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Auditors' Responses to Workload Imbalance and the Impact on Audit Quality*

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ABSTRACT

Using detailed data for fieldwork hours and audit hours by rank from audit engagements in Korea, we examine whether audits conducted under workload imbalance, proxied by busy-season audits, impair audit quality, and how auditors adjust staff assignments for busy-season audits. We generally find that busy-season audits are associated with lower audit quality, and that audit firms reduce the involvement of senior auditors during busy-season audits. In addition, the greater the involvement of senior auditors and junior auditors, the lesser the deterioration in audit quality. Finally, although there is no increase in interim audits in response to workload imbalance during busy seasons, increasing interim audits can mitigate the negative impact of busy-season audits on audit quality. Our results are relevant to auditors and regulators, who have expressed concerns about the adverse effects of workload imbalance on audit quality.

Keywords: audit quality, busy-season audits, end-of-year auditor hours by rank, interim audits, labor mix, workload imbalance

Déséquilibre de la charge de travail : réactions des auditeurs et incidence sur la qualité de l'audit

RÉSUMÉ

Les auteurs analysent des données exhaustives concernant les heures de travail sur le terrain et les heures d'audit selon le rang, tirées de missions d'audit réalisées en Corée, afin de déterminer, d'une part, si la réalisation d'audits en situation de déséquilibre de la charge de travail — selon la variable substitutive des audits de la période de pointe — est préjudiciable à la qualité de l'audit et, d'autre part, comment les auditeurs ajustent les affectations de personnel aux audits de la période de pointe. De façon générale, les auteurs constatent que les audits de la période de pointe sont associés à une qualité inférieure de l'audit et que les cabinets d'audit réduisent la participation des responsables de mission aux audits de la période de pointe. En outre, plus la participation des responsables de mission et des assistants d'audit est grande, moins la détérioration de la qualité de l'audit est marquée. Enfin, même si aucune augmentation des audits intermédiaires n'est observée en réaction au déséquilibre de la charge de travail au cours des périodes de pointe, la multiplication des audits intermédiaires peut atténuer l'incidence négative des audits de la période de pointe sur

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la qualité de l'audit. Les résultats de l'étude intéresseront les auditeurs et les autorités de réglementation, qui se sont dits préoccupés par les répercussions néfastes du déséquilibre de la charge de travail sur la qualité de l'audit.

Mots clés : audits de la période de pointe, audits intermédiaires, composition de l'effectif, déséquilibre de la charge de travail, heures des auditeurs en fin d'exercice selon le rang, qualité de l'audit

1. Introduction

In this study, we investigate how auditors adapt to workload imbalance—a situation in which auditors experience a workload spike and an increase in demands on their time and cognitive resources—and the extent to which their adaptive responses influence audit quality. A distinctive feature of work life in auditing firms is the severe workload imbalance that typically occurs during the first three months of the year due to clustering caused by firms, particularly listed firms, choosing December fiscal year-ends. For example, continental European and Korean firms have a strong preference for December year-ends. Over 90 percent of these firms have December fiscal year-ends (Kamp 2002; Park 2015), while in the United States, over 65 percent of all publicly traded companies have a December year-end. This fiscal year-end clustering creates workload imbalances, and auditors have to manage long hours, tight deadlines, and constant pressure for prolonged periods.[1]

Our research question about auditors' adaptive responses to workload imbalance and the impact on audit quality is motivated by regulatory concerns. Specifically, regulators such as the PCAOB have raised concerns that scheduling and heavy workload demands can place pressure on audit partners and other team members, who may compromise their professional skepticism by prematurely completing audit assignments, translating into lower audit quality (PCAOB 2012). Using experiments and/or surveys, prior studies examine the effects of work and time pressure (Kelley and Margheim 1990; Raghunathan 1991; Sweeney and Summers 2002; Coram et al. 2004) on the performance of specific tasks at the individual auditor level (e.g., inventory valuation; McDaniel 1990). These studies do not address the effects on overall audit quality at the audit firm or client level. A recent archival study by Lambert et al. (2017) examines time pressure at the client level. The authors operationalize audit time pressure using audit delay, which is measured by the number of days between the audit report date and fiscal year-end date. We note that an engagement that does not entail an audit delay may still be subject to workload imbalance. In fact, the attempt to avoid an audit delay can cause audit engagement clustering around reporting deadlines, leading to workload imbalance. Lopez and Peters (2012) operationalize audit workload imbalance by taking the ratio of the sum of audit fees charged to clients with the same fiscal year-end month to total audit fees collected by the local office for the year. However, they acknowledge that audit fees may capture elements other than audit effort (e.g., competitive market pressures or audit fee premiums). In our study, we determine workload imbalance using audit engagements rather than audit delay (as in Lambert et al. 2017) or audit fees (as in Lopez and Peters 2012), resulting in a more refined measure of workload imbalance. Additionally, we examine an audit firm's allocation of staff across engagements in response to workload imbalance.

More importantly, we investigate whether the way audit firms cope with workload imbalance affects audit quality. Since workload imbalance occurs within the first quarter of every calendar year, audit firms are expected to adopt coping measures (Brown and Solomon 1992; Low and Tan 2011). However, some of the measures that auditors adopt can be dysfunctional, such as reducing auditor-hours or reducing the number of experienced auditors on an engagement, while other measures can be adaptive, such as shifting some of the work to off-peak periods. The

1. The AICPA website lists the features of busy seasons, along with survival tips (see http://www.aicpa.org/InterestAreas/YoungCPANetwork/Resources/Pages/reduce-stress-at-work.aspx).

PCAOB, for instance, has questioned the effectiveness of roll-forward procedures, in which auditors conduct extensive and substantive testing prior to the year-end and roll that work forward to end-of-year balances (PCAOB 2013). While it is reasonable to assume that auditors are likely to take measures in response to potential workload pressure during busy seasons, no research to date has examined the measures that audit firms adopt and the direct effects of their coping strategies on audit quality.

Effective 2014, the Act on External Audit of Stock Companies in Korea requires that audit firms provide the start and end dates for fieldwork engagements in their clients' audit reports. This allows us to more precisely measure the period during which audit firms experience a workload imbalance. In addition, audit firms in Korea adhere to International Standards on Auditing, and the Big 4 audit firms in Korea follow the global application standards of the audit methodologies, thereby justifying the use of this setting to examine our research questions. Using each engagement's disclosed end-of-year fieldwork period, we proxy for workload imbalance by determining auditors' busy seasons, during which there are greater-than-usual spikes in engagements. We consider a "busy season" as a period with a clustering of audit engagements that involve end-of-year fieldwork.[2]

To examine our research questions, we use data on 1,016 audit engagements conducted in Korea in fiscal year 2014. We find that compared to nonbusy-season audits, busy-season audits are characterized by larger discretionary accruals and a higher incidence of misstatements, which are our proxies for audit quality. This evidence implies that workload imbalance leads to lower audit quality. We also document that audit firms adjust their labor mix for busy-season audits by reducing the auditor-hours worked as well as the proportion or mix of auditor-hours expended by senior auditors. The hours spent by review partners, engagement partners, and junior auditors do not vary across busy-season audits, although there is an increase in the mix or proportion of hours spent by them. We find no variation in the proportion of hours expended by nonaudit experts, but observe a decline in their hours expended in response to busy-season audits.[3] In addition, we find that the higher the proportion of senior and junior auditor end-of-year hours in the total end-of-year auditor-hours, the less the deterioration in audit quality. We do not observe this attenuating effect for the greater proportion of time spent by review partners, engagement partners, and nonaudit experts in response to busy-season audits. These results on the impact of auditor involvement across ranks on audit quality are generally consistent when we use logged auditor-hours by rank. We do not observe more time spent on interim audits during busy seasons but find that completing audit procedures during earlier interim periods mitigates the deterioration in audit quality for busy-season audits.

We contribute to the literature on audit quality in the following ways. First, we provide the first empirical evidence on how auditors respond to workload imbalances during busy seasons and the extent to which these responses influence audit quality. This evidence has important implications for auditors, regulators, and financial statement users because workload imbalance can hinder auditors from applying an appropriate level of professional skepticism, which impairs audit quality. Thus, it is important to understand how auditors cope with workload imbalances and whether those coping measures are effective. Second, using audit engagements that involve the end-of-year fieldwork during busy seasons to proxy for workload imbalance, we provide more robust evidence that workload imbalance impairs audit quality. However, like any single-country

2. If an audit firm's number of engagements at a particular date is greater than 20 percent of the total number of the audit firm's clients, we define that particular date as a busy date. We then identify the start and end dates of busy seasons. Later, we verify that this 20 percent cutoff point corresponds most closely to the client clustering observed in the data. Appendix 2 illustrates how we determine busy seasons. If 70 percent or more of the fieldwork period for an audit engagement lies within the start and end dates of busy season, we regard the audit engagement as a busy-season audit.

3. Based on our data, the use of the term "junior auditors" refers to staff auditors, while senior auditors include audit seniors and managers.

study, our analysis is subject to the caveat that the evidence may not be applicable or relevant to other jurisdictions, including the United States or Canada, where there are differences in the regulatory and litigation environment governing auditors.

The remainder of the paper proceeds as follows. Section 2 develops hypotheses based on theoretical considerations. Sections 3 and 4 describe the research design and present the data and descriptive statistics, respectively. Section 5 reports the empirical results. Section 6 provides additional analysis, and section 7 concludes.

2. Background and hypothesis development

Effect of workload imbalance

Theory in psychology, namely the Yerkes-Dodson Law (Yerkes and Dodson 1908), posits an inverted U-shaped relationship between workload imbalance and individual performance. Workload imbalance induces stress or arousal. As stress increases, performance initially increases as the stress activates greater cognitive resources for conducting a task. However, performance eventually begins to suffer; this happens when the demands associated with conducting the task and the associated behavioral and physiological stress exceed attentional resources, leading to impaired performance (Alderman and Dietrick 1982; Kelley and Margheim 1990; Raghunathan 1991; Sweeney and Summers 2002; Muse et al. 2003; Coram et al. 2004). Given that workload imbalances during busy seasons are intense and last several months, the stress or arousal auditors experience exceeds the optimal level in the inverted U-shaped curve, and this workload imbalance leads to lower auditor performance.

Prior research on workload imbalances among auditors traditionally uses experimental or survey approaches. These studies examine a dominant feature of workload imbalances, namely, time pressure—the extent to which a task must be completed with insufficient time—as a theoretical construct. In an auditing context, time pressure occurs in an environment characterized by workload imbalance because multiple clients have the same deadlines during the busy season. Prior experimental studies on deadline pressure generally document its adverse effects on auditor performance (McDaniel 1990; Low and Tan 2011; Bennett and Hatfield 2017).

More recently, researchers develop archival approaches to examine the effects of workload pressure, operationalizing it as busy seasons (Lopez and Peters 2012) or the time between issuance of an audit report and the 10-K filing deadline (Lambert et al. 2017). These studies report similar findings to those in the prior literature. A distinctive feature of the audit firm setting, compared with the individual-auditor setting in experiments/surveys, is that apart from the behavioral and physiological stress of workload imbalance on auditors, an audit firm's resources are stretched during periods with workload imbalances. Constraints on an audit firm's resources can also impair audit quality. We state this hypothesis as follows:

HYPOTHESIS 1. *Audit quality will be lower in the presence of workload imbalance.*

Although tested in prior studies, we formally state and test Hypothesis 1 as it provides a starting point for our analysis on how auditors' adaptive responses moderate this effect. Additionally, it is important to reexamine this hypothesis insofar as our proxy for workload imbalance at the engagement level differs from the firm-level proxy used in an archival study that tests the same hypothesis (Lopez and Peters 2012).[4] A firm-level rather than engagement-level proxy for workload imbalance is limited as it does not account for the possibility that audit firms can spread their workloads over the period between January and March or alter their audit procedures. Prior

4. Lopez and Peters (2012) operationalize workload imbalance using the ratio of the monthly sum of audit fees charged to clients with the same fiscal year-end month in each local office to the total annual audit fees collected by the local office.

accounting, psychology, and organizational behavior studies have not examined an engagement-level setting, which captures how firms can allocate resources within and across engagements/projects.

How do auditors adapt to workload imbalances?

