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경영학석사학위논문

**The Joint Effect of Audit Firm Tenure
and Big 4 Auditor on the Intensity of
Real Earnings Management**

계속감사기간과 Big 4 감사인이
실질이익조정에 미치는 영향

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The Joint Effect of Audit Firm Tenure and Big 4 Auditor on the Intensity of Real Earnings Management

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Abstract

This study analyzes the effect of audit firm tenure and Big 4 auditor on the magnitude of firms' using real earnings management. Using 42,012 firm-year observations in the U.S., I find that longer audit firm tenure is positively associated with the intensity of real earnings management, suggesting that firms conduct real earnings management as a substitute of accrual earnings management. In addition, the firms are less likely to be engaged in real earnings management when they are audited by Big 4 auditor suggesting that Big 4 auditors deter the firm using real earnings management. Furthermore, I find that the positive association between the level of real earnings management and audit firm tenure is conditioned on the presence of Big 4 audit firm. Overall, the results provide valuable insights to the literature on the effects of auditor characteristics on real earnings management.

Keywords : audit firm tenure, Big 4, real earnings management, audit quality, auditor characteristics

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1. Introduction

Firms can opportunistically manage their earnings in two ways, accrual-based earnings management and real earnings management. Even though the use of real earnings management has significantly increased since the Sarbanes-Oxley Act was adopted (Cohen et al. 2008), managers prefer real earnings management to accrual earnings management (Graham et al. 2005), previous literature has been focused more on accrual-based earnings management. The studies generally agree with that high quality audit proxied by audit firm tenure (Johnson et al. 2002; Myers et al. 2003; Chen et al. 2008), and the presence of Big 4 auditor (Becker et al. 1998; Behn et al. 2008) restrains the firm's use of accrual earnings management¹. However, findings on real earnings management have been mixed. Chi et al. (2011) find that real earnings management is increased when the firm is audited by the same auditor for a longer period, or when the firm is audited by Big 4 auditor. On the other hand, Choi et al. (2011) suggest that Big 4 auditors conduct monitoring role not only on accrual earnings management but also on real earnings management.

This paper examines the two questions regarding the real earnings management, the effects of audit firm tenure, and the presence of Big 4 on the level of earnings management. First, I test whether the level of real earnings management is affected

¹ In this study, previous Big 8, 6, and 5 audit firms are collectively called Big 4 for simplicity.

by the quality of audit in terms of audit firm tenure and the presence of Big 4. Second, I investigate whether the impact of length of audit firm tenure on real earnings management is pronounced by the presence of Big 4 auditor.

There exist two competing views regarding the role of external auditing on real earnings management. First, auditors may have limited attention to restrict real earnings management, because auditors have neither duty of detecting nor authority to penalize the real earnings management. From this perspective, high quality audit is positively associated with real earnings management because managers are more likely to engage in real earnings management as substitute for accrual earnings management (Chi et al. 2011). On the other hand, auditors may concern real earnings management and do care for reducing real earnings management because of the related risk aroused from the negative consequences on future firm value. From this point of view, high quality audit is negatively associated with real earnings management (Choi et al. 2011). I focus on the two proxies for high quality audit: audit firm tenure and the presence of Big 4 auditor.

Next, I examine the joint effect of audit firm tenure and Big4 auditor. I expect that the effect of audit firm tenure on real earnings management is more pronounced when the firm is audited by Big 4 auditor. Big 4 auditors are more likely to reinforce auditors' competency as audit firm tenure lengthen compared to the non-Big 4

auditors. It is because of to the better training system and documentation infrastructure. In addition, the economic dependency on any one client is smaller for Big 4 audit firm due to the virtue of size (DeAngelo 1981; Johnson et al. 2002), Big 4 audit firms can alleviate the concerns regarding auditors' independence problem arising as the tenure prolongs.

I test these hypotheses using 42,012 firm-year observations in the U.S. collected from the Compustat database, for the sample period covering from 2002 to 2017. As for the dependent variable, the magnitude of real earnings management is measured by abnormal cash flow from operation, abnormal productions costs, and abnormal discretionary expenses that are used in the Roychowdhury (2006)'s model, where predicted values are estimated for each industry-year. I regress real earnings management on audit firm tenure, the presence of Big 4, and the interaction of both.

I find that longer audit firm tenure is positively associated with the intensity of real earnings management, which suggests that firms conduct real earnings management as a substitute of accrual earnings management. I also find that the firms are less likely to be engaged in real earnings management when they are audited by Big 4 auditor. In addition, I find that the positive association between the level of real earnings management and audit firm tenure is conditioned on the Big 4

audit firm. The results are robust to alternative measurements of dependent variable; and the alternative tenure sample.

This study contributes to the real earnings management literature. This study provides additional empirical findings to the literature about the relationship between real earnings management and accrual earnings management by adding control variables. Also, this study contributes to the generalizability of the existing theory regarding real earnings management by expanding the sample firms.

In addition, this study provides more insights to the understanding about the quality difference between Big 4 audit firms and non-Big 4 audit firms. The empirical findings show that the quality difference is pronounced as audit firm tenure prolongs. This provides a link between academia and practices by providing empirical support on the audit qualities may differ depending on whether the audit is provided by Big 4 auditor or non-Big 4 auditor as audit firm tenure lengthen. The results can be used as a guidance for regulators who are interested in institutionalization of limiting the audit firm tenure such as mandatory rotation. Prior studies mainly focus on accrual earnings management when weigh the cost and benefit of mandatory rotation (Myers et al. 2003; Davis et al. 2009). This study not only suggests that increased in real earnings management should be considered when analyzing the benefit of the mandatory auditor rotation but also suggests that

regulators should consider the audit firm size when employ the policy. In other words, my empirical findings provide a policy implication that it may be more effective to selectively apply the auditor mandatory rotation requirements only to non-Big 4 auditors who failed to improve the quality of audit when the audit period is prolonged.

The rest of the paper is organized by the following sections. Section 2 provides prior studies in the context of hypotheses development. Section 3 explains variable measurement and empirical models used in this paper. Section 4 provides explanation on sample selection, and data, and presents empirical results. Section 5 covers several sensitivity tests. Lastly, section 6 concludes the paper.

2. Literature review and hypotheses development

2.1 Literature review

Jensen and Meckling (1976) stated that agency problems and information asymmetry between the principal and agents allow the agents to manage earnings. Earnings management could be conducted through real activities as well as accrual activities (Roychowdhury 2006; Cohen and Zarowin 2010; Zang 2011). An extensive prior literature examines auditors' role on earnings management and suggests that high quality auditors constrain the magnitude of accrual earnings management (Becker et al. 1998; Johnson et al. 2002).

Audit firm tenure means the number of years of an audit firm being engaged in a company (Myers et al. 2003). The relation between audit firm tenure and accrual-based earnings management is agreed well in prior literature. The primary conclusion in the literature is that the higher financial reporting quality which is proxied by discretionary accrual can be achieved with the longer the audit serviced provided by a firm auditing a client (Johnson et al. 2002; Myers et al. 2003; Chen et al. 2008). Solomon et al. (1999) argue that auditors can get better understanding on the business and risks of the client as the auditor-client relationship lengthens. Since auditors have limited client-specific information for newer clients, Kenny (2011) also argues that the audit expertise would be impaired during the early tenure and it leads to the low audit quality. A few studies report that the longer tenure leads to the lower audit quality due to the impaired auditor independence when the audit quality is not measured as the discretionary accruals. For example, Vanstraelen (2000) uses data from Belgium and argues that the longer tenure is related with the deterioration in audit quality, which is measured by propensity to issue a modified audit opinion for distressed companies. I believe that the long audit firm tenure leads to a decrease in accrual earnings management due to the increased auditor competency. In many study, audit quality is measured with the discretionary accrual that is related to accrual earnings management and shows positive relations between long tenure and

high audit quality. However, some studies show that long tenure is related to the poor audit quality when the audit quality is not related to the accrual earnings management. In my thesis, I will assume that the long tenure would decrease accrual earnings management.

There is an extensive literature investigating the relation between Big 4 audit firms and accrual earnings management. They argue that Big 4 audit firms provide higher earnings quality measured by the level of discretionary accrual than non-Big 4 auditors (Becker et al. 1998; Behn et al. 2008). In comparison with non-Big 4 auditors, Big 4 auditors provide greater inspection on financial reporting process to prevent future litigation or reputation damage (Hogan 1997).

Unlike accrual earnings management, a few studies examine the relations between high quality auditor, characterized with longer audit firm tenure or audit firm size (whether Big 4/ non-Big 4), and the magnitude of real earnings management. Even though Chi et al. (2011) examine these issue, their study differs from my study. They test only with the client firms having strong incentives to manage their earnings, while my research focuses on every firm in the United States. Also, the empirical findings in prior studies are mixed in terms of the relation with the quality of audit and real earnings management. Chi et al. (2011) indicate that the magnitude of real earnings management is positively associated with high quality

auditors measured by Big 4, and a longer audit firm tenure. They suggest high quality auditors constrain accrual earnings management, therefore the firms use real earnings management as a substitute. On the other hand, Choi et al. (2011) examine the real earnings management using international data and suggest that Big 4 audit firms do monitoring role on real earnings management, and the high quality audit in terms of the presence of Big-N audit firms is negatively associated with real earnings management. Even though, Choi et al. (2011) conduct many kinds of robustness test, cross-national studies have their own problems. I will expand findings in the previous literature by adding more control variables and conducting a single case study.

