The dependent variable is *AQ*. *OT* is calculated as the negative ratio of coefficient on *T* to 2*coefficient on T^2 ($-\frac{\text{coefficient on } T}{2*\text{coefficient on } T^2}$). *Short* is 1 when the number of years the auditor serves the same client for less than three years, and 0 otherwise. *Long* is 1 when the number of years the auditor serves the same client for more than 8 years (in Model 3) or 30 years (in Model 4), and 0 otherwise. *logT* is the natural log of the number of years the auditor has provided service to the same client. Refer to Appendix C for all other variable definitions.

result supports regulators' concern about the detrimental effect of long-standing auditor-client relationship on audit quality, however, only for a small percentage of firms. However, since the turning point of audit quality in the pooled regression is 16 years, this also suggests that audit quality remains relatively high for a certain period of time even after the point when audit quality starts to deteriorate. This result further questions the necessity for mandatory auditor rotation.

7.4 Alternative Specifications of Auditor Tenure

Tenure is defined as the number of years an auditor has audited a firm since 1974. However, this may introduce measurement error since the auditor may have already audited the client before 1974. Auditor identification became available in Compustat since 1974. Of the 52,490 observations in the full sample for which tenure is measured with potential error, 2,264 observations consist of companies that had the same auditor starting in 1974. For these observations, tenure is equal to 1 in 1974, 2 in 1975, 3 in 1976, and so on. However, the auditor in 1974 could have been hired 24 years earlier in 1950. Hence, for companies in the full sample such as IBM (which had the same auditor PricewaterhouseCoopers throughout the 1974–2008 sample period since 1958), tenure is clearly measured with potential error starting in 1974. Therefore, I replaced the corrected tenure values for these observations and re-estimated the regressions. The tenor of the main results remains.

Since cash flow statement information became available in 1988 in Compustat, I also define tenure as the number of years that the auditor has served the client since 1988. This allows more variations in the tenure variable. Nevertheless, the main results are almost identical using this alternative cutoff date to calculate auditor tenure.

7.5 Alternative Specifications for Industry Specialist and Client Importance

In my main analysis, I define a industry specialist based on the largest market share on the national level following prior literature (Balsam et al. 2003; Krishnan 2005; Myers et al. 2003; Gul et al. 2009) and client importance based on the client's total assets on the national level following Chen et al. (2010). However, recent studies suggest that audit firm's industry expertise at the local office level plays a more important role in determining audit quality than audit firm's expertise on the national level (Ferguson et al. 2003; Francis et al. 2005; Chen et al. 2010; Reichelt and Wang 2010). Lim and Tan (2010) suggest using audit fees or total fees to proxy for the economic bond between an auditor and his client. Therefore, I limit my data to have available audit fee information from Audit Analytics covering fiscal years from 2000 to 2008. This limits my sample to 21,476 observations with an average of 11 years in auditor tenure and an average of -0.0427 in audit quality. I redefine auditor specialist as the largest market share based on total fees in an industry and MSA market within a year[21]. I also exclude industry and MSA markets with less than two audit firms and two clients to prevent an audit firm from being classified as an expert because it is the sole audit firm in a given industry and MSA. I recalculate client importance as the ratio of the total fees from a given client to the total fees from all the clients of an auditor rather than as the ratio of total assets from a given client to the total assets from all the clients of an auditor.

Consistent with my main results based on Compustat data, I find that audit quality first increases with auditor tenure at the earlier years and then decreases with auditor tenure at the later years for the refined sample. Similar to the conclusion that SOX prolongs the turning point

[21] In a sensitivity test, I also calculate the largest market share based on audit fees in an industry and MSA market within a year, my inferences do not change.

of audit quality in my analysis on the regulation effect, I find that the turning point of audit quality is around 22 years, longer than the turning point of the pre-SOX period in the main analysis. The inferences on the impact of auditor type, auditor specialization, and client importance on the relation between auditor tenure and audit quality do not change. Consistent with my main results, I also find that the deterioration of audit quality concentrate on firms with non-BigN auditors, non-Specialist auditors, and auditors with high-client importance where the *Bonding Effect* is more pronounced.

7.6 Alternative Model Specifications for Accruals

I employ Dechow and Dechev's (2002) accrual quality measure, modified by McNichol's (2002), to proxy for audit quality in the main tests. I also conduct robustness tests using other measures to estimate discretionary accruals. Specifically, I re-estimate the discretionary accruals using the following models: 1) the cross-sectional modified Jones (1991) model; 2) performance-adjusted modified Jones model (Kothari et al. 2005); 3) modified McNichol's accrual quality model controlling for conservatism and past performance (Ball and Shivakumar 2006; Gul et al. 2009). I obtain similar results as reported in the main analysis.

In addition, I use the standard deviation of the residual (rather than the residual) for 5 years, following Francis et al. (2005) model, as a measure of audit quality. I further decompose the *AQ* into innate and discretionary components and use the discretionary component as a measure of audit quality since prior literature indicates that the discretionary component is more associated with management's opportunistic behavior. Nonlinearity persists in this specification although I can no longer compare BigN auditors group with Non-BigN auditors group due to lack of sufficient observations for non-BigN auditors group. The remaining main results still hold. The fact that different measures of discretionary accruals provide consistent results demonstrates that my findings are not sensitive to alternative measures.

7.7 Signed Accrual Quality Tests

In the main analyses, I use the absolute value of accrual quality, which captures the combined effect of both income-increasing and income-decreasing accruals), as a measure of audit quality. However, auditors may consider income-increasing accruals as a greater threat because they are related to management's opportunistic behavior in managing earnings. On the other hand, understatements can be considered as conservatism, which is regarded as an attribute for a high quality audit (Ashbaugh et al. 2003). Thus, I conduct separate tests based on the signed accrual quality.

The results based on the negative accrual quality are similar to the main results (as reported in Table 4) based on the full sample. The results based on the positive accrual quality, however, are mixed. All results hold except for the High-Client Importance vs. Low-Client Importance analysis using the positive accrual quality sample. Neither the High-Client Importance group nor the Low-Client Importance group exhibits a non-linearity between auditor tenure and audit quality. Therefore, the adverse consequence of long-tenure is mainly driven by the negative accruals. This is consistent with the regulators' concerns that auditors allow managers to use 'cookie jar' reserves to manage earnings (Levitt 1998).

