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Industry Level Audit Pricing Competitiveness of the Japanese Market from Big 4 to Big 3 Period

Frendy

The 2006 dissolution of PwC ChuoAoyama significantly changed market share composition of Japanese audit firms which marked the transition from Big 4 period to Big 3 period. This study aims to investigate audit market pricing competitiveness among individual audit firms at the industry level using a sample of Japanese firms listed in the First Section of Tokyo Stock Exchange during the transition from Big 4 period (2004-2005) to Big 3 period (2006-2011). The study investigates the pricing competitiveness among individual audit firms at the industry level by examining the association between audit fee as the dependent variable and as variable of interest while controlling for other variables affecting audit fee using panel fixed effects multivariate regression models. The results show that the audit pricing at the industry level among individual audit firms within Big N and non-Big N audit market remains competitive; even after considering the transition from the Big 4 to the Big 3 period. The competitive audit pricing among individual audit firms suggests that Japanese audit market at the industry level represents a buyer's market where audit clients have more power to set audit pricing.

Keywords: Audit pricing competitiveness, Industry level market concentration, Audit fee, Big 3, Japan.

Ⅰ. Introduction

In April 2005, one client of ChuoAoyama - the PwC affiliated audit firm in Japan - committed the then largest accounting fraud in Japan (Skinner and Srinivasan, 2012). In an effort to restore its reputation, PwC split ChuoAoyama into two firms in May 2006: Misuzu and Aarata. Misuzu was later dissolved in 2007 because one of its clients was involved in an accounting fraud. Aarata continues to operate as a smaller and high-quality PwC affiliate in Japan. The market exit of both PwC Misuzu and PwC ChuoAoyama reduced auditor choice for Japanese clients which have significant implications for auditor competition. Although Big 4 audit firms still hold the largest audit share in Japanese market as a group, the 2007 total audit fee income data revealed that PwC Aarata (PwC ChuoAoyama successor firm)'s market share is less than one-third of the third largest Japanese Big 4 affiliated firms (Fukukawa, 2011). This event significantly changed the structure of the Japanese large audit market from the Big 4 period (2004-2005) to the Big 3 period (2006 onwards). There is a significant concern that Japanese audit market is becoming less competitive following such a significant market disruption, which is commonly caused by a merger or exit of one of Big N[1)] auditors. When one of the Big N auditors leaves the market, the issue of auditor concentration becomes more important as large listed companies have more limited choices for audit service.

Higher concentration auditors in the audit service market might increase the potential for price fixing arrangements, reduction in consumer choice, and an escalation in conflicts of interest between audit and non-audit services

(Pong, 1999). There is also a concern that an over-aggressive competition among auditors might promote audit fee low balling behavior and opinion shopping (Beattie et al., 2003). Accounting regulators in other developed countries have seriously considered the potential association between higher supplier concentration in audit market and non-competitive behavior (Competition Commission UK, 2011; United States General Accounting Office, 2003).

Audit service is considered as a commodity where the suppliers of audit service (audit firms) compete mostly on pricing (Peecher, 2003). This study is interested in investigating pricing competitiveness among individual audit firms at the industry level in Japan. A smaller pool of large auditors is particularly critical in highly concentrated industries if companies wish to hire a firm that is not associated with their competitors (McMeeking, 2007). Regulators have expressed concern of a less competitive market if audit market concentration is associated with higher audit fees (Eshleman and Lawson, 2017). Thus, the sudden market exit of one of major Japanese audit firms, PwC ChuoAoyama, raises an important concern of whether the remaining auditors exploits their higher market concentration by engaging in non-competitive audit pricing at the industry level.

This study investigates audit pricing competitiveness at the industry level in Japan by examining the relationship between audit fee and audit market concentration. The following two competing theories might explain the relationship between audit fee and industry level audit market concentration (Pearson and Trompeter, 1994). First, the structural-conduct-performance (SCP) theory establishes a link between industry concentration and firm behavior where a persistently highly concentrated industries result in greater monopoly power and higher price (Beattie and Fearnley, 1994). Thus, an audit market has low-levels of pricing competition at the industry level if audit fee is positively associated with the industry level audit market concentration.

On the other hand, auditors in a highly competitive priced market share their cost savings with their clients and audit market leaders can justify their market dominance by earning less audit fee per audit client, consistent with the economy of scale theory (Newton et al., 2013). Tonge and Wootton (1991) conclude that an audit market is competitively priced when audit fee does not vary with auditors' market share. Thus, an audit market is competitively priced at the industry level if audit fee is negatively associated or does not vary with the industry level audit market concentration. Five measures of industry level audit market concentration are employed: *CR4* (concentration ratio of the four largest auditors), *CR3* (concentration ratio of the three largest auditors, respectively), *Adj_H* (adjusted Herfindahl Index), *G* (Gini coefficient), and *COMMON4* (auditors' commonality among the four largest clients). The empirical results show that audit fee does not vary with industry level audit market concentration; which suggest that audit pricing at the industry level among individual audit firms, within Big N auditors and within non-Big N auditors in Japan remains competitive; even after considering the transition from the Big 4 period to the Big 3 period. The competitive audit pricing among individual audit firms suggests that Japanese audit market at the industry level represents a buyer's market where audit clients have more power to set audit pricing. This conclusion is consistent with Huber's (2015) argument that audit firms are price takers in a competitive market.

The remainder of the paper is organized as follows. In Section 2, prior literatures on audit market concentration and competition are discussed. Section 3 develops hypotheses related to

audit pricing competition among individual firms at the industry level. Section 4 discusses research method that includes: empirical regression models, control variables, industry level audit market concentration measures, and sample selection process. In Section 5, descriptive statistics and estimation results of the multivariate panel fixed effect regressions models related to the hypotheses are evaluated. Section 6 concludes the paper.

Ⅱ. Literature Review

1. Industry Level Audit Market Pricing Competitiveness: Market Concentration and Audit Fee

The issue of auditor concentration becomes more important following a market exit of large auditors as large listed companies have more limited choices of auditors that can meet their audit requirements in short term. The smaller pool of large auditors is particularly critical in highly concentrated industries if companies wish to hire a firm that is not associated with their competitors (McMeeking, 2007). Economic theory on effect of market concentration on economic welfare is mixed (McMeeking et al., 2007). Pound and Francis (1981) suggest that accounting services market is an oligopoly with a 'competitive fringe' that is characterized with market constrained among a few large service providers. Participants of an oligopoly market have a strong incentive to engage in anti-competitive behaviors and have excess profits (Beattie and Fearnley, 1994; OECD Competition Committee, 1999). Kallapur et al. (2010) examine a sample of U.S. listed firm years from 2000 to 2006 and they find that low audit market concentration is associated with lower audit fee, which indicates a competitive pricing behavior among auditors.

The degree of seller concentration can infer the degree of competitive pricing in a market (Buijink et al., 1998). In the event of a drastic change in audit market structure, regulators are concerned about perceived threats to auditor independence, in particular whether the market dominance of large auditors in the public firm audit market might reduce competition. Pong and Burnett (2006) investigate the market impact of PwC merger in 1998 and they find that the increase in audit services market concentration post-merger has not led to an increase in audit prices. DeFond and Zhang's (2014) seminal literature review on auditing research find that the limited number and the mixed findings of studies investigating the relationship between concentration increases audit fees. Prior empirical literatures show mixed conclusions regarding the structure of public audit service market, with some studies describing the industry as competitive and others as oligopolistic (Huber, 2015).

(1) *Audit Market with Low-Levels of Pricing Competition at the Industry Level: Positive Association between Market Concentration and Audit Fee*

Audit firms will charge higher fees in a non-competitive *public audit service market* than would otherwise be seen in a competitive industry, ceteris paribus. In this non-competitive market, consumer (audit clients) surplus is minimized while producer (audit firms) surplus is maximized (Huber, 2015). A higher supplier concentration in a market can reduce consumer welfare if surviving companies engage in anticompetitive behavior (e.g., higher prices) resulting from tacit or non-tacit price collusion. The structural-conduct-performance (SCP) theory posits that a positive association between audit market concentration and audit fee implies an audit market with low-levels of pricing competition. The SCP theory predicts that a market with higher concentration of suppliers is associated with higher prices (non-competitive pricing) as market leaders leverage their market dominance by fixing prices.

