Ownership Structure, Audit Fees, and Audit Quality in Japan

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August, 2014

Acknowledgments
I appreciate the helpful comments of Hiroshi Uemura, Hu Dan, Jose Antonio Gonzalo, Eriko Kameoka, Tatsuo Kurogi, Philomena Leung, Nobuyuki Maeyama, Akihiro Noguchi, Oliver Rui, Tomomi Takada, Rong Yang, and workshop participants at the 2013 European Accounting Association Annual Congress, the 19th International Symposium on Audit Research, the 2013 American Accounting Association Annual Meeting, and Nagoya University. I gratefully acknowledge the financial support by JSPS KAKENHI (Grant Number 24730386). All errors are my own.

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ABSTRACT

This study provides empirical evidence on how ownership structure moderates the association between accounting accruals (measured by accrual quality) and abnormal audit fees. Previous research shows that auditor–client economic dependence erodes auditor independence. Most researchers focused on U.S. firms to assess the effects of audit committees or boards of directors on the association between auditor–client economic bonding and audit quality. However, alternative governance mechanisms to these firms exist in Japan and can provide a new perspective on this issue. A unique feature of Japanese company ownership structure is that stable shareholdings exist, such as financial institutions' shareholdings and cross-shareholdings (corporate shareholdings). This governance structure is different from those found not only in the United States but also in other countries that have seen previous research on this issue, such as Australia and the United Kingdom. No research is available that focuses on how the relationship between accrual quality and abnormal audit fees are moderated by financial institutions' shareholdings in the Japanese market. Thus, to fill this gap, this study uses the accrual-quality measure developed by Dechow and Dichev (2002) as a gauge for audit quality. The results demonstrate that higher audit fees are likely to compromise auditors' independence and, thereby, result in lower audit quality. In contrast, financial institutions' shareholdings are negatively associated with accrual quality. This result indicates that higher financial institutions' shareholdings lead to greater accrual quality. In addition, I find an association between audit quality and abnormal audit fees, moderated by financial institutions' shareholdings.

Keywords: ownership structure; abnormal audit fees; accrual quality; Japanese audit market.

Data Availability: All the data used in this study are publicly available.

INTRODUCTION

This study examines how ownership structure moderates the association between audit fees and audit quality (measured by accrual quality) with specific reference to financial institutions' shareholdings in the Japanese equity market. Furthermore, it investigates the effects of this ownership structure on the association between abnormal audit fees and accrual quality in Japan.

A unique ownership structure exists in Japan that is highly concentrated among corporate stakeholders and Japanese financial institutions. Most firms are closely connected and affect one another through financial institutions' shareholding of equity ownership and generally depend on a large commercial bank (main bank) for their primary banking needs (Aoki and Patrick 1994; Douthett and Jung 2001). The *keiretsu* system is famous as the most typical form of organization of these corporate groups. Thus, this study sheds light on the effect of institutional ownership, particularly for financial institutions' shareholdings.

Economics theory identifies two effects of ownership structures on management incentives to follow certain strategies: the alignment effect and the entrenchment effect. The entrenchment effect motivates financial statement suppliers (firms) to opportunistically manage earnings. This notion is consistent with the traditional view that stable shareholders (including financial institutions' shareholders) are less efficient because concentrated ownership creates incentives for controlling shareholders to expropriate wealth from other shareholders (Shleifer and Vishny 1997). Another source of entrenchment is the potentially greater information asymmetry between stable shareholders and other shareholders. For example, Fan and Wang (2002) suggested that concentrated ownership restricts accounting information flows to outside investors. Thus, the entrenchment effect predicts that the presence of stable shareholders (including financial institutions' shareholders) is associated with lower earnings quality.

A competing view is the alignment effect, which is based on the argument that stable shareholders (including financial institutions' shareholders) have the incentive to report earnings in good faith; thus, earnings are of higher quality. The alignment effect implies that concentrated ownership creates higher levels of monitoring by controlling owners (Shleifer and Vishny 1997), indicating that controlling stable shareholders might more effectively monitor firms. For example, stable shareholders (including financial institutions' shareholders) have incentives to create long-term employee loyalty (Jackson and Miyajima 2007). Shareholders with financial institutions' shareholdings are expected to have an incentive to monitor firm managers because they are the firm's trade partners (Osano 1996; Isagawa 2007). These corporate groups maintain long-term relationships by exchanging equity stakes in one another, creating reciprocal voting rights. This situation also implies a credible mutual commitment among firms and ensures that managers who act opportunistically are dismissed or demoted. In short, by using their high level of monitoring ability, financial institutions' shareholders can control firm management's opportunistic behavior. Therefore, I expect that this corporate governance system and ownership structure will affect the quality of audited financial reporting through improved monitoring ability.

Recently, a large number of accounting and auditing scandals occurred in the United States. For example, Arthur Andersen, once one of the Big 5 accounting firms in the United States, collapsed in 2002 because of its role in the Enron scandal. Similarly, one of Japan's large accounting firms, ChuoAoyama—renamed Misuzu in 2006—collapsed in 2007 because of the Kanebo audit failures[1]. The role of auditing in verifying and ensuring the quality of corporate earnings has come under considerable scrutiny because of these recent audit failures. Differences

[1] Recently, certain studies have shed light on the Kanebo/ChuoAoyama scandal in Japan. For example, see Numata and Takeda (2010), Murase et al. (2011), and Skinner and Srinivasan (2012).

in quality between audits result in variation in auditor credibility and the earnings quality of their clients. Because auditor quality is multidimensional and inherently unobservable, no single auditor characteristic can serve as its proxy. However, many previous studies used the auditor's brand name as a proxy for audit quality to examine the relationship between brand name and earnings quality (see Becker et al. 1998; Reynolds and Francis 2000).

Until 2009, the Japanese economy was the second largest in the world (after the United States) in terms of nominal gross domestic product, and the Tokyo Stock Exchange still has the second largest total market value of listed company shares. Although some research has been done on the recent condition of the Japanese audit market (e.g., Fukukawa 2011; Kasai 2009; Muramiya and Takada 2010; Skinner and Srinivasan 2012; Yazawa 2008, 2011), the studies conducted did not provide adequate investigations on the topic, unlike in the United States. Furthermore, previous literature did not shed light on the nature of the effect of (abnormal) audit fees on audit quality by considering ownership structure. Therefore, using data from the Japanese audit market for the fiscal years 2004–2007, this study clarifies the relationship between Japanese company ownership structure, (abnormal) audit fees, and audit quality in the Japanese market, which, unlike the U.S. audit market, has never been examined in this regard.

The sample data for this research consist of 6,302 observations, including available audit fees and financial institutions' shareholdings data from March 2004 to March 2007. The primary interest of this study is the effect of financial institutions' shareholdings on the association between (abnormal) audit fees and accrual quality in Japanese firms.

Multivariate models suggest that after controlling the previously established correlates of accrual quality, financial institutions' shareholdings are negatively associated with accrual quality. This result indicates that larger financial institutions' shareholdings lead to greater

accrual quality. In addition, I investigate whether the effect of (abnormal) audit fees on audit quality is contingent on financial institutions' shareholdings. The results show that a negative or insignificant association between (abnormal) audit fees and accrual quality (which can act as a proxy for audit quality) exists for firms with significant financial institutions' shareholdings. These findings indicate that high (abnormal) audit fees may not impair audit quality when financial institutions' shareholdings are significant. In this study, I use abnormal audit fees instead of row audit fees as a fee dependence measure.

The present study contributes to the literature on this topic by comparing the earnings quality of audit clients with high financial institutions' shareholdings with that of clients with low financial institutions' shareholdings. Earnings quality is a concept that does not have a commonly accepted definition in the literature. Rather, extant literature uses various measures to capture different manifestations of the quality of earnings. This study examines the effect of financial institutions' shareholdings on accrual quality, as outlined by Dechow and Dichev (2002).

In addition, my paper contributes to the literature on the effects of (abnormal) audit fees on audit quality. From a theoretical perspective, I contribute to the corporate ownership literature by demonstrating that the "fee-audit quality effect" (a type of auditor–client economic bond) in the Japanese accounting profession is conditional on financial institutions' shareholdings. Furthermore, my results support previous research findings that higher stable shareholdings (include financial institutions' shareholdings) do not lead to reduced earnings quality (e.g., Noma 2002; Kimura 2004; Wang 2006; Otogawa and Kitagawa 2007; Teshima and Shuto 2008). My results also support the findings from more recent studies that focused on the combined effects of audit fees, earnings management, and audit committees (e.g., Sharma et al. 2011). As previously

stated, this study provides empirical evidence that financial institutions' shareholdings can moderate threats to auditor independence, thus protecting the quality of financial reporting in Japanese firms.

The remainder of the paper is organized as follows. The next section provides a brief background for financial statement audits and ownership structure in Japan. The third section reviews prior literature and develops empirically testable hypotheses. The research method and results follow, and the final section discusses the results and concludes the paper.

BACKGROUND

Financial Statement Audits in Japan

Since formally introduced in Japan in 1948, financial statement audits by certified public accountants have played as important a role in Japanese capital markets as they do in markets in other developed countries. The *Financial Instruments and Exchange Law* requires the financial statement of publicly listed companies to be audited by certified public accountants. Similar to the situation in the United States, the Japanese audit market was dominated by the Big 4 audit firms (ShinNihon, Azsa, Tohmatsu, and ChuoAoyama) until 2006. Each Japanese Big 4 firm was the local affiliate of a Big 4 international audit firm (ShinNihon with Ernst & Young, Azsa with KPMG, Tohmatsu with Deloitte Touche Tohmatsu, and ChuoAoyama with PricewaterhouseCoopers).