While extant studies examine the consequences of workload imbalances on audit quality, no study analyzes how auditors respond to workload imbalances at the engagement level. The seasonal workload imbalance period (January to March) is a recurring annual event. Therefore, auditors know and can take adaptive measures to prepare for this impending workload imbalance (Brown and Solomon 1992; Low and Tan 2011). This is also consistent with prior research suggesting that decision makers modify their decision strategies according to environmental constraints (Payne et al. 1988) and that audit partners can select the optimal number of clients so their busyness does not adversely affect audit quality.[5] Accordingly, we posit that the nature of auditors' adaptive responses moderates the relationship between workload imbalance and audit quality. Given workload imbalances, if these adaptive responses aim merely to reduce the workload-imbalance pressure (without due consideration for audit quality—for example, cutting corners), then audit quality will suffer. In contrast, if these adaptive responses aim to ensure that an auditor can maintain audit quality within the constraints of workload imbalances, then audit quality will remain stable.

Dysfunctional impact of adaptive responses on the relationship between workload imbalance and audit quality

We first discuss the case in which responses involve cutting corners at the expense of audit quality. End-of-year fieldwork is a major component of an audit, and an insufficient number of staff members to conduct fieldwork across all engagements likely creates a bottleneck during busy seasons when workload imbalance reaches its peak. During this period, multiple fieldwork assignments must start at about the same time, and auditors need to allocate limited audit staff across many engagements within a limited time window. During a year-end audit, auditors ranging from staff auditors to audit seniors and audit managers are deeply involved in fieldwork, and an audit partner generally becomes involved at the end of the audit. The auditors below the partner level are therefore more likely to feel the constraints. In particular, at the evidence collection stage, constraints are likely to occur at the senior auditor level (generally those with three or more years of experience), given that auditors tend to leave an audit firm three to six years after joining it (Accounting Today 2012). To address constraints in audit fieldwork (including evidence collection), a possible approach is to limit the involvement of audit team members or adjust the labor mix of auditors among audit team members. When there are not enough audit team members to assign to engagements, an easy default action is to simply reduce the number of auditors per engagement.

Having an inadequate number of audit staff members at the fieldwork level can lead to insufficient evidence collection and fieldwork tests, resulting in lower audit quality.[6] Prior experimental research shows that the audit review process cannot mitigate this impairment if critical audit evidence/findings are not initially documented (Ricchuite 1999). Overall, a reduction in auditor involvement at each rank during busy seasons can be associated with lower audit quality. We formally specify our hypotheses as follows:

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5. Goodwin and Wu (2016) examine audit-partner busyness, which refers to the extent to which audit partners have multiple clients. They argue that audit partners optimally choose the extent of their busyness so that, in equilibrium, there is no causal relationship between audit-partner busyness and audit quality. While this audit-partner-busyness construct differs from that of workload imbalance, conceptually, workload imbalance leads to busy partners.
6. A caveat to this is that lower audit staff involvement at end-of-year audits can simply mean that an audit firm spent more auditor time during interim audits.

HYPOTHESIS 2. *Audit firms assign fewer auditors at each rank to audit engagements in the presence of workload imbalance.*

HYPOTHESIS 3. *Lower auditor involvement at each auditor rank under workload imbalance is associated with lower audit quality.*

Beneficial impact of adaptive responses on the relationship between workload imbalance and audit quality

We next discuss cases in which adaptive responses have a beneficial impact on audit quality. The use of interim audits is an adaptive response to workload imbalances that may have a positive impact on audit quality. Interim audits involve conducting some audit procedures before the fiscal year-end and are particularly useful when auditors are aware of audit deadlines before their audit engagement begins. Consequently, they can factor in these deadlines and staff constraints in advance and shift some audit procedures to an earlier interim period rather than performing them at year end. Shifting audit procedures to the interim audit reduces staff time and the overall time required for the year-end audit, potentially mitigating any deterioration in audit quality. We first examine whether auditors increase the time spent on an interim audit as an adaptive response to conducting audits during a busy season with workload imbalances, and then analyze whether more interim audits are associated with higher audit quality. We formally state the following hypotheses:

HYPOTHESIS 4. *Auditors increase interim audits in the presence of workload imbalance.*

HYPOTHESIS 5. *A higher proportion of time spent by auditors during interim audits in response to workload imbalance is associated with higher audit quality.*

3. Model specification

Auditor-hours by rank

The Act on External Audit of Stock Companies Article 7-2 mandates that all audit firms in Korea disclose the number of auditors involved in audit engagements and the auditor-hours devoted to these engagements. This includes a breakdown of staff member numbers and auditor-hours by audit partners, senior auditors (i.e., audit seniors and audit managers based on the Act on External Audit of Stock Companies, which considers senior auditors as those with more than three years of experience), junior auditors (i.e., staff auditors), review partners, and nonaudit experts. Appendix 1 illustrates the numbers of auditors and auditor-hours by rank for the audit of Samsung Electronics in 2014.[7]

Proxy for workload imbalance

The External Audit of Stock Companies Article 7-2 also mandates that audit firms disclose the start and end dates of each fieldwork assignment, which enables us to operationalize workload imbalance and analyze audits conducted at the engagement level. We proxy for workload imbalance by determining auditors' busy seasons, which are periods during which there are major spikes in the number of engagements.

7. In 2014, PwC reported using 110 auditors and 43,411 auditor-hours in total. Fifty-nine of these were senior auditors (which included managers and audit seniors). The number of auditors is adjusted for part-time staff in the audit team. For example, assume that three auditors spend 4, 6, and 8 hours per day on an audit engagement; then the number of auditors disclosed would be 2.25, taking the total hours (18 hours) divided by, say, 8 hours a day. However, the data disclosed do not show the fractional auditor-hours in detail, potentially causing some measurement error and weakening the power of our tests to reject the null hypotheses.

To measure an audit firm's busy season, we first count the number of engagements an audit firm has on a particular date. If this number exceeds 20 percent of the audit firm's total number of clients, we define this date as a busy date. In general, busy dates occur consecutively over a period.[8] For such scenarios, we use the first and last busy dates to mark a busy season. Appendix 2 shows how we calculate the busy season of PwC Korea for 2014, which spans the period from January 26 to February 13.

The audit execution data provide the beginning and ending dates of fieldwork for each audit engagement. Utilizing these data, we regard an audit as a "busy-season audit" if 70 percent or more of the fieldwork period falls within the busy-season period. In sensitivity analysis, we use 60 and 80 percent as alternative benchmarks to classify busy-season audits to check whether the results are robust to these specifications. The number of audit engagements classified as busy-season audits does not change regardless of the cutoff points, and the results of our subsequent analyses remain qualitatively unchanged.

Audit quality measures

We use three proxies for audit quality: absolute-performance-matched discretionary accruals (*ABDA*), signed-performance-matched discretionary accruals (*PMDA*), and misstatements of financial reports (*MISSTATE*). Our two discretionary accruals measures capture a firm's aggressive interpretations and applications of GAAP. Following Kothari et al. (2005), we use *ABDA* and *PMDA*. For the signed-accruals dependent variables, we focus on income-increasing *PMDA* ($PMDA > 0$) because auditors are more concerned about constraining managers' attempts to increase income (Nelson et al. 2005), and present separate results for income-decreasing *PMDA* ($PMDA < 0$). To estimate discretionary accruals, we control for firm performance using return on assets (*ROA*) given that the accruals of firms with unusual performance are likely to be systematically nonzero. We calculate performance-matched discretionary accruals by matching a given firm with a control firm that has the most similar firm-year performance.[9]

Discretionary accrual measures capture within-GAAP earnings management. By contrast, misstatements (*MISSTATE*) capture corrections for GAAP violations or errors in prior financial reports and reflect an auditor's failure to report GAAP-inconsistent treatments. While prior studies employ corrections for material prior-year errors (commonly referred to as restatements in the literature) as a proxy for audit quality (Kinney et al. 2004; Coram et al. 2004; Francis et al. 2013), our *MISSTATE* measure includes corrections for both material and immaterial prior-year errors. Documentation of corrections for immaterial errors is available during our sample period, and including them not only enhances the power of our tests, but also allows us to capture "at-the-margin" material prior-period errors that may have been strategically classified downwards as immaterial.[10] Such corrections for immaterial errors are associated with reliable positive market

8. When we employ a cutoff point of 20 percent, the typical busy season for an end-of-year audit is about three weeks, which is quite close to the clustering interval of clients observed in Table 2. On the other hand, the busy season becomes about one and a half weeks when we use a 30 percent cutoff point, which is much shorter than the clustering interval observed. Therefore, it appears that 20 percent better reflects audit firms' busy seasons.

9. Specifically, we match firms by 2-digit industry and *ROA* quintiles and then subtract the mean value of discretionary accruals (*DA*) for the same *ROA* quintile from firm *j*'s *DA*.

10. One limitation of using corrections for material errors (i.e., restatements) as a proxy for audit quality is its low frequency, undermining statistical power (DeFond and Zhang 2014; Song et al. 2008). Additionally, accounting standards covering the treatment of misstatements provide little guidance for assessing the materiality of a misstatement, although determining whether a prior period error will result in a restatement hinges on its materiality. The SEC observes that, in the absence of guidance from the Boards, some regulators (e.g., the SEC staff and some foreign regulators) have established their own guidance regarding evaluations of materiality (SEC 2011). In Korea, under K-GAAP, an entity must restate its financial statements to correct material prior-period errors, and if the errors are immaterial, an entity must adjust the effects as a nonoperating item in an income-statement account. In the transition period to IFRS adoption, some entities employed the principles under K-GAAP and adjusted the ending balances as a nonoperating item in an income-statement account in cases where prior-period errors were immaterial. Our sample increases from 91 (8.9 percent) using corrections for material errors alone to 134 (13.2 percent) using corrections for both material and immaterial errors.

reactions and are value-relevant (see Choudhary et al. 2016, who draw this conclusion using data related to corrections of immaterial errors disclosed in Audit Analytics). We code *MISSTATE* as one if the year-end financial statements are subsequently restated or reflect a prior-year error correction in the income statement, and zero otherwise.

Research design

To test Hypothesis 1, we estimate the following model based on prior audit quality studies (e.g., Becker et al. 1998; Bills et al. 2016; Goodwin and Wu 2016) after pooling across 1,016 audit engagements conducted in Korea in fiscal year 2014:

$$\begin{aligned} ABDA\,(PMDA, MISSTATE) = {} & \alpha_0 + \alpha_1 BUSY + \alpha_2 SIZE + \alpha_3 LEV + \alpha_4 ROA + \alpha_5 MTB + \alpha_6 INVREC \\ & + \alpha_7 EXPORT + \alpha_8 LOSS + \alpha_9 SALEGR + \alpha_{10} SALEVOL \\ & + \alpha_{11} CFO + \alpha_{12} CFOVOL + \alpha_{13} ALTMANZ + \alpha_{14} FIRST \\ & + \alpha_{15} BIG + \alpha_{16} TENURE + \alpha_{17} INTERIM + Industry\ dummy + \varepsilon. \end{aligned} \tag{1}$$

We follow Bills et al. (2016) and use the same control variables for the dependent variables *ABDA*, *PMDA*, and *MISSTATE*. To mitigate the effects of extreme values, we winsorize all continuous control variables in equation (1) at the top and bottom 1 percent.[11] We use ordinary-least-square models for the continuous dependent variables (*ABDA* or *PMDA*), and logit models for our indicator dependent variable (*MISSTATE*). We use robust standard errors to correct for potential heteroscedasticity. Appendix 3 provides the definitions and measurements for all variables in equation (1). The test variable is our proxy for workload imbalance, busy season (*BUSY*), a dummy variable that equals one if a firm receives an end-of-year external audit from an audit firm during a busy season, and zero otherwise. Since larger values of abnormal accruals and misstatements imply lower audit quality, we expect α_1 in equation (1) to be positive if workload imbalance is associated with lower audit quality.