7.8 Control for Endogeneity

The implicit assumption underlying the study is that auditor tenure choice is exogenous. However, auditors may be more inclined to keep clients with higher accrual quality to protect their reputation while clients of higher accrual quality are more inclined to retain the incumbent auditors. Thus, auditor tenure and accrual quality may be endogenously determined. To control for endogeneity, I employ a two-stage least-squares regression (2SLS) approach. I first obtain the predicted value of tenure and then substitute the predicted tenure in the second-stage regression. Based on Gul et al. (2009), I estimate the first-stage regression using the following model:

$$T = \beta_0 + \beta_1 Aturn + \beta_2 L1absDD + \beta_3 ROA + \beta_4 ROA\_LOSS + \beta_5 RatioCurrent + \beta_6 RatioDA + \beta_7 RatioQuick + \beta_8 Size + \beta_9 Size^2 + \beta_{10} OCF + \beta_{11} Growth + \beta_{12} Lit + \beta_{13} AltmanZ + \beta_{14} Age + \beta_{15} Age^2 + \beta_{16} Export + \beta_{17} SEG + \beta_{18} BigN + \beta_{19} CI + \beta_{20} SPEC + \beta_j IndDum + \beta_k YrsDum + \varepsilon \quad (5.1)$$

Where:

Aturn	=	Asset turnover, measured as current assets divided by total assets;
L1absDD	=	Previous year's absolute value of discretionary accruals (the residual from model 3.1);
ROA	=	Return on assets, measured as earnings before interest and taxes divided by total assets;
ROA_Loss	=	An interaction term between *ROA* and *Loss*, where *Loss* is a dummy variable equals 1 if the firm incurred a loss in the previous year and 0 otherwise;
RatioCurrent	=	Current ratio, calculated as current assets divided by total assets;
RatioDA	=	Debt-asset ratio, calculated as long-term debt divided by total assets;
RatioQuick	=	Quick ratio, measured as current assets minus inventory divided by current liabilities;
IndGrowth	=	Industry sales growth, calculated as $\sum_{i=1}^{N} Sales_{i,t} / \sum_{i=1}^{N} Sales_{i,t-1}$ by SIC-2 industry groups;

In addition to the control variables used in the second-stage regression[22], the above model controls for firm complexity (*Aturn*, *RatioCurrent*, *RatioQuick*), and firm risk (*RatioDA*, *ROA*, *ROA_Loss)*. I control for firm complexity and firm risk because a firm with these characteristics is more likely to retain an auditor who understands the firm's business better. Previous year's discretionary accruals are included because firms with higher earnings quality may retain the

[22] Larker and Rusticus (2008) suggests to include the second-stage control variables into the first-stage regression.

same auditor and the incumbent auditor may tend to drop a client with lower earnings quality. I also include industry and year fixed effects to control for industry-invariant and year-invariant factors. Due to the additional data requirements, the sample drops to 34,357 firm-year observations. The first-stage estimation results (untabulated) show that *T* has a positive relation with *Aturn*, *ROA*, *RatioCurrent*, *RatioDA*, OCF, *Lit*, *AltmanZ*, *Age*, *Size*, *SEG*, *BigN* and *CI*, and a negative association with *L1absDD*, *ROA_Loss*, *RatioQuick*, *Growth*, Age^2, $Size^2$, and *SPEC*. The partial R^2 is reasonably high, suggesting that the instruments are unlikely to be weak. The second-stage results confirm the major finding that audit quality is a concave function of auditor tenure. In other words, audit quality increases in the earlier years of tenure and decreases in the later years of tenure. The significant positive coefficient (0.0683) on *PT* and the significant negative coefficient (-0.0019) on PT^2 suggest that audit quality first increases with auditor tenure and then decreases with auditor tenure. However, the turning point of audit quality extends to 18 years and it is significant at 1% level, similar to the pooled regression results in Table 4.

7.9 Alternative Measure of Audit Quality – Going-Concern Audit Report

One may argue that earnings quality is jointly determined by the management and the auditor. Therefore, I conduct empirical tests on an alternative more direct proxy of audit quality: the propensity for the auditor to issue going-concern opinions for financially-distressed firms.

The findings in prior literature on the effect of auditor tenure on auditor's propensity to issue going-concern opinions are mixed. For example, using Australian data, Carey and Simnett (2006) document that the auditor's propensity to issue a going-concern opinion for distressed firms is negatively related to audit partner tenure. Using U.S. data, Geiger and Raghunandan (2002) find significantly more audit reporting failures in the earlier years of engagements, by examining the association between prior audit opinions and the length of tenure for a sample of firms entering bankruptcy during the period of 1996 to 1998. Other studies, however, do not find any tenure effect on auditors' decisions to issue going-concern opinions (Francis and Yu 2009; Reichelt and Wang 2010).

Following prior literature (Hopwood et al. 1994; Mutchler et al. 1997; Reynold and Francis 2000; DeFond et al. 2002; Francis and Yu 2009; Reichelt and Wang 2010), I limit going-concern analysis to a subsample of financially-distressed clients since a going-concern opinion is most likely for financially-distressed firms. Therefore, this data requirement reduces my sample to 6,740 financially-distressed firm-year observations (firms with non-positive net income) for the period of 2000 to 2008 with other control variables available in Audit Analytics.

I estimate a logit model for the pooled sample with clustered robust standard errors to correct for heteroscedasticity and serial dependence (Rogers 1993) as follows:[23]

$$\text{Probit } [GC=1] = f(\beta_0 + \beta_1 T + \beta_2 T^2 + \boldsymbol{X}'\beta + \varepsilon) \qquad (7.1)$$

Where *GC* is coded as 1 if a client receives a going-concern audit report, and 0 otherwise. The test variable is T and T^2, and $\boldsymbol{X}$ is a vector of control variables that include *Age*, Age^2, *Size*, $Size^2$, *Lit*, *AltmanZ*, *BigN*, *ROA*, *Leverage*, *MtoB*, *Influence*, *NSPEC*, *CSPEC*, *BSPEC*, and *logOffice*.

Similar to the regression in the main results, I control for firm age (*Age*, Age^2), firm size (*Size*, $Size^2$), audit risk (*Lit*, *AltmanZ*), and auditor type (*BigN*). Different from the regression in the main results, I also control for firm performance (*ROA*), financial risk (*Leverage*), and firm growth opportunities (*MtoB*). I use audit fee to proxy for client importance (*Influence*) rather than sales revenue. Recent studies argue that city-level industry specialization is more appropriate (Francis et al. 2005; Reichelt and Wang 2010). Thus, in addition to controlling for

[23] I also run a probit model, the results are very similar.

national-level industry specialization (*NSPEC*), I also control for city-level industry specialization (*CSPEC*), and joint national- and city-level industry specialization (*BSPEC*). Since Francis and Yu (2009) document that auditor size is a determinant of audit quality, I also control for audit firm size (*logOffice*).