Recently, some notable accounting and auditing scandals have occurred in both the United States and Japan. As noted in the introduction, failures of companies such as Arthur Andersen in the United States have been paralleled by failures such as that of ChuoAoyama/Misuzu in Japan.

The fees paid to Japanese auditors are generally much lower than in the United States (Fuchida and Litan 2006). According to Inoue (2006) and the Japanese Institute of Certified Public Accountants (JICPA; 2008), firm size measured by assets or sales is the most important determinant of fees paid to auditors in Japan, although fees are not exactly proportional to firm size. Rather, fee increases follow a curve, with the increase diminishing as firm size increases.

Financial institutions' shareholdings in Japan

The competitive strength of postwar Japan appears not to rest on the allocative efficiency of the market but on the organizational efficiency of firms generated by investment stakeholders in developing and maintaining firm-specific capabilities (Jackson and Miyajima 2007). Moreover, Aoki (1988) and Porter (1990) stated that corporate governance plays an important role in facilitating long-term investments and promoting cooperation, demonstrating an important alternative to the U.S. model. In addition, Jackson and Miyajima (2007) indicated that one of the main institutional features of corporate governance in Japan is corporate ownership and finance.

Corporate ownership in Japanese firms is characterized by "stable shareholders" with reciprocally held financial institutions' shareholdings among corporations and banks. The largest single shareholder—often the main bank—does not typically exceed a 5% stake[2], but the web of small, reciprocal financial institutions' shareholdings often account for 20% of shares and stable shareholders over 40%. These horizontal groupings form a dense and stable network of long-term relationships (Osano 1996). These ownership ties often overlap with and underwrite various

[2] Today, this regulation is revised.

other cooperative business relationships within corporate groups. These groups include both the bank-centered horizontal *keiretsu,* such as the Mitsubishi group (Gerlach 1992), or the vertically structured *keiretsu*, such as the famous buyer–supplier relationships in the Japanese automobile industry (Sako 1992). Moreover, stable shareholders protect firms from hostile takeovers and short-term stock market pressures. In turn, these shareholders receive stable dividends and can expect moderate growth in share prices.

Shareholders with financial institutions' shareholdings are expected to have an incentive to monitor firm managers because they are the firms' trade partners (Osano 1996; Isagawa 2007). Because these corporate groups maintain long-term relationships by exchanging an equity stake in one another, reciprocal voting rights are created. Such a situation also implies a credible mutual commitment among firms and ensures that managers who act opportunistically are dismissed or demoted. By using their strong monitoring ability, financial institutions' shareholders can control the opportunistic behavior of firm management.

PRIOR LITERATURE AND HYPOTHESES

Prior Literature on Audit Fees, Non-Audit Fees, and Earnings Quality (Audit Quality)

A number of studies use accrual measures, including abnormal accruals and accrual quality, to examine the association between fees paid to auditors and auditor independence. Because of the sudden collapse of giant companies such as Enron in the United States, many academic authors in the auditing field launched a closer examination of the relationship between auditor independence and audit fees. The influence of fees paid to auditors on accrual measures, particularly in the case of U.S. firms, is examined in this context.

Although numerous studies examined the relationship between fees paid to auditors and accrual measures, the results are mixed. For example, Frankel et al. (2002) found that auditor independence is compromised when clients pay non-audit fees that are high relative to total audit fees. In contrast, Ashbaugh et al. (2003), Reynolds et al. (2004), and Chung and Kallapur (2003) found no significant negative relationships between fees and audit quality. Furthermore, Larcker and Richardson (2004) and Gul et al. (2007) reported a negative relationship between non-audit fees and audit quality for only a subset of their samples. Larcker and Richardson (2004) found a negative relationship for firms with weak governance, whereas Gul et al. (2007) found a negative relationship only for firms in which auditor tenure is relatively brief (not longer than three years). Huang et al. (2007) found no negative relationship between non-audit fee components and audit quality after the enactment of the SOX. Thus, the results of prior studies regarding U.S. firms generally reported that high non-audit fees do not jeopardize auditor independence.

The relationships between fees paid to auditors and accrual measures were also examined in the international context. With respect to U.K. firms, Ferguson et al. (2004) found that non-audit services compromise auditor independence. Choi et al. (2009) reported that the provision of tax services by Korean auditors generally improves audit quality by curtailing opportunistic accounting procedures by firms' management. Thus, prior studies provided inconsistent evidence regarding the relationship between non-audit fees and accrual measures that serve as a proxy for audit quality.

As discussed previously, prior studies focused on whether higher fees compromise auditor independence and highlighted *non-audit fees*. However, the authors sometimes examined the compromise of auditor independence with regard to the association between *audit fees* and audit quality. Hoitash et al. (2007) and Srinidhi and Gul (2007) reported that high audit fees

increase auditor effort and audit quality. Srinidhi and Gul (2007) posited that audit fees are linked to auditors' efforts, whereas non-audit fees may compromise auditor independence. They conceive the hypothesis that audit fees are likely to reflect effort because the auditing market is closely regulated and competitive, and audits of listed firms are mandated. Srinidhi and Gul (2007) examined whether audit fees are positively correlated with accrual quality and found that expected (normal) audit fees are correlated with accrual quality, whereas unexpected (abnormal) fees have no relationship with accrual quality. Frankel et al. (2002), Huang et al. (2007), and Gul et al. (2007) also found a positive relationship between audit fees and accrual measures, although they do not form a hypothesis concerning the relationship between audit fees and efforts. In contrast, Hoitash et al. (2007) reported that expected (normal) and unexpected (abnormal) audit fees are negatively associated with accrual quality. Furthermore, Choi et al. (2010) found an asymmetric relationship between unexpected (abnormal) audit fees and audit quality measured by abnormal accruals. The results showed that abnormal audit fees are negatively associated with audit quality for observations with positive abnormal audit fees, whereas no significant relationship exists for observations with negative unexpected (abnormal) audit fees.

In addition, a few studies shed light on the relationship between audit fees and earnings quality (audit quality) in the Japanese audit market. For example, Yazawa (2008) found that audit fees and abnormal audit fees are significantly positively related to abnormal accruals. Similarly, Kasai (2009) reported that audit fees and abnormal audit fees have a positive effect on accrual quality[3]. These studies proposed that audit fees and abnormal audit fees have a negative

[3] In Japan, joint provision of audit and non-audit services was restricted in 2004. Moreover, companies are required by regulation to disclose the audit and non-audit fees paid to auditors in their annual security reports after March 2004, resulting in relatively low non-audit fees. In addition, the distinction between audit and non-audit fees is ambiguous. Therefore, previous research focusing on the Japanese audit market was unable to use data on non-audit fees.

effect on auditor independence. Thus, the results of prior studies regarding Japanese firms generally reported that high audit and abnormal audit fees jeopardize auditor independence.

Consequently, conflicting results occurred regarding the influence of fees paid to auditors on the independence of auditors. Prior studies showed that researchers are inclined to posit negative relationships between audit quality and *non-audit fees*, although the results are mixed. In contrast, they posited two possible relationships between *audit fees* and audit quality. Some authors proposed that audit fees have a negative effect on auditor independence, whereas others proposed that it has a positive effect on auditors' effort.

Prior Literature on Ownership Structure and Earnings Quality

In financial accounting research, one of the main topics is the effect of the corporate ownership structure or corporate organization structure on financial reporting. In fact, a number of studies exist on the association between corporate ownership structure and earnings quality. For example, Warfield et al. (1995) suggested that greater management ownership is more inclined to lower abnormal accruals. Gabrielsen et al. (2002) and Yeo et al. (2002) investigated the relationship between management ownership and earnings quality in a non-U.S. setting. Moreover, Chung et al. (2002) demonstrated that institutional investors restrict opportunistic behavior by management. Another study showed that foreign shareholdings and bond financings provide effective monitoring of managerial discretion of profit firms to enhance the valuation of abnormal accruals (Chung et al. 2004). In addition, Wang (2006) found consistent evidence that founding family ownership is associated with lower abnormal accruals, greater earnings informativeness, and less persistent transitory loss components in earnings. In auditing research,

Lennox (2005) showed that the association between managerial ownership and audit quality is significantly negative at low and high levels of ownership.

Several studies focused on the effect of corporate groups on earnings quality. Douthett and Jung (2001) reported that *keiretsu* firms have smaller abnormal accruals than non-*keiretsu* firms, and that *keiretsu* membership has a positive effect on earnings response coefficients in Japanese firms. Jung and Kwon (2002) and Kim and Yi (2006) indicated that chaebol-affiliated companies have larger abnormal accruals than non-chaebol-affiliated companies, and such group membership has a negative effect on earnings response coefficients in Korean firms. Moreover, Fan and Wong (2002) and Francis et al. (2005) investigated the relationship between earnings informativeness measured by the earnings–return relation and ownership structure.

Recently, some studies have shed light on Japanese companies. For example, Kimura (2006) and Shuto (2006) found that managerial ownership has a positive effect on the earnings–return relationship and earnings response coefficients in Japanese firms. In addition, Noma (2002) and Shuto (2006) reported that institutional shareholdings have a negative effect on abnormal accruals. Noma (2002) provided evidence that foreign shareholdings have a positive effect on abnormal accruals. Other studies showed that managerial ownership is significantly negatively related to abnormal accruals and the asymmetric timeliness of earnings (Teshima and Shuto 2008; Shuto and Takada 2010). Shuto and Kitagawa (2011) investigated the relationship between managerial ownership and cost of debt, and Shuto and Iwasaki (2011) found that stable shareholders encourage firm managers to smooth earnings and discourage them from engaging in big bath behavior. Otogawa and Kitagawa (2007) examined the association between cross-shareholdings and several earning quality measures.