We include in our model several control variables that are likely to influence audit quality. We expect client size (*SIZE*) to be negatively correlated with discretionary accruals/misstatements (Becker et al. 1998). We include leverage (*LEV*) as companies with more debt in their capital structures have greater incentives to manage earnings due to debt covenant constraints (DeFond and Jiambalvo 1994). We include *ROA* to control for the effect of performance on our audit quality proxies (Kasznik 1999; Kothari et al. 2005). Following Hribar and Nichols (2007), we control for capital market pressures to manage earnings and include a market-based variable, market-to-book ratio (*MTB*), as a proxy for risk and growth. We use the ratio of inventory and accounts receivables scaled by total assets (*INVREC*) and ratio of export sales to total sales (*EXPORT*) as proxies for the scope and complexity of a client firm's business, respectively. We expect auditor-hours to be positively related to these variables. We also expect that firms with negative earnings (*LOSS*) will have a negative association with audit quality. Following Francis and Yu (2009), we also include the following control variables, as they are associated with audit quality: one-year growth rate in sales (*SALEGR*) (Menon and Williams 2004); volatility of sales growth (*SALESVOL*) measured by the standard deviation of sales for the most recent three fiscal years (Hribar and Nichols 2007); operating cash flows (*CFO*) (Dechow et al. 1995); cash flow volatility (*CFOVOL*), measured by the standard deviation of cash flows for the most recent three fiscal years (Doyle et al. 2007; Hribar and Nichols 2007); and a summary measure of financial distress based on the Altman bankruptcy model (*ALTMANZ*). To control for the auditor effect on audit

11. Observations that exceed three standard deviations of their values comprise 0.3 percent of the overall sample. Standard errors for all variables change little as we move from trimming observations at three standard deviations to trimming or winsorizing 1 percent of the observations.

quality (Johnson et al. 2002; Myers et al. 2003), we include a first-year audit dummy (*FIRST*) and auditor tenure (*TENURE*) in the primary analyses. Big 4 auditors typically spend more effort/time on an audit than non-Big 4 auditors because Big 4 audit firms are more likely to be exposed to litigation risk (Simunic and Stein 1996). Therefore, we include a Big 4 versus non-Big 4 dummy variable (*BIG*), which controls for this difference. In addition, we add the interim audit variable (*INTERIM*) to the regression model because we expect the effect of busy-season audits on audit quality to be conditional on the extent and nature of interim audit work.

Hypothesis 2 predicts that auditors can modify the mix of auditors of various ranks in response to workload imbalances. To test Hypothesis 2, we separately estimate each of the following regressions:

$$\begin{aligned}
&EoY\ (AUD,\ ReviewPRT,\ PRT,\ SEN,\ JUN,\ NonAudEXPT)_ratio \text{ or}\\
&LEoY\ (AUD,\ ReviewPRT,\ PRT,\ SEN,\ JUN,\ NonAudEXPT)_HR\\
&\quad = \beta_0 + \beta_1 BUSY + \beta_2 SIZE + \beta_3 LEV + \beta_4 ROA + \beta_5 MTB + \beta_6 LOSS\\
&\qquad + \beta_7 NSUB + \beta_8 EXPORT + \beta_9 FIRST + \beta_{10} TENURE + \beta_{11} INTERIM\\
&\qquad + Industry\ dummy + Audit\ Firm\ dummy + \varepsilon. \qquad (2)
\end{aligned}$$

Equation (2) examines the effects of busy-season audits on end-of-year auditor-hour ratios or logged end-of-year audit hours according to each auditor's rank. *EoYAUD_ratio* refers to the proportion of end-of-year auditor-hours to total auditor-hours. End-of-year auditor-hour ratios by rank (*EoYReviewPRT_ratio*, *EoYPRT_ratio*, *EoYSEN_ratio*, *EoYJUN_ratio*, and *EoYNonAudEXPT_ratio*) are the proportions of auditor-hours for review partners, engagement partners, senior auditors, junior auditors, and nonaudit experts, respectively, divided by end-of-year auditor-hours. *LEoYAUD_HR* refers to the logarithm of the number of end-of-year auditor-hours. Logged values of end-of-year auditor-hours by rank (*LEoYReviewPRT_HR*, *LEoYPRT_HR*, *LEoYSEN_HR*, *LEoYJUN_HR*, and *LEoYNonAudEXPT_HR*) are the logarithms of the number of end-of-year auditor-hours spent by review partners, engagement partners, senior auditors, junior auditors, and nonaudit experts, respectively. The auditor-hour ratios by rank measures control for varying end-of-year auditor-hours across audit engagements, and reflect the fact that auditors consider the overall mix of auditor-hours by rank (and the hours of involvement of an auditor rank relative to that of other auditor ranks) in their audit programs. The use of raw auditor-hours by rank (which does not control for end-of-year total auditor-hours) can lead to a misclassification when comparing engagements with varying end-of-year total auditor-hours. Prior studies that employ auditor-hours by rank also use a similar approach (e.g., Bell et al. 2008). The use of raw auditor-hours by rank has the advantage of delineating the effects of auditor-hours, or the numerator effect, in the ratio measure. We use both ratio and logged auditor-hours in our tests of Hypotheses 2 and 3. If busy seasons (*BUSY*) reduce audit staff allocation, β_1 will be significantly negative.

The correlation between firm size and the proportions of end-of-year auditor-hours by rank is significant at the 1 percent level.[12] These results highlight the importance of controlling for engagement size because the ratio of end-of-year auditor-hours may simply capture a size effect. To control for the correlation between audit staff composition and firm size, we analyze the effects of busy-season audits on the size-adjusted proportion of end-of-year auditor-hours by auditor rank using the following approach. First, we form five portfolios based on client firm size. Second, we calculate the median of the proportion of end-of-year auditor-hours by rank (the ratio

12. The correlations (untabulated) between firm size and the proportions of end-of-year auditor-hours, review partners, engagement partners, senior auditors, junior auditors, and nonaudit experts are −0.265, −0.203, −0.267, −0.111, 0.171, and 0.324, respectively, and they are significant at the 1 percent level. The results using size-unadjusted end-of-year auditor-hours by rank are largely similar to those using size-adjusted ratios as dependent variables.

of end-of-year auditor-hours by rank to total end-of-year auditor-hours) in each size quintile. Third, we subtract the median from the proportion of end-of-year auditor-hours by rank to obtain the size-adjusted proportion of end-of-year auditor-hours by rank. As Table 5 shows, the correlation between the size-adjusted proportion of end-of-year auditor-hours and firm size is not significant at conventional levels. Similarly, we also employ size-adjusted end-of-year auditor-hours by rank because the calculation of auditor-hours may not consider engagement size.

We control for variables that determine auditor-hours. Auditors spend more time on bigger and more complex clients (O'Keefe et al. 1994); we proxy for client size by the logarithm of total assets,[13] and for the scope and complexity of a client firm's business by *NSUB* and *EXPORT*. Auditors spend more time on riskier clients (Ashbaugh et al. 2003), and we proxy a client's risk characteristics by *LEV*, *ROA*, *MTB*, and *LOSS*; the coefficients on *LEV*, *MTB*, and *LOSS* are expected to be positive, and that on *ROA* to be negative. We include an auditor-related variable, initial audit engagement (*FIRST*), as new auditors spend more effort/time to understand the business of a new client. We also include another auditor-related variable, auditor tenure (*TENURE*), as auditors spend more effort/time to obtain evidence in the initial years of the auditor-client relationship, implying a negative coefficient on *TENURE*. We add the *INTERIM* variable because interim audits influence end-of-year auditor-hours. We include *Audit Firm* fixed effects to control for variations in the way audit firms vary their staff allocations for busy season audits.

The differential allocation of time by auditors of each rank can affect audit quality. To test the effects of the differential time spent by auditors of each rank in response to busy seasons on audit quality (Hypothesis 3), we use the following equation:

$$\begin{aligned} ABDA\,(PMDA, MISSTATE) = {} & \alpha_0 + \alpha_1 BUSY + \alpha_2 Low\_ratio\,(\text{or}\,Low\_HR) + \alpha_3 BUSY \\ & \times Low\_ratio\,(\text{or}\,Low\_HR) + \alpha_4 SIZE + \alpha_5 LEV + \alpha_6 ROA \\ & + \alpha_7 MTB + \alpha_8 INVREC + \alpha_9 EXPORT + \alpha_{10} LOSS \\ & + \alpha_{11} SALEGR + \alpha_{12} SALEVOL + \alpha_{13} CFO + \alpha_{14} CFOVOL \\ & + \alpha_{15} ALTMANZ + \alpha_{16} FIRST + \alpha_{17} BIG + \alpha_{18} TENURE \\ & + \alpha_{19} INTERIM + Industry\ dummy + \varepsilon. \end{aligned} \quad (3)$$

Equation (3) examines the effect on audit quality of reduced time spent by auditors at each rank during busy seasons. We code *Low_ratio* (*Low_HR*) in equation (3) as one if the proportion (number) of end-of-year auditor-hours at each rank is below the median in each size quintile, and zero otherwise. The lower proportion (the smaller number) of hours spent by auditors at each rank in response to busy-season audit engagements can be associated with lower audit quality. In that case, α_3, the coefficient on *BUSY*×*Low_ratio* (*Low_HR*), will be significantly positive.

Hypothesis 4 investigates whether auditors increase the time spent on an interim audit in response to busy-season audits. In addition, we examine the effects of interim audits on the relationship between busy-season audits and audit quality (Hypothesis 5). It should be noted that larger firms are more likely to have more extensive interim audits due to stronger controls and more complex transactions, which, in turn, can lead to higher audit quality. Consistent with this premise, the correlation between the size-unadjusted interim-auditor-hours ratio (interim-auditor-hours/total auditor-hours) and firm size is 0.2648, which is significantly positive at the 1 percent level. To control for the effect of firm size in our test of the effect of interim audits on audit quality, we take the following steps to calculate the size-adjusted interim ratio, denoted as

13. Notwithstanding the use of size-adjusted auditor-hour measures, we also include *SIZE* as a control variable because in some specifications, we observed a significant coefficient on the *SIZE* control variable. Results are largely similar when we exclude the *SIZE* control variable except in two circumstances: in the test of Hypothesis 2, *EoYPRT_ratio* becomes insignificant; in the test of Hypothesis 5, with *MISSTATE* as dependent variable, the interaction term *BUSY*×*INTERIM* becomes insignificant while the interaction term *BUSY*×*LINTERIM_HR* becomes significant.

TABLE 1
Procedures for sample selection

Firms listed on the Korean stock market with December-fiscal-year-end dates in nonfinancial industries in 2014	1,525
Minus firms that do not disclose fieldwork start and end dates	(183)
Minus firms audited by audit firms with fewer than 10 listed companies as clients	(218)
Minus firms audited by audit firms with no busy seasons	(37)
Minus firms with missing variables	(71)
Final sample	1,016

Notes: Audit firms which can spread their end-of-year audit engagements throughout the year may not have busy seasons. In this paper, we define a busy date for an audit firm to be one when they are conducting end-of-year audit fieldwork for more than 20 percent of their total number of clients on a particular date. If audit firms do not have busy dates, their engagements are eliminated from our sample.

INTERIM_ratio. First, we sort the sample in ascending order with respect to firm size and calculate the median value of the size-unadjusted interim-auditor-hours ratio (interim-auditor-hours/ total auditor-hours) in each size quintile. Second, we subtract this median value from the size-unadjusted interim-auditor-hours ratio within each quintile to derive *INTERIM_ratio*. As Table 5 shows, the correlation between *INTERIM_ratio* and firm size (*SIZE*) is −0.011 and not significant at conventional levels. *INTERIM_ratio* is skewed, and we code the dummy variable *INTERIM* as one if *INTERIM_ratio* is greater than the median within each quintile, and zero otherwise.[14] We also employ *LINTERIM_HR*, the logarithms of size-adjusted interim audit hours, to capture the extent of interim audits. We predict that more interim audits are associated with higher audit quality, or less audit quality deterioration, even if the related audit fieldwork is conducted during busy seasons.

4. Sample selection and descriptive statistics

Data and sample selection

In August 2014, Korea's Financial Supervisory Service (FSS, similar to the SEC in the United States) announced a revision of the Act on External Audit of Stock Companies. This Act requires audit firms to provide detailed data in clients' audit reports on the conduct of audits to ensure that auditors spend sufficient time to maintain high audit quality. The required data include the number of auditors and auditor-hours by rank, and the percentage of time spent on audit planning, fieldwork, and substantive testing before year-end, along with the start and end dates of the fieldwork (Table 1).