A number of empirical studies support the SCP theory. Using the setting large audit firm mergers and demise of Andersen in U.K. from 1985-2002; McMeeking et al. (2007) find that concentration ratios are associated with higher audit fees, where auditees are likely to pay higher fees when their former auditor merges with a larger firm. The higher concentration in audit market also disproportionately affects non-audit switching clients, where firms significantly increase audit fees on repeat engagements during the mergers of U.K. audit firms from 1990-2005 (McMeeking, 2007). Chen et al. (2007) show that the large auditors earn a fee premium in the less competitive Chinese supplementary market, but not in the competitive statutory market. Huang et al. (2016) further examine the competition in the Chinese audit market and they find that market concentration is significantly and positively associated with audit fees. Likewise, Ding and Jia (2012) observe a significant increase in audit fees for U.K. clients of PricewaterhouseCoopers and other large auditors following the PwC merger in 1998. These findings are consistent with the classical micro-economic theory and industry structure theory of oligopolistic supply market where higher concentration increases the supplier market power via higher audit fees.

(2) *Audit Market with Competitive Pricing at the Industry Level: Negative and Non-Significant Association between Market Concentration and Audit Fee*

Economic events that create higher market concentration (e.g., post-merger) can increase consumer welfare if such events reduce marginal costs, create efficiencies and enhance product differentiation. Fewer competitors can lead to a more competitive market if consumer search cost is reduced and competitors drive price to marginal cost, consistent with the characteristics of a classic Bertrand market (Causholli et al., 2010). The economies of scale framework argues that higher concentration of large suppliers enable market leaders to exploit their large scale of size and operational efficiency to provide lower audit fees to customers. Concentration on the audit supplier has been attributed in part, to the ability of large firms to specialize their audit services to the requirements of large public companies audit, specific industries expertise, efficient audit cost through economies of scale and significant barrier to entry (Pound and Francis, 1981). Accordingly, the economy of scale theory predicts that suppliers in a highly concentrated market exploit their large scale of business and maintain market dominance by providing a lower fee to their consumers.

Although audit firms have experienced a number of large-scale mergers over the last four decades; Danos and Eichenseher (1986) analyze auditor selections of 299 sample firms from 1964 to 1980 and they indicate that there is no significant increase in aggregate Big Eight equilibrium market share. Tonge and Wootton (1991) examine the mergers of Big 8 and find that those mergers do not necessarily result in less competition and higher prices as the remaining firms become more comparable in size, market shares, and resources. Tonge and Wootton conclude that an audit market is competitively priced when audit fee does not vary with auditors' market share. Thavapalan et al. (2002) investigate the effect of PwC 1998 merger on the competition in the Australian market and finds that there is a more equitable spread of clients between the main audit firms for a number of industry sectors following the merger. This evidence suggests that merged audit firms do compete in the market of large public companies.

2. Japanese Audit Market Transition from Big 4 to Big 3 Period

Japanese audit market changed dramatically in 2006 following the dissolution of PwC ChuoAoyama. The figure tracks the market

share trend among the Japanese large audit firms from 2004 to 2011. Figure 2.1 shows that the aggregate market share of PwC affiliated firms in Japan decreased significantly from 21.68% in 2005 to 11.96% in the following year. Around a quarter of former ChuoAoyama's clients switched to new auditors (Skinner and Srinivasan, 2012). As a result, PwC Aarata's (PwC ChuoAoyama successor firm) market share in 2007 is less than one-third of the third largest Japanese Big 4 affiliated firms (Fukukawa, 2011) and Figure 2.1 supports Fukukawa's result. Thus, this research set the cutoff period between the Big 4 and Big 3 period between 2005 and 2006, where Big 4 period consists of fiscal year 2004 and 2005 and Big 3 period begins from fiscal year 2006 onwards. The cut-off period from the Big 4 to Big 3 period illustrated in Figure 2.1 is consistent with prior research that investigated Japanese audit market using the Big 3 period (Fukukawa, 2011; Kim and Fukukawa, 2013).

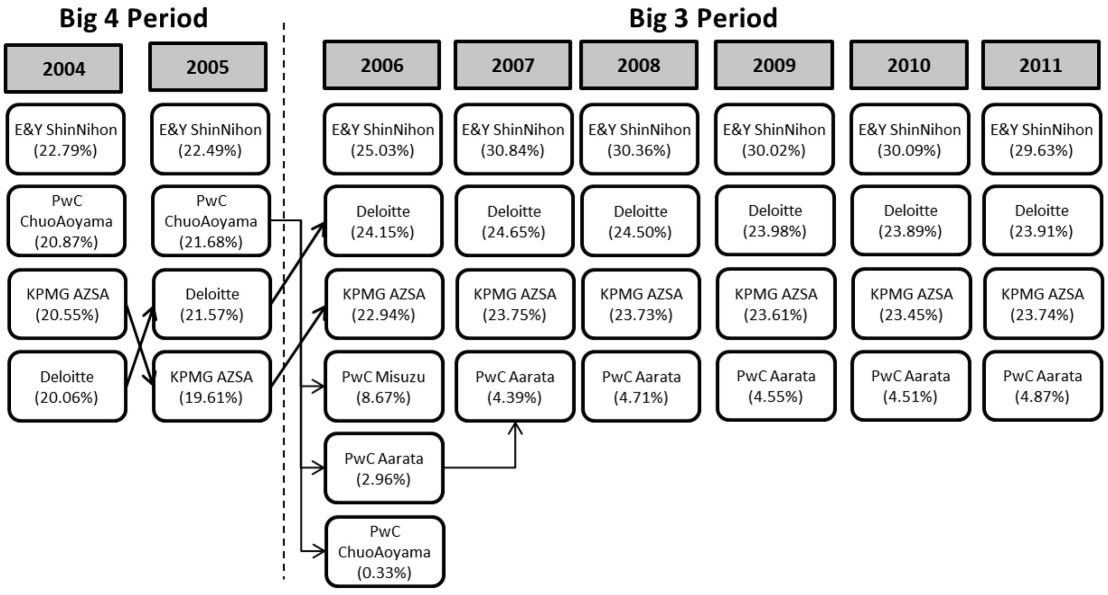
Ⅲ. Hypotheses Development

1. Industry Level Audit Market Pricing Competition among Audit Firms

The smaller pool of large auditors is particularly critical in highly concentrated industries if companies wish to hire a firm that is not associated with their competitors (McMeeking, 2007). Regulators have expressed concern of a less competitive market if audit market concentration is associated with higher audit fees (Eshleman and Lawson, 2017). Thus, the sudden market exit of one of major Japanese audit firms, PwC ChuoAoyama, raises an important concern of whether the remaining auditors exploits their higher market concentration by engaging in non-competitive audit pricing at the industry level.

This research investigates the relationship between audit fee and auditor concentration at the industry level. The smaller pool of large auditors is particularly critical in highly concentrated industries if companies wish to hire a firm that is not associated with their com-

Figure 2.1
Market Share (Client Number) Development of the Largest Japanese Auditors (2004-2011)



petitors (McMeeking, 2007). Five measures of industry level audit market concentration are employed: *CR4* (concentration ratio of the four largest auditors), *CR3* (concentration ratio of the three largest auditors, respectively), *Adj_H* (adjusted Herfindahl Index), *G* (Gini coefficient), and *COMMON4* (auditors' commonality among the four largest clients). Two countervailing theories can explain pricing competitiveness of an audit market at the industry level by associating audit fee with industry level auditor market concentration (Pearson and Trompeter, 1994). In one hand, an audit market has low-levels of pricing competition at the industry level if audit fee is positively associated with the industry level audit market concentration. Conversely, an audit market is competitively priced at the industry level if audit fee is negatively associated or does not vary with the industry level audit market concentration.

First, the structural-conduct-performance (SCP) theory establishes a link between industry concentration and firm behavior where a persistently highly concentrated industries result in greater monopoly power and higher price (Beattie and Fearnley, 1994). The SCP theory argues that industry market structure determines firms' market behaviors and economic performance where the degree of market competition within an industry is reflected in the pricing policies. The SCP theory applied at the industry level predicts that industry market leaders in a highly concentrated industry will employ their market power to fix fees (Pearson and Trompeter, 1994). Thus, an audit market has low-levels of pricing competition at the industry level if audit fee is positively associated with the industry level audit market concentration, assuming other factors that affect audit fees (including audit quality) are held constant. Prior empirical studies that find a *positive* association between market concentration and audit fee are consistent with the characteristic of an audit market with low-levels of pricing competition (Carson et al., 2012; Chen et al., 2007; Ding and Jia, 2012; Huang et al., 2016; McMeeking, 2007; McMeeking et al., 2007).