According to the previously mentioned literature, the effects of stable shareholdings (including financial institutions' shareholdings) are unclear. To begin with, only a few studies focused on the effect of stable shareholdings (financial institutions' shareholdings) on earnings quality in Japan. Most researchers also focused on the effect of audit committees and boards of director characteristics on earnings quality (audit quality) in U.S. firms (Klein 2002; Carcello et al. 2011). No research investigated how corporate governance mechanisms moderate the relationship between auditor–client economic bonding and earnings quality (audit quality), except for Sharma et al. (2011). DeFond and Francis (2005) addressed the absence of studies integrating the interplay between corporate governance mechanisms such as the auditor and the audit committee. They placed less importance on the effect of ownership structure on the quality of financial reporting. However, ownership structure has played an important role as a corporate governance mechanism in Japanese firms. Examining such interactions is important because stable shareholders (including financial institutions' shareholders) monitor both the external audit process and earnings quality. Therefore, this study sheds light on the effect of stable shareholders (financial institutions' shareholders) on the quality of financial reporting in Japan. Furthermore, as per my knowledge, no research examined the moderate effect of financial institutions' shareholdings on the association between auditor–client economic bonding and earnings quality (audit quality) in Japanese firms. Therefore, this study provides empirical evidence on how financial institutions' shareholdings moderate the association between accounting accruals (measured by accrual quality) and audit fees (abnormal audit fees).

Hypotheses Development

As noted previously, I examine how ownership structure moderates the association between accounting accruals (measured by accrual quality) and (abnormal) audit fees. First, I verify that higher audit fees are likely to have compromised auditors' independence, thereby leading to lower accrual quality.

Most researchers use the magnitude of abnormal accruals (or discretionary accruals) as a proxy for audit quality (e.g., Frankel et al. 2002; Ashbaugh et al. 2003; Chung and Kallapur 2003; Larcker and Richardson 2004). Accruals could be driven by opportunistic earnings management and non-opportunistic communication of future information (e.g., Healy and Palepu 1993). In addition, a debate on whether and how abnormal (discretionary) accruals can be separated from total accruals persists (e.g., Dechow et al. 1995). However, Dechow and Dichev (2002) proposed accrual quality as another accrual measure. This measure systematically estimates the association between current accruals and realized cash flows in the current, succeeding, and previous years. Thus, accrual quality deteriorates when accruals are driven by opportunism but not when they are driven by an intention to convey private information.

By construction, abnormal (discretionary) accruals can capture any intentional bias in accruals created by management. Because material misstatements in financial reports are likely to include intentional and unintentional biases, studies using abnormal (discretionary) accruals examined only intentional bias made by management; they did not capture the unintentional portion of misstatements in financial reports. The Dechow and Dichev (2002) measure is believed to capture both intentional and unintentional accrual biases. Considering the objectives of independent auditors that financial statements ought to be free from material misstatements, their accrual quality might be a better measure for exploring audit quality. Indeed, more recent studies, such as Hoitash et al. (2007), Srinidhi and Gul (2007), Doyle et al. (2007), Ashbaugh et

al. (2008), and Lim and Tan (2010), use this measure to examine audit quality. Therefore, this paper uses their accrual measurements as a proxy for accrual quality to examine audit quality in the Japanese audit market.

This study uses abnormal audit fees to capture the auditor–client economic bond, defined as the difference between actual audit fees (actual fees paid to auditors for their financial statement audits) and the normal audit fee level. According to Choi et al. (2010), actual audit fees are split into two components: normal audit fees and abnormal audit fees. Normal audit fees reflect normal profits, auditors' effort costs, and litigation risk (Simunic, 1980; Simunic and Stein 1996; Choi et al. 2010), whereas abnormal audit fees reflect auditor–client economic bonding (Higgs and Skantz 2006; Choi et al. 2010). Whereas normal audit fees are determined by factors that are common across different clients (e.g., client size, client complexity, and client-specific risk), abnormal audit fees are determined by factors that are idiosyncratic to a specific client. Furthermore, Kinney and Libby (2002) noted that abnormal audit fees can capture the profitability of auditor-provided services, and abnormal audit fees can better capture an auditor's economic bond to a specific client than normal or actual audit fees. In addition, prior studies regarding Japanese firms generally reported that high abnormal audit or total fees jeopardize auditor independence (Yazawa 2008; Kasai 2009).

Most previous studies on the association between audit fees and audit quality focused primarily on the effect of non-audit fees on auditor independence and audit quality. Since the Enron scandal and collapse of Arthur Andersen, many studies examined whether the payment of non-audit fees paid to an auditor by the same client impairs auditor independence and, as a result, lowers audit quality in the context of earnings management (e.g., Frankel et al. 2002; Ashbaugh et al. 2003; Chung and Kallapur 2003; Larcker and Richardson 2004), the propensity to issue

going-concern opinions (DeFond et al. 2002), and conservatism (Ruddock et al. 2006). These accounting and auditing scandals in the United States resulted in auditors in many countries being prohibited from providing certain non-audit services to the same client by the regulator. However, neither regulators nor academics paid sufficient attention to the abnormally high audit fees on audit quality found internationally. Furthermore, in Japan, providing audit and non-audit services together was restricted in 2004; companies are required, by regulation, to disclose audit and non-audit fees paid to auditors in their annual security reports after March 2004, meaning that the amount of non-audit fees is relatively low. In addition, the distinction of audit and non-audit fees is ambiguous. Hence, this study focuses primarily on the effect of abnormal audit or total audit fees (the sum of audit and non-audit fees)[4] on audit quality in the Japanese audit market. To provide empirical evidence on the above prediction, I propose the following hypothesis.

H1: A positive association exists between abnormal audit fees and accrual quality.

Second, this study verifies the relationship between financial institutions' shareholdings and quality of earnings (accrual quality). As previously stated in the literature review, a number of studies exist on the association between corporate ownership structure and earnings quality. Most researchers focused on U.S. firms in assessing the effects of audit committees, boards of director characteristics, and large shareholders on earnings quality[5]. Japanese firms' ownership structure is highly concentrated among corporate stockholders, with financial institutions

[4] Hoitash et al. (2007) reported that an auditor's economic bonding with its client increases as the auditor receives higher abnormal total fees from clients, thus impairing auditor independence.
[5] For more details on this topic, see Carcello et al. (2011) and Hope (2012).

representing a majority of the stock holdings (Douthett and Jung 2001). A unique feature of the Japanese company ownership structure is the industrial group known as the *keiretsu*. These companies are interrelated through cross-holdings of equity ownership and generally rely on a major commercial bank for their primary banking needs (Aoki 1990; Lichtenberg and Pushner 1994). *Keiretsu* companies maintain close financial and personal ties through cross-shareholdings, credit holdings, interlocking corporate directorates within the groups, and a variety of business transactions[6].

Douthett and Jung (2001) indicated that the bank plays an important role in monitoring. The *keiretsu* main bank, as both creditor and stockholder, has strong incentives to stay informed about firms and their investment opportunities. Sheard (1989) stated that the Japanese main bank system may act as a substitute for screening and monitoring institutions, such as credit rating institutions and security analysts, or may act as an alternative to the takeover market. In addition, Douthett and Jung (2001) argued that the main bank has better access to a company's inside information. Thus, this information sharing within a group may assist in reducing fraud and misrepresenting accounting information, thereby helping to prevent management's manipulation of earnings by constraining discretionary accruals (Douthett and Jung 2001). Furthermore, Darrough et al. (1998) hypothesized the negative effect of financial institutions and corporate ownership on the discretionary accruals of Japanese companies; this result shows a negative effect of financial institution ownership but not that of corporate ownership, which is attributed to the stock market crash of 1990. Other studies indicated that financial institutions' shareholdings are negatively correlated with the absolute value of discretionary accruals of Japanese companies (Noma 2002; Kimura 2004).

[6] For more details on the *keiretsu*, see Aoki (1994) and Sheard (1994).

I hypothesize that financial institutions' shareholdings have a negative effect on earnings quality (accrual quality). Because financial institutions, including commercial banks, scrutinize accounting reports, I consider that a manager is less likely to use accruals when financial institutions have larger stakes. Therefore, I presume that financial institutions are more interested in the creditworthiness of firms, and therefore are more vigilant regarding accruals than other shareholders (e.g., Aoki 1990; Lichtenberg and Pushner 1994). To provide empirical evidence on this prediction, I propose the following hypothesis.

H2: A negative association exists between financial institutions' shareholdings and accrual quality.

Finally, I investigate the combined effect of abnormal audit fees and financial institutions' shareholdings on accrual quality. As previously stated, the Japanese main bank plays an important role in monitoring, and this system may substitute for screening and monitoring institutions such as credit rating institutions, security analysts, and external auditors. Thus, the accessibility to information that a main bank has may be of some significance in Japan, where external audit functions are relatively weak. Yamaura (2008) and Iyoda et al. (2011, Ch. 1) also argued that the Japanese financial statement audit is relatively weak compared to that found in other countries such as the United States. In fact, the main bank plays an especially important role in monitoring management behavior. On the one hand, abnormally high fees jeopardize auditor independence, leading to lower earnings quality (audit quality); on the other hand, the main bank screens and monitors the auditor–client relationship and its effect on financial reporting. Consequently, I expect the strength of an association, if any, between abnormal audit

fees and accrual quality to be less pronounced when the shareholding of financial institutions is relatively high. I propose the following interaction hypothesis.