We identify all December-fiscal-year-end firms listed on the Korean Stock Exchange and Korea Securities Dealers Automated Quotations in 2014. We manually collect auditor-hour information from each firm's audit reports as included on the FSS disclosure website, and obtain financial data from TS 2000 (the Compustat-equivalent in Korea), and market-related data from FnGuide (the I/B/E/S-equivalent in Korea).

We obtain an initial sample of 1,525 firms from the KIS Value database from Korea Investors Service, Inc. (KIS).[15] We exclude 183 firms that do not disclose fieldwork start and end dates, and 218 firms audited by audit firms with fewer than 10 listed companies as clients. These criteria ensure that audit firms have sufficient engagements to be properly classified as having a busy season. As a result, we exclude 37 audit firms with no busy seasons, thus alleviating the problem of potential selection bias. We also exclude 71 firms with missing financial variables. The final sample contains 1,016 firms. We collect the corrections of material prior-period errors

14. Fisher's skewness coefficient is −7.822 (p = 0.0001), indicating that the distribution is highly skewed to the left.
15. KIS is a professional credit-rating agency in Korea and an affiliate of Moody's. The KIS Value database includes financial statement information.

from the footnotes to the financial statements of the firms in our study, and the corrections of immaterial prior-period errors from the income statements.

Descriptive statistics

Table 2 shows the aggregate number of clients with December fiscal year-ends, split by the date where fieldwork is performed by auditors for the three-month period after the fiscal year-ends. We cover the period from January 2, 2015, to March 27, 2015. Numbers in bold indicate the number of clients greater than 250. There is a spike in the number of clients on January 26, and

TABLE 2

Aggregate number of clients with December fiscal year-ends, split by the date where fieldwork is performed by auditors for the three-month period after the fiscal year-ends (clustering indicated in bold)

Date	Number of clients by date
2015-01-02	1
2015-01-05	4
2015-01-06	7
2015-01-07	14
2015-01-08	20
2015-01-09	22
2015-01-12	58
2015-01-13	61
2015-01-14	71
2015-01-15	77
2015-01-16	81
2015-01-19	140
2015-01-20	147
2015-01-21	171
2015-01-22	182
2015-01-23	180
2015-01-26	**254**
2015-01-27	**263**
2015-01-28	**287**
2015-01-29	**281**
2015-01-30	**280**
2015-02-02	**335**
2015-02-03	**341**
2015-02-04	**375**
2015-02-05	**377**
2015-02-06	**360**
2015-02-09	**385**
2015-02-10	**381**
2015-02-11	**425**
2015-02-12	**418**
2015-02-13	**393**
2015-02-16	**253**
2015-02-17	216
2015-02-23	250
2015-02-24	230
2015-02-25	235
2015-02-26	195
2015-02-27	182

(The table is continued on the next page.)

TABLE 2 (continued)

Date	Number of clients by date
2015-03-02	111
2015-03-03	95
2015-03-04	90
2015-03-05	73
2015-03-06	61
2015-03-09	24
2015-03-10	20
2015-03-11	16
2015-03-12	16
2015-03-13	16
2015-03-16	14
2015-03-17	11
2015-03-18	11
2015-03-19	8
2015-03-20	7
2015-03-23	5
2015-03-24	4
2015-03-25	4
2015-03-26	3
2015-03-27	2

this spike continues over a three-week period until February 16[16] and sharply trails down in early March. Our proxy for busy seasons results in a three-week busy season, which closely corresponds to this observed clustering. Overall, the figure shows that the dates in which auditors perform fieldwork are clustered within three to five weeks for the three-month period after the fiscal year-ends.

In Figure 1, we draw a timeline with the following stages: audit planning, quarterly reviews, internal control evaluations, and end-of-year audits. The total number of auditor-hours (*AUD_HR*) consists of interim-auditor-hours (*INTERIM_HR*) and end-of-year auditor-hours (*EoYAUD_HR* = *AUD_HR* − *INTERIM_HR*). Interim-auditor-hours include hours spent on audit planning, quarterly reviews, and internal control evaluations, while end-of-year auditor-hours include all auditor-hours worked after the fiscal year-end on year-end fieldwork, engagement quality-control reviews, and audit report preparation. Consequently, *FIELD_DAY*, the number of days required for auditors to collect audit evidence from clients after fiscal year-end, is a subset of the number of days required for an end-of-year audit. This is because, in addition to fieldwork, audit firms devote hours to the conduct of the review partner's review and the preparation of their audit reports.

Table 3 presents relevant summary statistics for the variables. The total auditor-hours (*AUD_HR*) are 1,490.9, which comprise 997.8 auditor-hours spent before the end-of-year (*INTERIM_HR*) and 493.1 end-of-year auditor-hours (*EoYAUD_HR*). We divide *EoYAUD_HR* into hours spent by review partners (*EoYReviewPRT_HR*; 7.5 hours), engagement partners (*EoYPRT_HR*; 36.4 hours), senior auditors (*EoYSEN_HR*; 313.1 hours), junior auditors (*EoYJUN_HR*; 112.9 hours), and nonaudit experts (*EoYNonAudEXPR_HR*; 23.2 hours).

16. An audit firm needs three to five days to issue its auditor's report after the end of fieldwork, given that the review partners require sufficient time to conduct the review work and for the engagement partners to sign off on the auditor's report. Client firms must issue and distribute their audited financial statements one week before the shareholders' meeting and file the business report with the FSS before the end of March. This suggests that auditors ought to finish their audits two weeks before the end of March. Thus, we observe that the last two weeks of March are free of audit engagements.

The average value of *BUSY* is 0.66, implying that 66 percent of the audit engagements entail fieldwork that is conducted during a busy season. The mean value of the size-unadjusted *INTERIM_ratio* (= *INTERIM_HR/AUD_HR*) is 0.669, indicating that 66.9 percent of the total auditor-hours are used before the inclusion of post-fiscal-year-end fieldwork.[17] This implies that auditors spend approximately 997.8 hours on audit planning, quarterly reviews, tests of controls, and interim audits.

5. Empirical results

Univariate analysis: Busy-season audits versus nonbusy-season audits

Table 4 shows that the total end-of-year auditor-hours (*EoYAUD_HR*) during busy seasons is 484.5, and the average time spent conducting fieldwork (*FIELD_DAY*) is 7.11 days. The end-of-year auditor-hours include fieldwork, fieldwork review, and audit report preparation. It usually takes between three to five days for an auditor to conduct a post-fieldwork review and prepare their audit report. Hence, we deduct this time from the numerator when computing the average end-of-year auditor-hours spent on fieldwork per day for an audit team. The latter ranges from 63 to 65 hours per day ($(484.5 - 24)/7.11 \approx 65$; $(484.5 - 40)/7.11 \approx 63$), assuming an eight-hour workday.

However, this number should be interpreted with caution, because, like review partners, engagement partners and nonaudit experts are less likely to be fully involved in fieldwork. In fact, the total end-of-year auditor-hours of review partners, engagement partners, and nonaudit experts are 7.6, 35.2, and 23.0 hours (see Table 4), respectively. In contrast, we expect that senior auditors and junior auditors will be fully engaged in the field after the fiscal year-end. Indeed, the average auditor-hours per day during fieldwork after the fiscal year-end are 42.9 (305 hours/7.11 days) for senior auditors and 16.0 (114 hours/7.11 days) for junior auditors. The corresponding average end-of-year auditor-hours of a senior auditor during fieldwork is 12.4 hours per day (42.9 hours per day/3.47 senior auditors), and that for a junior auditor is 10.7 hours per day (16.0 hours per day/1.49 junior auditors). A 12.4-hour workday implies that senior auditors work 50 percent more than the eight-hour workday of a normal worker, which likely increases auditor fatigue and adversely impacts audit effectiveness.

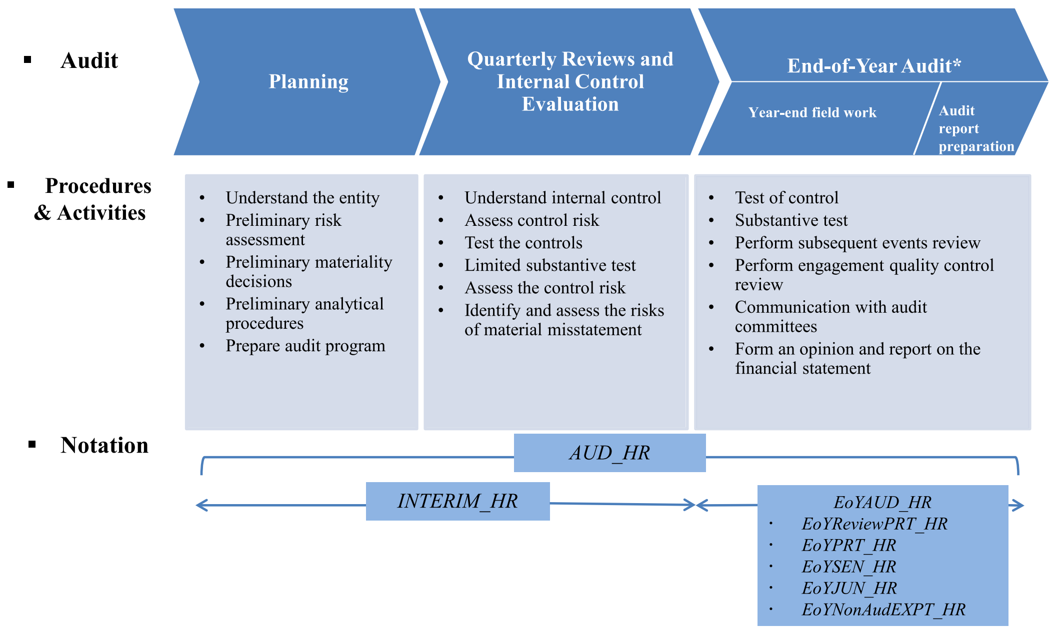
The average number of fieldwork days during a nonbusy season is 8.3 days, which is 18.57 percent higher than the number of fieldwork days during a busy season (7.1 days).[18] This 1.2-day difference implies either that auditors work overtime to achieve the equivalent fieldwork hours or fieldwork hours are reduced. However, we note that auditors are likely to be involved in multiple audit engagements, so it may be difficult to complete the appropriate fieldwork hours even if auditors work overtime. Recall that auditors experience 11- to 12-hour workdays during busy seasons. Therefore, there is a real possibility that auditors "cut corners" in their procedures due to the reduced time available and the fatigue resulting from working long hours. This can lead to lower audit quality.

Table 4 presents univariate analyses of audit quality variables for busy-season audits and nonbusy-season audits, as well as end-of-year auditor-hours variables. Our proxies for audit quality, *ABDA* and *PMDA*, are greater for clients audited during busy seasons than for those audited during nonbusy seasons. In addition, the mean of *MISSTATE* for busy-season audits (0.148) is greater than that for nonbusy-season audits (0.101) and is significant at the 5 percent level. The size-adjusted end-of-year review-partner-hours ratio and junior-auditor-hours ratio are significantly greater for busy-season than nonbusy-season audits, but the opposite is true for the

17. In Table 3, we present the size-adjusted statistics of *INTERIM_ratio* and the end-of-year hour ratios by rank. For brevity, the size-unadjusted statistics of these ratios are not tabulated.

18. The number of partners, senior auditors, and junior auditors working on audits does not differ significantly between busy and nonbusy seasons. This suggests that the number of auditors by rank assigned to an audit is more or less fixed ahead of time, and does not change pre- and post-busy season. The total end-of-year auditor-hours also do not differ between busy and nonbusy seasons. On the other hand, during the busy season, the number of review-partner hours spent after fiscal year-end (*EoYReviewPRT_HR*) tends to increase, while the number of senior-auditor hours spent after fiscal year-end (*EoYSEN_HR*) tends to significantly decrease.

Figure 1 Audit procedures and audit variables notation



* The end-of-year audit can be roughly divided into year-end field work and audit report preparation period. Audit evidence is gathered through year-end field work and audit report is prepared after internal review process.