Table 11 presents the regression results on going-concern tests. Column I presents the

Table 11
Going Concern Audit Report Tests

	(I)		(II)		
	Logit Model		Bootstrap Method (Logit Model)		
				95% Interval	
Variable	Estimate	p-value	Estimate	*LowerCL*	*UpperCL*
Intercept	*-1.4808*	*0.0274*	*-1.8630*	*-1.9792*	*-1.7469*
T	***0.1139***	***0.0183***	***0.0615***	***0.0551***	***0.0679***
T2	***-0.0032***	***0.0433***	***-0.0021***	***-0.0023***	***-0.0019***
Size	*-0.9177*	*<.0001*	*-0.4331*	*-0.4687*	*-0.3975*
Size2	*0.0616*	*<.0001*	*0.0269*	*0.0240*	*0.0297*
Age	*-0.0383*	*0.1913*	*-0.0055*	*-0.0093*	*-0.0018*
Age2	*0.0008*	*0.1275*	*0.0003*	*0.0002*	*0.0004*
Lit	*-0.6413*	*<.0001*	*-0.5297*	*-0.5561*	*-0.5033*
Leverage	*-0.1908*	*0.1929*	*-0.1390*	*-0.1643*	*-0.1138*
MtoB	*-0.0014*	*0.0705*	*-0.0016*	*-0.0021*	*-0.0011*
AltmanZ	*-0.0872*	*<.0001*	*-0.0786*	*-0.0804*	*-0.0768*
Influence	*0.0968*	*0.8865*	*-0.3126*	*-0.4100*	*-0.2151*
logOFFICE	*-0.2250*	*0.0007*	*-0.1625*	*-0.1716*	*-0.1535*
ROA	*-2.2792*	*<.0001*	*-1.4371*	*-1.4871*	*-1.3872*
BigN	*0.9821*	*0.0007*	*0.6378*	*0.5934*	*0.6822*
NSPEC	*-0.5111*	*0.0448*	*-0.2905*	*-0.3278*	*-0.2531*
CSPEC	*0.3601*	*0.0697*	*0.3207*	*0.2961*	*0.3453*
BSPEC	*1.2436*	*0.0007*	*0.6954*	*0.6388*	*0.7521*
OT	***17.7936***		***15.3711***	***13.9786***	***16.7636***
N	*6740*		*6740*	*6740*	*6740*
Pseudo R^2	*38.47%*		*14.22%*	*13.95%*	*14.49%*

***, **, * indicates that the coefficient is statistically different from zero at the 1%, 5%, 10% level of significance. Column I probit model results are estimated with robust standard errors to correct for heteroscedasticity and serial dependence. The 95 percent confidence intervals in Column II are calculated from 1,000 bootstrap replications of the estimation based on resampling from the dataset with replacement of clusters. *OT* is calculated as the negative ratio of coefficient on *T* to 2*coefficient on T^2 ($-\frac{\text{coefficient on } T}{2*\text{coefficient on } T^2}$). Refer to Appendix C for all variable definition.

logit model results where the standard errors are corrected for heteroscedasticity and serial correlation. Column II reports the average estimates and the 95% confidence interval using the bootstrap method. As expected, the coefficient on *T (0.1139)* is positive and significant while the coefficient on T^2 (-0.0032) is negative and significant, indicating that auditor's propensity to issue going-concern opinion increases with auditor tenure in the earlier years and decreases with auditor tenure in the later years. And the turning point is 18 years in the pooled regression and the average turning point is 15 years with a 95% confidence interval of 14 to 17 years in the bootstrapped method. This nonlinear relationship between auditor tenure and auditor's propensity to issue a going-concern opinion supports the main results.

I find that BigN auditors, city-level specialists, and joint national- and city-level specialists are more likely to issue going-concern opinions for financially distressed firms, evidenced from the positive coefficients on *BigN*, *CSPEC*, *BSPEC*. This is consistent with the notion that high-quality auditors (BigN and auditor specialists) provide a higher quality audit due to higher economic incentives to be independent.

7.10 Effect of Auditor Switches on Audit Quality

Even though audit quality tends to first increase with auditor tenure due to a *Learning Effect* and decrease with auditor tenure due to a *Bonding Effect*, it is unclear whether a mandatory or voluntary audit firm rotation would generate a net benefit to audit quality for a specific firm, as intended. In a mandatory audit firm rotation regime, audit quality for a specific firm should increase after rotation if the positive force from the increase of auditor independence due to 'fresh look' dominates the negative force from the decrease of client-specific knowledge. The converse would be true if the negative force from the decrease of client-specific knowledge dominates the positive force from the increase of auditor independence due to 'fresh look'. In a voluntary audit firm rotation regime, on the other hand, audit quality should decrease after the switches if firms change auditors for opinion shopping or for lower audit fees. In contrast, audit quality should improve after switches if firms change auditors for better services. To further explore the effect of mandatory audit firm rotation or voluntary audit firm rotation on audit quality, I examine the Arthur Andersen clients surrounding SOX and the voluntary auditor switches separately in the following subsections.

7.10.1 Forced Auditor Switches – Arthur Andersen Clients

To take advantage of the unique setting created by the collapse of Arthur Andersen (AA) to examine the cost or benefit to audit quality a company faces in a mandatory audit firm rotation regime, I examine 524 AA former clients to investigate whether the benefit from the increase of auditor independence outweighs the cost of loss of client-specific knowledge for a firm by comparing audit quality between the first year audit by the new auditor and the last year audit by AA. In untabulated results, I find that the mean audit quality (-0.0461) is more negative than the mean audit quality (-0.0453) for the first year audit by the new auditor than the last year audit by AA. However, in the multivariate analysis, I find that the coefficient on the intercept for the first year audit by a new auditor is significantly less negative that the coefficient on the intercept for the last year audit by AA. I also expand the AA sample to 2 years, 3 years, and 4 years before and after the demise of AA. I find that the average turning point of audit quality is 12-13 years for the last four years of AA audits and the coefficient on the intercept for the last 2, 3, and 4 years is significantly more negative than the coefficient on the intercept for 2, 3, and 4 years after the forced switches to other auditors. The results on AA clients seem to imply that mandatory audit form rotation may generate a net benefit for an individual firm on average. Nevertheless, an alternative explanation is that the increased independence requirements in post-SOX period has improved audit quality in general. Therefore, whether the results from AA clients can be generalized to other firms is still an open question.