H3: The association between abnormal audit fees and accrual quality is less pronounced when the financial institutions' shareholding is relatively high.

(Insert Table 1 here)

METHOD

First, I estimate accrual quality using a multivariate model. The independent variables include a measure of audit fees and control variables based on previous studies (Hoitash et al. 2007; Srinidhi and Gul 2007; Doyle et al. 2007; Ashbaugh et al. 2008; Choi et al. 2010; Dhaliwal et al. 2010; Lim and Tan 2010).

Dependent Variable: Measure of Accrual Quality

My measure of accrual quality is based on Dechow and Dichev's (2002) model, which assumes that current accruals are estimates of future cash flow realizations, and accrual quality is an inverse function of the precision of these estimates. Accrual quality can be impaired by both intentional and unintentional errors. Auditors' efforts and their competence enable them to extract more information and reduce accrual estimation errors. I follow Dechow and Dichev (2002) to form the estimation model.

$$\frac{TCA_t}{SIZE} = \beta_0 + \beta_1 \frac{CFO_{t-1}}{SIZE} + \beta_2 \frac{CFO_t}{SIZE} + \beta_3 \frac{CFO_{t+1}}{SIZE} + \varepsilon. \qquad (1)$$

where *TCA* represents operating accruals and *CFO* represents cash flow from operations. *TCA* is equal to (Δcurrent assets− Δcash) − (Δcurrent lia bilities − Δshort term debt included in current liabilities). The accrual quality is measured as an absolute value of the residual in the previous regression. The equation is estimated in cross section for each industry; the industry classifications are based on those of *Tosho* (Tokyo Stock Exchange). Following Francis et al. (2005), I estimate Equation (1) for industries having at least 20 firms in year *t*.

Test Variable for H1: Measure of Abnormal Audit Fees

Audit and total fees are separated into expected (normal) and unexpected (abnormal) portions to estimate Equation (2). Following Simunic (1980), Craswell et al. (1995) and others[7], the following model is constructed to estimate the expected (normal) fee levels. The unexpected (abnormal) fees are then estimated by deducting the estimated fees from the actual fees.

$$LNFEE = \gamma_0 + \gamma_1 LNSIZE + \gamma_2 SUBS + \gamma_3 LEV + \gamma_4 LOSSDUM + \gamma_5 LATERAL + \gamma_6 Up + \gamma_7 DOWN + \gamma_8 BIGN + \gamma_9 DL + \varepsilon. \quad (2)$$

[7] According to Matsumoto et al. (2009), the determinant factors of audit fees for Japanese firms in March 2009 were total assets, inventory, and receivables divided by total assets, number of subsidiaries, current assets divided by current liabilities, going-concern dummy, loss propensity, audit firm size, and listed section dummy (the dummy variable indicating whether firms are listed on the first section of the Japanese stock market). This result suggests that the circumstances of the Japanese audit market are slightly different from those of other countries that have seen previous research on this issue, such as the United States. Thus, the same variable is set as the independent variable to estimate normal audit fees based on Matsumoto et al. (2009). Significant variables to the audit fees are selected as the independent variables in Equation (2).

Table 1 shows the definition of all independent variables. *LNFEE* is either the audit fee (*LNFEE*) or the total audit fee (*LNTOTAL*). The demand for audit services is likely to increase with firm size, leading to a positive association between firm size and audit fee. *LNSIZE* is included to control for client size. Audit fees are inclined to be higher for clients with more complex business operations. *SUBS* is set as a proxy for client complexity. In addition, *LEV* and *LOSSDUM* are included as proxies for a client's risk characteristics. Because auditors charge higher fees for risky clients (Simunic and Stein, 1996), *BIGN* is set to capture the effect of audit quality differentiation on audit fees[8]. The listed section dummy is also included (a dummy variable that indicates whether the firms are listed on the first section of the Japanese stock market). In Japan, the impact of the standard fee table for auditors on audit fees is relatively large; thus, I control for this effect[9]. Finally, I set auditor change variables because this event affects audit fees[10]. All of these variables' coefficients are expected to be positive (Simunic 1980; Craswell et al. 1995; Simunic and Stein 1996; Choi et al. 2010) except for auditor change variables (*LATERAL*, *UP*, *DOWN*). Untabulated results show that the independent variables are significant, and the signs are consistent with previous studies except for *LEV*.

[8] I employ two commonly used size classifications of audit firms. The auditor classifications are as follows.

(1) *Big 4 National Audit Firms* include Azusa, ChuoAoyama, Shinnihon, and Tohmatsu in 2006. ChuoAoyama, a local affiliate of PricewaterhouseCoopers, was banned from auditing for three months (July–September) by the Japanese Financial Services Agency in 2006 because of the Kanebou audit failures. ChuoAoyama split into Misuzu and Arata. Thus, the *Big 5 National Audit Firms* were defined in 2007 as Azusa, Misuzu, Arata, Shinnihon, and Tohmatsu.

(2) *Small and medium audit firms* include the remaining audit firms that do not fall under the Big 4 or Big 5 categories.

[9] The fees paid to Japanese auditors are generally much lower than in the United States. (Fuchida and Litan 2006). Low audit fees in Japan are said to be the result of rules prescribed in the Certified Public Accountant Law. JICPA is used to determine the standard fee table for auditors in accordance with this law, the table presenting the minimum basic fee for each section of the market. In April 2002, the basic fee for listed firms on the first (second) section of the Japanese stock market was an estimated ¥10 (seven) million, or approximately $100,000. Execution fees are separately determined for responsible and assistant auditors (Tagaya and Naito 2003).

[10] For more details on this topic, see Simon et al. (1988).

Research Model to Test Hypothesis 1

To test the association between abnormal audit fees and accrual quality (H1), I estimate according to the studies by Frankel et al. (2002), Ashbough et al. (2003), and Chung and Kallapur (2003). The theoretical discussion in the hypothesis development section suggests a positive association between abnormal audit fees and accrual quality in Japan; therefore, I estimate a positive coefficient on *FEE* in Equation (3). That is, the test of the hypothesis is that the coefficient on *FEE* is significantly greater than zero. To test H1, I construct Equation (3) as follows.

$$AQ = \gamma_0 + \gamma_1 FEE + \gamma_2 LNSIZE + \gamma_3 OPCYCLE + \gamma_4 SALESVLT + \gamma_5 LOSSDUM + \gamma_6 BIGN + \gamma_7 LATERAL + \gamma_8 UP + \gamma_9 DOWN + Industry + Year + u. \quad (3)$$

where *AQ* is the accrual quality measure, following Dechow and Dichev (2002), and *FEE* is abnormal audit (total audit) fees. To isolate the factors that might influence accrual quality, the following control variables are included in this equation: sales volatility (*SALESVLT*), firm size (*LNSIZE*), operating cycle (*OPCYCLE*), and loss propensity (*LOSSDUM*). Because prior studies often used audit firm size as a proxy for audit quality (DeAngelo 1981), accrual quality might differ between large and small auditors' clients. To control for this systemic difference in accrual quality, I include auditor size (*BIGN*), which is equal to 1 if the audit firm is a large one and 0 if otherwise. These control variables are specified according to Dechow and Dichev (2002) and

others[11]. *SALESVLT* is the standard deviation of sales scaled by total sales in year *t*, *LNSIZE* is the natural logarithm of average total assets, and *OPCYCLE* is equal to 365/(sales/average accounts receivable) + 365/(cost of goods sold/average inventory). In addition, auditor change might influence accrual quality. Therefore, an indicator variable (*LATERAL*) is added to control for auditor changes, which is equal to 1 if there are auditor changes and 0 if otherwise[12]. In addition, we utilize the following independent variables to control for the possibility that an initial audit affects accrual quality: whether the auditor changes from a small or medium audit firm to a large audit firm (*UP*) and whether the auditor changes from a large audit firm to a small or medium audit firm (*DOWN*). *LOSSDUM* is equal to 1 if net income is negative and 0 if otherwise. An indicator variable (*Industry*) is included for the *Tosho* industry classification code, and an indicator variable for year (*Year*) is included in the regression model. Finally, *u* is an error term.

The variable of interest, *FEE*, is defined in two ways, where *FEE* is the abnormal audit-fee measure. I use abnormal audit fees and total fees (audit and non-audit fees) as the measures for audit fees. An observation of $\gamma_1 < 0$ is consistent with the notion that high audit fees can improve accrual quality. However, $\gamma_1 > 0$ suggests that the higher the audit fees, the lower the accrual quality. I predict the latter.

Research Model to Test Hypothesis 2

To test H2, the association between financial institutions' shareholdings and accrual quality (H2), I estimate according to Warfield et al. (1995), Otogawa and Kitagawa (2007), and

[11] For more details about control variables for accrual quality, see Hoitash et al. (2007), Srinidhi and Gul (2007), Doyle et al. (2007), Ashbaugh et al. (2008), Dhaliwal et al. (2010), and Lim and Tan (2010).
[12] For more details on this variable, see Table 1.

Teshima and Shuto (2008). The empirical prediction in the hypothesis development section suggests a negative association between financial institutions' shareholders and accrual quality in Japan; I estimate a negative coefficient on *FIN* in Equation (4). That is, the test of the hypothesis is that the coefficient on *FIN* is significantly greater than zero. To test H2, I construct Equation (4) as follows.

$$AQ = \gamma_0 + \gamma_1 FIN + \gamma_2 LNSIZE + \gamma_3 OPCYCLE + \gamma_4 SALESVLT + \gamma_5 LOSSDUM + \gamma_6 BIGN + \gamma_7 LATERAL + \gamma_8 UP + \gamma_9 DOWN + Industry + Year + u. \quad (4)$$

where *AQ* is the accrual-quality measure following Dechow and Dichev (2002), and *FIN* is the fraction of shares owned by shareholders of financial institutions at the end of the fiscal year. The observation $\gamma_1 < 0$ is consistent with the notion that high financial institutions' shareholdings can improve accrual quality. However, $\gamma_1 > 0$ suggests that the higher the financial institutions' shareholdings, the lower the accrual quality. I estimate the former.