Notes: Although the number of auditor-hours expended before the end of a year affects auditors' engagement risks and the range of substantive tests, a deficiency in time and human resources during the end-of-year period can cause audit quality to deteriorate. In our analyses, we divide auditor-hours into interim-auditor-hours (*INTERIM_HR*) and end-of-year auditor-hours (*EoYAUD_HR*). Interim-auditor-hours include the time spent on audit planning, quarterly reviews, and internal control evaluations. On the other hand, end-of-year auditor-hours includes the time spent on inventory checks, fieldwork, engagement quality-control reviews, and forming an audit opinion.

size-adjusted senior-auditor-hours ratio. Similarly, the size-adjusted end-of-year review-partner hours are significantly greater for busy-season than nonbusy-season audits, while the size-adjusted senior-auditor hours are significantly smaller for busy-season than nonbusy-season audits. In contrast, there are no significant differences in the control variables (including risk-related variables) between the two groups, except for the *BIG* variable. It appears that audit firms do not systematically conduct high (or low) risk audits based on whether it is during a busy (or nonbusy) season.

Table 5 shows the Pearson correlations among selected variables.[19] The association between *PMDA* and *BUSY* is significantly positive (p-value < 0.05), indicating that audit quality is lower for audits during busy seasons. There is a significantly positive correlation between *MISSTATE* and *BUSY*, indicating a higher frequency of misstatements during busy-season audits than during nonbusy-season audits.

Effects of busy-season audits on audit quality

Table 6 presents the test results of busy-season audit effects on audit quality. We use *ABDA*, *PMDA* > 0, *PMDA* < 0, and *MISSTATE* as dependent variables. The coefficients on *BUSY* are significantly positive for *ABDA* and *PMDA* > 0. Column 5 presents the regression results when we use *MISSTATE* as the dependent variable. The coefficient on *BUSY* is statistically significant and

19. To test for multicollinearity, we check the variance inflation factor. The maximum variance inflation factor for the variables in Table 5 is 3.18, indicating that multicollinearity is not a serious problem in our regression models.

TABLE 3
Descriptive statistics

Variables	Mean	SD	Min.	Median	Max
FIELD_DAY	7.519	5.508	2.000	5.000	40.000
ReviewPRT_Num	2.017	1.357	1.000	2.000	13.000
PRT_Num	1.103	0.308	1.000	1.000	3.000
SEN_Num	3.460	2.606	0.750	3.000	66.810
JUN_Num	1.440	1.520	0.000	1.250	24.190
NonAudEXPT_Num	2.847	3.936	0.000	1.000	28.000
AUD_HR	1,490.898	1,344.040	392.000	1,049.500	8,120.000
INTERIM_HR	997.825	944.393	79.000	674.612	6,745.439
EoYAUD_HR	493.072	457.670	76.667	366.250	3,841.095
EoYReviewPRT_HR	7.520	6.098	1.000	6.000	38.964
EoYPRT_HR	36.439	35.495	4.364	24.000	204.000
EoYSEN_HR	313.082	296.433	59.545	234.523	2,371.759
EoYJUN_HR	112.872	144.427	0.000	78.633	1,019.077
EoYNonAudEXPT_HR	23.159	45.848	0.000	1.500	271.361
EoYAUD_ratio	−0.006	0.054	−0.190	0.000	0.134
EoYReviewPRT_ratio	0.002	0.010	−0.013	0.000	0.039
EoYPRT_ratio	0.034	0.088	−0.046	0.000	0.337
EoYSEN_ratio	−0.007	0.159	−0.369	0.000	0.296
EoYJUN_ratio	−0.002	0.159	−0.257	0.000	0.365
EoYNonAudEXPT_ratio	0.019	0.051	−0.063	0.000	0.202
INTERIM_ratio	−0.007	0.093	−0.297	0.000	0.193
LEoYAUD_HR	0.000	0.481	−1.675	−0.018	1.554
LEoYReviewPRT_HR	0.000	0.627	−2.244	−0.016	2.007
LEoYPRT_HR	0.000	0.778	−2.164	−0.080	2.217
LEoYSEN_HR	0.000	0.538	−1.494	0.025	1.627
LEoYJUN_HR	0.000	0.731	−2.928	0.034	1.881
LEoYNonAudEXPT_HR	0.000	1.360	−3.796	0.149	2.983
LINTERIM_HR	0.000	0.446	−2.098	0.000	1.326
INTERIM	0.498	0.500	0.000	0.000	1.000
ABDA	0.051	0.056	0.000	0.033	0.352
PMDA	−0.001	0.073	−0.233	0.000	0.308
MISSTATE	0.132	0.339	0.000	0.000	1.000
BUSY	0.660	0.474	0.000	1.000	1.000
SIZE	19.275	1.465	16.545	19.015	24.153
LEV	0.463	0.228	0.065	0.465	1.078
ROA	0.016	0.093	−0.459	0.026	0.274
MTB	1.448	1.289	0.194	1.005	7.971
INVREC	0.282	0.151	0.014	0.279	0.714
EXPORT	0.170	0.277	0.000	0.000	0.959
LOSS	0.292	0.455	0.000	0.000	1.000
SALEGR	0.035	0.275	−0.673	0.018	1.412
SALEVOL	0.034	0.034	0.000	0.024	0.198
CFO	0.051	0.089	−0.288	0.048	0.323
CFOVOL	0.055	0.041	0.005	0.045	0.251
ALTMANZ	0.008	0.004	0.000	0.009	0.015
FIRST	0.156	0.364	0.000	0.000	1.000
BIG	0.666	0.472	0.000	1.000	1.000
TENURE	5.350	3.222	1.000	5.000	16.000
NSUB	0.954	1.060	0.000	0.693	5.380

Notes: All continuous variables are winsorized at the 1 and 99 percent levels. See Appendix 3 for variable definitions.

positive. These results are consistent with Hypothesis 1, which predicts workload imbalance is associated with lower audit quality.

To examine the economic significance of the key results, we take the mean values of all explanatory variables except *BUSY* in Table 5, and calculate the expected values of *ABDA* and income-increasing *PMDA (PMDA* > 0) for busy-season audits. Their expected values are 0.065 and 0.087, respectively. In contrast, the corresponding expected values for nonbusy-season audits are 0.056 and 0.076, respectively. Thus, *ABDA* and *PMDA* > 0 increase by 16.07 and 14.47 percent, respectively, for busy-season audits compared to nonbusy-season audits. As another measure of economic significance, the odds ratio in a logit model shows that the likelihood of misstatements (*MISSTATE*) increases by 19.38 percent for busy-season audits compared to nonbusy-season audits.

However, it is important to stress that we no longer find supporting evidence when we restrict the sample to corrections for material errors—that is, when excluding corrections for immaterial errors. A potential reason for this is the decrease in power caused by the exclusion of corrections for immaterial errors, and this comprises about one-third of the total error correction observations in our sample. Another reason is that auditors do permit some slack in audit quality unless it results in materially deficient financial reporting. We note that managers also have incentives to understate corrections for material errors by judging material errors as immaterial.

The influence of workload imbalance on auditor-hour allocation by auditor rank

Hypothesis 2 predicts that audit firms assign fewer auditors of each rank to audit engagements in the presence of a workload imbalance. Table 7 shows how auditors allocate auditor-hours in response to busy-season audits. Disaggregated labor hours by auditor rank allow for a more powerful test of audit firms' adjustments to busy seasons compared to aggregated hours. We use two measures of auditor-hour allocation: the proportion of end-of-year auditor-hours by auditor rank and the logged values of end-of-year auditor-hours by auditor rank. The ratio measure reflects the mix of auditor-hours by each auditor rank relative to the hours spent by all audit team members across all ranks. We compute this measure by scaling end-of-year auditor-hours for each rank by end-of-year total auditor-hours. Busy-season audits can affect both the numerator and denominator of this ratio. To isolate the effects of busy-season audits on the numerator, we also employ end-of-year auditor-hours for each rank. We take the log transformations for these measures because their distributions are skewed and have large variances.

In panel A, the dependent variables are *EoYAUD_ratio* [end-of-year total auditor-hours (*EoYAUD_HR*) divided by total auditor-hours], as well as *EoYReviewPRT_ratio*, *EoYPRT_ratio*, *EoYSEN_ratio*, *EoYJUN_ratio*, and *EoYNonAudEXPT_ratio*, which are the ratios of auditor-hours at each auditor rank to end-of-year total auditor-hours (*EoYAUD_HR*). In panel B, the dependent variables are *LEoYAUD_HR* (logged values of end-of-year total auditor-hours), as well as *LEoYReviewPRT_HR*, *LEoYPRT_HR*, *LEoYSEN_HR*, *LEoYJUN_HR*, and *LEoYNonAudEXPT_HR*. We include audit firm dummy variables to control for audit firm fixed effects.

In panel A, we observe an insignificant association between *BUSY* and *EoYAUD_ratio*, suggesting that auditors neither increase nor decrease the proportion of end-of-year auditor-hours as a percentage of total auditor-hours during busy seasons.[20] In addition, we find that *BUSY* is

20. We find that *BIG* is the only control variable that is significant for every dependent variable when we repeat the analysis in Table 7, panel A, by replacing the *Audit Firm* dummy variables with the *BIG* variable. We reason that Big 4 and non-Big 4 audit firms have different staff mixes and may differentially alter the staff mix for busy-season audits. The mean junior-auditor-hour ratio is 0.079 for non-Big 4 audit firms and 0.272 for Big 4 audit firms, indicating that non-Big 4 audit firms have a lower proportion of less experienced staff compared to Big 4 audit firms. Thus, non-Big 4 audit firms have greater constraints in changing junior-auditor-hours during busy season audits, whereas Big 4 audit firms have more discretion in shifting the staff allocation from high-level auditor-hours to low-level auditor-hours. In addition, the mean nonaudit expert hour ratio is 0.002 for non-Big 4 audit firms and 0.051 for Big 4 audit firms, indicating that the tendency for Big 4 audit firms to hire nonaudit experts is higher than that for non-Big 4 audit firms. This allows Big 4 audit firms to shift some of its job assignments to nonaudit experts.

TABLE 4 Descriptive statistics for firms audited during busy seasons and nonbusy seasons

Variables	Busy season (N = 671)		Nonbusy season (N = 345)		*t*-statistics for tests of difference in means
	Mean	*SD*	Mean	*SD*	
End-of-year audit engagement variables					
FIELD_DAY	7.109	4.976	8.316	6.350	−3.325***
ReviewPRT_Num	2.015	1.297	2.02	1.468	−0.060
PRT_Num	1.109	0.316	1.093	0.291	0.787
SEN_Num	3.471	3.016	3.438	1.523	0.194
JUN_Num	1.491	1.606	1.339	1.333	1.515
NonAudEXPT_Num	3.055	4.066	2.443	3.641	2.351**
AUD_HR	1,478.806	1,302.193	1,514.414	1,423.564	−0.400
INTERIM_HR	994.334	919.715	1,004.616	991.967	−0.124
EoYAUD_HR	484.472	444.359	509.799	482.733	−0.869
EoYReviewPRT_HR	7.603	5.900	7.359	6.472	0.605
EoYPRT_HR	35.179	34.711	38.892	36.901	−1.580
EoYSEN_HR	304.873	278.396	329.048	328.533	−1.231
EoYJUN_HR	113.853	147.649	110.964	138.136	0.302
EoYNonAudEXPT_HR	22.965	44.407	23.536	48.593	−0.188
Dependent variables					
ABDA	0.053	0.059	0.047	0.051	2.460**
PMDA	0.004	0.076	−0.011	0.066	3.229***
MISSTATE	0.148	0.355	0.101	0.302	2.058**
EoYAUD_ratio	−0.006	0.054	−0.006	0.052	−0.109
EoYReviewPRT_ratio	0.003	0.010	0.001	0.009	2.796***
EoYPRT_ratio	0.032	0.086	0.039	0.093	−1.297
EoYSEN_ratio	−0.013	0.163	0.004	0.151	−1.818*
EoYJUN_ratio	0.005	0.16	−0.016	0.156	2.008**
EoYNonAudEXPT_ratio	0.020	0.049	0.018	0.053	0.629
INTERIM_ratio	−0.005	0.094	−0.012	0.097	1.164
INTERIM	0.505	0.500	0.484	0.500	0.638
LEoYAUD_HR	−0.014	0.468	0.028	0.503	−1.313
LEoYReviewPRT_HR	0.024	0.612	−0.046	0.653	1.682*
LEoYPRT_HR	−0.027	0.756	0.053	0.817	−1.553
LEoYSEN_HR	−0.025	0.544	0.049	0.523	−2.096**
LEoYJUN_HR	−0.024	0.730	0.049	0.733	−1.284
LEoYNonAudEXPT_HR	−0.026	1.316	0.059	1.457	−0.675
LINTERIM_HR	−0.005	0.441	0.009	0.455	−0.487
Control variables					
SIZE	19.312	1.450	19.204	1.492	1.113
LEV	0.459	0.228	0.469	0.226	−0.654
ROA	0.019	0.088	0.010	0.101	1.383
MTB	1.412	1.299	1.517	1.269	−1.228
INVREC	0.286	0.152	0.275	0.149	1.125
EXPORT	0.168	0.277	0.174	0.279	−0.338
LOSS	0.294	0.456	0.290	0.454	0.124
SALEGR	0.037	0.262	0.032	0.298	0.269
SALEVOL	0.034	0.034	0.035	0.033	−0.598
CFO	0.049	0.089	0.055	0.089	−1.073
CFOVOL	0.055	0.043	0.055	0.038	0.092
ALTMANZ	0.008	0.004	0.008	0.004	0.501
FIRST	0.151	0.358	0.168	0.375	−0.730

(The table is continued on the next page.)