2.2 Hypotheses development

2.2.1 Audit quality and real earnings management

Unlike high quality audit detects and constrains the accrual earnings management, the effect on real earnings management of high quality audit is unclear. Chi et al. (2011) argue that the real earnings management has a tendency to be under the auditor's scrutiny. Auditors are required to provide reasonable assurance of financial statements that there is no material misstatements under the Generally Accepted Accounting Principles (GAAP). Therefore, so long as the firms'

transactions are well recognized in their financial statements complying with the GAAP, it is not the duty of auditors to deter real earnings management. Kim et al. 2010 also argue that real earnings management itself, cannot influence auditors' opinion. Auditors are not mandated to judge the firms' operational decision quality (Commerfore et al. 2016). Auditors are required to conduct analytical review procedures. When performing the procedures, auditors should assess the reasonableness of the account balance if certain account balance shows material changes. However, it is difficult for auditors to penetrate the intent of such changes. For example, it is hard to distinguish whether discounting sales prices, giving lenient credit terms, overproduction, and cutting discretionary expenditures are the results of opportunistic decisions or optimal operational decisions. Real earnings management can be a great alternative for managers who want to boost earnings because it is less likely to be imposed a sanction by auditors (Cohen et al. 2008). Zang (2011), Choi et al. (2011), and Chi et al. (2011) claim that accrual earnings management and real earnings management work as a substitute. Ewert and Wagenhofer (2005) analytically show that managers tend to choose real earnings management when accounting flexibility is reduced. From this point of view, I expect that the audit quality, in terms of audit firm tenure and Big 4 auditors is positively associated with the levels of real earnings management. Firms will shift

from accrual earnings management to real earnings management because higher quality auditors successfully constrain the accrual earnings management than lower quality auditors.

On the other hand, it is also possible that the high quality audit deters managers from conducting real earnings management. Since real earnings management causes negative consequences on the future firm value, shareholders could be imposed greater long-term costs than accrual earnings management (Roychowdhury 2006; Cohen et al. 2008). For example, immediate sales discount might bring a lower gross profit in the long run, or a cut in research and development expenses weaken the firms' long-term competitive strength. Shareholders might impose a liability on auditors when these kinds of costs are reflected. Ibrahim et al. (2011) are in line with this argument. They argue that real earnings management is positively associated with litigation against firms. Also, auditors are aware of the increased litigation risk. Sohn's (2011) survey conducted with the public accountants working for Big4 audit firms shows that more than 30% of auditors perceive that real earnings management activities and future litigation penalties are positively associated. Auditors are likely to increase their audit fees (Choi et al. 2016), and even tend to resign (Kim and Park 2014) when the firms conduct greater magnitude of real earnings management due to the assessed risk. Therefore, auditors are incentivized to dissuade real earnings

management for preventing litigation problems (Choi et al. 2011). From this point of view, I expect that the high quality audit measured as a longer audit firm tenure and Big 4 auditors is negatively associated with the level of real earnings management. Since two opposite expectations are possible regarding the association between high quality audit and the magnitude of real earnings management, I suggest the following hypotheses in a null form.

Hypothesis 1a: Other things being equal, audit quality, proxied by audit firm tenure, has no association with the magnitude of real earnings management.

Hypothesis 1b: Other things being equal, audit quality, proxied by the presence of a Big 4 audit firm, has no association with the magnitude of real earnings management.

2.2.2 Joint effect of audit firm tenure and Big 4 auditors on real earnings management

As for my second hypothesis, I examine whether the association between audit firm tenure and real earnings management is differentiated by the presence of Big 4 auditors. Prior literature regarding the audit firm tenure and the presence of Big 4 audit firm generally agree with their impact on an increase in audit quality. To my knowledge, however, the joint effect of audit firm tenure and the presence of Big 4

audit firm on audit quality has not been studied yet. DeAngelo (1981) claims that the audit quality is defined as a joint probability of an auditors' competence and auditors' independence. As audit firm tenure lengthens, two possible outcomes are expected. One is an increase in competency (Solomon et al. 1999), and the other is a decrease in independence (Mautz and Sharaf 1961). I expect that Big 4 audit firms and non-Big 4 audit firms work differently in terms of competency and independence. Big 4 auditors are more likely to reinforce auditors' competency as audit firm tenure lengthen than non-Big 4 auditors. Over time, auditors are able to acquire the client-specific knowledge and to communicate with client more effectively. Auditors' competency is likely to increased when accumulated knowledge hand over properly to successors, especially when engagement team members are changed as the years go by. Big audit firms generally build custom audit documentation software and put lots of efforts to software training (i.e., KPMG: eAudit, PricewaterhouseCoopers: Aura, Ernst & Young: Canvas). They store working papers that support the underlying audit, even the record of communication. However, small audit firms usually use off-the-shelf software, which is hard to managed effectively.² In that case, I expect that the knowledge advantage of a longer audit firm tenure would

² Interviewed with a CPA who has worked both in PwC and Morison KSi. She mentioned that the working paper documentation systems are totally different. I also interviewed another CPA who has experience in both PwC and local accounting firm. He explained that the local accounting firm has no documentation system.

lessen. Big 4 auditors are more likely to alleviate a decrease in auditors' independence as audit firm tenure lengthens than non-Big 4 auditors. Even though Deloitte's (2011) comment letter on the Public Company Accounting Oversight Board (PCAOB)'s mandatory rotation proposal suggests that audit quality is less likely to decrease with longer auditor tenure, the PCAOB concerns about long audit firm tenure and deliberates on implementation of audit firm rotation (Reid and Carcello 2017). I expect that such concerns possibly manifest differently depending on the size of audit firms. Big 4 audit firms have the greater number of portfolio of clients than non-Big 4 audit firms. For whom having large clients, the termination of one client-relationship is not that material. Johnson et al. (2002) suggest that large firms are perceived as more independent because they have the financial strength to stand alone by virtue of the size. They can terminate the relationship more easily, if necessary. Moreover, DeAngelo (1981) suggests that auditors with a broad list of clienteles have reduced incentives to do worse for retaining any one client firm. She explains that any one client audit fee is not significantly important for a large audit firm. From this point of view, I expect that the presence of Big 4 audit firms could alleviate the concerns regarding auditor's independence problem that arises as the tenure lengthen. Finally, I state my second hypothesis that there are the differential

effects of the relationship between audit firm tenure and real earnings managements depending on the presence of Big 4 audit firms as follow.

Hypothesis 2: Other things being equal, the association between audit firm tenure and the magnitude of real earnings management is more pronounced by the presence of Big 4 auditors.

3. Research design

3.1 Measurement and variables

3.1.1 Dependent variable

Measurement of real earnings management

Following Roychowdhury (2006), I measure the degree of real earnings management focusing on three components of real operational activities (Roychowdhury 2006; Cohen et al. 2008; Cohen and Zarowin 2010). The first is abnormal cash flow from operations caused by sales manipulation such as immoderate sales discounts or granting lenient credit terms to accelerate the timing of sales. The second is abnormal production cost caused by overproduction for reporting lower cost of goods sold. The last is abnormal discretionary expenses that reduces discretionary expenditures.

Following Roychowdhury (2006) that studies investigating real earnings management, I first estimate the expected level of three operational activities by estimating Equations (1), (2), and (3) for each year and industry identified as two-digit SIC code as follows³:

$$CFO_{i,t}/TA_{i,t-1} = \alpha_1(1/TA_{i,t-1}) + \alpha_2(Sales_{i,t}/TA_{i,t-1}) + \alpha_3(\Delta Sales_{i,t}/TA_{i,t-1}) + \varepsilon_{i,t} \quad (1)$$

$$PROD_{i,t}/TA_{i,t-1} = \alpha_1(1/TA_{i,t-1}) + \alpha_2(Sales_{i,t}/TA_{i,t-1}) + \alpha_3(\Delta Sales_{i,t}/TA_{i,t-1}) + \alpha_4(\Delta Sales_{i,t-1}/TA_{i,t-1}) + \varepsilon_{i,t} \quad (2)$$

$$DISEXP_{i,t}/TA_{i,t-1} = \alpha_1(1/TA_{i,t-1}) + \alpha_2(Sales_{i,t}/TA_{i,t-1}) + \varepsilon_{i,t} \quad (3)$$

, where for each firm i and year t , CFO is cash flow from operating activities; $Sales$ refers to the sales; $\Delta Sales$ is the change in sales amount from year $t-1$ to t ; TA indicates total assets; $PROD$ is production costs, the sum of the changes in inventory and cost of goods sold; and $DISEXP$ refers to discretionary expenditures, the sum of research and development, advertising, and selling, general and administrative expenses.

After estimating the each linear regression, I calculate the residuals respectively to get unexpected portions and denote as AB_CFO , AB_PROD , AB_DISEXP . For adjusting the order, I multiply (-1) to AB_CFO and AB_DISEXP .

³ I only use observations having at least 10 observations in each year-industry.

Higher values of $(-1) \times AB_CFO$, AB_PROD , and $(-1) \times AB_DISEXP$ indicate greater intensity of real earnings management. Following Cohen et al. (2008), I compute a single comprehensive measurement of RM in order to capture the effects of real earnings management through three activities by combining these variables as follow:

$$RM_{i,t} = (-1) \times (AB_CFO_{i,t}) + AB_PROD_{i,t} + (-1) \times (AB_DISEXP_{i,t}) \quad (4)$$

, where for each firm i and year t , AB_CFO is abnormal cash flow from operating activities; AB_PROD refers to the abnormal production costs; and AB_DISEXP denotes abnormal discretionary expenditures.

3.1.2 Independent variables

Measurement of audit firm tenure

Audit firm tenure is the length of the year that the firm has been audited by the same audit firm. Following Johnson et al. (2002), I code changed auditor as the same with prior auditor when the changes were caused by audit firm mergers. For calculating audit firm tenure, I use Compustat database for the information of audit firm. The data consists of all firm-year from 1992 to 2017. I calculate $TENURE$ variable as the number of consecutive years that the audit firm has been retained and $LOGTENURE$ is a natural log of $TENURE$ variable.