Research Model to Test Hypothesis 3

To test H3 on whether associated abnormal audit fees are conditional on the monitoring effectiveness of the financial institutions (monitoring by the main bank), I introduce a financial institutions' shareholding variable and test it against abnormal audit fees. This research design is similar to that used in Sharma et al. (2011) and tests the effects of abnormal audit fees on accrual quality moderated by financial institutions' shareholdings. To test H3, I construct Equation (5) as follows.

$$AQ = \gamma_0 + \gamma_1 FEE + \gamma_2 FIN + \gamma_3 FEE*FIN + \gamma_4 LNSIZE + \gamma_5 OPCYCLE + \gamma_6 SALESVLT$$
$$+ \gamma_7 LOSSDUM + \gamma_8 BIGN + \gamma_9 LATERAL + \gamma_{10} UP + \gamma_{11} DOWN$$
$$+ Industry + Year + u. \quad (5)$$

The test variable in Equation (5) is *FEE*FIN*—the interaction term of abnormal audit fees and financial institutions' shareholdings. All other variables are as previously defined. H3 suggests that the coefficient on the interaction term, *FEE*FIN*, in Equation (5) is negative (or not significant). This conjecture implies that if ownership structure (the shareholdings of financial institutions) has the effect of mitigating agency conflicts, then the association between auditor–client economic bonding and accrual quality may be negative (or not significant) for concentrated financial institution ownership. To test this conjecture, I estimate Equation (5) for accrual quality. Because of the potential non-linear effects of financial institutions' shareholdings in Japan, I create two dummy variables for the ownership of financial institutions. These variables are equal to 1 if ownership by financial institutions is greater than 20% (or 40%) and 0 if otherwise[13].

RESULTS

Sample Selection

I use samples of companies listed on the Japanese stock market from March 2004 to March 2007. I examine the companies with 2004–2007 fiscal year ends for the following reason. The introduction of auditing of internal control reports created by members of management was

[13] Jackson and Miyajima (2007) argued that the web of small, reciprocal financial institutions' shareholdings often accounts for 20% of shares and stable shareholders over 40% in Japanese firms. Thus, I set these two indicator variables to ownership greater than 20% or 40%.

likely to change the audit environment in Japan. The *Financial Instruments and Exchange Law* required auditors to conduct audits on management assessments of internal controls in addition to financial statements from the fiscal year beginning on or after April 2008. To control for these changes, we limit the sample period to up to March 2007.

Regulations require Japanese companies to disclose the audit and non-audit fees paid to auditors in their annual security reports after March 2004. As previously stated, internal control audits began after April 2008 in Japan; however, many companies had dealt with this regulation since early 2008. Thus, to rule out the effects from this regulation, I exclude the 2008 fiscal year end sample and focus on March 2004–2007 fiscal year ends. In addition, sample observations are obtained for firms with fiscal year ends in March[14]. Firms who changed their fiscal year ends, those engaging in mergers and acquisitions, and those jointly audited by more than two audit firms are excluded from the sample. In addition, I exclude SEC registrants because these firms tend to pay much higher fees to auditors than firms listed only on the domestic Japanese market. Furthermore, firms from the financial service industry are excluded from the analysis, as in previous research.

Financial data were collected from the *Nikkei NEEDS–Financial QUEST* database, and audit fees and auditor data were collected from *NEEDS-MT Data on Directors and Audit Opinions* and annual corporate security reports. The final sample observations were 1,236 for 2004, 1,674 for 2005, 1,672 for 2006, and 1,720 for 2007.

Descriptive Statistics and Correlation Analysis

[14] More than 70% of the listed Japanese companies have fiscal year ends in March.

Table 2 provides the descriptive statistics. The average (median) audit (*FEE*) and non-audit fees (*NONFEE*) are ¥24.650 million (¥19.200 million) and ¥1.809 million (¥0.000 million), respectively. According to Table 2, non-audit fees are significantly smaller than audit fees because Japanese auditors are prohibited from providing certain non-audit services to their audit clients since 2004. Therefore, I assume that non-audit fees had no significant effect on audit quality, justifying my decision not to focus on the effect of non-audit fees on accrual quality.

The average *FIN* ownership is 22% (median 20%) and is relatively smaller than the 26–32% range reported in Japan (Noma 2002; Shuto 2006; Teshima and Shuto 2008). The difference is attributed to the changes in circumstances surrounding Japanese firms in recent years. Previous research that examined the ownership structure of Japanese firms primarily focused on the Japanese market from 1990 to 2000; however, this study sheds light on more recent years (March 2004–2007). Jackson and Miyajima (2007) and Shuto and Iwasaki (2011) indicated that although the value of stable shareholdings (including shareholdings by financial institutions) gradually decreased after the year 2000, that of foreign ownership largely increased during this period[15]. Shuto and Iwaski (2011) reported that the average percent of foreign (company) ownership is 8.0, similar to those of foreign (company) ownership in my sample firms (untabulated).

A Big Four (or Big Five) firm audited 80% of the sample. Eleven percent of the sample reported a loss during the fiscal year (*LOSS* mean = 0.110). The descriptive statistics of control variables for accrual quality are similar to those of previous research that examined the association between (abnormal) audit fees and accrual quality of Japanese firms (Kasai 2009).

[15] For more details on the changes in circumstances surrounding Japanese firms in recent years, see Jackson and Miyajima (2007).

(Insert Table 2 here)

The correlation matrix is reported in Table 3, which shows that the relationships between *AQ* and some of the fee variables (*LNFEE*, *LNTOTAL*) are negative, implying that accrual quality is higher when audit and total audit fees are higher. In contrast, Table 3 shows that positive correlations exist between *ABFEE* (*ABTOTAL*) and *AQ*, indicating that abnormal portions of the fees correlate with low accrual quality. Similarly, the financial institution ownership variable (*FIN*) is negatively correlated with accrual quality, indicating that accrual quality is higher when financial institutions' shareholdings are higher.

(Insert Table 3 here)

These univariate relations suggest that audit fees influence auditor efforts, and therefore, higher fees produce higher accrual quality. However, with regard to abnormal fees, higher values correlate with lower accrual quality. These results also show that concentrated ownership by financial institutions improves accrual quality. In the following section, I investigate whether these univariate relationships are confirmed in multivariable settings and examine how concentrated financial institution ownership affects the association between abnormal audit fees and accrual quality.

Multivariate Results

Table 4 reports the regression results for the test of H1, which states a positive association between (abnormal) audit fees and accrual quality. According to Table 4, all fee

variables have positive and statistically significant values. In particular, the coefficients for the audit fees and the total audit fees are 0.004 (*t*-value = 3.38) and 0.005 (*t*-value = 4.11), respectively. These positive and significant coefficients are consistent with the concept that auditors receiving high fees compromise their independence, which leads to lower accrual quality. This further evidence supports the concept that auditors enjoy abnormally high fees, which jeopardizes their independence. The coefficients for the abnormal audit and abnormal total audit fees are 0.006 (*t*-value = 4.13) and 0.007 (*t*-value = 4.91), respectively. The control variables are generally significant and have the expected signs, except for the audit firm size variable (*BIGN*) and auditor change variables (*LATERAL*, *UP*, *DOWN*)[16]. In conclusion, the results in Table 4 indicate that higher fees correlate with lower audit quality; that is, the evidence is consistent with H1. In the next test, I confirm that accrual quality is higher when financial institutions' shareholdings are higher. Table 5 reports the results of these tests relating to H2.

(Insert Table 4 here)

Table 5 reports the regression results for the test of H2, which states a negative association between financial institutions' shareholdings and accrual quality. According to Table 5, all *FIN* variables have negative and statistically significant values. In particular, the coefficients for *FIN20* and *FIN40* are −0.004 (*t*-value = −4.34) and −0.004 (*t*-value = −4.67), respectively. These results suggest that financial institutions' shareholdings have a potential non-linear effect on accrual quality in Japan. The control variables are generally significant and have

[16] This result is from the Big Four's market shares (*BIGN* mean = 0.800). Thus, the impact of the difference of audit firm size on audit quality (accrual quality) is not observed in this analysis. Because the sample size of the auditor change is also small, the impact of the auditor change on audit quality (accrual quality) is limited.

the expected signs, except for the audit firm size variable (*BIGN*) and auditor change variables (*LATERAL*, *UP*, *DOWN*). Column three of Table 5 shows that the coefficient of the *LNSIZE* variable is negative but not significant. Because the *LNSIZE* variable is highly correlated with *FIN* in Table 5[17], the indicator variables (*FIN20* and *FIN40*) might be a better measure for avoiding the multicollinearity concern than using the raw data (*FIN*)[18]. Previous studies indicated that managerial, institutional (including corporate ownership), and foreign companies ownerships could also influence managerial behavior in Japanese firms (e.g., Lichtenberg and Pushner 1994; Noma 2002; Kimura 2004; Shuto 2006; Teshima and Shuto 2008; Shuto and Takada 2010; Shuto and Iwasaki 2011). Thus, these variables need to be added to Equation (5) to control this problem. To address this issue, I conduct additional analysis in the next section. In conclusion, the results in Table 5 indicate that a higher financial institution ownership correlates with higher audit quality; that is, the evidence is consistent with H2.