7.10.2 Voluntary Auditor Switches

An alternative for mandatory audit firm rotation is voluntary audit firm rotation since one size-fits-all mandatory audit firm rotation may not benefit all the firms. To examine the net cost or benefit for a voluntary audit firm rotation on a firm, I compare the audit quality for the first year audit by the new auditor with that for the last year audit by the prior auditor for 867 firms who underwent auditor switches during my sample period from 1988 to 2008. For brevity, I do not tabulate the results. In untabulated results, I find that the mean (median) auditor tenure is 11(9) years for the last year of audit switches while the mean audit quality is – 0.41267 for the last year audit for the prior auditor, which is lower than -0.04742 for the first year audit for the new auditor. However, in the multivariate analysis with control variables and fixed effects, I find that the coefficient (-0.1504, significant at 1% level) on the intercept for the first year audit for the new auditor is significantly less negative than the coefficient (-0.2040, significant at 1% level) on the intercept for the last year audit for the prior auditor. The results imply that, for voluntary audit firm rotation, the benefit from the increase of auditor independence outweighs the loss of client-specific knowledge for a firm.

8. SUMMARY AND CONCLUSION

This paper contributes to the auditor tenure literature by showing the cases where a monotonic increasing function exists (e.g., Myers et al. 2003; Mansi et al. 2004; Ghosh and Moon 2005) and where a non-monotonic relation between auditor tenure and audit quality occurs (e.g., Davis et al. 2009; Boone et al. 2008). Specifically, this study extends Myers et al. (2003) in showing that earnings quality increases with auditor tenure only when the *Bonding Effect* is weak, such as in firms audited by specialist auditors and only in industries with high litigation risk. This paper also brings the analysis in Davis et al. (2009) a step forward to show that the concavity of audit quality only exists when the *Bonding Effect* is strong, such as in firms audited by non-specialist auditors and by auditors of high client importance and in low litigation industries.

My study has implications for regulators, researchers, practitioners, and audit committees. First, the estimated average turning point of 12 years in this paper implies that mandatory auditor rotation at 10 years of tenure may not be necessary. The extended turning point of audit quality from 14 years in the pre-SOX era to 18 years in the post-SOX era renders the rotation requirement even more questionable. Second, the shorter turning point in high technology industries (12 years) relative to low technology industries (18 years) implies that the maximum audit quality can be reached may be lower for high complex audits than for low complex audits. Thus, audit complexity may not be a valid reason for not requiring audit firm rotation, as claimed by the audit profession. Regulators and audit committees can use the estimated turning point to determine the appropriateness in requiring mandatory or voluntary audit firm rotation. Third, my study indicates that audit quality, even after its turning point, stays relative high for a period of time. Therefore, using a fixed turning point of 5 or 9 years as a cut-off to compare audit quality for short tenure and long tenure would undoubtedly hinder researchers' ability to find the negative impact of lengthy tenure. Lastly, My study suggests that the following alternatives can be used to enhance auditor independence and boost objectivity and professional skepticism: 1) encourage auditors to develop industry knowledge; 2) forbid auditors from accepting overly large clients relative to their client portfolios; and 3) raise auditor legal liability.

My study certainly has its limitations. First, to simplify my empirical analysis, I assume a quadratic model correctly captures the true relation between auditor tenure and audit quality. However, future research may refine this simplified model and assumption. Second, this study relies on accrual quality to measure the unobservable audit quality. Although I have conducted robustness tests on other measures of discretionary accruals, the measurement error associated with any estimation model may still drive my results. Furthermore, perceived audit quality is vital for the efficient allocation of limited resources in the capital market. Therefore, whether my results extend to perceived audit quality also merit the consideration of future research. Finally, the audit committee takes on critical responsibility in ensuring the quality of financial reporting and the hiring and monitoring of auditors. Thus, without considering the effect of the audit committee, this study may have a correlated omitted variable problem. Therefore, it is worthwhile for future research to explore the role that the audit committee plays in the relation between auditor tenure and audit quality.

REFERENCES

AFL-CIO (2003) Re: File no. s7-49-02. http://www.sec.gov/rules/proposald/s74902/manson1.htm.

American Institute of Certified Public Accountants (AICPA), 1978. *The Commission on Auditors' Responsibilities: Report, Conclusions and Recommendations. The Cohen Commission. New York: AICPA.*

American Institute of Certified Public Accountants (AICPA), 1987. *Report of the National Commission on Fraudulent Financial Reporting. New York: AICPA.*

American Institute of Certified Public Accountants (AICPA), 1992. *Statement of Position Regarding Mandatory Rotation of Audit Firms of Publicly Held Companies. New York: AICPA.*

American Institute of Certified Public Accountants (AICPA), 1999. *Auditing Standards: Original Pronouncements. New York: AICPA.*

American Institute of Certified Public Accountants (AICPA), 2004. Rin 2550-aa24: Proposed Amendments to Corporate Governance Regulation. http://www.fhfa.gov/webfiles/1963/9CorpGovAmendAICPA.pdf.

American Institute of Certified Public Accountants (AICPA), 2006. *Conceptual Framework for AICPA Independence Standards. New York: AICPA.*

Anthony, J. H., and K. Ramesh, 1992. Association between Accounting Performance Measures and Stock Prices: A Test of the Life Cycle Hypothesis, *Journal of Accounting and Economics* 15, 203-227.

Antle, R. and B. Nalebuff , 1991. Conservatism and Auditor-Client Negotiations. *Journal of Accounting Research* 29: 31-54.

Arrunada, B., and C. Paz-Ares, 1997. Mandatory rotation of company auditors: A critical examination, *International Review of Law & Economics* 17, 31.

Ashbaugh, H., R. LaFond, and B. W. Mayhew, 2003. Do Nonaudit Services Compromise Auditor Independence? Furthure Evidence, *Accounting Review* 78, 611-639.

Ball, R. A. Y. and L. Shivakumar, 2006. The Role of Accruals in Asymmetrically Timely Gain and Loss Recognition, *Journal of Accounting Research* 44(2), 207-242.

Balsam, S., J. Krishnan, and J. S. Yang, 2003. Auditor Industry Specialization and Earnings Quality, *Auditing* 22, 1-97.

Bamber, E. M., and L. S. Bamber, 2009. Discussion of "Mandatory Audit Partner Rotation, Audit Quality, and Market Perception: Evidence from Taiwan", *Contemporary Accounting Research* 26, 393-402.