Second, an audit market is characterized with competitive pricing when suppliers with a dominant market share can justify and maintain their market dominance by providing a lower fee to consumers, consistent with the economy of scale theory (Pearson and Trompeter, 1994). Competitive pricing among auditors can be inferred if the audit market is sufficiently large and concentrated; where auditors can achieve economies of scale and pass the savings onto their clients (Eshleman, 2013). When exogenous entry costs to an audit market is high, only larger audit firms with large economy of scale can operate efficiently (Sirois and Simunic, 2011). Suppliers who accumulate a high level of industry expertise have more capability to develop more efficient process to provide a same level of service with lower cost compared to the non-market leader suppliers. Auditors in a highly competitive priced market share their cost savings with their clients and audit market leaders can justify their market dominance by earning less audit fee per audit client (Newton et al., 2013). Tonge and Wootton (1991) find that market concentration ratios (based on number of clients) do not vary across clients' revenues and clients' market values that serve as proxies of audit fee. Tonge and Wootton conclude that an audit market is competitively priced when audit fee does not vary with auditors' market share. Thus, an audit market is competitively priced at the industry level if audit fee is negatively associated or does not vary with the industry level audit market concentration, assuming other factors that affect audit fees (including audit quality) are held constant. Consistent with the competitive audit market hypothesis, several empirical studies find a negative or *non-significant* association between

market concentration and audit fee (Danos and Eichenseher, 1986; Eshleman, 2013; Ferguson and Scott, 2014; Numan and Willekens, 2012; Pearson and Trompeter, 1994; Tonge and Wootton, 1991).

The relationship between audit fee and industry level audit market concentration can be explained by two competing hypotheses (audit market with low-levels of pricing competition and competitively priced audit market). Thus, the following non-directional alternative hypothesis H1 is adopted:
H1: Audit fee is associated with industry−level audit market concentration, other things being equal.

2. Industry Level Audit Market Pricing Competition among Audit Firms following the Transition from Big 4 to Big 3 Period

Following the market transition from the Big 4 period (2004-2005) to the Big 3 period (2006-2011), PwC Aarata's (PwC ChuoAoyama successor firm) market share in 2007 is less than one-third of the third largest Japanese Big 4 affiliated firms (Fukukawa, 2011), consistent with Figure 2.1.The transition also increases individual market shares of Big N auditors and the corresponding audit market concentration at the industry level (see Table 5.1). The market transition from Big 4 to Big 3 period raises an important concern of whether the remaining auditors exploits their higher market power at the industry level by engaging in non-competitive audit pricing. The smaller choice of large auditors within an industry is particularly important in highly concentrated industries if companies wish to hire auditor that is not associated with their competitors (McMeeking, 2007).

After considering the market transition event from Big 4 to Big 3 period, two countervailing theories from Section 3.1 are expanded to explain changes in pricing competitiveness of an audit market at the industry level by associating audit fee with the interaction between industry level auditor market concentration and the transition event. First, the structural-conduct-performance (SCP) theory argues that an audit market becomes *less competitively* priced at the industry level when audit fee is *positively* associated with the interaction between industry level audit market concentration and the transition event from Big 4 to Big 3 period. Alternatively, audit pricing at the industry level remains *competitively* priced following the transition from Big 4 to Big 3 period if audit fee is negatively associated or does not vary with both the industry level audit market concentration and the transition event.

Consistent with prior H1, the relationship between audit fee and industry level audit market concentration can be explained by two competing hypotheses (audit market with low-levels of pricing competition and competitively priced audit market). Thus, the following non-directional alternative hypothesis H2 is adopted:
H2: Audit fee is associated with the interaction variable between industry-level audit market share concentration and audit market transition from Big 4 period (2004-2005) to Big 3 period (2006-2011), other things being equal.

Ⅳ. Research Method

1. Empirical Models

(1) *Industry Level Audit Market Pricing Competition among Audit Firms: Audit Market Concentration Model*

Competition among audit firms in the listed firms market is relevant because large and globalized audit clients put a high value on audit service (Pound and Francis, 1981). Section 3.1 discusses two countervailing hypotheses (audit market with low-levels of pricing competition and competitively priced audit market) on pricing competitiveness of an audit market

at the industry level by associating audit fee with industry level auditor market concentration.

CR (α_1 coefficient) variables in Equation 4.1 are estimated to test whether the degree of industry-level audit market concentration affects audit fee. Consistent with the SCP theory, a statistically significant positive *CR* (α_1 coefficient) indicates an audit market with low-levels pricing competition at the industry level where audit fee increases as audit market becomes more concentrated. Conversely, an audit market is competitively priced at the industry level if audit fee is negatively associated or does not vary with the industry level audit market concentration, which is indicated with a statistically significant negative or non-significant *CR* (α_1 coefficient).

The main variable of interest in Equation 4.1 is the industry level audit market concentration variables (*CR*) which comprise of: concentration ratio of the largest four auditors (CR4), concentration ratio of the largest three auditors (CR3), adjusted Herfindahl-Herschmann Index (*ADJ_H*), Gini coefficient (*G*), and auditor commonality among the largest four clients (*COMMON4*). To allow for a more comprehensive analysis, the market concentration variables are disaggregated for each industry-year. The definition and formulas of those variables are discussed in more details in Section 4.3.

Big3Per dummy variable denotes the transition from Big 4 period to Big 3 period to control for the significant increase of industry level audit market concentration during the period (refer to Section 5.2). *Big3Per* variable has a value of 1 from fiscal year 2006 and 2011 to represent time period after Big 3 audit firms dominate the Japanese audit market and 0 otherwise. The rationale for determining the cutoff point related to the transition from Big 4 period to Big 3 period is discussed in more details in Section 2.6.

Audit market size (measured as the relative size of clients in their industry — *ClientSeg* variable) is an important aspect to consider when analyzing audit market concentration, because market concentration is expected to be inversely related to market size (Eshleman, 2013). Audit market size can moderate the effect of market concentration audit pricing where larger markets create a greater demand for audit services, which create a positive association between market size and audit pricing. On the other hand, as audit market size becomes larger, auditors might be more likely to achieve economies of scale and reduce their audit fee. In a large audit clients market segments, a more concentrated market contributes to a higher audit fee while the opposite results are observed for smaller audit clients market segments (Ciconte et al., 2015). *Big N* dummy variable controls for audit fee premium paid to larger size auditors.

Audit fee model in the following Equation 4.1 regresses industry level audit market concentration (*CR*) on audit fee while controlling for clients', auditors' and audit engagements' attributes. Individual firm fixed effect panel regression model is employed to control for omitted firm-specific variables that might affect audit fee. In addition, year and industry effects are controlled so that the regression estimates results are less likely to be affected by contemporaneous changes in regulatory measures and other omitted time and industry level variables that affect audit pricing (Francis et al., 2013; Kallapur et al., 2010). The following panel fixed-effect ordinary least squares (OLS) regression model is estimated after correcting for heteroscedastic standard errors (regression variables are defined in Table 4.1):

$$AF_{i,t} = \alpha_1 CR_{j,k,t} + \alpha_2 Big3Per_{i,t} + \alpha_3 ClientSeg_{i,t} + \alpha_4 BigN_{i,t} + \sum \alpha_j Controls_{j,i,t} + \varepsilon_{i,t}$$ .Equation 4.1

(2) *Industry Level Audit Market Pricing Competition among Audit Firms following the Transition from Big 4 to Big 3 Period: Difference-in-Difference Analysis*

The sudden exit of a major audit supplier following the transition from Big 4 to Big 3 period raises an important concern of whether the remaining auditors exploits their higher market power at the industry level by engaging in non-competitive audit pricing. The smaller choice of large auditors within an industry is particularly important in highly concentrated industries if companies wish to hire auditor that is not associated with their competitors (McMeeking, 2007). The transition from Big 4 to Big 3 period provides an opportunity to observe whether the transition event affect industry level audit pricing competitiveness that is inferred by the association between audit fee and the interaction between the transition period and auditor market concentration at the industry level. Thus, we expand prior hypothesis H1 by employing difference-in-difference (DiD) analysis to estimate whether the transition from Big 4 to Big 3 period affects the relationship between audit fee and audit market concentration. The regression estimate of the difference-in-difference interaction variable between *CR and Big3Per* (α5 coefficient) in the following Equation 4.2 captures how the association between audit fee and industry-level audit market concentration is differentially affected by the audit market transition from Big 4 to Big 3 period.

Consistent with H1 described in Section 3.2, two countervailing theories can explain changes in pricing competitiveness of an audit market at the industry level by associating audit fee with the interaction between industry level auditor market concentration and the market transition event from Big 4 to Big 3 period. First, the structural-conduct-performance (SCP) theory argues that an audit market becomes *less competitively* priced at the industry level when audit fee is *positively* associated with the interaction between industry level audit market concentration and the transition event from the Big 4 to Big 3 period. A statistically significant positive difference-in-difference interaction variable between *CR* and *Big3Per* (α_5 coefficient) indicates a *less competitive* audit pricing market following the Big 4 to Big 3 transition where audit fee is increasing as the industry level audit market becomes more concentrated in the Big 3 period.