(Insert Table 5 here)

Tables 6.1 and 6.2 report the regression results for the test of H3, which states that the association between auditor–client economic bonding and accrual quality is moderated by financial institution monitoring (main bank monitoring). According to Tables 6.1 and 6.2, all interaction terms (*FEE*FIN*) are generally negative and statistically significant (or insignificant) values. Not all of the control variables are significant; however, the signs of the variables with significant coefficients are as I expected. In particular, the coefficients for *ABFEE*FIN20* and

[17] See Table 3 (correlation matrix).
[18] The correlation coefficients of *FIN20* and *FIN40* to *LNSIZE* are slightly lower than *FIN* (untabulated analysis).

*ABTOTAL*FIN20* are −0.006 (*t*-value = −2.04) and −0.007 (*t*-value = −2.32), respectively. Also of interest are the coefficients on *FEE* (*ABFEE* and *ABTOTAL*), which are positive and significant for all models shown in Tables 6.1 and 6.2. In contrast, the coefficients on *FIN* (*FIN*, *FIN20* and *FIN40*) are negative and significant for all models shown in Tables 6.1 and 6.2. In the presence of the interaction term, the positive and significant coefficients on *FEE* (*ABFEE* and *ABTOTAL*) indicate that, in the absence of the monitoring effectiveness of financial institutions (main bank monitoring), auditor–client economic bonding is adversely related to earnings quality. These results imply that the monitoring effectiveness of financial institutions (monitoring by the main bank) moderates the impact of potential auditor–client economic bonding on accrual quality.

(Insert Tables 6.1 and 6.2 here)

Additional Analyses

The Effect of the Audit Fees Variable in 2004

As stated in the sample selection part, Japanese firms were only required to disclose audit fees after March 2004. Although audit fee data for March 2004 are available, their disclosure was required by Cabinet Office regulations and not mandated. Hayashi et al. (2005) showed that more than 200 firms with March 2004 fiscal year ends did not disclose the fees paid to their auditors, whereas there were only 11 firms with March 2005 fiscal year ends (Machida 2007). Hence, audit fee availability in 2004 is limited. Considering the limited availability of the data, I performed my tests in Tables 7.1 and 7.2 by excluding the sample from 2004. The results for my

test variables retain their significance. That is, the interaction term *FEE*FIN* gives negative and statistically significant values except for *ABFEE*FIN*.

(Insert Tables 7.1 and 7.2 here)

Control for Japanese Ownership Structure

To address a potential omitted variable problem, I examine the impact of other Japanese ownership structure variables on the association between abnormal audit (total) fees, the financial institutions' shareholdings, and accrual quality. Prior research suggested that managerial ownership, corporate shareholdings, and foreign shareholdings could also influence managerial behavior in Japanese firms (e.g., Lichtenberg and Pushner 1994; Noma 2002; Kimura 2004; Shuto 2006; Teshima and Shuto 2008; Shuto and Takada 2010; Shuto and Kitagawa 2011; Shuto and Iwasaki 2011). Thus, I include these ownership variables in Equation (5) to control for this problem. That is, I add three control variables to the regression model[19]. Untabulated results for my test variables retain their significance. That is, the interaction term *FEE*FIN* yields negative and statistically significant values except for *ABFEE*FIN* and *ABTOTAL*FIN*.

The Sign of Abnormal Audit Fees and the Asymmetric Impact on Accrual Quality

Prior studies shed light on the relationship between the sign of abnormal audit fees and audit quality (e.g., Krishnan et al. 2005; Higgs and Skantz 2006; Choi et al. 2010; Asthana and Boone 2012). Choi et al. (2010) suggested that the association between abnormal audit fees and

[19] These variables are defined as follows: *CORP* is the fraction of shares owned by other corporations, *DIR* is the fraction of shares owned by all directors, and *FOREIGN* is the fraction of shares owned by foreign companies.

audit quality is asymmetric and non-linear in the sense that the association is conditioned on the sign of abnormal audit fees. That is, abnormal audit fees are negatively (positively) associated with audit quality for clients with positive abnormal audit fees. Thus, I divided the sample into two parts based on the sign of the abnormal audit fees and re-estimated Equation (5). The untabulated results remain the same for clients with positive abnormal audit fees. However, the sample consisting of negative abnormal audit fees shows opposite results. These untabulated results are consistent with previous research (e.g., Choi et al. 2010).

CONCLUSION

This study examines how ownership structure moderates the association between abnormal audit fees (auditor–client economic bonding) and audit quality (measured by accrual quality), with specific reference to financial institutions' shareholdings in the Japanese equity market. The results show that a negative (or not) significant association exists between abnormal audit fees and accrual quality (audit quality) for firms with a high level of financial institutions' shareholdings. These findings indicate that abnormally high audit fees may not impair audit quality when financial institutions' shareholding is high.

This study contributes to the literature on the effects of abnormal audit fees on audit quality. From a theoretical perspective, I contribute to the corporate ownership literature by demonstrating that the "fee-audit quality effect" (a type of auditor–client economic bond) in the Japanese accounting profession is conditional on financial institutions' shareholdings. Furthermore, my results support previous research findings that higher stable shareholdings (including financial institutions' shareholdings) do not lead to reduced earnings quality and the findings of more recent studies that focus on the combined effects of audit fees, earnings

management, and audit committees. As stated previously, this study provides empirical evidence that financial institutions' shareholdings can moderate threats to auditor independence, thus protecting the quality of financial reporting in Japanese firms.

This research has some limitations. Audit effectiveness can be measured in various ways, such as through audit opinions or the frequency of restatements. However, I focus on accrual quality to measure audit quality. In future research, audit quality should be measured in different ways, and its relation to audit fees and corporate governance mechanisms should be examined in the context of the Japanese audit market. In addition, this study does not control for the impact of boards of directors and the statutory auditor (*kansayaku*) on audit quality (earnings quality) in Japanese firms. Furthermore, my results might not be applicable generally because I examine Japanese firms from 2004 to 2007. Even with these limitations, this study provides new evidence concerning the relationship between auditor independence and corporate governance mechanisms in the Japanese audit market.

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Table 1 Definitions of variables

Variables	*Descriptions*
FEE =	audit fees (millions of JPY)
NONFEE =	non-audit fee (millions of JPY)
TOTAL =	total audit fees (millions of JPY)
LNFEE =	natural logarithm of audit fees
LNTOTAL =	natural logarithm of total audit fees
ABFEE =	abnormal component of audit fees
ABTOTAL =	abnormal component of total audit fees
AQ =	absolute value of residuals from annual cross-sectional estimation of the Dechow and Dichev (2002) model
LNSIZE =	natural logarithm of average total assets
SALESVLT =	standard deviation of sales from 2002 to 2007, scaled by sales
OPCYCLE =	365/(sales/average accounts receivables) + 365/(cost of goods sold/average inventory)
LOSSDUM =	an indicator variable equal to 1 if the audit client reported a loss in current fiscal year, or 0 if otherwise
FIN=	the fraction of shares owned by financial institutions
LATERAL=	an indicator variable equal to 1 if initial audit engagement from March 2004 to March 2007 shows an auditor realignment to another audit firm within the same class as the predecessor audit firm's classification; 0 if otherwise. If the auditor of this firm is ChuoAoyama in 2006, and ChuoAoyama is replaced by Misuzu or Arata in 2007, then I regard that the auditor of this firm does not change.
UP=	an indicator variable equal to 1 if auditor change reflects a change to a larger audit firm such as from a small and medium audit firm to a Big 4 or Big 5 audit firm; 0 if otherwise
DOWN=	an indicator variable equal to 1 if auditor change reflects a change to a smaller audit firm such as a Big 4 or Big 5 audit firm to a small and medium audit firm; 0 if otherwise.
SUBS=	natural logarithm of the number of subsidiaries
LEV=	ratio of total debt to average total assets
BIGN=	an indicator variable equal to 1 when the auditor is a member of the Big 4 (defined by Azusa, ChuoAoyama, Shinnihon, and Tohmatsu in 2006) or Big 5 (defined by Azusa, Misuzu, Arata, Shinnihon, and Tohmatsu in 2007); 0 if otherwise
DL=	an indicator variable equal to 1 when the sample firms listed on the first section of the Japanese stock markets; 0 if otherwise

For Japanese firms, fees are measured in millions of JPY. The dollar–yen exchange rate during these periods was on average approximately $1 = ¥100.

Table 2 Descriptive statistics

Variables of all samples (2004–2007)

Variable	Mean	Std Dev	1st Qrt	Median	3rd Qrt	*N*
FEE (in millions of JPY)	24.650	31.839	15.000	19.200	27.000	6,302
NONFEE (in millions of JPY)	1.809	8.244	0.000	0.000	0.500	6,302
TOTAL (in millions of JPY)	26.460	34.993	15.000	20.000	28.000	6,302
LNFEE	3.024	0.513	2.708	2.954	3.295	6,302
LNTOTAL	3.066	0.550	2.708	2.995	3.332	6,302
ABFEE	0.000	0.307	−0.185	−0.014	0.170	6,302
ABTOTAL	−0.002	0.327	−0.205	−0.023	0.178	6,302
AQ	0.028	0.038	0.007	0.017	0.035	6,302
LNSIZE	10.744	1.435	9.717	10.577	11.596	6,302
SALESVLT	0.116	0.164	0.040	0.075	0.142	6,302
OPCYCLE	142.567	57.796	53.924	142.892	234.437	6,302
LOSSDUM	0.110	0.313	0.000	0.000	0.000	6,302
FIN	0.221	0.130	0.117	0.202	0.309	6,302
LATERAL	0.019	0.138	0.000	0.000	0.000	6,302
UP	0.004	0.069	0.000	0.000	0.000	6,302
DOWN	0.006	0.077	0.000	0.000	0.000	6,302
SUBS	1.817	1.296	0.693	1.791	2.708	6,302
LEV	0.533	0.211	0.381	0.544	0.685	6,302
BIGN	0.800	0.399	1.000	1.000	1.000	6,302
DL	0.568	0.495	0.000	1.000	1.000	6,302

Notes: All variables are defined in Table 1. For Japanese firms, fees are measured in millions of JPY. The dollar–yen exchange rate during these periods was on average approximately $1 = ¥100.