3.2 Model specification and other variables

To test Hypothesis 1a and 1b, I estimate following Equations (5) and (6). I develop the model based on prior studies investigating real earnings management (Choi et al. 2011; Zang 2011).

$$\begin{aligned}
 RM_{i,t} = & \beta_0 + \beta_1 \times TENURE_{i,t} + \beta_2 \times BIG4_{i,t} + \beta_3 \times SIZE_{i,t} \\
 & + \beta_4 \times LEV_{i,t} + \beta_5 \times ROA_{i,t-1} + \beta_6 \times LOSS_{i,t-1} + \beta_7 \times MB_{i,t} \\
 & + \beta_8 \times SGROW_{i,t} + \beta_9 \times LIND_{i,t} + \beta_{10} \times HHI_{i,t} \\
 & + \beta_{11} \times ZSCORE_{i,t-1} + \beta_{12} \times CYCLE_{i,t-1} + \beta_{13} \times ISSUE_{i,t} \\
 & + YearFE + \varepsilon_{i,t}
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 RM_{i,t} = & \beta_0 + \beta_1 \times LOGTENURE_{i,t} + \beta_2 \times BIG4_{i,t} + \beta_3 \times SIZE_{i,t} \\
 & + \beta_4 \times LEV_{i,t} + \beta_5 \times ROA_{i,t-1} + \beta_6 \times LOSS_{i,t-1} + \beta_7 \times MB_{i,t} \\
 & + \beta_8 \times SGROW_{i,t} + \beta_9 \times LIND_{i,t} + \beta_{10} \times HHI_{i,t} \\
 & + \beta_{11} \times ZSCORE_{i,t-1} + \beta_{12} \times CYCLE_{i,t-1} + \beta_{13} \times ISSUE_{i,t} \\
 & + YearFE + \varepsilon_{i,t}
 \end{aligned} \tag{6}$$

, where for firm i , and year t , RM refers to the proxy for real earnings management; $TENURE$ is the number of consecutive years that the firm i has been audited by retained audit firm in year t ; $LOGTENURE$ is the natural logarithm of $TENURE$; and $BIG4$ is a dummy variable that equals to one if firm i is audited by one of the Big 4 auditors in year t and zero, otherwise.

The dependent variable is RM , the proxy for real earnings management. The main variables are $LOGTENURE$, $TENURE$, and $BIG4$. If longer audit firm tenure make firms to substitute accrual earnings management to real earnings management, β_1 will be positive. On the other hand, if auditors' scrutiny on not only accrual

earnings management but also on real earnings management increases, β_1 is expected to be a negative sign (Hypothesis 1a). In addition, the coefficient on *BIG4* (β_2) is expected to have a positive sign when the firm is more likely to resort on real earnings management as a substitute. Otherwise, the coefficient of *BIG4* (β_2) will be negative if the Big 4 auditors do monitoring role on real earnings management (Hypothesis 1b).

The second hypothesis is to examine whether the association between audit firm tenure and the level of real earnings management is more pronounced when the firm is audited by Big 4 auditor. To test this prediction, I interact *TENURE* and *LOGTENURE* variables with *BIG4* in the regression model as follows:

$$\begin{aligned}
RM_{i,t} = & \beta_0 + \beta_1 \times TENURE_{i,t} * BIG4_{i,t} + \beta_2 \times TENURE_{i,t} \\
& + \beta_3 \times BIG4_{i,t} + \beta_4 \times SIZE_{i,t} + \beta_5 \times LEV_{i,t} + \beta_6 \times ROA_{i,t-1} \\
& + \beta_7 \times LOSS_{i,t-1} + \beta_8 \times MB_{i,t} + \beta_9 \times SGROW_{i,t} + \beta_{10} \times LIND_{i,t} \quad (7) \\
& + \beta_{11} \times HHI_{i,t} + \beta_{12} \times ZSCORE_{i,t-1} + \beta_{13} \times CYCLE_{i,t-1} \\
& + \beta_{14} \times ISSUE_{i,t} + YearFE + \varepsilon_{i,t}
\end{aligned}$$

$$\begin{aligned}
RM_{i,t} = & \beta_0 + \beta_1 \times LOGTENURE_{i,t} * BIG4_{i,t} \\
& + \beta_2 \times LOGTENURE_{i,t} + \beta_3 \times BIG4_{i,t} + \beta_4 \times SIZE_{i,t} \\
& + \beta_5 \times LEV_{i,t} + \beta_6 \times ROA_{i,t-1} + \beta_7 \times LOSS_{i,t-1} + \beta_8 \times MB_{i,t} \quad (8) \\
& + \beta_9 \times SGROW_{i,t} + \beta_{10} \times LIND_{i,t} + \beta_{11} \times HHI_{i,t} \\
& + \beta_{12} \times ZSCORE_{i,t-1} + \beta_{13} \times CYCLE_{i,t-1} + \beta_{14} \times ISSUE_{i,t} \\
& + YearFE + \varepsilon_{i,t}
\end{aligned}$$

, where for firm i , and year t , RM refers to the proxy for real earnings management; $TENURE$ is the number of consecutive years that the firm i has been audited by retained audit firm in year t ; $LOGTENURE$ is the natural

logarithm of *TENURE*; and *BIG4* is a dummy variable that equals to one if firm *i* is audited by one of the Big 4 auditors in year *t* and zero, otherwise.

If the association between audit firm tenure and the magnitude of real earnings management is more pronounced by the presence of Big 4 auditors, the coefficient on the interaction term (β_1) is expected to have a positive sign (Hypothesis 2).

I include various firm-specific control variables in Equations (5), (6), (7), and (8) based on prior studies. I include *SIZE* variable which refers to the natural logarithm of sales in millions of U.S dollars to control for the relative firm size. To control for client-specific financial status, I include *LEV* variable calculated by the ratio of total liabilities to total assets to control for client-specific financial status, and *ISSUE* variable which equals one when a firm has obtained long-term debt with total amounts exceeding 5% of total assets and zero, otherwise. To control for the firm performance, I include *ROA*, computed by the return on assets to control for firm performance, *LOSS* which is an indicator variable that equals one if the firm report a loss in the year, and zero otherwise, and *SGROW* variable which is the annual sales growth rate to control for firm specific performance. I also include *MB* variable, the ratio of market value to book value of equity for controlling firm's growth opportunity. Following Krishnan et al. (2011), I include *LIND*, a dummy variable equals one if the industry of firm *i* belongs to a litigious industry, identified as SIC

code among 2833-2836, 3570, 3577, 3600-3674, 7371-7379, and 8731-8734. I include *HHI*, Herfindahl-Hirschman Index measuring whether belongs to a competitiveness market which is calculated by squaring the market share of each firm competing in a market and then summing the resulting numbers. Choi et al. (2011) suggest that the degree of market competitiveness affect the use real earnings management. Following Zang (2011), I include *ZSCORE*, and *CYCLE* which are suggested as costs associated with earnings management. As in the prior studies, *ZSCORE* denotes modified version of Altman's Z-score (Altman 1986, 2000)⁴ indicating firm's financial health. *CYCLE*⁵ refers to the length of the firm's operating cycles indicating the firm's accounting flexibility. I summarize more detailed definitions of the variables used in this study in the Appendix.

⁴ The formula of *ZSCORE* follows:
$$ZSCORE_t = 0.3 \frac{NI_t}{Asset_t} + 1.0 \frac{Sales_t}{Asset_t} + 1.4 \frac{Retained\ Earnings_t}{Asset_t} + 1.2 \frac{Working\ Capital_t}{Asset_t} + 0.6 \frac{Stock\ Price \times Shares\ Outstanding_t}{Total\ Liabilities_t}$$

Following Zang (2011), I use *ZSCORE* of at the beginning of the year ($ZSCORE_{t-1}$). The higher *ZSCORE* indicates the healthier financial condition.

⁵ The *CYCLE* variable is calculated as the days receivable plus the days inventory less the days payable at the beginning of the year (Dechow 1994). The longer the *CYCLE* denotes the greater accounting flexibility.

4. Sample, data, and empirical results

4.1 Sample and data

4.1.1 Sample selection

To construct the sample, I retrieve all firm-year observations from Compustat database for the period covers 2002 to 2017. The initial sample size is 148,868 firm-year observations from 69 industries classified by SIC two-digit code. Then I exclude financial industry (SIC 6000-6999) because these firms have different accounting characteristics due to the different revenue-cost structure. For comparability, I also exclude the observations that the month in which a company ends its fiscal year is not December.

Any firm-year observations that do not have necessary variables to calculate test variables, control variables used in this study are eliminated from the sample. I only use the observations that having at least 10 observations in each industry-year. The final sample consists of 42,012 firm-year observations⁶. Table 1 presents the detailed sample selection procedures. For reducing the impact of outliers, I winsorize each variable at 5th and 95th percentiles by industry and fiscal year.

[Table 1. Sample selection]

⁶ The final number of observations may vary in accordance with the availability of the covariates.

4.1.2 Sample characteristics

Table 2 shows the distribution of sample used in this study, by the length of consecutive years that the client has been audited with the same audit firm, which has a minimum value of 1 year and a maximum value of 26 years. The firm-year observations belong to 3 year-long audit firm tenure is the most frequent observations among the entire sample, accounts for 8.3%. The observations below 7 year-long audit firm tenure accounts for approximately half of the entire observations. I use both *TENURE* and *LOGTENURE* (natural logarithm of audit firm tenure) variables for the proxy of audit firm tenure for mitigating concerns that longer audit firm tenure observations derive the results of the test.

[Table 2. Sample distribution by audit firm tenure]

The descriptive statistics and Pearson correlation matrix used in this study are summarized in Table 3. Panel A shows the descriptive statistics for dependent variable, the components of dependent variable (i.e., *AB_CFO*, *AB_PROD*, and *AB_DISEXP*) and test variables. The mean and median of *RM* equal 0.036 and 0.028, respectively. The sample firms have been kept the auditor-client relationship for consecutive 8.8 years, on average. The market share of Big 4 audit firm of the sample is 83.2%, on average.