Bamber, E. M., and V. M. Iyer, 2007. Auditors' Identification with Their Clients and Its Effect on Auditors' Objectivity, *Auditing* 26, 1-24.

Barton, J. 2005. Who Cares About Auditor Reputation? *Contemporary Accounting Research* 22 (3): 549-586.

Bazerman, M. H., K. P. Morgan, and G. F. Loewenstein 1997. The Impossibility of Auditor Independence. *Sloan Management Review* 38 (4): 89-94.

BDO Seidman, 2003. Re: Release No. 33-8154 Strengthening the Commission's Requirements Regarding Auditor Independence File No. s7-49-02. http://www.sec.gov/rules/proposed/s74902/bdoseidman1.htm.

Becker, C., M. DeFond, J. Jiambalvo, and K. Subramanyam, 1998. The Effect of Audit Quality on Earnings Management, *Contemporary Accounting Research* 15, 1-24.

Blouin, J., B. M. Grein, B. R. Rountree, 2007. An Analysis of Forced Auditor Change: The Case of Former Arthur Andersen Clients, *Accounting Review* 82 (3): 621-650.

Boone, J. P., I. K. Khurana, K. K. Raman, 2008. Audit Firm Tenure and the Equity Risk Premium, *Journal of Accounting, Auditing & Finance* 23 (1): 115-140.

Carcello, J. V. and A. L. Nagy, 2004. Audit Firm Tenure and Fraudulent Financial Reporting, *Auditing* 23 (2), 57-69.

Carey, P., and R. Simnett, 2006. Audit Partner Tenure and Audit Quality, *Accounting Review* 81, 653-676.

Catanach, A., and P. Walker, 1999. The International Debate Over Mandatory Auditor Rotation: A Conceptual Research Framework, *Journal of International Accounting, Auditing & Taxation* 8, 43-66.

Chen, C. Y., and C. J. Lin., Y. C. Lin, 2008. Audit Partner Tenure, Audit Firm Tenure, and Discretionary Accruals: Does Long Auditor Tenure Impair Earnings Quality? *Contemporary Accounting Research* 25 (2): 415-445.

Chen, J. T., and R. P. Manes. 1985. Distinguishing the Two Forms of the Constant Percentage Learning Curve Model. *Contemporary Accounting Research* 1 (2):242-252.

Chen, S., S. Y. J. Sun, and D. Wu, 2010. Client Importance, Institutional Improvements, and Audit Quality in China: An Office and Individual Auditor Level Analysis, Accounting Review 85, 127-158.

Chi, W., and H. Huang, 2005. Discretionary Accruals, Audit-firm Tenure and Audit-partner Tenure: Empirical Evidence from Taiwan, Journal of Contemporary Accounting and Economics 1, 65-92.

Choi, J.-H, J.-B. Kim, X. Liu, and D.A. Simunic, 2008. Audit Pricing, Legal Liability Regimes, and Big 4 Premiums: Theory and Cross-Country Evidence. *Contemporary Accounting Research* 25 (1): 55-99.

Chung, H., and S. Kallapur, 2003. Client Importance, Nonaudit Services, and Abnormal Accruals, *Accounting Review* 78, 931-955.

Coffee, John, 2004. Gatekeeper Failure and Reform: The Challenge of Fashioning Relevant Reforms, 84 Boston University Law Review 301, 349-53.

Cohen, D.A., A. Dey, and T. Z. Lys, 2008. Real and Accrual-Based Earnings Management in the Pre- and Post-Sarbanes-Oxley Periods. *Accounting Review* 83, 757-787.

Commission on Public Trust and Private Enterprise, 2003. *Findings and Recommendations Part 2: Corporate Governance Part 3: Audit and Accounting. New York:Conference Board.*

Conference Board, 2003. *Findings and Recommendations of the Commission on Public Trust and Private Enterprise. New York, NY.*

Conference Board, 2005. *Findings and Recommendations of the Commission on Public Trust and Private Enterprise. New York, NY.*

Congress, U.S., 2002. Sarbanes – Oxley Act H.R. 3763. 2002. U.S.

Daniels, B. W., and Q. Booker, 2009. Bank Loan Officers' Perceptions of Audit Firm Rotation, *CPA Journal* 79, 36-40.

Davis, L. R., B. S. Soo, and G. M. Trompeter, 2009. Auditor Tenure and the Ability to Meet or Beat Earnings Forecasts, *Contemporary Accounting Research* 26, 517-548.

DeAngelo, L. E., 1981a. Auditor Independence, `Low Balling', and Disclosure Regulation, *Journal of Accounting and Economics* 3, 113-127.

DeAngelo, L. E., 1981b. Auditor Size and Auditor Quality, *Journal of Accounting & Economics* 3, 183-199.

Dechow, P. M., and I. D. Dichev, 2002. The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors, *Accounting Review* 77, 35.

Dechow, P. M., A. P. Hutton, L. Meulbroek, and R. G. Sloan, 2001. Short-sellers, fundamental analysis, and stock returns, *Journal of Financial Economics* 61, 77-106.

DeFond, M. L., and J. R. Francis, 2005. Audit Research after Sarbanes-Oxley, *Auditing* 24, 5-30.

DeFond, M. L., and J. Jiambalvo, 1994. Debt covenant violation and manipulation of accruals, *Journal of Accounting & Economics* 17, 145-176.

DeFond, M. L., and K. R. Subramanyam, 1998. Auditor changes and discretionary accruals, *Journal of Accounting & Economics* 25, 35-67.

Deis, D. R. and G. A. Giroux, 1992. Determinants of Audit Quality in the Public-Sector, *The Accounting Review* 67 (3): 462-479.

Dopuch, N., R. R. King, and R. Schwartz, 2001. An Experimental Investigation of Retention and Rotation Requirements, *Journal of Accounting Research* 39(1): 93-117.

Doty, James R., 2011. *Keynote Address: The Reliability, Role and Relevance of the Audit: A Turning Point*. Speech made on May 5, 2011 at Baruch College in New York, NY.

Dunn, K. and B. Mayhew, 2004. Audit Firm Industry Specialization and Client Disclosure Quality, *Review of Accounting Studies* 9(1): 35-58.

Dunham, K. J., 2011. Firms That Want to Switch Auditors Find It Takes Time, Money and Faith. *Wall Street Journal Online* (March 15).

Dye, Ronald A. 1993. Auditing Standards, Legal Liability, and Auditor Wealth, *Journal of Political Economy* 101(5): 887-914.

Economist, 2004. *The Future of Auditing: Called to Account*.

European Commission, 2010. Green Paper – Audit Policy: Lessons from the Crisis – Com (2010) 561 Final. Brussels.