Conversely, an audit market remains competitively priced at the industry level following the transition from the Big 4 to Big 3 period if audit fee is negatively associated or does not vary with both the industry level audit market concentration and the transition event. A statistically significant negative or non-significant difference-in-difference interaction variable between *CR* and *Big3Per* (α_5 coefficient) indicates a *competitive* audit pricing market following the Big 4 to Big 3 transition where audit fee is negatively associated or does not vary with industry level audit market concentration in the Big 3 period.

We expand prior Equation 4.1 by interacting the variable of interest − industry level audit market concentration (*CR*) − with the *Big3Per* dummy variable that denotes the transition from Big 4 period to Big 3 period in the following Equation 4.2 to estimate the difference-in-difference coefficient (α_5 coefficient). Thus, the panel fixed-effect audit market concentration ordinary least squares (OLS) regression model (variables are defined in Table 4.1) is estimated as follows (variables are defined in Table 4.1):

$$AF_{i,t} = \alpha_1 CR_{j,i,t} + \alpha_2 Big3Per_{i,t} + \alpha_3 ClientSeg_{i,t} + \alpha_4 BigN_{i,t} + \alpha_5 CR_{j,i,t} \times Big3Per_{i,t} + \sum \alpha_j Controls_{j,i,t} + \varepsilon_{i,t} \quad \cdots\cdots \text{Equation 4.2}$$

2. Audit Fee Determinants and Control Variables

Significant control variables identified in Cobbin (2002) and Hay et al. (2006) audit fee meta-analysis are considered and included in the audit fee regression models. Cobbin (2002) reviews 56 audit fee studies from 17 countries from 1980-2000 and Cobbin concludes that auditor size, auditee size, complexity and risk are significant determinants of audit fees regardless of the level of differentiation across markets. Hay et al. (2006) perform meta-analysis and examine 186 independent variables from 147 audit fee papers that were published over 27 years (1977-2003) using samples of more than 20 countries. Consistent with prior audit fee studies; client's attributes (client size, business complexity, risk, and accounting standards), auditor's attributes (audit staff number, audit tenure period, non-audit fee and industry specialization), and audit engagement's attributes (audit opinion, audit quality, client's bargaining power, auditor industry dominance, competitor distance, and exogenous events) are controlled in the audit fee regression models (Carson et al., 2014; Causholli et al., 2010; Fukukawa, 2011; Hay, 2013; Numan and Willekens, 2012; Simunic, 1980).

The variables used in audit market concentration (Equation 4.1) regression models are summarized in the following Table 4.1.

Table 4.1

Variables Included in the Audit Fee Premium and the Audit Market Concentration Regression Models

Description	Variable	Definition
Dependent variable	*AF*	natural log of total audit fee, which consists of fee paid to external auditors for financial statement audit of the parent company and consolidated subsidiaries.
Variables of Interest		
Audit Market Concentration Model: Equation 4.1 and 4.42	*CR*	industry-level audit market concentration variables, which includes: concentration ratio of the largest four auditors (*CR4*), concentration ratio of the largest three auditors (*CR3*), adjusted Herfindahl-Herschmann Index (*Adj_H*), Gini coefficient (G), and auditor commonality among the largest four clients (*COMMON4*). Refer to Section 4.3. for more details.
	Big3Per	dummy variable equals to 1 if the audit took place during the Big 3 period (2006-2011), and 0 otherwise.
	BigN	dummy variable equals to 1 if the client is audited by one of the Japanese auditors affiliated with the global Big 4 audit firms networks (Deloitte Touche Tohmatsu, E&Y Shin Nihon, KPMG AZSA, PwC Aarata, PwC Chuo Aoyama, and PwC Misuzu), and 0 otherwise.
Control Variables (*$Controls_{j,i,t}$*)		
Description	**Variable**	**Definition**
Client's attributes - size	*TA*	natural log of clients' total assets.
Client's attributes - size	*IndPTA*	ratio of the client's total assets to total assets of companies within the industry-year.
Client's attributes - complexity	*SUBS*	natural log of number of consolidated subsidiaries (if a company has zero subsidiaries, it is re-coded as 1 before taking the natural log).
Client's attributes - complexity	*FORN*	ratio of the client's overseas sales to net sales.

Client's attributes - risk	*ROI*	ratio of the client's net income to total assets.
Client's attributes - risk	*LIQ*	ratio of the client's current assets (less inventories) to current liabilities.
Client's attributes - risk	*LEV*	ratio of the client's total liabilities to total equity.
Client's attributes - risk	*LOSS*	dummy variable equal to 1 if the client incurred a net loss in the previous fiscal year, and 0 otherwise.
Client's attributes - accounting standards	*GAAP*	dummy variable equal to 1 if the client is a SEC registrant or an IFRS adopter, and 0 otherwise.
Auditor's attributes	*TEAM*	natural log of number of CPAs, junior accountants and other staffs employed in the audit engagement (excluding engagement partners).
Auditor's attributes	*TENR*	number of years an auditee has hired its current auditor.
Auditor's attributes	*NAF*	natural log of non-audit fee paid by the client to its current year auditor.
Auditor's attributes	*AISpec*	auditor's industry specialization variable which measures auditor market share within the industry-year (based on client number).
Auditor's attributes	*DOMN*	industry dispersion measure which measures market dominance of an auditor as it obtained more clients in the industry.
Audit engagement's attributes	*AOP*	dummy variable equal to 1 if the client received a modified audit opinion or worse, and 0 if the client received an unqualified audit opinion with additional notes or better.
Audit engagement's attributes	*ACC*	audit quality measure, measured by the absolute value of total discretionary accruals estimated using the modified Jones (1991) model.
Audit engagement's attributes	*POW*	client's bargaining power with its auditor in the industry, calculated by the relative size of the client' s audit fee divided by the sum of the auditor' s total audit fee received from all its clients in the industry.
Audit engagement's attributes	*DIST*	competitor distance, measured by the smallest absolute audit market share (based on client number) difference between audit leader and its closest competitor within an industry.
Audit engagement's attributes	*GFC*	dummy variable equal to 1 if the audit took place in fiscal year 2008 to control for the effect of global financial crisis, and 0 otherwise.
Audit engagement's attributes	*REG*	dummy variable equal to 1 if the audit took place in fiscal year 2007 to control for the amendment of the Financial Instruments and Exchange Act (FIEA) that is effective in fiscal year 2008 (refer to Table 2.1 for more details), and 0 otherwise.

3. Audit Market Concentration Variables

Market structure is commonly measured in terms of concentration ratios, which capture the joint market share of leading firms (Beattie and Fearnley, 1994). Market share concentration measures aims to summarize the number, size, and distribution of competitors within an industry and are a good indicator of market competition (Beattie et al., 2003; Francis et al., 2013; Pong, 1999). For example, market concentration has been used a valid measure of competition of the banking industry in different geographical markets (Kallapur et al., 2010).

This paper employs client number as the main

measure of industry-level audit market share (market concentration). Prior literature employ both audit fee and number of clients to measure audit market activities and market concentration at the industry level (Carson et al., 2014; Kallapur et al., 2010). However, endogeneity problem is introduced because the audit fee regression models employ audit fee as a dependent variable and the variable of interest - audit-fee based market concentration - is used simultaneously on the other side of the equation. This relationship might bias the regression estimates and show a correlation regardless of whether there is in fact any behavioral relationship between market share and audit fee (PwC, 2006). Compared to audit fee based market share measure, concentration measures that is based on number of audit clients facilitates analysis of shifts in concentration due to auditor changes (Pong, 1999). Thus, the number of audit clients as the measurement basis of the audit market concentration measures control for both the endogeneity and the market size scale effects on audit pricing.

Five measures of audit market concentration are calculated for each industry group and fiscal year: *CR4* (concentration ratio of the four largest auditors), *CR3* (concentration ratio of the three largest auditors, respectively), *Adj_H* (adjusted Herfindahl Index), *G* (Gini coefficient), and *COMMON4* (auditors' commonality among the four largest clients). The absolute measures of auditor market share concentration are estimated by concentration ratio of the n largest auditors (*CRn*) and the adjusted Herfindahl-Herschmann Index (*Adj_H*). This paper employs those two measures as they are most widely used in economic literatures and regulator reports (Beattie and Fearnley, 1994; Le Vourc'h and Morand, 2011; McMeeking, 2007; U.S. Department of Justice and Federal Trade Commission, 2010). The concentration ratio (*CRn*) variable measures the combined audit activities (number of audit clients) market shares of the *n* number of leading auditors in each industry (Pearson and Trompeter, 1994). *CRn* is still widely used in prior market share studies because of it is simple to calculate and understand (Pong, 1999). Following Pearson and Trompeter (1994), *CRn* is calculated using the following steps. First, for each industry, the market share controlled by the *n* audit industry leaders is determined by summing the clients audited by those *n* auditors. Second, the total market for each industry is calculated by summing the number audit clients for all sample companies in that industry. Lastly, CR-*n* is calculated by dividing the summed market shares of the top *n* audit firms by the total industry market, resulting in the percent of the industry-specific market audited by the N number of audit market leaders. To ensure completeness of analysis, *CR3* and *CR4* represent the three and four largest audit market leaders in each industry, respectively. The formula of *CRn* is expressed as follows (Le Vourc'h and Morand, 2011b):

$$CRn_{k,t} = \sum_{i=1}^{n,k,t} \frac{s_{n,k,t}}{S_{k,t}} \quad \cdots\cdots \text{Equation 4.3}$$

where: $CRn_{k,t}$ = concentration ratio of the largest n audit firms in industry k and time t

$s_{n,k,t}$ = number of clients audited by the n largest audit firms in industry k and time t

$S_{k,t}$ = total number of clients audited by all auditors in industry k and time t

However, *CRn* only takes into account market share of the *n* largest auditors and ignores the rest of other firms in the market (Pong, 1999). Herfindahl-Herschmann Index (*H*) is a better measure of concentration than *CRn* because it takes into account the relative market share of the suppliers in an industry (Thavapalan et al., 2002). Furthermore, *H* captures the variation of number of audit firms within an industry and distribution of market share (clients) across those firms (Newton et al., 2013).