TABLE 4 (continued)

Variables	Busy season (*N* = 671)		Nonbusy season (*N* = 345)		*t*-statistics for tests of difference in means
	Mean	*SD*	Mean	*SD*	
BIG	0.690	0.463	0.620	0.486	2.235**
TENURE	5.414	3.255	5.226	3.157	0.882
NSUB	0.942	1.036	0.976	1.107	−0.483

Notes: See Appendix 3 for variable definitions. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed *t*-tests. The *t*-statistics are based on robust standard errors adjusted for heteroscedasticity.

negatively associated with *EoYSEN_ratio*, while *BUSY* is positively associated with *EoYReviewPRT_ratio*, *EoYPRT_ratio* and *EoYJUN_ratio*.[21]

In panel B, the coefficient on *LEoYAUD_HR* is negative and significant. In contrast, the coefficient on the corresponding ratio is insignificant in panel A, suggesting that both the numerator, *EoYAUD_HR*, and denominator, total audit hours, decline during busy-season audits, rendering the ratio insignificant. Similar to the ratio measure, the coefficient on *LEoYSEN_HR* is negative and significant. The coefficients on both *LEoYReviewPRT_HR*, *LEoYPRT_HR* and *LEoYJUN_HR* are statistically insignificant, in contrast to the significantly positive coefficients for the corresponding ratio measures. These results suggest that the positive coefficients on *EoYReviewPRT_ratio*, *EoYPRT_ratio*, and *EoYJUN_ratio* in panel A could be due to a lower denominator, end-of-year audit hours. To further explore this issue, we examine the numerators of *LEoYRevPRT_HR*, *LEoYPRT_HR*, and *LEoYJUN_HR*. Busy-season audits are associated with marginally higher review-partner-audit-hours compared to nonbusy-season audits (see Table 4). Therefore, *EoYReviewPRT_ratio* is associated with both an increasing numerator and a decreasing denominator, so significantly positive changes in the ratio can be due to changes in either the numerator or denominator or both. On the other hand, we find no significant effect of busy-season audits on engagement-partner-hours and junior-auditor-hours (see Table 4). Therefore, the significant coefficients on *EoYPRT_ratio* and *EoYJUN_ratio* are driven by a smaller-denominator effect.

Collectively, both the ratio and logged hour measures indicate that busy-season audits are associated with a decline in the involvement of senior auditors. The logged hours measure indicates no significant difference in the time involvement of auditors of other ranks. The ratio measure, which accounts for varying end-of-year total auditor-hours across engagements, implies that audit firms attempt to complement the decline in involvement of senior auditors by altering the mix of hours for auditors of other ranks. Specifically, audit firms increase the proportions of review-partner hours, engagement-partner-hours and junior-auditor-hours relative to total end-of-year auditor-hours. Nevertheless, the reduction in senior-auditor hours may be a source of concern. First, review partners perform a quality-control function and engagement partners take responsibility for the overall quality of each engagement, both of which mitigate the reduced time spent by senior auditors. However, this quality-control aspect may not be effective if the collection of initial evidence is incomplete. Second, junior auditors may not have sufficient fieldwork experience compared to senior auditors. Overall, these results are partially consistent with Hypothesis 2 in that audit firms assign fewer senior-auditor hours when they conduct audits when workload imbalance exists.

21. We re-run the regression without the size control variable to avoid redundancy since we employ size-adjusted dependent variables. The coefficient on *BUSY* for the dependent variable *EoYPRT_ratio* becomes insignificant when we exclude the *SIZE* control variable. Other than this, all the results remain unchanged in Table 7.

TABLE 5 Pearson correlations between the variables (N = 1,016)

ID	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)	*ABDA*	1.00															
(2)	*PMDA*	0.01	1.00														
(3)	*MISSTATE*	0.10*	−0.03	1.00													
(4)	*LEoYAUD_HR*	0.00	−0.06	0.05	1.00												
(5)	*LEoYReviewPRT_HR*	0.00	−0.03	0.05	0.48*	1.00											
(6)	*LEoYPRT_HR*	0.09*	0.02	0.06*	0.39*	0.30*	1.00										
(7)	*LEoYSEN_HR*	−0.02	−0.04	0.04	0.86*	0.35*	0.34*	1.00									
(8)	*LEoYJUN_HR*	−0.01	−0.04	0.03	0.61*	0.32*	0.29*	0.27*	1.00								
(9)	*LEoYNonAudEXPT_HR*	0.05	−0.10*	0.05	0.34*	0.29*	0.28*	0.12*	0.29*	1.00							
(10)	*EoYAUD_ratio*	0.01	−0.04	0.04	0.37*	0.17*	0.31*	0.34*	0.20*	0.03	1.00						
(11)	*EoYReviewPRT_ratio*	0.01	0.01	0.00	−0.28*	0.63*	−0.02	−0.33*	−0.15*	0.04	−0.11*	1.00					
(12)	*EoYPRT_ratio*	0.12*	0.06*	0.03	−0.18*	−0.06	0.74*	−0.18*	−0.13*	−0.02	0.13*	0.09*	1.00				
(13)	*EoYSEN_ratio*	−0.02	0.02	−0.01	−0.07*	−0.18*	−0.05	0.43*	−0.57*	−0.37*	0.00	−0.15*	−0.05	1.00			
(14)	*EoYJUN_ratio*	−0.04	−0.02	−0.01	0.15*	0.15*	−0.32*	−0.28*	0.67*	0.07	−0.07*	0.04	−0.42*	−0.83*	1.00		
(15)	*EoYNonAudEXPT_ratio*	0.03	−0.10*	0.02	0.13*	0.08*	−0.16*	−0.09*	0.08*	0.76*	0.01	−0.01	−0.23*	−0.41*	0.24*	1.00	
(16)	*INTERIM*	−0.02	−0.06*	−0.01	−0.52*	−0.26*	−0.29*	−0.49*	−0.30*	−0.04	−0.26*	0.15*	0.01	−0.06	0.01	0.11*	1.00
(17)	*INTERIM_ratio*	−0.03	−0.04	−0.03	−0.38*	−0.19*	−0.23*	−0.36*	−0.22*	−0.05	−0.15*	0.11*	−0.02	−0.03	0.02	0.07*	0.75*
(18)	*LINTERIM_HR*	−0.02	−0.12*	0.05	0.56*	0.27*	0.13*	0.44*	0.35*	0.33*	0.15*	−0.16*	−0.19*	−0.13*	0.17*	0.24*	0.41*
(19)	*BUSY*	0.05	0.10*	0.06*	−0.04	0.05	−0.05	−0.07*	−0.05	−0.03	0.00	0.09*	−0.04	−0.05	0.06*	0.02	0.04
(20)	*SIZE*	−0.19*	0.00	0.06	0.14*	0.08*	0.06	0.12*	0.09*	0.10*	0.03	−0.08*	−0.20*	−0.02	0.03	−0.06	−0.02
(21)	*LEV*	0.05	0.03	0.09*	0.12*	0.07*	0.13*	0.11*	0.10*	0.06	0.08*	−0.07*	0.00	0.00	−0.01	−0.04	−0.06
(22)	*ROA*	−0.17*	0.24*	−0.12*	−0.10*	−0.06	−0.10*	−0.08*	−0.09*	−0.10*	−0.11*	0.00	−0.07*	0.01	0.02	−0.01	−0.03
(23)	*MTB*	0.11*	−0.12*	−0.03	0.08*	0.02	0.05	0.06*	0.04	0.15*	0.03	−0.03	0.05	−0.02	−0.03	0.12*	−0.01
(24)	*INVREC*	0.00	0.15*	0.03	0.01	−0.06	0.06*	0.00	0.07*	−0.03	0.03	−0.08*	0.08*	−0.01	−0.01	−0.02	0.02
(25)	*EXPORT*	0.01	−0.07*	−0.06	0.00	0.01	−0.02	0.01	0.07	−0.01	0.00	0.04	0.00	0.02	0.01	−0.01	0.05
(26)	*LOSS*	0.12*	−0.05	0.08*	0.09*	0.08*	0.08*	0.06	0.10*	0.06	0.08*	0.04	0.07*	−0.03	0.01	0.01	0.00
(27)	*SALEGR*	0.03	0.09*	−0.03	−0.04	−0.01	−0.04	−0.04	−0.04	−0.01	−0.04	0.01	−0.03	−0.01	0.03	−0.01	−0.08*
(28)	*SALEVOL*	0.17*	−0.06*	0.00	0.04	0.01	0.06	0.03	0.04	−0.01	0.02	0.00	0.10*	0.00	−0.02	−0.01	−0.01
(29)	*CFO*	−0.11*	−0.50*	−0.08*	−0.03	0.00	−0.09*	−0.03	−0.03	0.02	−0.05	0.02	−0.10*	−0.01	0.03	0.07*	0.01
(30)	*CFOVOL*	0.22*	−0.02	0.04	−0.03	−0.01	−0.02	−0.03	−0.01	−0.01	−0.02	0.03	0.04	0.00	0.00	0.03	0.02
(31)	*ALTMANZ*	−0.06*	0.04	0.10*	0.07*	0.05	0.09*	0.06	0.10*	0.00	0.08*	−0.05	−0.03	−0.01	0.02	−0.08*	−0.01
(32)	*FIRST*	0.13*	0.05	0.02	0.00	0.01	0.10*	0.00	−0.01	0.13*	−0.04	0.00	0.08*	0.02	−0.07*	0.03	−0.03
(33)	*BIG*	−0.11*	−0.04	0.02	0.28*	0.17*	−0.41*	0.12*	0.13*	−0.02	−0.05	−0.07*	−0.65*	−0.28*	0.51*	0.31*	−0.06
(34)	*TENURE*	−0.09*	−0.01	0.01	0.01	0.00	−0.07*	−0.01	0.02	−0.11*	0.00	−0.01	−0.09*	−0.03	0.09*	−0.03	0.04
(35)	*NSUB*	−0.13*	−0.06	−0.01	0.26*	0.14*	0.13*	0.24*	0.17*	0.04	0.11*	−0.08*	−0.15*	0.04	0.01	−0.15*	−0.05

(The table is continued on the next page.)