Table 3 Correlation Matrix

	AQ	*LNFEE*	*LNTOTAL*	*ABFEE*	*ABTOTAL*	*FIN*	*LNSIZE*	*OPCYCLE*	*SALESVLT*	*LOSSDUM*	*BIGN*	*LATERAL*	*UP*	*DOWN*
AQ	1.000													
LNFEE	−0.061	1.000												
LNTOTAL	−0.055	0.980	1.000											
ABFEE	0.058	0.597	0.563	1.000										
ABTOTAL	0.072	0.570	0.598	0.947	1.000									
FIN	−0.166	0.483	0.476	−0.015	−0.022	1.000								
LNSIZE	−0.128	0.774	0.773	0.001	0.004	0.626	1.000							
OPCYCLE	0.048	−0.012	−0.019	−0.004	−0.014	0.050	0.017	1.000						
SALESVLT	0.240	−0.042	−0.035	0.036	0.049	−0.143	−0.117	−0.124	1.000					
LOSSDUM	0.171	−0.079	−0.087	0.005	0.006	−0.163	−0.148	0.044	0.076	1.000				
BIGN	−0.025	0.165	0.186	−0.000	−0.000	0.039	0.098	−0.056	0.004	−0.056	1.000			
LATERAL	0.012	0.051	0.050	0.022	0.018	−0.037	0.027	−0.024	0.027	0.005	0.018	1.000		
UP	−0.009	0.014	0.012	−0.001	−0.004	0.017	0.022	0.014	0.028	−0.017	0.012	−0.009	1.000	
DOWN	0.025	−0.034	−0.037	−0.020	−0.018	−0.036	−0.025	−0.009	0.008	0.051	−0.125	−0.011	−0.005	1.000

Notes: Pearson correlations are reported. All variables are defined in Table 1.

Table 4 Regression results of accrual quality on audit fees and control variables

Panel A: Results with total amount of fees

Independent Variables	*Expected Signs*	*LNFEE*		*LNTOTAL*	
Intercept		0.042	(7.47)	0.044***	(7.66)
LNFEE		0.004***	(3.38)		
LNTOTAL				0.005***	(4.11)
LNSIZE	—	−0.003***	(−6.83)	−0.003***	(−7.32)
OPCYCLE	+	0.000***	(3.50)	0.000***	(3.53)
SALESVLT	+	0.052***	(3.33)	0.052***	(3.32)
LOSSDUM	+	0.016***	(7.50)	0.015***	(7.48)
BIGN		−0.000	(−0.79)	−0.001	(−1.04)
LATERAL		0.003	(1.13)	0.003	(1.12)
UP		−0.006	(−1.60)	−0.006	(−1.57)
DOWN		0.008	(1.14)	0.008	(1.16)
N		6,302		6,302	
Adj. R²		0.098		0.099	

Panel B: Results with abnormal audit fees

Independent Variables	*Expected Signs*	*ABFEE*		*ABTOTAL*	
Intercept		0.042***	(7.46)	0.042***	(7.49)
ABFEE		0.006***	(4.13)		
ABTOTAL				0.007***	(4.91)
LNSIZE	—	−0.002***	(−6.18)	−0.002***	(−6.22)
OPCYCLE	+	0.000***	(3.46)	0.000***	(3.49)
SALESVLT	+	0.052***	(3.33)	0.052***	(3.32)
LOSSDUM	+	0.016***	(7.57)	0.016***	(7.57)
BIGN		−0.000	(−0.33)	−0.000	(−0.33)
LATERAL		0.003	(1.17)	0.003	(1.18)
UP		−0.006	(−1.61)	−0.006	(−1.58)
DOWN		0.008	(1.17)	0.008	(1.18)
N		6,302		6,302	
Adj. R²		0.099		0.100	

Notes:

The regression model is

$$AQ = \gamma_0 + \gamma_1 FEE + \gamma_2 LNSIZE + \gamma_3 OPCYCLE + \gamma_4 SALESVLT + \gamma_5 LOSSDUM + \gamma 6\ BIGN + \gamma 7\ LATERAL + \gamma 8\ UP + \gamma 9\ DOWN + Industry + Year + u. \quad (3)$$

Indicator variables for *Tosho* industry classification code (*Industry*) and for the year (*Year*) are included but not reported.

The *p*-values are from two-tailed tests. The *t*-statistics (White [1980] heteroscedasticity consistent *t*-statistics) are reported in parentheses.

***, **, * represent significance at the 0.01, 0.05, and 0.10 levels or better, respectively.

See Table 1 for the definitions of variables.

Table 5 Regression results of accrual quality on financial institutions' shareholdings and control variables

Results with financial institutions' shareholdings							
Independent Variable	*Expected Sign*	*FIN*		*FIN20*		*FIN40*	
Intercept		0.031***	(5.25)	0.036***	(6.06)	0.039***	(6.64)
FIN		−0.031***	(−6.53)				
FIN20				−0.004***	(−4.34)		
FIN40						−0.004***	(−4.67)
LNSIZE	—	−0.000	(−0.98)	−0.001***	(−3.22)	−0.001***	(−4.70)
OPCYCLE	+	0.000***	(3.62)	0.000***	(3.58)	0.000***	(3.48)
SALESVLT	+	0.052***	(3.28)	0.052***	(3.32)	0.053***	(3.33)
LOSSDUM	+	0.015***	(7.17)	0.015***	(7.37)	0.016***	(7.54)
BIGN		−0.000	(−0.54)	−0.000	(−0.48)	−0.000	(−0.33)
LATERAL		0.002	(0.78)	0.002	(1.03)	0.003	(1.24)
UP		−0.006	(−1.64)	−0.006	(−1.64)	−0.006*	(−1.67)
DOWN		0.007	(0.97)	0.007	(1.03)	0.008	(1.10)
N		6,302		6,302		6,302	
Adj. R²		0.103		0.099		0.097	

Notes:
The regression model is

$$AQ = \gamma_0 + \gamma_1 FIN + \gamma_2 LNSIZE + \gamma_3 OPCYCLE + \gamma_4 SALESVLT + \gamma_5 LOSSDUM + \gamma_6 BIGN + \gamma_7 LATERAL + \gamma_8 UP + \gamma_9 DOWN + Industry + Year + u. \quad (4)$$

FIN = fraction of the shares owned by financial institutions;
FIN20 = 1 if the fraction of the shares owned by financial institutions greater than 0.2 (20%), and 0 if otherwise;
FIN40 = 1 if the fraction of the shares owned by financial institutions greater than 0.4 (40%), and 0 if otherwise;
Indicator variables for *Tosho* industry classification code (*Industry*) and for the year (*Year*) are included but not reported.
The *p*-values are from two-tailed tests. The *t*-statistics (White [1980] heteroscedasticity consistent *t*-statistics) are reported in parenthesis. ***, **, and * represent significance at the 0.01, 0.05, and 0.10 levels or better, respectively. See Table 1 for the definitions of variables.

Table 6.1 Regression results of accrual quality on abnormal audit fees conditional on financial institutions' shareholdings

Results with abnormal audit fees							
Independent Variable	*Expected Sign*	*FIN*		*FIN20*		*FIN40*	
Intercept		0.030***	(5.15)	0.035***	(5.93)	0.038***	(6.63)
ABFEE		0.010**	(2.48)	0.009***	(3.40)	0.006***	(4.04)
FIN		−0.031***	(−6.52)				
*ABFEE*FIN*		−0.016	(−1.35)				
FIN20				−0.004***	(−4.40)		
*ABFEE*FIN20*				−0.006**	(−2.04)		
FIN40						−0.005***	(−4.77)
*ABFEE*FIN40*						−0.004	(−1.56)
LNSIZE	—	−0.000	(−0.91)	−0.001***	(−3.08)	−0.001***	(−4.66)
OPCYCLE	+	0.000***	(3.68)	0.000***	(3.67)	0.000***	(3.50)
SALESVLT	+	0.051***	(3.26)	0.052***	(3.31)	0.052***	(3.32)
LOSSDUM	+	0.015***	(7.18)	0.015***	(7.36)	0.016***	(7.55)
BIGN		−0.000	(−0.46)	−0.000	(−0.38)	−0.000	(−0.29)
LATERAL		0.001	(0.61)	0.002	(0.87)	0.003	(1.12)
UP		−0.006	(−1.57)	−0.006	(−1.57)	−0.006	(−1.62)
DOWN		0.008	(1.05)	0.008	(1.11)	0.008	(1.16)
N		6,302		6,302		6,302	
Adj. R²		0.106		0.102		0.100	

Notes:
The regression model is

$$AQ = \gamma_0 + \gamma_1 ABFEE + \gamma_2 FIN + \gamma_3 ABFEE*FIN + \gamma_4 LNSIZE + \gamma_5 OPCYCLE + \gamma_6 SALESVLT + \gamma_7 LOSSDUM + \gamma_8 BIGN + \gamma_9 LATERAL + \gamma_{10} UP + \gamma_{11} DOWN + Industry + Year + u. \quad (5)$$

ABFEE = abnormal component of audit fees;
FIN = fraction of the shares owned by financial institutions;
FIN20 = 1 if the fraction of the shares owned by financial institutions greater than 0.2 (20%), and 0 if otherwise;
FIN40 = 1 if the fraction of the shares owned by financial institutions greater than 0.4 (40%), and 0 if otherwise;
Indicator variables for *Tosho* industry classification code (*Industry*) and for the year (*Year*) are included but not reported.
The *p*-values are from two-tailed tests. The *t*-statistics (White [1980] heteroscedasticity consistent *t*-statistics) are reported in parenthesis. ***, **, and * represent significance at the 0.01, 0.05, and 0.10 levels or better, respectively. See Table 1 for the definitions of variables.