Panel B presents the descriptive statistics for firm-level control variables. The mean value of *SIZE* (natural logarithm of sales) is 6.044, implying that the average

sales amount of the sample firms is US\$422 million per year. The sample firm's leverage (*LEV*) is 48.2%, on average. The average *ROA* (return on asset) is -3%, indicates the sample firms generate approximately -3% return on assets. The mean value of *LOSS* is 0.325 indicates that about 32.5% of entire observations report losses. The average value of *MB* (natural logarithm of market-to-book ratio of equity) is 0.802, which implies that the sample firms market-to-book ration of equity is an average of 223%. The mean value of *SGROW* (annual sales growth) is 0.135 indicating that the sales of average firms grow by 13.5% annually. About 25.5% of sample firms belong to litigious industry (*LIND*) defined by Krishnan et al. (2011) (i.e., the industries under SIC code among 2833-2836, 3570-3577, 3600-3674, 7371-7379, and 8731-8734). The mean value of *CYCLE* is 62.47 indicating that the average days of operating cycle of sample firms exhibit 62.47 days, computed as the sum of the days receivables and the days inventory less the days payable. The mean value of *ISSUE* is 0.19, which implies that the average 19% of sample firms fund exceeding 5% of total assets average.

Panel C shows the Pearson correlation coefficients for every variable used in this study. *RM* is negatively correlated with *BIG4*, indicating that Big 4 auditors conduct monitoring role on real earnings management, which is consistent with Choi et al. (2011). a firm audited by a Big 4 auditor. On the other hand, the level of real earnings management (*RM*) is not significantly correlated with the length of audit firm tenure (*TENURE*, and *LOGTENURE*). The correlation between *TENURE* and

BIG4 is positive indicating that Big 4 audit firms exhibit longer auditor-client relationship.

[Table 3. Descriptive statistics and correlation matrix]

4.2 Empirical results

4.2.1 Univariate results

Panel A of Figure 1 shows the 75th percentile, mean, median, and 25th percentile of real earnings management measure (*RM*) by audit firm tenure decile⁷. Mean, median and 25th percentile of *RM* shows the highest in the 10th decile of audit firm tenure. Even though *RM* fluctuates between the first decile and the third decile, *RM* increases fairly steadily with tenure, in particular, after fourth decile of tenure.

Panel B of Figure 1 shows that the mean value of *RM* of the firm audited by Big 4 auditor, and non-Big 4 auditor, respectively by audit firm tenure decile. Except for the extreme decile of audit firm tenure, the magnitude of real earnings management (*RM*) is smaller for the observations with Big 4 audit firm than for the

⁷ Following Myers et al. (2003), I analyze *RM* by tenure decile rather than by year of tenure. Since there are few observations with long tenure (i.e., smaller than 10% observations only accounts for 18 to 26 years of audit firm tenure), small number of long-tenure observations are likely to affect high variance in the real earnings management measure. This problem can be mitigated by grouping into deciles.

firms audited by non-Big 4 auditor. For the firms audited by Big 4 auditor exhibit increasing trend. In fact, after the fourth decile of tenure, the effect seems monotonic. However, there seems no decreasing or increasing trend in *RM* for the firms audited by non-Big 4 auditor.

These results hint that the firms conduct more real earnings management as audit firm tenure lengthens, and Big 4 audit firms deter the client to conduct real earnings management. Although these results are suggestive, I perform multivariate analyses in the next sections to control for other potential factors likely to influence the cross-sectional distribution of real earnings management.

[Figure 1. Real earnings management by deciles of audit firm tenure]

4.2.2 Multivariate results

Effect of audit firm tenure and Big 4 auditor on real earnings management

Table 4 present the results of estimating Hypothesis 1a and Hypothesis 1b, which examines the effect of audit firm tenure on the magnitude of real earnings management and the effect of the presence of Big 4 auditor on the level of real earnings management by running Equations (5), and (6). Column (1) shows the regression of *RM* with *TENURE* variable and other variables, while Column (2) shows the results that *RM* regressed on *LOGTENURE* and others. The coefficients

of *TENURE* and *LOGTENURE* are positive. The coefficient on *TENURE* is 0.0017 and the coefficient on *LOGTENURE* is 0.0093. Both coefficients are statistically significant at the 1% level. Thus, Hypothesis 1a in null form is rejected in favor of the real earnings management increases as audit firm tenure lengthens. From an economic perspective, a one standard deviation increasing in audit firm tenure (5.96 reported in Panel A of Table 3) corresponds to an increase in *RM* 28.14% of the sample mean, when audit firm tenure is measured on a yearly basis⁸. This empirical evidence suggests that auditors' competency increases as audit firm tenure lengthens, and managers are more likely to increase real earnings management as substitute of accrual earnings management, consistent with Chi et al. (2011)⁹.

On the other hand, the coefficient on *BIG4* is negative and statistically significant at the 5% level. The coefficients of *BIG4* are -0.0135 and -0.0128 using Equations (5), and (6), respectively. Thus, Hypothesis 1b is also rejected in favor of the real earnings management decreases with the presence of Big 4 audit firms. From an economic perspective, when a firm switches its auditor from a non-Big 4 audit firm to a Big 4 audit firm, *RM* decrease 0.013 corresponds to approximately 37.5%

⁸ As reported in Table 4, the coefficient on *TENURE* is 0.0017, and the standard deviation of *TENURE* for the estimation sample is 5.96 as reported in Panel A of Table 3. For the *RM*, the product of these two values is 0.01, or about 28.14 percent of the *RM* sample mean of 0.036. All other marginal effects are calculated in a similar logic.

⁹ The finding is consistent with Chi et al. (2011) but they only focus on a small number of sample firms restricted to have strong incentives to manage earnings. Their findings may be difficult to generalize.

of the sample mean. This empirical evidence suggests that high quality audit in terms of being audited by Big 4 audit firm conducts monitoring role on real earnings management, consistent with Choi et al. (2011)¹⁰. This is because expected litigation and reputation costs associated with negative consequences of real earnings management are greater for Big 4 audit firms than non-Big 4.

Table 4 shows the regression results for the firm-level control variables. The smaller firm (*SIZE*), the highly levered firms (*LEV*), the firms generating smaller return on assets (*ROA*), and the firms reporting losses (*LOSS*) lead to real earnings management. The results also show that firms are less likely to conduct real earnings management when the firms' sales annually grow higher level (*SGROW*), as well as when the firms have more growth opportunity (*MB*). When firms are in an industry that belongs to litigious industry (*LIND*) or to intensively competitive industry (*HHI*), the managers are less likely to resort in real earnings management, which is surprising. Zang (2011) suggests that healthier financial condition is associated with lower cost of real activities manipulation. Consistent with Zang 2011, the firms with healthier financial condition (*ZSCORE*) are more likely to conduct real earnings management. The negative coefficient on *CYCLE* is negative suggesting that when the firms' operating cycle is longer, the managers are less likely to conduct real

¹⁰ The finding is consistent with Choi et al. (2011) but I expand their study by adding more control variables under single country setting.

earnings management. The result is also consistent with Zang (2011) showing that the longer operating cycle indicates the more flexible accounting report. Accounting flexibility reduces the dependence on real earnings management.

[Table 4. Effect of audit firm tenure and Big 4 auditor on real earnings management]

Joint effect on real earnings management

In the previous section, I show that firms are more likely to engage in real earnings management as audit firm tenure lengthen and the presence of Big 4 auditors deters firms to do real earnings management. In this section, I test Hypothesis 2, whether the effect of longer audit firm tenure on real earnings management is pronounced with the presence of Big 4 audit firm by running Equations (7), and (8). Since I have observed the positive relationship between audit firm tenure and real earnings management in the previous analyses, I can expect that the coefficient of $TENURE \times BIG4$ ($LOGTENURE \times BIG4$) by using Equations (7), and (8) exhibits positive and larger than the coefficient of $TENURE$ ($LOGTENURE$) by using Equations (5), and (6).

The results are presented in Table 5. The coefficient of $BIG4$ is negative and statistically significant at the 1% level. This further confirms that the presence of Big 4 audit firm deters managers' engagement in real earnings management in Table 4. However, the coefficients of $TENURE$ and $LOGTENURE$ become statistically

insignificant suggesting that the positive relationship between audit firm tenure and the level of real earnings management is not enable when the firm is audited by non-Big 4 auditors. The coefficients on $TENURE \times BIG4$ ($LOGTENURE \times BIG4$) are 0.0038 and 0.0225, respectively. Both coefficients are positive and statistically significant at the 1% level. Economically, a one standard deviation increase in $TENURE$ (5.96 reported in Panel A of Table 3), Big 4 auditors increase RM by about 0.023 (5.96×0.0038). The empirical evidence suggests that the effect of longer audit firm tenure on real earnings management is driven by the firms only when they are audited by Big 4 auditors, supporting Hypothesis 2.

[Table 5. Joint effect on real earnings management]

Figure 2 shows the effect of audit firm tenure on real earnings management conditioning on whether the firm is audited by Big 4 or non-Big 4 auditor with 95% of confidence intervals. When the firms are audited by the Big 4, the effect of $TENURE$ on RM consistently increase. However, the effect of $TENURE$ consistently decrease as the audit firm tenure increases from 1 year to 13 years in observations audited by non-Big 4 auditor. The effect of audit firm tenure on real earnings management becomes not significant from 14th year as the coefficient is not statistically different from zero.

[Figure 2. Real earnings management by *TENURE* conditioning on Big 4 auditor]

Generally, the results for other control variables are not qualitatively different from the results in Table 4. For brevity, I omit the detailed explanations. In summary, the results in Table 4 and Table 5 suggest that firms increase real earnings management as the audit firm tenure lengthens. This tenure effect on real earnings management is pronounced only when the firms audited by Big 4 auditors. In addition, Big 4 auditors doing monitoring role on real earnings management.

5. Additional tests

In this section, I conduct sensitivity tests with alternative measures to further confirm the robustness of the findings. First, I use various alternative measurements for real earnings management. Second, I rerun the models with alternative sample firms without quick-turnover observations.