A smaller H number indicates a more equal distribution of market share among suppliers in the observed industry-level audit market. If market share of all auditors are equal, then H equals 1/N and H is higher when the audit market share is unequal for a given N (Kallapur et al., 2010). For example, a market where 4 auditors firms have equal market shares will have the H value of 0.25. However, H is sensitive to the number of audit firms within the industry level and the index value is negatively correlated with the number of auditors, as shown in the 4 auditors' market example. Thus, the adjusted Herfindahl-Herschmann Index (Adj_H) that is more robust to changes in number of auditors is employed in this study and Adj_H is calculated as follows (Dunn et al., 2011):

$$Adj\_H_{k,t} = \sum_{i=1}^{n,k,t}\left(\frac{x_{k,t,i}}{S_{k,t}}\right)^2 - \frac{1}{n_{k,t}} \quad \text{..... Equation 4.4}$$

where: Adj_ $H_{k,t}$ = the adjusted Herfindahl-Herschmann Index of industry k and time t

$x_{k,t,i}$ = number of clients audited by audit firm i in industry k and time t

$S_{k,t}$ = total number of clients audited by all auditors in industry k and time t

$n_{k,t}$ = the number of auditors in industry k and time t

The Adj_H index measures the difference between the Herfindahl-Herschmann Index (H) and the expected market share given the number of existing auditors in the industry. Both the CRn and Adj_H variables measure auditor concentration and the lower values of those indexes suggest a less concentrated industry-level audit market.

The relative measure of auditor market share concentration at the industry level is estimated by the Gini coefficient (G). The Gini calculates market share equality that measures the deviation between the Lorenz curve[2] and a 45 degree angle line representing equal market share (Bigus and Zimmermann, 2008). When market shares are more equal, the G index will be closer zero. The Gini coefficient adjusted for number of auditors is as follows (Dunn et al., 2011):

$$G_{k,t} = \frac{2}{n_{k,t}^2 \overline{X_{k,t}}} \sum_{i=1}^{n,k,t}\left[\left(i - \frac{n_t+1}{2}\right) X_{k,t,i}\right] \times 100$$

..... Equation 4.5

where: $G_{k,t}$ = the Gini coefficient of industry k and time t

$n_{k,t}$ = total number of auditors in industry k and time t

$\overline{X_{k,t}}$ = mean audit market share (number of clients) of all auditors in industry k and time t

$X_{k,t,i}$ = market share (number of clients) of auditor i in industry k and time t

In the sample, the largest 4 audit clients within each industry account for 20.38% of total audit fee paid in the Big 4 period (2004-2005). This figure drops significantly to 12.62% in the Big 3 period (2006-2011). To complement the absolute and relative industry-level audit market concentration measures, the commonality of auditor concentration among the four largest clients in an industry is measured using the *COMMON4* variable. *COMMON4* variable represents a market equality measure derived from the perspective of audit demand. Following consolidation from Big 5 to Big 4, Dunn et al. (2011) find that the largest four clients of large auditors (*COMMON4*) are more likely to share the same auditor. Thus, the *COMMON4* variable takes one of the following four values: 1 (each of the four clients use a different auditor), 2 (four clients use three different auditors), 3 (four clients use two different auditors), and 4 (each of the four clients use the same auditors). The higher values of *COMMON*4 measure the higher degree of shared auditors among the four largest clients in the industry.

4. Sample Selection

Japanese companies publicly listed in the First Section of the Tokyo Stock Exchange (TSE) from fiscal year 2004 to 2011 are employed as the sample of this study. The observation period for the Big 3 period is limited to fiscal year 2011 as additional sample years might aggravate the imbalanced sample between Big 4 period (two fiscal years: 2004-2005) and Big 3 period (six fiscal years: 2006-2011). All of the audit fee and control variables data are obtained from the Nikkei Economic Electronic Database Systems (NEEDS) FinancialQUEST and Japanese securities filings information (*yukashoken hokokusho*) extracted from the *eol* database. Most Japanese companies end their fiscal year on March 31. Thus the fiscal year ended March 31, 2004 is considered as fiscal year 2003 or FY2003, consistent with prior literature (Skinner and Srinivasan, 2012). Prior to the 2004 CPA Law amendment, the Japanese Institute of Certified Public Accountants (JICPA) issued a standard audit fees table that put substantive upper limits on audit fees payable to auditors. After the amendment, audit fees are expected to increase to market equilibrium (Kasai and Takada, 2012). The observation period of this study begins from fiscal year 2004 due to audit fee data availability and controlling for the effect of revised regulations on audit fee.

Japanese auditors are allowed to perform joint audit engagement with a single client where each firm formulates policies and procedures with regard to joint audits in its audit manuals, pursuant to Auditing Standards Board Report No. 12 of The Japanese Institute of Certified Public Accountants (JICPA) (Certified Public Accountants and Auditing Oversight Board, 2006). Joint audit is excluded from the sample because each firm has different fee structure and audit engagement process that can confound the audit fee analyses. Observations that have less than ten listed companies within an industry-year group are excluded to control for small sample bias so that the sample size within an industry-year is sufficiently large (Pong and Burnett, 2006). The disproportionate market power of Big N firms on smaller industries is controlled by excluding those small sample observations (Francis et al., 2013). Firms from banking, insurance, finance, and security industries are excluded to control for the distinct financial reporting and regulatory frameworks of financial firms.

The sample selection process is shown in the following Table 4.2. The initial sample of eight years fiscal period consists of 22,824 firm-year observations, which are then reduced to 16,563 firm-year observations after firms with missing audit fee and regression control variables are excluded. 184 and 164 observations are excluded to control for joint audit and small sample effect, respectively. Lastly, 905 firm-year observations from financial firms are also excluded. The final sample consists of 15,310

Table 4.2
Selection and Distribution of Sample Firms

Firms listed in First Section of TSE from FY 2004－2011	22,824
- missing audit fee information	(5,929)
- missing regression control variables	(332)
- firms will multiple auditors (joint audit)	(184)
- industry with less than ten listed companies within an industry-year	(164)
- firms from banking, insurance, securities & other financial industries	(905)
Final sample (firm years)	**15,310**

firm-year observations which represent 2,157 unique companies.

V. Regression Models Descriptive Statistics and Estimation Results

Table 5.1 shows sample size and audit fee statistics for the sample. The final sample (15,310 firm-years observation) selection process is described in details in Table 4.2. Mean (median) audit fee from 2004-2011 is 77.03 (42) million yen. Mean audit fee after the transition to the Big 3 period (2006-2011) is higher than the Big 4 period (2004-2005) (79.52 million yen compared to 68.09 million yen) which is statistically significant at 5% level (p value = 0.012).