TABLE 5 (continued)

ID	Variables	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)
(17)	*INTERIM*	1.00																	
(18)	*LINTERIM_HR*	0.31*	1.00																
(19)	*BUSY*	0.02	−0.02	1.00															
(20)	*SIZE*	−0.01	0.15*	0.03	1.00														
(21)	*LEV*	−0.03	0.07*	−0.02	0.31*	1.00													
(22)	*ROA*	−0.01	−0.13*	0.04	0.16*	−0.18*	1.00												
(23)	*MTB*	0.02	0.08*	−0.04	−0.21*	−0.01	−0.01	1.00											
(24)	*INVREC*	−0.01	0.01	0.04	−0.14*	0.17*	0.04	−0.07*	1.00										
(25)	*EXPORT*	0.01	0.04	−0.01	−0.10*	−0.03	−0.03	−0.02	0.10*	1.00									
(26)	*LOSS*	0.03	0.09*	0.00	−0.18*	0.16*	−0.69	0.05	−0.03	0.08*	1.00								
(27)	*SALEGR*	−0.05	−0.12*	0.01	0.01	0.17*	0.28*	0.21*	0.03	−0.03	−0.21*	1.00							
(28)	*SALEVOL*	0.01	0.03	−0.02	−0.30*	−0.08*	−0.23*	0.24*	−0.06	0.18*	0.25*	−0.10*	1.00						
(29)	*CFO*	0.03	−0.02	−0.03	0.07*	−0.17*	0.56*	0.13*	−0.17*	0.06	−0.42*	0.19*	−0.07*	1.00					
(30)	*CFOVOL*	0.04	−0.02	0.00	−0.22*	0.03	−0.13*	0.13*	0.05	0.11*	0.14*	−0.01	0.38*	−0.05	1.00				
(31)	*ALTMANZ*	−0.02	0.06	0.02	0.38*	0.70*	−0.26*	−0.51*	0.22*	0.01	0.19*	−0.08*	−0.18*	−0.26*	−0.04	1.00			
(32)	*FIRST*	0.03	−0.03	−0.02	−0.04	0.03	0.03	0.03	−0.03	−0.08*	0.00	0.04	−0.01	0.00	0.02	−0.04	1.00		
(33)	*BIG*	−0.03	0.26*	0.07*	0.35*	0.04	0.11*	−0.03	−0.13*	−0.06	−0.10*	0.02	−0.12*	0.08*	−0.06	0.05	−0.14*	1.00	
(34)	*TENURE*	0.02	0.04	0.03	0.05	−0.03	0.02	−0.09*	0.00	0.06	−0.01	−0.08*	−0.02	0.02	−0.03	0.07*	−0.52*	0.16*	1.00
(35)	*NSUB*	−0.02	0.24*	−0.02	0.68*	0.23*	0.04	−0.09*	−0.06	−0.06	−0.08*	−0.07*	−0.18*	0.03	−0.20*	0.27*	−0.06*	0.20*	0.08*

Notes: See Appendix 3 for variable definitions. * denotes significance at the 0.05 level based on two-tailed tests.

TABLE 6 The effects of busy-season audits on audit quality

Variables	*ABDA*	*PMDA* > 0	*PMDA* < 0	*MISSTATE*
Constant	0.102***	0.084***	−0.026	−7.298***
	(3.38)	(2.73)	(−0.88)	(−3.73)
BUSY	**0.010*** **	**0.011*** **	**−0.001**	**0.462** **
	(2.80)	**(3.34)**	**(−0.37)**	**(1.99)**
SIZE	−0.004**	−0.002	0.001	0.172**
	(−2.48)	(−1.53)	(0.66)	(2.02)
LEV	0.050***	0.013	−0.018	0.686
	(3.10)	(0.87)	(−1.48)	(0.96)
ROA	−0.108*	0.540***	0.523***	−3.829**
	(−1.67)	(8.99)	(12.56)	(−2.57)
MTB	−0.002	−0.002	0.002	−0.037
	(−0.83)	(−1.06)	(1.18)	(−0.34)
INVREC	−0.005	−0.015	−0.002	0.559
	(−0.32)	(−1.14)	(−0.15)	(0.75)
EXPORT	−0.006	0.005	0.001	−0.724*
	(−0.96)	(0.80)	(0.12)	(−1.68)
LOSS	−0.006	0.017***	0.016***	−0.048
	(−0.97)	(3.10)	(3.41)	(−0.16)
SALEGR	0.004	0.007	0.008	−0.093
	(0.47)	(0.91)	(0.88)	(−0.23)
SALEVOL	0.061	0.051	−0.070	−2.416
	(0.94)	(0.92)	(−1.11)	(−0.62)
CFO	−0.024	−0.635***	−0.568***	0.087
	(−0.51)	(−14.34)	(−12.91)	(0.06)
CFOVOL	0.188***	0.069	−0.079	2.824
	(3.42)	(1.43)	(−1.58)	(1.15)
ALTMANZ	−3.115***	−1.174	1.663*	9.470
	(−2.99)	(−0.95)	(1.95)	(0.18)
FIRST	0.017**	0.008	−0.007	0.389
	(2.57)	(1.29)	(−1.37)	(1.25)
BIG	−0.006	−0.009**	−0.001	−0.017
	(−1.43)	(−2.42)	(−0.33)	(−0.07)
TENURE	0.000	−0.000	0.000	0.039
	(0.33)	(−0.32)	(0.02)	(1.17)
INTERIM	−0.004	0.000	−0.002	−0.157
	(−1.06)	(0.11)	(−0.69)	(−0.80)
Industry dummy	Yes	Yes	Yes	Yes
Observations	1,016	471	545	1,016
Adj. R^2/Pseudo R^2	0.16	0.62	0.58	0.08

Notes: The table shows the regression results for equation (1), which examines the association between busy-season audits and audit quality. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels. *Z*-statistics are shown in parentheses for the logistics regression with the dependent variable *MISSTATE*, and *t*-statistics for the OLS regression with the discretionary accruals as the dependent variables. Refer to Appendix 3 for variable definitions. Bold text indicates variable of interest.

Effect of audit staff assignment on the relationship between busy-season audits and audit quality

Hypothesis 3 predicts that the reduced time auditors of each rank spend in response to busy seasons is associated with lower audit quality. In Table 8, panel A, we examine the interaction between *Low_ratio* (an indicator variable equal to one if the proportion of end-of-year auditor-hours for each rank is below the median in each size quintile, and zero otherwise) and *BUSY* for audit quality, measured by *ABDA* and *PMDA* > 0. We find that the interaction effect of *BUSY*×*Low_ratio* is significantly positive for end-of-year auditor-hours for senior and junior auditors.[22] This indicates that audit quality is lower when the proportion of senior/junior auditors is lower during busy seasons compared to nonbusy seasons. This supports the PCAOB's view that the number of hours invested in an audit is an operational input indicator of a higher degree of audit quality (PCAOB 2013). Table 8, panel A, also presents our results using *PMDA* < 0 and *MISSTATE* as proxies for audit quality. In contrast to the results for *ABDA* and *PMDA* > 0, the coefficient on *BUSY*×*Low_ratio* is insignificant for end-of-year hours expended by any auditor rank.[23]

We repeat the analysis using the corresponding audit-hour measures instead of ratio measures, and present the results in Table 8, panel B. We examine the interaction between *Low_HR* (an indicator variable equal to one if the number of end-of-year auditor-hours for each rank is below the median in each size quintile, and zero otherwise) and *BUSY* on audit quality. The results across audit quality proxies for the interaction effect of *BUSY*×*Low_HR* are consistent with the ratio measure, with one exception: for the dependent variable *PMDA* < 0, the coefficient on *BUSY*×*Low_HR* is marginally significant using the log-senior-auditor-hours measure, but insignificant using the equivalent senior-auditor-hours ratio measure. Overall, the results are consistent with the prediction in Hypothesis 3 and indicate that audit quality is lower when senior/junior auditors spend less time during busy seasons versus nonbusy seasons.[24]

The influence of workload imbalance on interim audits

Hypothesis 4 predicts that auditors increase the use of interim audits in the presence of a workload imbalance. To test this hypothesis, we employ *INTERIM*, *INTERIM_ratio*, and *LINTERIM_HR* as dependent variables. The results in Table 9 show that the coefficients on *BUSY* are statistically indistinguishable from zero for all dependent variables. Hence, the results do not support Hypothesis 4.

The effect of interim audits on the relationship between busy-season audits and audit quality

Hypothesis 5 predicts that a higher proportion of time spent by auditors during interim audits in response to busy-season audits is associated with higher audit quality. As with Hypothesis 4, we use three measures—*INTERIM*, *INTERIM_ratio*, and *INTERIM_HR*—to test this hypothesis. We find negative, and at least marginally significant, coefficients on *BUSY*×*INTERIM* for the dependent variables *ABDA*, *PMDA* > 0 and *MISSTATE* for both *INTERIM* and *INTERIM_ratio* measures; *PMDA* < 0 is also significant for the *INTERIM_ratio* measure but not for the *INTERIM* measure (see Table 10, panels A and B). Panel C shows that the coefficients on

22. For review-partner hours, the coefficient on the *BUSY*×*Low-ratio* interaction for *ABDA* is significantly negative (i.e., associated with lower audit quality). We interviewed review partners in Big 4 audit firms, and they indicated that review partners spend more hours than usual when the review process requires a discussion on complex audit issues with the engagement partner. Hence, one reason for this finding is not that review partners' greater time involvement leads to lower audit quality but rather that they spend more time on problematic engagements. Of course, our findings do suggest that the greater involvement of review partners at this late stage of an audit cannot fully mitigate audit quality issues.
23. We also obtain insignificant results with strictly material errors specified as the dependent variable.
24. The result that engagement partners neither increase audit hours nor play a role in mitigating the deterioration of audit quality during busy seasons may appear inconsistent with the results in Zerni (2012) and Knechel et al. (2015), which highlight the important role of engagement partners. However, Zerni (2012) focuses on audit fees, which may be unrelated to audit quality (Bedard 2012), while Knechel et al.'s (2015) study suggests both a positive and a negative influence due to partner involvement. Unlike these studies, we factor in the effort of other team members. The assignment of team members and decisions on the need for more interim audits, which we find helps mitigate the deterioration in audit quality, may be influenced by the audit partner. Finally, an audit firm may assign more competent audit partners to more challenging audit engagements during these periods. As a result, the greater hours that audit partners expend may not result in higher audit quality.

TABLE 7 The effects of busy-season audits on auditor-hour proportion and logged auditor-hours by auditors' rank

Panel A: Auditor-hour proportion as dependent variable

Variables	*EoY AUD _ratio*	*EoY Review PRT _ratio*	*EoY PRT _ratio*	*EoY SEN _ratio*	*EoY JUN _ratio*	*EoY NonAud EXPT _ratio*
Constant	−0.040	0.020***	−0.024	−0.031	0.028	0.012
	(−1.12)	(3.31)	(−0.55)	(−0.33)	(0.29)	(0.38)
BUSY	**0.002**	**0.001****	**0.007***	**−0.004***	**0.002***	**−0.004**
	(0.56)	**(2.33)**	**(1.65)**	**(−1.76)**	**(1.96)**	**(−1.14)**
SIZE	−0.000	−0.000	0.006***	0.009**	−0.014***	−0.001
	(−0.29)	(−0.48)	(2.94)	(2.07)	(−3.36)	(−0.62)
LEV	0.012	−0.002	0.013	−0.024	0.040*	0.001
	(1.38)	(−1.21)	(1.20)	(−1.03)	(1.78)	(0.18)
ROA	−0.045*	0.000	0.013	0.004	0.081	−0.026
	(−1.77)	(0.05)	(0.44)	(0.06)	(1.19)	(−1.17)
MTB	0.001	0.000	0.001	−0.001	−0.005	0.004
	(1.11)	(−1.87)	(0.79)	(−0.17)	(−1.39)	(3.44)
LOSS	0.002	0.001	−0.000	−0.016	0.014	−0.002
	(0.37)	(0.85)	(−0.07)	(−1.18)	(1.10)	(−0.49)
NSUB	0.007***	−0.000	−0.007***	0.008	0.005	−0.009
	(3.24)	(−1.14)	(−2.88)	(1.51)	(0.90)	(−4.77)
EXPORT	0.001	0.001	−0.012	0.010	0.019	−0.002
	(0.13)	(1.03)	(−1.62)	(0.66)	(1.23)	(−0.36)
FIRST	−0.004	−0.000	0.006	−0.011	−0.025*	0.008
	(−0.76)	(−0.45)	(0.86)	(−0.76)	(−1.82)	(1.61)
TENURE	−0.000	−0.000	0.001	−0.001	0.001	−0.000
	(−0.48)	(−0.48)	(0.76)	(−0.71)	(0.54)	(−0.78)
INTERIM	−0.016***	0.002***	−0.002	−0.006	−0.002	0.006**
	(−4.88)	(3.49)	(−0.51)	(−0.70)	(−0.25)	(2.13)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Audit Firm dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,016	1,016	1,016	1,016	788	562
Adj. R^2	0.11	0.23	0.52	0.30	0.25	0.21