Table 6.2 Regression results of accrual quality on abnormal total audit fees conditional on financial institutions' shareholdings

Results with abnormal total audit fees							
Independent Variable	*Expected Sign*	*FIN*		*FIN20*		*FIN40*	
Intercept		0.030***	(5.15)	0.035***	(5.91)	0.039***	(6.65)
ABTOTAL		0.011***	(2.89)	0.011***	(3.99)	0.007***	(4.71)
FIN		−0.031***	(−6.50)				
*ABTOTAL*FIN*		−0.017	(−1.47)				
FIN20				−0.004***	(−4.40)		
*ABTOTAL*FIN20*				−0.007**	(−2.32)		
FIN40						−0.005***	(−4.78)
*ABTOTAL*FIN40*						−0.004	(−1.60)
LNSIZE	−	−0.000	(−0.92)	−0.001***	(−3.07)	−0.001***	(−4.69)
OPCYCLE	+	0.000***	(3.72)	0.000***	(3.72)	0.000***	(3.52)
SALESVLT	+	0.051***	(3.25)	0.052***	(3.30)	0.052***	(3.31)
LOSSDUM	+	0.015***	(7.18)	0.015***	(7.34)	0.016***	(7.55)
BIGN		−0.000	(−0.43)	−0.000	(−0.34)	−0.000	(−0.28)
LATERAL		0.001	(0.62)	0.002	(0.87)	0.003	(1.12)
UP		−0.006	(−1.55)	−0.006	(−1.55)	−0.006	(−1.58)
DOWN		0.008	(1.05)	0.008	(1.12)	0.008	(1.17)
N		6,302		6,302		6,302	
Adj. R²		0.107		0.104		0.101	

Notes:
The regression model is

$$AQ = \gamma_0 + \gamma_1 ABTOTAL + \gamma_2 FIN + \gamma_3 ABTOTAL*FIN + \gamma_4 LNSIZE + \gamma_5 OPCYCLE + \gamma_6 SALESVLT + \gamma_7 LOSSDUM + \gamma_8 BIGN + \gamma_9 LATERAL + \gamma_{10} UP + \gamma_{11} DOWN + Industry + Year + u. \quad (5)$$

ABTOTAL = abnormal component of total audit fees;
FIN = fraction of the shares owned by financial institutions;
FIN20 = 1 if the fraction of the shares owned by financial institutions greater than 0.2 (20%), and 0 if otherwise;
FIN40 = 1 if the fraction of the shares owned by financial institutions greater than 0.4 (40%), and 0 if otherwise;
Indicator variables for *Tosho* industry classification code (*Industry*) and for the year (*Year*) are included but not reported.
The *p*-values are from two-tailed tests. The *t*-statistics (White [1980] heteroscedasticity consistent *t*-statistics) are reported in parenthesis. ***, **, and * represent significance at the 0.01, 0.05, and 0.10 levels or better, respectively. See Table 1 for the definitions of variables.

Table 7.1 Regression results of accrual quality on abnormal audit fees conditional on financial institutions' shareholdings

Results with abnormal audit fees							
Independent Variable	*Expected Sign*	*FIN*		*FIN20*		*FIN40*	
Intercept		0.028***	(5.57)	0.033***	(6.51)	0.037***	(7.51)
ABFEE		0.010***	(2.38)	0.009***	(3.10)	0.007***	(4.04)
FIN		−0.036***	(−6.51)				
*ABFEE*FIN*		−0.018	(−1.34)				
FIN20				−0.005***	(−4.62)		
*ABFEE*FIN20*				−0.006*	(−1.78)		
FIN40						−0.005***	(−4.96)
*ABFEE*FIN40*						−0.006**	(−2.16)
LNSIZE	—	−0.000	(−0.70)	−0.001***	(−2.88)	−0.001***	(−4.75)
OPCYCLE	+	0.000***	(3.87)	0.000***	(3.86)	0.000***	(3.64)
SALESVLT	+	0.036***	(4.16)	0.037***	(4.19)	0.038***	(4.20)
LOSSDUM	+	0.015***	(6.29)	0.016***	(6.50)	0.016***	(6.71)
BIGN		−0.001	(−0.73)	−0.000	(−0.70)	−0.000	(−0.59)
LATERAL		0.003	(1.04)	0.004	(1.27)	0.004	(1.48)
UP		−0.006	(−1.53)	−0.006	(−1.62)	−0.006*	(−1.70)
DOWN		0.009	(1.07)	0.010	(1.14)	0.010	(1.15)
N		5,066		5,066		5,066	
Adj. R²		0.086		0.081		0.079	

Notes:
The regression model is

$$AQ = \gamma_0 + \gamma_1 ABFEE + \gamma_2 FIN + \gamma_3 ABFEE*FIN + \gamma_4 LNSIZE + \gamma_5 OPCYCLE + \gamma_6 SALESVLT + \gamma_7 LOSSDUM + \gamma_8 BIGN + \gamma_9 LATERAL + \gamma_{10} UP + \gamma_{11} DOWN + Industry + Year + u. \quad (5)$$

ABFEE = abnormal component of audit fees;
FIN = fraction of the shares owned by financial institutions;
FIN20 = 1 if the fraction of the shares owned by financial institutions greater than 0.2 (20%), and 0 if otherwise;
FIN40 = 1 if the fraction of the shares owned by financial institutions greater than 0.4 (40%), and 0 if otherwise;
Indicator variables for *Tosho* industry classification code (*Industry*) and for the year (*Year*) are included but not reported.
The *p*-values are from two-tailed tests. The *t*-statistics (White [1980] heteroscedasticity consistent *t*-statistics) are reported in parenthesis. ***, **, and * represent significance at the 0.01, 0.05, and 0.10 levels or better, respectively. See Table 1 for the definitions of variables.

Table 7.2 Regression results of accrual quality on abnormal total audit fees conditional on financial institutions' shareholdings

Results with abnormal total audit fees							
Independent Variable	*Expected Sign*	*FIN*		*FIN20*		*FIN40*	
Intercept		0.028***	(5.56)	0.032***	(6.46)	0.037***	(7.54)
ABTOTAL		0.012***	(2.90)	0.011***	(3.78)	0.008***	(4.64)
FIN		−0.036***	(−6.50)				
*ABTOTAL*FIN*		−0.021*	(−1.66)				
FIN20				−0.005***	(−4.63)		
*ABTOTAL*FIN20*				−0.007**	(−2.29)		
FIN40						−0.005***	(−4.97)
*ABTOTAL*FIN40*						−0.006**	(−2.27)
LNSIZE	—	−0.000	(−0.68)	−0.001***	(−2.85)	−0.001***	(−4.77)
OPCYCLE	+	0.000***	(3.92)	0.000***	(3.92)	0.000***	(3.66)
SALESVLT	+	0.036***	(4.15)	0.037***	(4.19)	0.038***	(4.19)
LOSSDUM	+	0.015***	(6.28)	0.016***	(6.48)	0.016***	(6.70)
BIGN		−0.000	(−0.69)	−0.000	(−0.65)	−0.000	(−0.58)
LATERAL		0.003	(1.04)	0.004	(1.27)	0.004	(1.49)
UP		−0.006	(−1.51)	−0.006	(−1.60)	−0.006*	(−1.68)
DOWN		0.009	(1.07)	0.010	(1.14)	0.010	(1.15)
N		5,066		5,066		5,066	
Adj. R²		0.087		0.083		0.080	

Notes:
The regression model is

$$AQ = \gamma_0 + \gamma_1 ABTOTAL + \gamma_2 FIN + \gamma_3 ABTOTAL*FIN + \gamma_4 LNSIZE + \gamma_5 OPCYCLE + \gamma_6 SALESVLT + \gamma_7 LOSSDUM + \gamma_8 BIGN + \gamma_9 LATERAL + \gamma_{10} UP + \gamma_{11} DOWN + Industry + Year + u. \quad (5)$$

ABTOTAL = abnormal component of total audit fees;
FIN = fraction of the shares owned by financial institutions;
FIN20 = 1 if the fraction of the shares owned by financial institutions greater than 0.2 (20%), and 0 if otherwise;
FIN40 = 1 if the fraction of the shares owned by financial institutions greater than 0.4 (40%), and 0 if otherwise;
Indicator variables for *Tosho* industry classification code (*Industry*) and for the year (*Year*) are included but not reported.
The *p*-values are from two-tailed tests. The *t*-statistics (White [1980] heteroscedasticity consistent *t*-statistics) are reported in parenthesis. ***, **, and * represent significance at the 0.01, 0.05, and 0.10 levels or better, respectively. See Table 1 for the definitions of variables.