5.1 Alternative measurements for *RM*

I use decile ranks of *RM* following Choi et al. (2011). I define *RM2* computed as the average of the decile ranks of three components of real earnings manipulation (*AB_CFO*, *AB_PRDO*, and *AB_DISEXP*). This decile measure can reduce the noise in the measurement, and the impact of outliers. The regression results using *RM2*

measurements are presented in Column (1) and (2) of Table 6. Panel A shows the results for Hypothesis 1a and 1b. The coefficients of *TENURE* and *LOGTENURE* are significantly positive. The coefficient of *BIG4* is negative and significant. Panel B shows that the results for Hypothesis 2. The coefficients of interaction terms (*TENURE*×*BIG4* and *LOGTENURE*×*BIG4*) are significant and positive, and the coefficient on *BIG4* is still negative and significant. These results suggest that the impact of outliers is not material for main findings. Second, I define *RM3* equals one if *RM* belongs to the highest quartile, and zero otherwise, following Gunny (2010). Column (3), and (4) in each panel of Table 6 shows the regression results using *RM3* as dependent variable. The main findings are qualitatively similar to this modification. Third, I define *RM4* and *RM5* using two components of real earnings manipulation (Cohen and Zarowin 2010). *RM4* is calculated by the sum of abnormal cash flow from operation and abnormal production cost ($-1 \times AB_CFO + AB_PROD$), *RM5* is defined by the sum of abnormal operational cash flow, and abnormal discretionary expenditures ($-1 \times AB_CFO + -1 \times AB_DISEXP$). Column (5) to (8) in Table 6 show the repeated regression results. The results are weaker than previous findings but qualitatively robust.

[Table 6. Alternative measurements for *RM*]

5.2 Alternative sample firms without quick-turnover

Myers et al. (2003) suggest that the firms that switch auditor within the first two years are significantly different from other firms. Therefore, they eliminate the quick-turnover firms in their analyses investigating the relationship between audit firm tenure and earnings quality to adequately deal with the consequences of extended audit firm tenure. Following their approach, I eliminate the firm-year observations if the *TENURE* variable equals one, or two. Then I rerun the regression models for Hypothesis 1a and 1b, and Hypothesis 2, with alternative sample firms. Table 7 shows the results of the regressions. The number of observations decreased to 36,418. Except for the coefficient on *BIG4* in Panel A by using Equations (5), and (6), main findings are similar to those reported previously. The significance is disappeared, but the sign is still negative.

[Table 7. Alternative sample firms without quick-turnover]

Overall, the consistent results of several sensitivity checks reported in Table 6, and 7 collectively support the main findings in this paper.

6. Conclusion

In this study, I investigated whether the high quality audit identified by the longer audit firm tenure and the presence of Big 4 auditor affects firms' using of real

earnings management, and whether the relation between audit firm tenure and real earnings management is pronounced when the firm is audited by Big 4 auditor. By using the 42,012 U.S firm year observations, I found that the longer audit firm tenure is positively associated with the intensity of real earnings management, which suggests that firms conduct real earnings management as a substitute of accrual earnings management. In addition, the firms are less likely to be engaged in real earnings management when they are audited by Big 4 auditors, suggesting that the Big 4 auditors deter firms using of real earnings management. Furthermore, I found that the positive association between the level of real earnings management and audit firm tenure is conditioned on the presence of Big 4 audit firm. The results were consistent with alternative measurements of real earnings management and alternative sample firms without the observations under two years of audit firm tenure.

I believe that this study contributes to the real earnings management literature. I provide additional empirical findings to the literature about the relationship between accrual earnings management and real earnings management by adding more control variables. In addition, I contribute to the generalizability of the existing theory regarding real earnings management by testing the contested hypotheses on the expanded samples.

Moreover, this study provides more insights to the understanding about the quality difference between Big 4 audit firms and non-Big 4 audit firms. The empirical findings show that the quality difference is pronounced as audit firm tenure prolongs, which links between academia to the practices by providing empirical support on the audit qualities that may differ depending on whether the audit is provided by Big 4 auditor or non-Big 4 auditor as the audit firm tenure lengthen. The results can be used as a guidance for regulators who are interested in the institutionalization of limiting the audit firm tenure such as mandatory rotation. Different from prior studies that mainly focus on accrual earnings management for weighing the cost and benefit of mandatory rotation (Myers et al. 2003; Davis et al. 2009), this study not only suggests that increased in real earnings management should be considered when analyzing the benefit of the mandatory auditor rotation but also suggests that regulators should consider the audit firm size for employing the policy. In other words, my empirical findings provide a policy implication that it may be more effective to selectively apply the auditor mandatory rotation requirement only to non-Big 4 auditors who failed to improve the quality of audit when the audit period is prolonged.

This study can be extended to the studies regarding the tenure of audit partner level. Following the United Kingdom, the PCAOB mandates the engagement partner

to sign the audit report in the U.S.. When the tenure data of partner level becomes available as time goes by, investigating the relationship between audit partner tenure and real earnings management would provide meaningful implication. Even though I focused on audit firm tenure and the presence of Big 4 auditor as proxies of high quality audit, investigating what other audit quality components directly affect the firms using real earnings management would be meaningful for regulators and researchers. For example, investigating whether the intensity of communication with board of directors or internal control quality has effects on the degree of real earnings management can be tested by the future researchers.

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Appendix

Variable definition

Variable	Definition
Dependent variable for firm i in year t	
RM_{it}	<p>= proxies for real earning management calculated by the Roychowdhury (2006) model per industry-year. RM is the sum of abnormal cash flow from operating activities, abnormal discretionary expenses, and abnormal production costs. (-1) is multiplied to abnormal cash flow from operating activities and abnormal discretionary expenses for making higher RM represents the higher level of real earnings management;</p> $RM_{it} = (-1) \times AB_CFO_{it} + AB_PROD_{it} + (-1) \times AB_DISEXP_{it}$ <p style="margin-left: 40px;">AB_CFO_{it} = abnormal cash flow from operating activities;</p> <p style="margin-left: 40px;">AB_PROD_{it} = proxies abnormal productions costs;</p> <p style="margin-left: 40px;">AB_DISEXP_{it} = proxies abnormal discretionary expenses;</p>
Test variables for firm i in year t	
$TENURE_{it}$	= the number of consecutive years that the audit firm has been retained by the same clients;
$LOGTENURE_{it}$	= natural logarithm of the number of consecutive years that the audit firm has been retained by the same clients;
$BIG4_{it}$	= one when a firm is audited by one of the Big 4 auditors and zero otherwise;
Control variables for firm i in year t	
$SIZE_{it}$	= natural logarithm of sales at year end t in millions of U.S. dollars;
LEV_{it}	= the ratio of total liabilities to total assets at the year-end t , refers to the leverage;
ROA_{it-1}	= the income before extraordinary items at year end $t-1$ divided by total assets at the year-end $t-2$, refers to the return on assets;
$LOSS_{it-1}$	= one when a firm reports a negative income before extraordinary items for year $t-1$ and zero otherwise;
MB_{it}	= the ratio of market value of equity to book value of equity at the year-end t ;

- $SGROW_{it}$ = annual sales growth from year $t-1$ to t ;
- $LIND_{it}$ = one if a firm belongs to litigious industry which is identified as SIC code among 2833-2836, 3570, 3577, 3600-3674, 7371-7379, and 8731-8734 and zero otherwise in year t ;
- HHI_{it} = the level of market concentration calculated by summing the squares of the market share of each firm competing in the same 2-digit SIC industry;
- $ZSCORE_{it-1}$ = the modified version of Altman's Z-score (Altman 1986, 2000) measured by the formula as below at year end $t-1$
- $$ZSCORE_{t-1} = 0.3 \frac{NI_{t-1}}{Asset_{t-1}} + 1.0 \frac{Sales_{t-1}}{Asset_{t-1}} + 1.4 \frac{Retained Earnings_{t-1}}{Asset_{t-1}} + 1.2 \frac{Working Capital_{t-1}}{Asset_{t-1}} + 0.6 \frac{Stock Price \times Shares Outstanding_{t-1}}{Total Liabilities_{t-1}}$$
- $CYCLE_{it-1}$ = the length of the firm's operating cycles calculated by the days receivable (the average number of days a company takes to collect account receivables on goods sold) plus the inventory days (the average number of days goods remain in inventory before being sold) less days payable (the average number of days a company takes to pay its account payables) at the year-end $t-1$;
- $ISSUE_{it}$ = one when a firm has obtained long-term debt with total amounts exceeding 5% of total assets and zero otherwise.
-

[Table 1. Sample selection]

Sample selection procedure	Obs.
Observations in the Compustat data base cover 2003-2017	148,868
Delete:	
Financial industry (SIC 6000-6999)	49,578
Fiscal Year-end Month is not December	1,272
Industry-year observations smaller than 10	974
Missing data to calculate audit firm tenure	4,613
Missing data that do not have all necessary data for calculating test variables and control variables	50,419
Final sample	42,012

[Table 2. Sample distribution by audit firm tenure]

Tenure	Freq.	%	Cumulative %
1	2,947	7.0%	7.0%
2	2,647	6.3%	13.3%
3	3,470	8.3%	21.6%
4	3,205	7.6%	29.2%
5	3,233	7.7%	36.9%
6	2,798	6.7%	43.6%
7	2,430	5.8%	49.3%
8	2,234	5.3%	54.7%
9	2,022	4.8%	59.5%
10	1,791	4.3%	63.7%
11	2,389	5.7%	69.4%
12	2,104	5.0%	74.4%
13	1,821	4.3%	78.8%
14	1,518	3.6%	82.4%
15	1,281	3.1%	85.4%
16	1,109	2.6%	88.1%
17	848	2.0%	90.1%
18	758	1.8%	91.9%
19	677	1.6%	93.5%
20	599	1.4%	94.9%
21	482	1.2%	96.1%
22	442	1.1%	97.1%
23	373	0.9%	98.0%
24	319	0.8%	98.8%
25	273	0.7%	99.4%
26	242	0.6%	100.0%
Total	42,012	100.0%	

This table presents the sample distribution by audit firm tenure. Column (2) presents the number of observations. Column (3) shows the percentage of each observation. Column (4) shows the cumulative frequency by the total number of observations. See Appendix for detailed variable definitions.