Table 5.1 shows sample size and audit fee statistics for the sample. Mean (median) audit fee from 2004-2011 is 77.03 (42) million yen. Mean audit fee after the transition to the Big 3 period (2006-2011) is 16.8% higher than the Big 4 period (2004-2005) (79.52 million yen compared to 68.09 million yen) which is statistically significant at 5% level (p value=0.012). The highest peak of audit fee in 2007 can be attributed to more stringent accounting and auditing regulations following the amendment of Financial Instruments and Exchange Law and stricter JICPA self-regulations (Kasai & Takada, 2012). Audit fee returns to a lower equilibrium as a response from clients' pressure to decrease

Table 5.1

Sample Size, Number of Audit Firms and Audit Fee Descriptive Statistics

Year	**2004**	**2005**	**2006**	**2007**	**2008**
Sample size	1,481	1,854	1,873	1,964	2,005
Number of auditors	108	117	120	109	113
Year	**2009**	**2010**	**2011**	**Average 2004−2011**	**Total 2004−2011**
Sample size	2,010	2,040	2,083	*1,914*	*15,310*
Number of auditors	112	110	110	*112.375*	*199*
Audit Fee Statistics (million yen)					
Year	**2004**	**2005**	**2006**	**2007**	**2008**
Mean	67.03	68.94	86.30	95.96	73.36
Median	43.40	42.00	44.00	48.00	39.70
St. Dev.	168.94	195.56	355.30	384.06	149.85
Year	**2009**	**2010**	**2011**	**Average 2004−2011**	
Mean	75.33	74.99	72.33	*77.03*	
Median	40.00	39.00	38.00	*42.00*	
St. Dev.	154.45	161.57	150.53	*233.33*	
Year	**Average 2004−2005**		**Average 2006−2011**	**Relative Change (%)**	
Mean	68.09		79.52	*17%*	
Median	42.00		42.00	*0%*	
St. Dev.	184.19		245.23	*33%*	

audit fee after the 2007 audit fee hike (Nihon Keizai Shinbun, 2010).

Table 5.2 shows the descriptive statistics of control variables employed in the regression analyses over the observation period. The untabulated average mean (median) non-audit fee (*NAF*) is 2.52 (0) million yen. This figures shows that it is uncommon for auditors of Japanese listed firms to perform non-audit services. The non-audit services are commonly provided by Big N firms to their large size audit clients. The ratio of non-audit fee to audit fee paid by Japanese listed firms are extremely small (3.17%) when compared to other developed country that has similar audit and legal environment to Japan. In German audit market, the non-audit fee amount to 41.9% of the total fee paid to auditors and is considered to be as important as audit fee (Bigus and Zimmermann, 2008).

Only 250 firm-years (1.63% of total sample which consists of 39 unique companies) employ non-Japanese accounting standards (SEC registrants or IFRS). The mean (median) audit fee paid by clients who adopt non-Japanese accounting standards (SEC registrants or IFRS) is 1,040.63 million yen (530 million yen). These figures are significantly higher than audit fee

Table 5.2

Descriptive Statistics of Control Variables (2004-2011)

Independent Variables			Auditor Size (Mean)			Client Size (Mean)	
Client's attributes:	**Mean**	**Std.**	**Big N**[(a)]	**Mid-Tier**[(b)]	**Other Non-Big N**	**Large Client**[(c)]	**Small Client**[(d)]
TA (million yen)	255,144.57	796,194.64	297,269.57	92,865.40	83,557.41	300,104.15	182,178.65
IndPTA	0.01	0.04	0.02	0.01	0.01	0.01	0.01
SUBS	2.09	1.25	2.17	1.83	1.75	2.18	1.95
FORN	0.15	0.22	0.15	0.13	0.11	0.15	0.13
ROI	0.02	0.10	0.02	(0.00)	(0.02)	0.02	0.01
LIQ	0.78	0.17	0.79	0.77	0.77	0.79	0.78
LEV	1.82	6.61	1.74	1.82	2.41	1.70	2.0
ILOSS	0.16	0.36	0.14	0.22	0.23	0.15	0.16
GAAP	0.02	0.13	0.02	0.00	0.00	0.02	0.01
Auditor's attributes:							
TEAM	1.38	1.42	1.49	1.09	0.89	1.57	1.08
TENR	2.63	1.56	2.45	3.24	3.44	2.72	2.49
NAF	0.24	0.78	0.29	0.03	0.01	0.37	0.03
AISpec	0.20	0.11	0.24	0.03	0.02	0.25	0.12
DOMN	9.76	4.10	9.82	9.82	9.26	10.21	9.02
Audit engagement's attributes:							
AOP	0.00	0.04	0.00	0.00	0.00	0.00	0.00
POW	0.20	0.32	0.06	0.51	0.91	0.06	0.42
DIST	0.06	0.05	0.06	0.06	0.06	0.06	0.05
GFC	0.13	0.34	0.13	0.15	0.13	0.17	0.07
REG	0.13	0.33	0.13	0.13	0.12	0.17	0.07
ACC	0.05	0.07	0.05	0.06	0.06	0.05	0.05

The table provides the mean and standard deviation of the independent variables included in the regression models categorized by all observation period, auditor size and client size. Notes: [(a)]Big N firms include Deloitte Touche Tohmatsu, E&Y Shin Nihon, KPMG AZSA, PwC Aarata, PwC Chuo Aoyama, and PwC Misuzu. [(b)]Mid-tier firms include unaffiliated and mid-tier local audit firms affiliated with BDO International, Grant Thornton International, Kreston International, NEXIA International, Baker Tilly International, Crowe Horwath, PKF International, Plante&Moran, RSM International, and TIAG (The International Accounting Group). [(c)]A client is categorized as large client if the median total assets belong to the upper half (> 50th percentile) of the industry-year sample. [(d)]A client is categorized as small client if the median total assets belong to the lower half (< 50th percentile) of the industry-year sample. Definitions of the independent variables are described in Table 4.1.

paid by clients who follow Japanese GAAP (J-GAAP) with a mean (median) fee of 61.03 million yen (41.8 million yen). The higher audit fee paid by adopters of non-Japanese accounting standards is consistent with prior study (Kasai and Takada, 2012). These results can be attributed to company and auditor size, as results from Table 5.2 show that non-Japanese GAAP adopters are more likely to be large size clients that employ Big N auditors.

To ensure that the multicollinearity problem does not introduce bias the regression results, the variance inflation factor (VIF) for the audit fee regression models is calculated. The VIF value of ten is generally considered as rules of thumb to indicate excessive or serious multicollinearity (O'brien, 2007). Untabulated results show that the VIF of all the independent variables included in Equations 4.1 are lower than three. These results show that the regression estimates do not have a serious multicollinearity problem.

1. Industry Level Audit Market Pricing Competition among Audit Firms

Table 5.3 presents the estimation results of the audit market concentration regression model (Equation 4.1) for the period 2004 to 2011. The *CR* (concentration ratio) variables of interest are represented by five audit market concentration measures (*CR4, CR3, Adj_H, G,* and

Table 5.3

Panel Fixed Effect Multivariate Regression Estimates for Equation 4.1 with Audit Fee (AF) as Dependent Variable

Variable	Equation 4.1: Industry Level Audit Market Concentration Model								
	1. CR4			*2. CR3*			*3. Adj_H*		
	Coef.	t−stat	p−value	Coef.	t−stat	p−value	Coef.	t−stat	p−value
CR	**(0.159)**	**(1.199)**	**0.230**	**(0.156)**	**(1.150)**	**0.250**	**(0.396)**	**(0.811)**	**0.418**
ClientSeg	(0.028)	(2.792)	0.005 ***	(0.029)	(2.798)	0.005 ***	(0.028)	(2.766)	0.006 ***
BigN	0.269	14.691	0.000 ***	0.269	14.688	0.000 ***	0.268	14.674	0.000 ***
TA	0.251	33.874	0.000 ***	0.251	33.868	0.000 ***	0.251	33.838	0.000 ***
IndPTA	1.444	7.383	0.000 ***	1.445	7.392	0.000 ***	1.438	7.361	0.000 ***
SUBS	0.093	15.073	0.000 ***	0.093	15.060	0.000 ***	0.093	15.059	0.000 ***
FORN	0.053	2.473	0.013 **	0.053	2.489	0.013 **	0.053	2.483	0.013 **
ROI	(0.361)	(7.952)	0.000 ***	(0.362)	(7.963)	0.000 ***	(0.361)	(7.967)	0.000 ***
LIQ	0.120	4.244	0.000 ***	0.121	4.258	0.000 ***	0.121	4.262	0.000 ***
LEV	0.001	1.853	0.064 *	0.001	1.855	0.064 *	0.001	1.855	0.064 *
LOSS	0.095	9.348	0.000 ***	0.095	9.299	0.000 ***	0.095	9.313	0.000 ***
GAAP	1.507	24.706	0.000 ***	1.508	24.718	0.000 ***	1.508	24.712	0.000 ***
TEAM	0.014	4.516	0.000 ***	0.014	4.523	0.000 ***	0.014	4.505	0.000 ***
TENR	(0.015)	(5.257)	0.000 ***	(0.015)	(5.258)	0.000 ***	(0.015)	(5.256)	0.000 ***
NAF	0.138	13.795	0.000 ***	0.138	13.788	0.000 ***	0.139	13.799	0.000 ***
AISpec	0.152	2.582	0.010 ***	0.149	2.554	0.011 **	0.143	2.427	0.015 **
DOMN	0.016	6.524	0.000 ***	0.017	7.156	0.000 ***	0.019	5.020	0.000 ***
AOP	(0.215)	(2.006)	0.045 **	(0.215)	(2.005)	0.045 **	(0.215)	(2.002)	0.045 **
POW	0.208	9.598	0.000 ***	0.208	9.617	0.000 ***	0.206	9.635	0.000 ***
DIST	(0.546)	(3.968)	0.000 ***	(0.518)	(3.686)	0.000 ***	(0.506)	(3.334)	0.001 ***
GFC	(0.192)	(1.299)	0.194	(0.188)	(1.242)	0.214	(0.192)	(1.256)	0.209
REG	0.090	0.609	0.543	0.098	0.643	0.521	0.096	0.626	0.531
ACC	0.023	0.317	0.751	0.022	0.298	0.766	0.023	0.315	0.753
n			15,310		15,310			15,310	
Industry dummy variables			Included		Included			Included	
Year dummy variables			Included		Included			Included	
Adj. R-Squared			59.26%		59.26%			59.26%	