Ferguson, A., J. R. Francis, and D. J. Stokes, 2003. The Effects of Firm-Wide and Office-Level Industry Expertise on Audit Pricing, *Accounting Review* 78(2): 429-448.

Francis, J. R., K. Reichelt, and D. Wang, 2005. The Pricing of National and City-Specific Reputations for Industry Expertise in the U.S. Audit Market, *The Accounting Review* 80, 113-136.

Francis, J.R., and D. Wang, 2008. The Joint Effect of Investor Protection and Big 4 Audits on Earnings Quality around the World. *Contemporary Accounting Research* 25 (1): 157-191.

Francis, J.R., and M. D. Yu, 2009. Big 4 Office Size and Audit Quality. *Accounting Review* 84 (5): 1521-1552.

Francis, J. R., and E. R. Wilson, 1988. Auditor changes: A joint test of theories relating to agency costs and auditor differentiation. *The Accounting Review* 63(4): 663-682.

Frankel, R. M., M. F. Johnson, and K. K. Nelson, 2002. The Relation between Auditors' Fees for Nonaudit Services and Earnings Management, *Accounting Review* 77 (Supplement), 71-105.

General Accounting Office (GAO), 2003. *Public Accounting Firms: Required Study on the Potential Effects of Mandatory Audit Firm Rotation. GAO 04-216* (Washington, DC.).

Geiger, M. A., and K. Raghunandan, 2002. Auditor Tenure and Audit Reporting Failures, *Auditing* 21, 67.

Ghosh, A., and D. Moon, 2005. Auditor Tenure and Perceptions of Audit Quality, *Accounting Review* 80, 585-612.

Gul, F. A., S. Y. K. Fung, and B. Jaggi, 2009. Earnings quality: Some evidence on the role of auditor tenure and auditors' industry expertise, *Journal of Accounting and Economics* 47, 265-287.

Gul, F. A., B. L. Jaggi, and G. V. Krishnan, 2007. Auditor Independence: Evidence on the Joint Effects of Auditor Tenure and Nonaudit Fees, *Auditing* 26, 117-142.

Hills, R., 2002. *Statement. Oversight hearing on Accounting and investor protection issues raised by Enron and other public companies*.

Hogan, C. E., and D. C. Jeter, 1999. Industry Specialization by Auditors, *Auditing: A Journal of Practice and Theory* 18, 1-17.

Hopwood, W., J. C. McKeown, and J. F. Mutchler, 1994. A Reexamination of Auditor versus Model Accuracy within the Context of the Going-Concern Opinion Decision, *Contemporary Accounting Research* 10(2), 409-431.

Hoyle, J., 1978. Mandatory auditor rotation: the arguments and an alternative, *Journal of Accountancy* 145, 69-78.

IFAC, 2003. International Federation of Accountants (IFAC). 2003. Code of Ethics. New York, NY: IFAC.

Imhoff E. A., 2003. Accounting Quality, Auditing, and Corporate Governance, *Accounting Horizons 17(Supplement)*, 117-128.

IOSCO, 2005. *Strengthening Capital Markets Against Finanical Fraud* (Techinical committee of the International Organization of Securities Commissions February).

Johnson, V. E., I. K. Khurana, and J. K. Reynolds, 2002. Audit-firm tenure and the quality of financial reports, *Contemporary Accounting Research* 19, 637-660.

Jones, J. J., 1991. Earnings Management During Import Relief Investigations, *Journal of Accounting Research* 29, 193-228.

Knapp, M. C., 1991. Factors that Audit Committee Members Use as Surrogates for Audit Quality, *Auditing* 10(1), 35-52.

Kothari, S. P., A. J. Leone, and C. E. Wasley, 2005. Performance matched discretionary accrual measures, *Journal of Accounting & Economics* 39, 163-197.

Krishnan, G. V., 2003. Does Big 6 Auditor Industry Expertise Constrain Earnings Management?, *Accounting Horizons* 17, 1-16.

Krishnan, J., 2005. Client Industry Competition and Auditor Industry Concentration, *Journal of Contemporary Accounting and Economics* 1, 171-192.

Kwon, S. Y., 1996. The Impact of Competition within the Client's Industry on the Auditor Selection Decision, *Auditing* 15, 53-70.

Larcker, D. F. and S. A. Richardson, 2004. Fees Paid to Audit Firms, Accrual Choices, and Corporate Governance, *Journal of Accounting Research* 42(3), 625-658.

Lennox, C. S., 1999. Audit Quality and Auditor Size: An Evaluation of Reputation and Deep Pockets Hypotheses, *Journal of Business Finance & Accounting* 26(7/8): 779-805.

Levitt, A., 1998. The Numbers Game. Speech delivered at the NYU Center for Law and Business, September 28.

Li, D., 2010. Does auditor tenure affect accounting conservatism? Further evidence, *Journal of Accounting & Public Policy* 29, 226-241.

Lim, C.-Y., and H.-T. Tan, 2008. Non-audit Service Fees and Audit Quality: The Impact of Auditor Specialization, *Journal of Accounting Research* 46(1): 199-246.

Lim, C.-Y., and H.-T. Tan, 2010. Does Auditor Tenure Improve Audit Quality? Moderating Effects of Industry Specialization and Fee Dependence, *Contemporary Accounting Research* 27(3): 923-957.

Lys, T and R. L. Watts, 1994. Lawsuits against Auditors, *Journal of Accounting Research* 32(3), 65-93.

Mansi, S. A., W. F. Maxwell, and D. P. Miller, 2004. Does Auditor Quality and Tenure Matter to Investors? Evidence from the Bond Market, *Journal of Accounting Research* 42, 755-793.

Mautz, R. K., and H. A. Sharaf, 1961. *The Philosophy of Auditing. American Accounting Association Monograph No. 6* (American Accounting Association, Sarasota, FL).

McClaren, L., 1958. Rotation of Auditors, *Journal of Accountancy* 106 (4): 41-4.

McNichols, M. F., 2002. Discussion Of The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors, *Accounting Review* 77, 61.

Messick, D. M., and Sentis, K. P., 1979. Fairness and Preference, *Journal of Experimental and Social Psychology* 15, 418-434.

Moore D. A., P. E. Tetlock, L. Tanlu, and M. H. Bazerman (2006). Conflicts of Interest and The Case of Auditor Independence: Moral Seduction and Strategic Issue Cycling, *Academy of Management Review* 31 (1), 10-29.