[Table 3. Descriptive statistics and correlation matrix]

Panel A: Descriptive statistics for dependent variable and test variables

Variables	N	Mean	SD	Q1	Median	Q3
<i>RM</i>	42,012	0.036	0.661	-0.207	0.028	0.275
<i>AB_CFO</i>	42,012	0.079	0.292	-0.016	0.0583	0.172
<i>AB_PROD</i>	42,012	-0.019	0.419	-0.134	-0.017	0.079
<i>AB_DISEXP</i>	42,012	-0.130	0.606	-0.311	-0.096	0.029
<i>TENURE</i>	42,012	8.829	5.962	4.000	8.000	13.000
<i>LOGTENURE</i>	42,012	1.892	0.834	1.386	2.079	2.565
<i>BIG4</i>	42,012	0.832	0.374	1.000	1.000	1.000

Panel B: Descriptive statistics for firm-level control variables

Variables	N	Mean	SD	Q1	Median	Q3
<i>SIZE</i>	42,012	6.044	2.136	4.723	6.203	7.530
<i>LEV</i>	42,012	0.482	0.220	0.308	0.485	0.648
<i>ROA</i>	42,012	-0.030	0.310	-0.035	0.033	0.080
<i>LOSS</i>	42,012	0.325	0.468	0.000	0.000	1.000
<i>MB</i>	42,012	0.802	0.834	0.267	0.743	1.286
<i>SGROW</i>	42,012	0.135	0.488	-0.028	0.069	0.194
<i>LIND</i>	42,012	0.255	0.436	0.000	0.000	1.000
<i>HHI</i>	42,012	0.080	0.066	0.040	0.053	0.094
<i>ZSCORE</i>	42,012	3.959	6.658	1.453	2.859	4.990
<i>CYCLE</i>	42,012	62.474	108.289	17.398	53.605	101.977
<i>ISSUE</i>	42,012	0.191	0.393	0.000	0.000	0.000

Panel C: Pearson correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) <i>RM</i>	1.000														
(2) <i>TENURE</i>	0.011	1.000													
(3) <i>LOGTENURE</i>	0.005	0.914	1.000												
(4) <i>BIG4</i>	-0.023	0.280	0.306	1.000											
(5) <i>SIZE</i>	-0.010	0.351	0.313	0.320	1.000										
(6) <i>LEV</i>	0.072	0.080	0.061	0.102	0.394	1.000									
(7) <i>ROA</i>	-0.089	0.143	0.133	0.063	0.435	0.044	1.000								
(8) <i>LOSS</i>	0.066	-0.169	-0.151	-0.114	-0.440	-0.013	-0.410	1.000							
(9) <i>MB</i>	-0.161	0.040	0.043	0.080	-0.007	0.161	-0.093	-0.079	1.000						
(10) <i>SGROW</i>	-0.065	-0.090	-0.077	-0.005	-0.073	-0.049	-0.185	-0.007	0.155	1.000					
(11) <i>LIND</i>	-0.041	-0.066	-0.052	-0.015	-0.313	-0.232	-0.212	0.210	0.152	0.070	1.000				
(12) <i>HHI</i>	-0.005	0.037	0.023	<i>-0.019</i>	0.144	0.069	0.101	-0.071	-0.098	-0.039	-0.254	1.000			
(13) <i>ZSCORE</i>	-0.064	0.003	0.014	0.008	-0.036	-0.397	0.134	-0.107	0.128	0.054	0.068	-0.021	1.000		
(14) <i>CYCLE</i>	-0.002	0.059	0.046	-0.021	-0.032	-0.142	0.034	-0.009	-0.073	<i>-0.018</i>	0.028	-0.044	0.089	1.000	
(15) <i>ISSUE</i>	0.017	-0.006	-0.009	0.011	0.069	0.224	0.015	-0.006	0.031	0.101	-0.064	0.035	-0.047	-0.056	1.000

This table presents descriptive statistics and Pearson correlation matrix. Panel A shows the descriptive statistics for the dependent variable, the components of dependent variable, and the test variables used in the main regression analyses. Panel B shows the descriptive statistics for the other firm-level control variables. Total of 42,012 firm-year observations are used for the analyses. Mean represents the average value and SD represents the standard deviation of the corresponding variables. Panel B shows the Pearson correlation coefficients among the dependent, and control variables. Correlations that are significant at less than the 1% (5%) level are in boldfaced (italicized). See Appendix for detailed variable definitions.

[Table 4. Effect of audit firm tenure and Big 4 auditor on real earnings management]

<i>Dependent Variables =RM</i>	(1)	(2)
<i>Section A: Test variables</i>		
<i>TENURE</i>	0.00167*** (0.00041)	
<i>LOGTENURE</i>		0.00927*** (0.00287)
<i>BIG4</i>	-0.0135** (0.00638)	-0.0128** (0.00643)
<i>Section B: Firm-specific control variables</i>		
<i>SIZE</i>	-0.00539*** (0.00147)	-0.00501*** (0.00146)
<i>LEV</i>	0.325*** (0.01280)	0.324*** (0.01280)
<i>ROA</i>	-0.185*** (0.00819)	-0.185*** (0.00819)
<i>LOSS</i>	0.0110** (0.00547)	0.0106* (0.00547)
<i>MB</i>	-0.140*** (0.00291)	-0.140*** (0.00291)
<i>SGROW</i>	-0.0472*** (0.00457)	-0.0477*** (0.00457)
<i>LIND</i>	-0.0301*** (0.00547)	-0.0300*** (0.00547)
<i>HHI</i>	-0.307*** (0.03340)	-0.307*** (0.03340)
<i>ZSCORE</i>	0.00236*** (0.00037)	0.00234*** (0.00037)
<i>CYCLE</i>	-0.0000395** (0.00002)	-0.0000372* (0.00002)
<i>ISSUE</i>	-0.00256 (0.00562)	-0.00268 (0.00562)
<i>Year fixed effects</i>	Included	Included
<i>R²</i>	0.0834	0.0832
<i>Observations</i>	42012	42012

This table presents the multivariate regressions results to test Hypothesis 1a (the effect of longer audit firm tenure on the level of firms' real earnings management) and Hypothesis 1b (the effect of the presence of Big4 audit firm on the level of firms' real earnings management) using Equations (5), and (6). As audit firm tenure lengthens, firms conduct more real earnings management, supporting a substitutive relation between accrual earnings management and real earnings management. On the other hand, Big 4 auditors deter managers to conduct real earnings management. See Appendix for variable definitions. The numbers in the parentheses represent the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two tailed).

[Table 5. Joint effect on real earnings management]

<i>Dependent Variables =RM</i>	(1)	(2)
Section A: Test variables		
<i>TENURE</i>	-0.00181 (0.00130)	
<i>LOGTENURE</i>		-0.00903 (0.00639)
<i>BIG4</i>	-0.0343*** (0.00974)	-0.0454*** (0.01200)
<i>TENURE×BIG4</i>	0.00381*** (0.00134)	
<i>LOGTENURE×BIG4</i>		0.0225*** (0.00704)
Section B: Firm-specific control variables		
<i>SIZE</i>	-0.00546*** (0.00147)	-0.00518*** (0.00146)
<i>LEV</i>	0.324*** (0.01280)	0.324*** (0.01280)
<i>ROA</i>	-0.185*** (0.00819)	-0.185*** (0.00819)
<i>LOSS</i>	0.0113** (0.00547)	0.0108** (0.00547)
<i>MB</i>	-0.140*** (0.00291)	-0.140*** (0.00291)
<i>SGROW</i>	-0.0471*** (0.00457)	-0.0472*** (0.00457)
<i>LIND</i>	-0.0307*** (0.00548)	-0.0305*** (0.00547)
<i>HHI</i>	-0.307*** (0.03340)	-0.306*** (0.03340)
<i>ZSCORE</i>	0.00238*** (0.00037)	0.00237*** (0.00037)
<i>CYCLE</i>	-0.0000398** (0.00002)	-0.0000385* (0.00002)
<i>ISSUE</i>	-0.00244 (0.00562)	-0.00254 (0.00562)
<i>Year fixed effects</i>	Included	Included
<i>R²</i>	0.0835	0.0834
<i>Observations</i>	42012	42012

This table presents the multivariate regressions results to test Hypothesis 2 (the joint effect of longer audit firm tenure and the presence of Big 4 auditors on the level of firms' real earnings management) using Equations (7), and (8). As audit firm tenure lengthens, *RM* increases only when the firm is audited by Big 4 audit firm. See Appendix for variable definitions. The numbers in the parentheses represent the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two tailed).

[Table 6. Alternative measurements for *RM*]

Panel A: Regression results for Hypothesis 1a and 1b

<i>Dependent Variables</i>	(1) RM2	(2) RM2	(3) RM3	(4) RM3
<i>Section A: Test variables</i>				
<i>TENURE</i>	0.00459*** (0.00166)		0.000769** (0.00037)	
<i>LOGTENURE</i>		0.0216* (0.01160)		0.00289 (0.00259)
<i>BIG4</i>	-0.158*** (0.02570)	-0.154*** (0.02600)	-0.0443*** (0.00574)	-0.0432*** (0.00578)
<i>Section B: Firm-specific control variables</i>				
<i>SIZE</i>	-0.00141 (0.00592)	-0.0000977 (0.00589)	-0.0046*** (0.00132)	-0.0043*** (0.00131)
<i>LEV</i>	1.839*** (0.05180)	1.837*** (0.05180)	0.258*** (0.01150)	0.258*** (0.01150)
<i>ROA</i>	-0.835*** (0.03310)	-0.836*** (0.03310)	-0.100*** (0.00737)	-0.100*** (0.00737)
<i>LOSS</i>	0.342*** (0.02210)	0.341*** (0.02210)	0.0247*** (0.00492)	0.0244*** (0.00492)
<i>MB</i>	-0.705*** (0.01180)	-0.705*** (0.01180)	-0.0800*** (0.00262)	-0.0800*** (0.00262)
<i>SGROW</i>	-0.155*** (0.01850)	-0.157*** (0.01850)	-0.00537 (0.00412)	-0.00573 (0.00411)
<i>LIND</i>	-0.228*** (0.02210)	-0.228*** (0.02210)	-0.0328*** (0.00492)	-0.0327*** (0.00492)
<i>HHI</i>	-1.215*** (0.13500)	-1.213*** (0.13500)	-0.291*** (0.03010)	-0.291*** (0.03010)
<i>ZSCORE</i>	0.00466*** (0.00148)	0.00462*** (0.00148)	0.00221*** (0.00033)	0.00221*** (0.00033)
<i>CYCLE</i>	0.000155* (0.00008)	0.000163** (0.00008)	-0.0001*** (0.00002)	-0.0001*** (0.00002)
<i>ISSUE</i>	-0.0881*** (0.02270)	-0.0885*** (0.02270)	-0.0109** (0.00506)	-0.0110** (0.00506)
<i>Year fixed effects</i>	Included	Included	Included	Included
<i>R</i> ²	0.146	0.146	0.0448	0.0448
<i>Observations</i>	42202	42202	42202	42202