(Continued)

Variable	Equation 4.1: Industry Level Audit Market Concentration Model					
	4. G			*5. COMMON4*		
	Coef.	t−stat	p−value	Coef.	t−stat	p−value
CR	**0.005**	**6.451**	**0.000** ***	**0.020**	**1.628**	**0.103**
ClientSeg	(0.028)	(2.733)	0.006 ***	(0.028)	(2.765)	0.006 ***
BigN	0.271	14.803	0.000 ***	0.269	14.690	0.000 ***
TA	0.251	34.238	0.000 ***	0.251	33.925	0.000 ***
IndPTA	1.469	7.471	0.000 ***	1.437	7.361	0.000 ***
SUBS	0.092	15.052	0.000 ***	0.093	15.030	0.000 ***
FORN	0.037	1.734	0.083 *	0.052	2.430	0.015 **
ROI	(0.362)	(8.009)	0.000 ***	(0.362)	(7.985)	0.000 ***
LIQ	0.105	3.696	0.000 ***	0.121	4.259	0.000 ***
LEV	0.001	1.817	0.069 *	0.001	1.867	0.062 *
LOSS	0.096	9.406	0.000 ***	0.095	9.336	0.000 ***
GAAP	1.500	24.609	0.000 ***	1.506	24.752	0.000 ***
TEAM	0.015	4.709	0.000 ***	0.014	4.495	0.000 ***
TENR	(0.015)	(5.286)	0.000 ***	(0.015)	(5.263)	0.000 ***
NAF	0.137	13.673	0.000 ***	0.139	13.792	0.000 ***
AISpec	0.144	2.493	0.013 **	0.137	2.364	0.018 **
DOMN	0.015	6.189	0.000 ***	0.016	6.397	0.000 ***
AOP	(0.208)	(1.934)	0.053 *	(0.216)	(2.017)	0.044 **
POW	0.209	9.805	0.000 ***	0.205	9.648	0.000 ***
DIST	(0.535)	(4.067)	0.000 ***	(0.543)	(3.911)	0.000 ***
GFC	(0.206)	(1.745)	0.081 *	(0.187)	(1.315)	0.189
REG	0.106	0.894	0.371	0.102	0.716	0.474
ACC	0.025	0.341	0.733	0.023	0.321	0.748
n			15,310	15,310		
Industry dummy			Included	Included		
Year dummy			Included	Included		
Adj. R-Squared			59.36%	59.27%		

*, ** and *** represent statistical significance at the 10%, 5%, and 1% level, respectively. The dependent variable is AF (natural log of total audit fee). *CR* variables definitions: *CR4=concentration ratio of the four largest auditors; CR3*=concentration ratio of the three largest auditors; *Adj_H*=adjusted Herfindahl-Herschmann Index; *G*=Gini coefficient; *COMMON4*=auditor commonality among the four largest clients in an industry. Definitions of the independent variables are described in Table 4.1. Variables of interest relevant for the hypotheses are printed in bold.

*COMMON*4). The estimate of *CR* (α_1 coefficient) measures the degree of association between industry-level audit market concentration and audit fee. Results from Table 5.3 show that four out of five estimates of audit market concentration measures (*CR4, CR3, Adj_H,* and *COMMON4*) are statistically insignificant. These findings suggest that audit fee of individual audit firms at the industry-level does not vary with the industry-level audit market concentration.

An audit market is competitively priced at the industry level if audit fee is negatively associated or does not vary with the industry level audit market concentration, assuming other factors that affect audit fees (including audit quality) are held constant. Thus, there is insufficient evidence to accept H1 non-directional alternative hypothesis, which shows that an audit market is competitively pricing at the industry level. The results of this study is consistent with the conclusion reached by the US General Accounting Office (GAO) the increased audit market concentration following the dissolution of Arthur Andersen does not appear to impair audit pricing competition (United States General Accounting Office, 2003).

2. Industry Level Audit Market Pricing Competition among Audit Firms following the Transition from Big 4 to Big 3 Period

To test whether the association between industry-level audit market concentration and audit fee is differentially affected by the audit market transition from Big 4 to Big 3 (hypothesis H2), we include a dummy variable *Big3Per* that classifies the sample into Big 4 period (2004-2005) and Big 3 period (2006-2011) in Equation 4.2 . Table 5.4 presents the estimation results of the Equation 4.2.

Hypothesis 2 considers the market transition event from Big 4 to Big 3 period and argues that the relationship between audit fee and industry level audit market concentration can be explained by two competing theoretical frameworks. The structural-conduct-performance (SCP) theory argues that audit pricing at the industry level becomes less *competitively* priced following the transition from Big 4 to Big 3 period if audit fee is *positively* associated with the interaction between industry level audit market concentration and the transition event from Big 4 to Big 3 period. On the other hand, an audit market remains competitively priced at the industry level following the transition

Table 5.4

Panel Fixed Effect Multivariate Regression Estimates for Equation 4.2 with Audit Fee (AF) as Dependent Variable: Big 4 to Big 3 Period Transition Subsample

Variable	Equation 4.2: Industry Level Audit Market Concentration Model with Transition from Big 4 to Big 3 Period								
	1. CR4			*2. CR3*			*3. Adj_H*		
	Coef.	t−stat	p−value	Coef.	t−stat	p−value	Coef.	t−stat	p−value
CR	(0.014)	(0.063)	0.950	(0.000)	(0.000)	1.000	(0.720)	(1.127)	0.260
Big3Per	0.293	1.257	0.209	0.317	1.776	0.076 *	0.097	1.092	0.275
ClientSeg	(0.029)	(2.818)	0.005 ***	(0.029)	(2.825)	0.005 ***	(0.028)	(2.764)	0.006 ***
BigN	0.269	14.691	0.000 ***	0.269	14.705	0.000 ***	0.268	14.674	0.000 ***
CR×Big3Per	**(0.174)**	**(0.631)**	**0.528**	**(0.236)**	**(0.947)**	**0.343**	**0.406**	**0.655**	**0.512**
TA	0.251	33.889	0.000 ***	0.251	33.881	0.000 ***	0.251	33.841	0.000 ***
IndPTA	1.441	7.378	0.000 ***	1.445	7.388	0.000 ***	1.436	7.350	0.000 ***
SUBS	0.093	15.083	0.000 ***	0.093	15.064	0.000 ***	0.093	15.075	0.000 ***
FORN	0.053	2.465	0.014 **	0.053	2.473	0.013 **	0.053	2.490	0.013 **
ROI	(0.361)	(7.957)	0.000 ***	(0.362)	(7.964)	0.000 ***	(0.361)	(7.960)	0.000 ***
LIQ	0.121	4.247	0.000 ***	0.121	4.248	0.000 ***	0.121	4.258	0.000 ***
LEV	0.001	1.853	0.064 *	0.001	1.852	0.064 *	0.001	1.862	0.063 *
LOSS	0.095	9.343	0.000 ***	0.095	9.317	0.000 ***	0.095	9.296	0.000 ***
GAAP	1.507	24.714	0.000 ***	1.507	24.708	0.000 ***	1.508	24.717	0.000 ***
TEAM	0.014	4.521	0.000 ***	0.014	4.544	0.000 ***	0.014	4.502	0.000 ***
TENR	(0.015)	(5.255)	0.000 ***	(0.015)	(5.256)	0.000 ***	(0.015)	(5.251)	0.000 ***
NAF	0.138	13.793	0.000 ***	0.138	13.785	0.000 ***	0.139	13.802	0.000 ***
AISpec	0.152	2.578	0.010 ***	0.153	2.603	0.009 ***	0.142	2.409	0.016 **
DOMN	0.016	6.362	0.000 ***	0.017	7.265	0.000 ***	0.019	5.011	0.000 ***
AOP	(0.215)	(2.003)	0.045 **	(0.215)	(2.000)	0.046 **	(0.215)	(2.002)	0.045 **
POW	0.208	9.600	0.000 ***	0.209	9.598	0.000 ***	0.206	9.615	0.000 ***
DIST	(0.534)	(3.860)	0.000 ***	(0.510)	(3.597)	0.000 ***	(0.520)	(3.368)	0.001 ***
GFC	(0.191)	(1.296)	0.195	(0.185)	(1.203)	0.229	(0.193)	(1.258)	0.209
REG	0.090	0.611	0.541	0.101	0.654	0.513	0.094	0.614	0.539
ACC	0.022	0.303	0.762	0.022	0.299	0.765	0.024	0.324	0.746
n			15,310	15,310			15,310		
Industry dummy			Included	Included			Included		
Year dummy			Included	Included			Included		
Adj. R-Squared			59.25%	59.26%			59.25%		