Mutchler, J. F., W. Hopwood, and McKeown, J. M., 1997. The influence of contrary information and mitigating factors on audit opinion decisions on bankrupt companies, *Journal of Accounting Research* 35(2), 295-310.

Myers, J. N., L. A. Myers, and T. C. Omer, 2003. Exploring the Term of the Auditor-Client Relationship and the Quality of Earnings: A Case for Mandatory Auditor Rotation?, *Accounting Review* 78, 779-799.

Palmrose, Z. V., 1987. Litigation and Independent Auditors: The Role of Business Failures and Management Fraud, *Auditing: A Journal of Practice and Theory* 6 (2), 90-102.

Palmrose, Z. V., 1991. Trials of Legal Disputes Involving Independent Auditors – Some Empirical Evidence, *Journal of Accounting Research* 29, 149-185.

POB, 2002. *Final Annual Report 2001*. Stamford, Connecticut: Public Oversight Board.

PricewaterhouseCoopers, 2002. *Mandatory Rotation of Audit Firms: Will it Improve Audit Quality?* (New York, NY: PricewaterhouseCoopers LLP).

PricewaterhouseCoopers, 2007. *Mandatory Rotation of Audit Firms*. (New York, NY: PricewaterhouseCoopers LLP).

PricewaterhouseCoopers, 2010. *PwC believes enhancing audit quality and confidence is key* (New York, NY: PricewaterhouseCoopers LLP).

Public Company Accounting Oversight Board (PCAOB), 2011. *Concept Release on Auditor Independence and Audit Firm Rotation*. PCAOB Release No. 2011-006, August 16, 2011. Washington: PCAOB.

Reichelt, K. J., and D. Wang, 2010. National and Office-Specific Measures of Auditor Industry Expertise and Effects on Audit Quality, *Journal of Accounting Research* 48, 647-686.

Reynolds, J. K. and J. R. Francis (2000). "Does size matter? The influence of large clients on office-level auditor reporting decisions." *Journal of Accounting and Economics* **30**(3): 375-400.

Securities and Exchanges Commission (SEC), 1994, Staff Report on Auditor Independence. Washington, DC: SEC.

Securities and Exchanges Commission (SEC), 1999, Staff Accounting Bulletin No. 99: Materiality. Washington, DC: SEC.

Securities and Exchange Commission (SEC), 2000. *Revision of the Requirement on Auditor Independence*. Washington, DC: Government Printing Office.

Securities and Exchanges Commission (SEC), 2001, Revision of the Commission's Auditor Independence Requirements (33-7919). Washington, DC: SEC.

Securities and Exchange Commission (SEC), 2003. *Strengthening the Commission's Requirements Regarding Auditor Independence*. Washington, DC: Government Printing Office.

Silvers, D., 2002. *Testimony of Damon A. Silvers, associate general counsel, American Federation of Labor and Congress of Industrial Organizations*

Silvers, D., 2003. Comment Letter on the SEC's Proposed Rules on Auditor Independence. (File No. S7-49-02). January 13. Washington, D.C.: AFL: CIO.

Simunic, D. and M. Stein, 1987. Product Differentiation in Auditing: Auditor Choice in the Market for Unseasoned New Issues, *The Canadian Certified General Accountants Research Foundation* Research Monograph Number 13. British Columbia, Canada: The Canadian Certified General Accountants' Research Foundation.

Stanley, J. D., and T. F. DeZoort, 2007. Audit firm tenure and financial restatements: An analysis of industry specialization and fee effects, *Journal of Accounting and Public Policy* 26, 131-159.

Stice, J. D., 1991. Using Financial and Market Information to Identify Pre-engagement Factors Associated with Lawsuits Against Auditors, *Accounting Review* 66(3), 516-533.

Teoh, S. H., I. Welch, and T. J. Wong, 1998. Earnings management and the underperformance of seasoned equity offerings, *Journal of Financial Economics* 50, 63-99.

Teoh, S. H., T. J. Wong, and G. R. Rao, 1998. Are Accruals during Initial Public Offerings Opportunistic?, *Review of Accounting Studies* 3, 175-208.

TIAA-CREF, 2003. *Comment letter on the SEC's proposed rules on auditor independence*.

Turner, L., 1999. Call for Academic Research on Key Accounting Issues. http://www.sec.gov/news/extra/aaacall.htm

_____ and J. Godwin, 1999, Auditing, Earnings Management, and International Accounting Issues at the Securities and Exchange Commission. *Accounting Horizons* 13, 281-397.

U. S. Congress. 2002. Sarbanes – Oxley Act (H.R. 3763).

United States Senate (Metcalf committee), 1976. *The Accounting Establishment: A Staff Study Prepared by the Subcommittee on Reports, Accounting, and Management of the Committee on Government Operations*. Washington, D. C.: U.S. Government Printing Office.

Watts, R., and Zimmerman, 1981. *The Markets for Independence and Independent Auditors*.

Yelle, L. E. 1979. The Learning Curve: Historical Review and Comprehensive Survey. *Decision Sciences* 10 (2):302-328.

APPENDIX A

PREDICTIONS ON THE SHAPE
(Relation between Auditor Tenure and Audit Quality)

BE^{LS} <* $LE^{LS} \rightarrow \theta_2 > 0$ and
- BE^{ES} =* $LE^{ES} \rightarrow \theta_1 = 0 \rightarrow$ concave increasing
- BE^{ES} <* $LE^{ES} \rightarrow \theta_1 > 0 \rightarrow$ concave increasing with an increasing speed
- BE^{ES} >* $LE^{ES} \rightarrow \theta_1 < 0 \rightarrow$ convex decreasing and then convex increasing

BE^{LS} >* $LE^{LS} \rightarrow \theta_2 < 0$ and
- BE^{ES} =* $LE^{ES} \rightarrow \theta_1 = 0 \rightarrow$ concave decreasing
- BE^{ES} >* $LE^{ES} \rightarrow \theta_1 < 0 \rightarrow$ concave decreasing with an increasing speed
- LE^{ES} >* $BE^{ES} \rightarrow \theta_1 > 0 \rightarrow$ concave increasing and then concave decreasing

BE^{LS} =* $LE^{LS} \rightarrow \theta_2 = 0$ and
- BE^{ES} =* $LE^{ES} \rightarrow \theta_1 = 0 \rightarrow$ no relation
- BE^{ES} >* $LE^{ES} \rightarrow \theta_1 > 0 \rightarrow$ linear decreasing
- LE^{ES} >* $BE^{ES} \rightarrow \theta_1 < 0 \rightarrow$ linear increasing

Note:

LE → the *Learning Effect* associated with auditor experience
BE → the *Bonding Effect* associated with auditor independence
Supscript:ES → earlier stage of auditor tenure
Supscript:LS → later stage of auditor tenure
>* → dominates
=* → exactly offsets

APPENDIX B - TURNING POINT SCHEDULE

(The Relation between θ_1 and θ_2 and The Point of Time When *AQ* Reaches Maximum or Minimum)

$-(\theta_2/\theta_1)$	$-(\theta_1/\theta_2)$	Turning Point With Maximum (Minimum) *AQ*
0.01	100	50
0.02	50	25
0.03	34	17
0.04	26	13
0.05	20	10
0.06	16	8
0.07	14	7
0.08	12	6
0.10	10	5
0.12	8	4
0.16	6	3
0.25	4	2
0.50	2	1

θ_1 is the coefficient on auditor tenure *T* and θ_2 is the coefficient on square of auditor tenure T_2. *AQ* stands for audit quality. $-(\theta_2/\theta_1)$ is the negative ratio of decreasing speed at later years of T relative to the increasing speed of *AQ* at earlier years of *T*. On the other hand, $-(\theta_1/\theta_2)$ is the negative ratio of increasing speed at earlier years of *T* relative to the decreasing speed of *AQ* at later years of *T*.

APPENDIX C

VARIABLE DEFINITIONS

AQ	=	Accrual quality, measured as (-1)* absolute value of the residual from the Dechow and Dichev (2002) model modified by McNichols (2002) (see equation (1) in text).
T (T^2)	=	The number of consecutive years (the square of the number of consecutive years) that the firm has retained the auditor since 1974 ;
Age (Age^2)	=	The number of years (the square of the number of years) since the company first appeared in Compustat since 1950;
Size ($Size^2$)	=	The market value (square of the market value) of equity;
OCF	=	Cash flow from operations scaled by average total assets;
Growth	=	Sales growth, calculated as $(Sales_{i,t} - Sales_{i,t-1})/Sales_{i,t}$;
Lit	=	Indicator variable that takes the value of 1 if the firm operates in a high-litigation industry, and 0 otherwise. High-litigation industries are industries with sic codes 2833-2836, 3570-3577, 3600-3674, 5200-5961, and 7370-7374 (Frankel et al. 2002 and Ashbaugh et al. 2003);
AltmanZ	=	Altman (1983) Z-score, which is a measure of the probability of bankruptcy, with a lower value indicating greater financial distress;
Export	=	the ratio of foreign sales to total sales;
SEG	=	the natural log of the number of the geographical segments;
BigN	=	A dummy variable equals 1 if the auditor is a Big 4/5/6 auditor, and 0 otherwise;
CI	=	Client importance, calculated as the ratio of a client's total assets to the sum of the total assets of all the clients of an auditor;
SPEC	=	1 if the auditor is the national-level industry specialist (audit firm with the highest annual market share of clients' sales revenue in a particular two-digit SIC industry group) , and 0 otherwise;
TECH	=	1 if the firm is in a high technology industry (SIC code is in the 2830s, 3570s, 7370s, 8730s, and between 3825 and 3829), and 0 otherwise;
Aturn	=	Asset turnover, measured as current assets divided by total assets;
L1absDD	=	Previous year's absolute value of discretionary accruals (the residual from model 3.1);
ROA	=	Return on assets, measured as earnings before interest and taxes divided by total assets;
ROA_Loss	=	An interaction term between *ROA* and *Loss*, where *Loss* is a dummy variable equals to 1 if the firm incurred a loss in the previous year and 0 otherwise;
RatioCurrent	=	Current ratio, calculated as current assets divided by total assets;
RatioDA	=	Debt-asset ratio, calculated as long-term debt divided by total assets;
RatioQuick	=	Quick ratio, measured as current assets minus inventory divided by current liabilities;
IndGrowth	=	Industry sales growth, calculated as $\sum_{i=1}^{N} Sales_{i,t} / \sum_{i=1}^{N} Sales_{i,t-1}$ by SIC-2 industry groups;
PT (PT^2)	=	Predicted number of consecutive years (predicted square number of

		consecutive years) that the firm has retained the auditor from first-stage regression in equation 4.1;
GC	=	1 if the auditor issues a going-concern opinion, and 0 otherwise;
logOFFICE	=	log of practice office size based on aggregated client audit fees of a practice office in a specific fiscal year.
Influence	=	Ratio of a specific client's total fees (audit fees plus nonaudit fees) relative to aggregate annual fees generated by the practice office which audit the client;
NSPEC	=	Dummy variable that takes the value of1 if an auditor is the lead auditor in an industry in terms of aggregated audit fees in a specific year, and 0 otherwise;
CSPEC	=	Dummy variable that takes the value of 1 if an auditor is the lead auditor in terms of aggregated client audit fees in an industry within an Metropolitan Statistical Area (MSA) in a specific fiscal year, and 0 otherwise;
BSPEC	=	Dummy variable that takes the value of 1 if an auditor is both national-level and city-level industry specialists, and 0 otherwise;

VITA

Li Brooks was born in Shangrao, Jianxi Province of China. She attended Shaxi High School. Out of high school, she attended Changsha Railway University in Hunan Province of China in September 1983. She earned her Bachelor of Arts in English from Changsha Railway University in July 1987. After graduation, she taught English for two years at East-China Transportation University. In September 1989, she returned to Changsha Railway University to pursue her studies in English. She received her Master of Arts in English from Changsha Railway University in July 1992. Then she moved to Guangzhou, Guangdong Province, China, to teach English reading and writing for graduates at the English Training Center, Guangzhou Branch of Chinese Academy of Sciences. In January 2000, after seven years of teaching in Guangzhou, she decided to pursue her studies at Texas Tech University where she received her Master of Science in Accounting in May 2002. She worked as a part-time accountant at Lubbock Eye Clinic from August 2000 to June 2003. She worked as a tax accountant at the Midland office and an auditor at the Odessa office of Johnson & Miller Co. in Texas from July 2003 to December 2004. She joined Pattillo, Brown, and Hill LLP (Albuquerque, New Mexico) in January 2005. After working for two years as a senior auditor, she attended Louisiana State University in August 2007 and received her Doctor of Philosophy degree in December 2011. She taught managerial accounting and auditing at Louisiana State University while she was in the doctoral program. She is married to Jimmy Brooks and has one son (Aotian) and one daughter (Kristi). Her teaching interests are in auditing, financial accounting, taxation, and accounting information systems. Her research interest is on auditing and capital market research.