Panel A: Regression results for Hypothesis 1a and 1b (continued)

<i>Dependent Variables</i>	(5) RM4	(6) RM4	(7) RM5	(8) RM5
<i>Section A: Test variables</i>				
<i>TENURE</i>	0.000286 (0.00036)		0.00172*** (0.00048)	
<i>LOGTENURE</i>		0.000245 (0.00249)		0.0101*** (0.00337)
<i>BIG4</i>	-0.0455*** (0.00553)	-0.0445*** (0.00558)	-0.00152 (0.00748)	-0.0012 (0.00754)
<i>Section B: Firm-specific control variables</i>				
<i>SIZE</i>	-0.00117 (0.00127)	-0.00101 (0.00127)	-0.0080*** (0.00172)	-0.0077*** (0.00171)
<i>LEV</i>	0.234*** (0.01110)	0.234*** (0.01110)	0.233*** (0.01510)	0.232*** (0.01510)
<i>ROA</i>	-0.286*** (0.00728)	-0.286*** (0.00728)	-0.116*** (0.00974)	-0.116*** (0.00974)
<i>LOSS</i>	0.0479*** (0.00475)	0.0478*** (0.00475)	-0.00343 (0.00642)	-0.00381 (0.00642)
<i>MB</i>	-0.0869*** (0.00253)	-0.0869*** (0.00253)	-0.107*** (0.00342)	-0.107*** (0.00342)
<i>SGROW</i>	-0.0474*** (0.00399)	-0.0477*** (0.00399)	-0.0749*** (0.00538)	-0.0753*** (0.00537)
<i>LIND</i>	-0.134*** (0.00474)	-0.134*** (0.00474)	0.0210*** (0.00641)	0.0211*** (0.00641)
<i>HHI</i>	0.273*** (0.02900)	0.273*** (0.02900)	-0.245*** (0.03930)	-0.245*** (0.03930)
<i>ZSCORE</i>	-0.0030*** (0.00032)	-0.0030*** (0.00032)	0.00304*** (0.00043)	0.00302*** (0.00043)
<i>CYCLE</i>	-0.0001*** (0.00002)	-0.0001*** (0.00002)	0.0000104 (0.00002)	0.0000127 (0.00002)
<i>ISSUE</i>	-0.00372 (0.00488)	-0.00378 (0.00488)	0.0103 (0.00660)	0.0102 (0.00660)
<i>Year fixed effects</i>	Included	Included	Included	Included
<i>R²</i>	0.136	0.136	0.036	0.036
<i>Observations</i>	42043	42043	42012	42012

Panel B: Regression results for Hypothesis 2

<i>Dependent Variables</i>	(1) RM2	(2) RM2	(3) RM3	(4) RM3
<i>Section A: Test variables</i>				
<i>TENURE</i>	-0.00841 (0.00523)		-0.00106 (0.00117)	
<i>LOGTENURE</i>		-0.0377 (0.02580)		-0.00347 (0.00575)
<i>BIG4</i>	-0.236*** (0.03930)	-0.260*** (0.04850)	-0.0553*** (0.00876)	-0.0545*** (0.01080)
<i>TENURE×BIG4</i>	0.0142*** (0.00543)		0.00201* (0.00121)	
<i>LOGTENURE×BIG4</i>		0.0730** (0.02840)		0.00783 (0.00633)
<i>Section B: Firm-specific control variables</i>				
<i>SIZE</i>	-0.00167 (0.00593)	-0.00065 (0.00590)	-0.0046*** (0.00132)	-0.0043*** (0.00131)
<i>LEV</i>	1.836*** (0.05180)	1.835*** (0.05180)	0.258*** (0.01150)	0.258*** (0.01150)
<i>ROA</i>	-0.834*** (0.03310)	-0.835*** (0.03310)	-0.100*** (0.00737)	-0.100*** (0.00737)
<i>LOSS</i>	0.343*** (0.02210)	0.342*** (0.02210)	0.0248*** (0.00492)	0.0245*** (0.00492)
<i>MB</i>	-0.705*** (0.01180)	-0.705*** (0.01180)	-0.0799*** (0.00262)	-0.0799*** (0.00262)
<i>SGROW</i>	-0.155*** (0.01850)	-0.155*** (0.01850)	-0.00529 (0.00412)	-0.00558 (0.00411)
<i>LIND</i>	-0.230*** (0.02210)	-0.229*** (0.02210)	-0.0331*** (0.00493)	-0.0329*** (0.00493)
<i>HHI</i>	-1.215*** (0.13500)	-1.211*** (0.13500)	-0.291*** (0.03010)	-0.291*** (0.03010)
<i>ZSCORE</i>	0.00474*** (0.00148)	0.00471*** (0.00148)	0.00223*** (0.00033)	0.00222*** (0.00033)
<i>CYCLE</i>	0.000154* (0.00008)	0.000159** (0.00008)	-0.0001*** (0.00002)	-0.0001*** (0.00002)
<i>ISSUE</i>	-0.0876*** (0.02270)	-0.0880*** (0.02270)	-0.0108** (0.00506)	-0.0109** (0.00506)
<i>Year fixed effects</i>	Included	Included	Included	Included
<i>R²</i>	0.146	0.146	0.0449	0.0448
<i>Observations</i>	42202	42202	42202	42202

Panel B: Regression results for Hypothesis 2 (continued)

<i>Dependent Variables</i>	(5) RM4	(6) RM4	(7) RM5	(8) RM5
Section A: Test variables				
<i>TENURE</i>	-0.00193* (0.00112)		-0.000768 (0.00152)	
<i>LOGTENURE</i>		-0.0077 (0.00554)		-0.00371 (0.00750)
<i>BIG4</i>	-0.0588*** (0.00845)	-0.0587*** (0.01040)	-0.0165 (0.01140)	-0.0257* (0.01410)
<i>TENURE</i> × <i>BIG4</i>	0.00243** (0.00117)		0.00273* (0.00158)	
<i>LOGTENURE</i> × <i>BIG4</i>		0.00978 (0.00610)		0.0170** (0.00826)
Section B: Firm-specific control variables				
<i>SIZE</i>	-0.00121 (0.00127)	-0.00108 (0.00127)	-0.0081*** (0.00172)	-0.0078*** (0.00171)
<i>LEV</i>	0.234*** (0.01110)	0.234*** (0.01110)	0.232*** (0.01510)	0.232*** (0.01510)
<i>ROA</i>	-0.285*** (0.00728)	-0.285*** (0.00728)	-0.115*** (0.00974)	-0.116*** (0.00974)
<i>LOSS</i>	0.0481*** (0.00475)	0.0479*** (0.00475)	-0.00325 (0.00642)	-0.0037 (0.00642)
<i>MB</i>	-0.0868*** (0.00253)	-0.0868*** (0.00253)	-0.107*** (0.00342)	-0.107*** (0.00342)
<i>SGROW</i>	-0.0473*** (0.00399)	-0.0475*** (0.00399)	-0.0748*** (0.00538)	-0.0749*** (0.00538)
<i>LIND</i>	-0.135*** (0.00475)	-0.135*** (0.00474)	0.0206*** (0.00642)	0.0207*** (0.00641)
<i>HHI</i>	0.272*** (0.02900)	0.273*** (0.02900)	-0.245*** (0.03930)	-0.244*** (0.03930)
<i>ZSCORE</i>	-0.0030*** (0.00032)	-0.0030*** (0.00032)	0.00305*** (0.00043)	0.00304*** (0.00043)
<i>CYCLE</i>	-0.0001*** (0.00001)	-0.0001*** (0.00002)	0.0000103 (0.00002)	0.0000117 (0.00002)
<i>ISSUE</i>	-0.00365 (0.00488)	-0.00372 (0.00488)	0.0104 (0.00660)	0.0103 (0.00660)
<i>Year fixed effects</i>	Included	Included	Included	Included
<i>R</i> ²	0.136	0.136	0.0361	0.036
<i>Observations</i>	42043	42043	42012	42012

This table presents the results of sensitivity tests by using different measurements of *RM*. Panel A shows the multivariate regressions results to test Hypothesis 1a (the effect of longer audit firm tenure on the magnitude of the firms' real earnings management) and Hypothesis 1b (the effect of the presence of Big4 audit firm on the level of firms' real earnings management) using Equations (5), and (6). Panel B shows the regression results to test

Hypothesis 2 (whether the effect of longer audit firm tenure on the level of firm's real earnings management is differentiated by the presence of Big 4 auditor) using Equations (7), and (8). In each panel, Columns (1) and (2) report the results when real earnings management is measure with $RM2$, which is the average of decile ranks of $(-1) \times AB_CFO$, $(-1) \times AB_DISEXP$ and AB_PROD . In each panel, Columns (3) and (4) report the results when real earnings management is proxied with $RM3$, which is set to $RM3$ if RM belongs to the highest quartile of the sample distribution in each industry-year, and zero otherwise (Gunny 2010). In each column (5) and (6) report the results when earnings management is measured with $RM4$, which is calculated by the sum of $(-1) \times AB_CFO$ and AB_PROD . In each column (7) and (8) report the results when earnings management is calculated by $RM5$, which is calculated by the sum of $(-1) \times AB_CFO$ and $(-1) \times AB_DISEXP$ (Cohen and Zarowin 2010). Main findings are robust to all of these tests. See Appendix for variable definitions. The numbers in the parentheses represent the standard errors. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively (two tailed).