(Continued)

Variable	Equation 4.2: Industry Level Audit Market Concentration Model with Transition from Big 4 to Big 3 Period					
	4. G			*5. COMMON4*		
	Coef.	t−stat	p−value	Coef.	t−stat	p−value
CR	0.003	2.870	0.004 ***	0.034	2.189	0.029 **
Big3Per	0.001	0.029	0.977	0.197	4.422	0.000 ***
ClientSeg	(0.028)	(2.735)	0.006 ***	(0.028)	(2.750)	0.006 ***
BigN	0.270	14.756	0.000 ***	0.269	14.690	0.000 ***
CR*×*Big3Per	**0.002**	**1.458**	**0.145**	**(0.021)**	**(0.970)**	**0.332**
TA	0.251	34.285	0.000 ***	0.251	33.940	0.000 ***
IndPTA	1.470	7.474	0.000 ***	1.439	7.374	0.000 ***
SUBS	0.092	15.094	0.000 ***	0.093	15.072	0.000 ***
FORN	0.037	1.714	0.087 *	0.052	2.420	0.016 **
ROI	(0.362)	(8.003)	0.000 ***	(0.362)	(7.981)	0.000 ***
LIQ	0.105	3.699	0.000 ***	0.121	4.295	0.000 ***
LEV	0.001	1.818	0.069 *	0.001	1.873	0.061 *
LOSS	0.095	9.400	0.000 ***	0.095	9.319	0.000 ***
GAAP	1.500	24.606	0.000 ***	1.507	24.766	0.000 ***
TEAM	0.015	4.728	0.000 ***	0.014	4.494	0.000 ***
TENR	(0.015)	(5.287)	0.000 ***	(0.015)	(5.255)	0.000 ***
NAF	0.137	13.669	0.000 ***	0.139	13.793	0.000 ***
AISpec	0.145	2.506	0.012 **	0.135	2.338	0.019 **
DOMN	0.015	6.214	0.000 ***	0.016	6.408	0.000 ***
AOP	(0.208)	(1.930)	0.054 *	(0.215)	(2.006)	0.045 **
POW	0.208	9.789	0.000 ***	0.205	9.624	0.000 ***
DIST	(0.517)	(3.966)	0.000 ***	(0.543)	(3.916)	0.000 ***
GFC	(0.207)	(1.786)	0.074 *	(0.189)	(1.324)	0.185
REG	0.107	0.925	0.355	0.099	0.689	0.491
ACC	0.024	0.334	0.738	0.023	0.317	0.751
n			15,310	15,310		
Industry dummy			Included	Included		
Year dummy			Included	Included		
Adj. R-Squared			59.35%	59.26%		

*, ** and *** represent statistical significance at the 10%, 5%, and 1% level, respectively. The dependent variable is *AF* (natural log of total audit fee). *CR* variables definitions: *CR4*=concentration ratio of the four largest auditors; *CR3*=concentration ratio of the three largest auditors; *Adj_H*=adjusted Herfindahl-Herschmann Index; *G*=Gini coefficient; *COMMON4*=auditor commonality among the four largest clients in an industry. Definitions of the independent variables are described in Table 4.1. Variables of interest relevant for the hypotheses are printed in bold.

from Big 4 to Big 3 period if audit fee is negatively associated or does not vary with the industry level audit market concentration and the transition event (which can be inferred by the non-significant difference-in-difference regression estimate of the *CR*×*Big3Per* interaction variable in Equation 4.2).

Table 5.4 shows that all of the *CR*×*Big3Per* difference-in-difference interaction variables (*CR4, CR3, Adj_H, G,* and *COMMON4*) are statistically insignificant. These findings strongly suggest that audit fee does not vary with both the changes in the audit market concentration at the industry-level and the audit market transition from Big 4 to Big 3 period. Thus, there is insufficient evidence to accept H2 non-directional alternative hypothesis, which shows that audit pricing at the industry level remains competitively priced following the transition from Big 4 to Big 3 period.

Ⅵ. Conclusions

The 2010 European Commission report predicts that the collapse of one of the Big 4 large

audit firms could potentially impair the stability of the financial system (Bleibtreu and Stefani, 2012). The investigation on the structure of the public audit service market can provide evidence to the audit market regulators whether the market need further market regulation to promote competitiveness. Accordingly, the sudden demise of PwC ChuoAoyama in 2006 provided a real empirical setting to investigate the effect of increased audit market concentration on non-competitive audit pricing. This paper presents evidence on audit pricing competitiveness in the Japanese market in the crucial period of a significant audit market structural change following the demise PwC ChuoAoyama in 2006.

The descriptive statistics results of audit fee show that the average audit fee during the Big 3 period (2006-2011) is 16.8% higher than that of the Big 4 period (2004-2005). In addition, the ratio of non-audit fee to audit fee paid by Japanese listed firms are extremely small (3.17%). Japanese audit market is highly concentrated, with the three largest Big N auditors controlling more than 70% of the audit market share. Results of the industry-level audit market concentration analysis show that the industry level audit market concentration in the Big 3 period (2006-2011) is consistently higher compared to the Big 4 period (2004-2005). This research analyzes audit pricing competitiveness at the industry level in Japan by examining two competing hypotheses that explain the relationship between industry-level audit market concentration and audit fee. The structural-conduct-performance (SCP) theory applied at the industry level predicts that industry market leaders in a highly concentrated industry will employ their market power to fix fees (Pearson and Trompeter, 1994). Thus, an audit market has low-levels of pricing competition at the industry level if audit fee is positively associated with the industry level audit market concentration. On the other hand, an audit market is competitively priced at the industry level when audit fee is negatively associated or does not vary with the industry level audit market concentration. Suppliers with a dominant market share can justify and maintain their market dominance by providing a lower fee to consumers, consistent with the economy of scale theory (Pearson and Trompeter, 1994). An audit market is also competitively priced when audit fee does not vary with auditors' market share (Tonge and Wootton, 1991). Overall, the empirical results show that audit fee does not vary with industry level audit market concentration. This study indicates that the Japanese audit pricing at the industry level among individual audit firms, within Big N auditors and within non-Big N auditors remains competitive; even after considering the transition from the Big 4 period to the Big 3 period. Huber (2015) argues that audit firms in a competitive market are price takers. Thus, the competitive audit pricing among individual audit firms suggests that Japanese audit market at the industry level represents a buyer's market where audit clients have more power to set the audit pricing in Japan.

This study has a number of limitations. The observation period for the Big 3 period is limited to fiscal year 2011 as additional sample years might aggravate the imbalanced sample between Big 4 period (two fiscal years: 2004-2005) and Big 3 period (six fiscal years: 2006-2011). Audit firms do not disclose necessary information to calculate marginal costs and marginal revenues of audit services (Huber, 2015). In addition, this study is not able to obtain information on audit hours spent on individual audit engagement as an additional predictor variable on audit fee. To correctly infer audit market pricing competition, it is also necessary to measure the extent of effective internal audit effort that could effectively replace some external audit procedures and

audit pricing calculation (Simunic, 1980). Firms with robust internal control system are valued by auditors and are expected to reduce external auditors' audit hours which lead to lower fees (Hay, 2013). However, Japanese firms do not publicly disclose internal audit costs in the financial statements. The absence of accurate audit firms' cost structure, audit hours spent per audit engagement, and internal control efforts limit the explanatory power of audit fee regression models used in this study. Lastly, the external validity of this study might be debatable because the unique characteristics of the Japanese audit market setting makes it difficult to draw strong policy implication that is applicable for other developing countries (Skinner, 2011).

Note

1) Big N refers to Japanese audit firms affiliated with the international Big 4 audit firms networks (Deloitte Tohmatsu, Ernst & Young ShinNihon, KPMG AZSA, and PwC affiliated firms: ChuoAoyama, Misuzu, and Aarata).
2) A Lorenz curve measures the cumulative market share from the market share to the largest market share in an industry (Dunn et al., 2011). The more the curve slopes downwards - the more convex it is - the higher the level of market concentration (Bigus and Zimmermann, 2008).

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