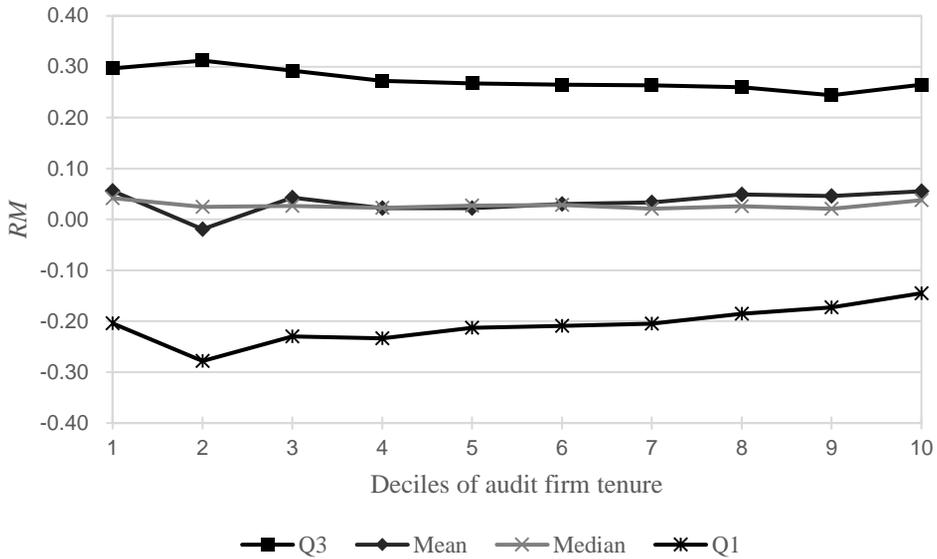
[Table 7. Alternative sample firms without quick-turnover]

Panel A: Regression results for Hypothesis 1a and 1b		
<i>Dependent Variables =RM</i>	(1)	(2)
<i>TENURE</i>	0.00220*** (0.00046)	
<i>LOGTENURE</i>		0.0201*** (0.00426)
<i>BIG4</i>	-0.00611 (0.00726)	-0.00636 (0.00727)
<i>Other variables</i>	Included	Included
<i>Year fixed effects</i>	Included	Included
<i>R²</i>	0.0857	0.0856
<i>Observations</i>	36418	36418
Panel B: Regression results for Hypothesis 2		
<i>TENURE</i>	-0.000936 (0.00161)	
<i>LOGTENURE</i>		-0.00535 (0.01200)
<i>BIG4</i>	-0.0296** (0.01370)	-0.0583** (0.02410)
<i>TENURE×BIG4</i>	0.00337** (0.00166)	
<i>LOGTENURE×BIG4</i>		0.0287** (0.01270)
<i>Other variables</i>	Included	Included
<i>Year fixed effects</i>	Included	Included
<i>R²</i>	0.0858	0.0858
<i>Observations</i>	36418	36418

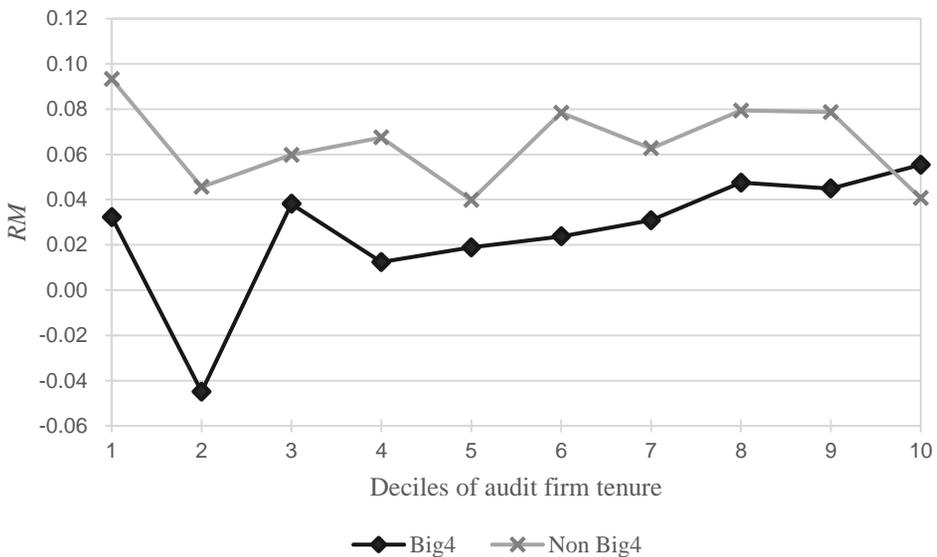
This table presents the results of sensitivity tests. Panel A shows the multivariate regressions results Hypothesis 1a (the effect of longer audit firm tenure on the magnitude of the firms' real earnings management) and Hypothesis 1b (the effect of the presence of Big4 audit firm on the level of firms' real earnings management) using Equations (5), and (6). Panel B shows the regression results to test Hypothesis 2 (whether the effect of longer audit firm tenure on the level of firm's real earnings management is differentiated by the presence of Big 4 auditor) using Equations (7), and (8). Following Myers et al. (2003), I rerun these models with alternative sample. I eliminate the firm-year observations if *TENURE* variable equals one, or two. Main findings are robust with alternative sample firms.

[Figure 1. Real earnings management by deciles of audit firm tenure]

Panel A: Real earnings management by deciles of audit firm tenure



Panel B: Real earnings management by deciles of audit firm tenure: Big4 versus non-Big4



Panel A presents the graph of 75th percentile, mean, median, and 25th percentile of the real earnings management measure (RM). Panel B present mean values of the real earnings management measure (RM) by audit firm type (Big 4/ non-Big 4). RM denotes the level of real earnings management calculated by the Roychowdhury (2006) model by industry-year. The higher deciles of tenure mean the longer audit firm tenure. $BIG4$ equals one when a firm is audited by one of the Big 4 auditors and zero, otherwise. See Appendix for detailed variables definition.

[Figure 2. Real earnings management by *TENURE* conditioning on Big 4 auditor]

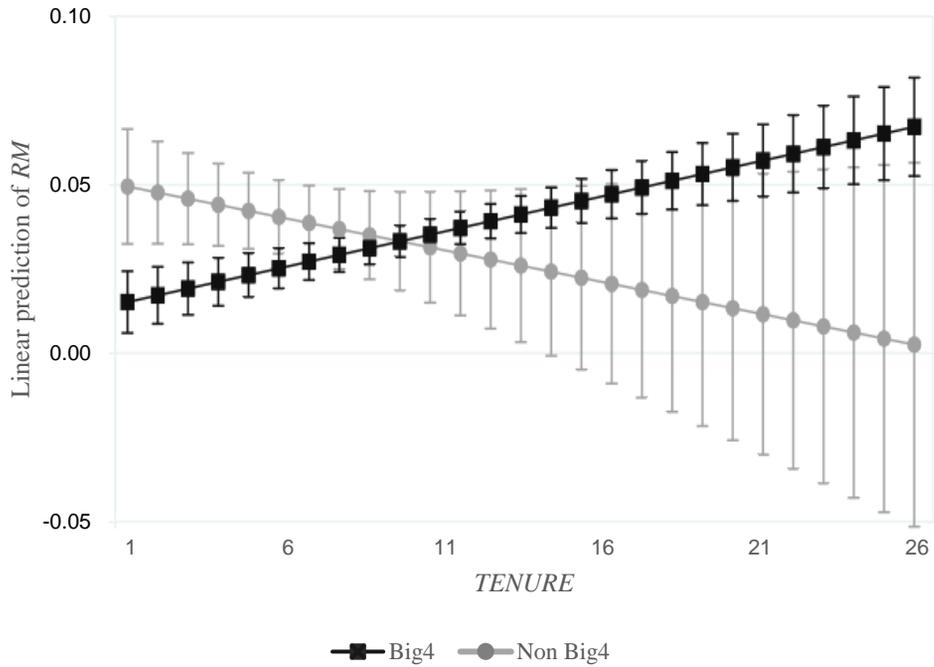


Figure 2 presents the effect of audit firm tenure on real earnings management conditioning on whether the firm is audited by Big 4 or non-Big 4 auditor with 95% of confidence intervals. *RM* denotes the level of real earnings management calculated by the Roychowdhury (2006) model by industry-year. *TENURE* denotes the consecutive years of retained auditor. See Appendix for detailed variables definition.

국문초록

계속감사기간과 Big 4 감사인이 실질이익조정에 미치는 영향

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본 연구는 계속감사기간과 Big 4 감사인이 실질이익조정에 미치는 영향에 대해 분석한다. 본 연구의 주요한 결과는 다음과 같다. 첫째, 계속감사기간이 길어질수록 실질이익조정의 정도가 증가하였으며, 이는 경영자들이 발생액 이익조정을 대체하는 수단으로 실질이익조정을 선택함을 시사한다. 둘째, Big 4 감사법인을 감사인으로 선임한 기업은 그렇지 않은 기업에 비해 실질이익조정 수준이 낮은 것으로 나타났다. 이는 Big 4 감사인은 실질이익조정을 억제시키는 역할을 수행하고 있음을 시사한다. 셋째, 계속감사기간의 증가에 따른 실질이익조정의 양(+)의 관계는 Big 4 감사인의 경우만 유의한 관계가 관찰 되었다. 즉, 앞서 계속감사기간이 길어질수록 실질이익조정이 증가한다는 검증결과는 non-Big 4 감사인 보다는 Big 4 감사인에 기인된 결과로 나타났다. 본 연구는 계속감사시간 및 Big 4 감사인과 실질이익조정 간의 관계를 살펴봄으로써 관련연구에 추가적인 공헌점을 제공할 것이며, 더불어 본 연구의 검증결과는 계속감사기간과 관련된 제도의 설정에 정책적 시사점을 제공한다는 측면에서 의의가 있다.

주요어 : 계속감사기간, Big 4, 실질이익조정, 감사품질, 감사인 특성

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