Panel B: Logged audit hours as dependent variable variable

Variables	*LEoY AUD _HR*	*LEoY Review PRT _HR*	*LEoY PRT _HR*	*LEoY SEN _HR*	*LEoY JUN _HR*	*LEoY NonAud EXPT _HR*
Constant	−0.157	0.631	−1.980***	−0.139	−1.553**	−3.042**
	(−0.53)	(1.47)	(−4.07)	(−0.41)	(−2.52)	(−2.08)
BUSY	**−0.045***	**0.034**	**0.011**	**−0.051**	**−0.082**	**−0.217***
	(−1.72)	**(0.89)**	**(0.26)**	**(−1.69)**	**(−1.56)**	**(−1.78)**
SIZE	−0.019	−0.021	0.103***	−0.007	−0.016	0.151**
	(−1.37)	(−1.03)	(4.50)	(−0.45)	(−0.61)	(2.56)
LEV	0.232***	0.145	0.317***	0.214***	0.405***	0.089
	(3.33)	(1.43)	(2.77)	(2.67)	(2.90)	(0.28)
ROA	−0.312*	−0.318	−0.309	−0.288	−0.024	−1.955**
	(−1.66)	(−1.16)	(−1.00)	(−1.33)	(−0.06)	(−2.07)
MTB	0.023**	0.000	0.036**	0.022*	0.015	0.167***
	(2.21)	(0.00)	(2.11)	(1.84)	(0.69)	(3.30)
LOSS	0.047	0.071	0.013	0.026	0.107	−0.038
	(1.25)	(1.29)	(0.20)	(0.60)	(1.42)	(−0.22)
NSUB	0.129***	0.094***	0.058**	0.141***	0.145***	−0.025
	(7.61)	(3.84)	(2.09)	(7.21)	(4.39)	(−0.34)

(The table is continued on the next page.)

TABLE 7 (continued)

Panel B: Logged audit hours as dependent variable variable

Variables	*LEoY AUD _HR*	*LEoY Review PRT _HR*	*LEoY PRT _HR*	*LEoY SEN _HR*	*LEoY JUN _HR*	*LEoY NonAud EXPT _HR*
EXPORT	−0.020	0.039	−0.102	0.009	0.030	0.112
	(−0.41)	(0.56)	(−1.28)	(0.16)	(0.31)	(0.50)
FIRST	0.071*	0.079	0.143**	0.056	0.014	0.413**
	(1.73)	(1.32)	(2.11)	(1.18)	(0.17)	(2.20)
TENURE	0.002	−0.001	0.009	0.001	0.009	−0.001
	(0.52)	(−0.14)	(1.19)	(0.17)	(1.06)	(−0.08)
INTERIM	−0.353***	−0.237***	−0.336***	−0.359***	−0.329***	−0.212*
	(−14.37)	(−6.65)	(−8.31)	(−12.67)	(−6.81)	(−1.92)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Audit Firm dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,016	1,016	1,016	1,016	788	562
Adj. R^2	0.39	0.24	0.37	0.35	0.24	0.17

Notes: The table shows the regression results for equation (2), which examines the effect of busy-season audits and end-of-year auditor-hours (proportion) by each auditor's rank. Some non-Big 4 audit firms' audit teams do not have junior auditors because they frequently hire experienced auditors. Therefore, the number of junior auditors is smaller than that for senior auditors. Some audit engagements do not use nonaudit experts during the end-of-year audit. Therefore, the number of nonaudit experts is lower than that for other engagements. The *t*-statistics (in parentheses) are based on robust standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests. Refer to Appendix 3 for variable definitions. Bold text indicates variable of interest.

BUSY×*LINTERIM_HR* are negative and at least marginally significant for the dependent variables *ABDA* and *PMDA* > 0. Overall, the results are consistent with Hypothesis 5.

6. Additional analyses

Effect of auditor industry expertise

The use of industry-specialist auditors may mitigate any differences in audit quality arising from busy-season audits (Simunic and Stein 1987; Maletta and Wright 1996; Balsam et al. 2003; Krishnan 2003). We assess this possibility using analyses similar to our earlier tests. We employ a dummy variable *SPEC*, which equals one if auditors' clients have the largest market share in a specific industry, and zero otherwise. Untabulated results show that the coefficient on *BUSY* is positive and significant, while the coefficient on *BUSY*×*SPEC* is insignificant for the dependent variables *ABDA* and *PMDA* > 0. The coefficient on *BUSY* is insignificant but that on *BUSY*×*SPEC* is positive and significant for the dependent variable *MISSTATE*. In addition, the sum of the coefficients on *BUSY* and *BUSY*×*SPEC* remains positive and significant for all dependent variables.[25] This suggests that audit quality deterioration due to workload imbalance from busy-season audits remains even if auditors have industry expertise and regardless of how we measure audit quality.

25. We replicate this test by replacing this firm-level industry specialization measure with a partner-level specialization measure. We define an engagement partner as an industry specialist if he or she is serving at least two listed clients in a particular industry, as a large portion of engagement partners serve only one client in an industry. We also measure partner-level industry specialization by the number of years of experience he/she has with an industry. The results are not significant, regardless of the measure we use. This may be due to the noisy measure of partner-level industry specialization or the lack of power.

TABLE 8 The effects of audit-hour proportion and logged audit hours by auditors' rank on audit quality for busy-season audits

Panel A: Audit-hour proportion (*Low_ratio*) as interaction variable

	Dependent variable = *ABDA*					Dependent variable = *PMDA* > 0				
Variables	*EoY Review PRT_ratio*	*EoY PRT_ratio*	*EoY SEN_ratio*	*EoY JUN_ratio*	*EoY NonAud EXPT_ratio*	*EoY Review PRT_ratio*	*EoY PRT_ratio*	*EoY SEN_ratio*	*EoY JUN_ratio*	*EoY NonAud EXPT_ratio*
Constant	0.111***	0.120***	0.126***	0.086***	0.120***	0.101***	0.104***	0.106***	0.101***	0.103***
	(4.06)	(4.21)	(4.48)	(3.29)	(4.35)	(3.47)	(3.47)	(3.15)	(3.43)	(3.51)
BUSY	**0.016*** **	**0.012** **	**0.006* **	**0.008* **	**0.009* **	**0.012** **	**0.015*** **	**0.015*** **	**0.002**	**0.009* **
	(3.43)	**(2.22)**	**(1.78)**	**(1.65)**	**(1.95)**	**(2.43)**	**(3.01)**	**(3.00)**	**(0.50)**	**(1.69)**
Low_ratio	**0.008**	**−0.000**	**0.001**	**0.002**	**−0.005**	**−0.004**	**0.000**	**0.002**	**−0.013** **	**−0.003**
	(1.54)	**(−0.08)**	**(0.15)**	**(0.37)**	**(−0.84)**	**(−0.79)**	**(0.08)**	**(0.38)**	**(−2.39)**	**(−0.39)**
***BUSY*×**	**−0.016** **	**−0.008**	**0.003** **	**0.001* **	**−0.003**	**−0.002**	**−0.006**	**0.001** **	**0.019*** **	**0.005**
Low_ratio	**(−2.31)**	**(−1.15)**	**(2.13)**	**(1.73)**	**(−0.42)**	**(−0.24)**	**(−0.88)**	**(1.97)**	**(2.70)**	**(0.68)**
CONTROLS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,016	1,016	1,016	788	562	471	471	471	346	235
Adj. R^2	0.14	0.14	0.12	0.13	0.14	0.59	0.59	0.4	0.59	0.59

	Dependent variable = *PMDA* < 0					Dependent variable = *MISSTATE*				
Variables	*EoY Review PRT_ratio*	*EoY PRT_ratio*	*EoY SEN_ratio*	*EoY JUN_ratio*	*EoY NonAud EXPT_ratio*	*EoY Review PRT_ratio*	*EoY PRT_ratio*	*EoY SEN_ratio*	*EoY JUN_ratio*	*EoY NonAud EXPT_ratio*
Constant	−0.016	−0.015	−0.071**	−0.010	−0.022	−5.498***	−5.129***	−5.544***	−5.534***	−5.335***
	(−0.57)	(−0.49)	(−2.07)	(−0.41)	(−0.79)	(−3.53)	(−3.29)	(−3.49)	(−3.53)	(−3.36)
BUSY	**−0.006**	**−0.002**	**0.002**	**−0.004**	**−0.001**	**0.580**	**0.274**	**0.610**	**0.609**	**0.533* **
	(−1.20)	**(−0.32)**	**(0.29)**	**(−0.83)**	**(−0.13)**	**(1.81)**	**(0.93)**	**(1.96)**	**(1.88)**	**(1.68)**
Low_ratio	**−0.006**	**−0.003**	**−0.008**	**−0.005**	**0.007**	**0.155**	**−0.417**	**0.179**	**0.526**	**−0.157**
	(−0.97)	**(−0.50)**	**(−1.02)**	**(−0.83)**	**(0.99)**	**(0.42)**	**(−1.05)**	**(0.47)**	**(1.42)**	**(−0.40)**
***BUSY*×**	**0.011**	**0.001**	**0.004**	**0.007**	**−0.000**	**−0.231**	**0.364**	**−0.301**	**−0.285**	**−0.144**
Low_ratio	**(1.50)**	**(0.16)**	**(0.50)**	**(0.93)**	**(−0.05)**	**(−0.54)**	**(0.84)**	**(−0.69)**	**(−0.66)**	**(−0.33)**

(The table is continued on the next page.)

TABLE 8 (continued)

Panel A: Audit-hour proportion (*Low_ratio*) as interaction variable

	Dependent variable = *PMDA* < 0					Dependent variable = *MISSTATE*				
Variables	*EoY Review PRT_ratio*	*EoY PRT_ratio*	*EoY SEN_ratio*	*EoY JUN_ratio*	*EoY NonAud EXPT_ratio*	*EoY Review PRT_ratio*	*EoY PRT_ratio*	*EoY SEN_ratio*	*EoY JUN_ratio*	*EoY NonAud EXPT_ratio*
CONTROLS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	545	545	545	422	327	1,016	1,016	1,016	788	562
Adj. R^2/ Pseudo R^2	0.53	0.53	0.30	0.53	0.53	0.05	0.05	0.05	0.05	0.05

Panel B: Logged audit hours (*Low_HR*) as interaction variable

	Dependent variable = *ABDA*					Dependent variable = *PMDA* > 0				
Variables	*LEoY Review PRT_HR*	*LEoY PRT_HR*	*LEoY SEN_HR*	*LEoY JUN_HR*	*LEoY NonAud EXPT_HR*	*LEoY Review PRT_HR*	*LEoY PRT_HR*	*LEoY SEN_HR*	*LEoY JUN_HR*	*LEoY NonAud EXPT_HR*
Constant	0.115***	0.118***	0.120***	0.089***	0.081**	0.100***	0.101***	0.103***	0.047*	0.070*
	(4.15)	(4.00)	(4.37)	(3.14)	(2.37)	(3.38)	(3.22)	(3.10)	(1.93)	(1.95)
BUSY	**0.013*** **	**0.013*** **	**0.012** **	**0.007**	**0.004**	**0.015*** **	**0.016*** **	**0.019*** **	**0.008**	**0.010**
	(2.71)	**(2.62)**	**(2.51)**	**(1.48)**	**(0.78)**	**(3.22)**	**(3.08)**	**(3.47)**	**(1.48)**	**(1.32)**
Low_HR	**0.004**	**0.003**	**0.010* **	**−0.002**	**−0.007**	**0.005**	**0.004**	**0.010** **	**0.003**	**−0.003**
	(0.71)	**(0.56)**	**(1.73)**	**(−0.31)**	**(−1.09)**	**(0.92)**	**(0.63)**	**(1.95)**	**(0.57)**	**(−0.36)**
BUSY× Low_HR	**−0.010** **	**−0.011**	**0.002** **	**0.001* **	**0.007**	**−0.005**	**−0.008**	**0.015** **	**0.102* **	**−0.001**
	(−1.98)	**(−1.55)**	**(2.14)**	**(1.73)**	**(0.97)**	**(−0.72)**	**(−1.02)**	**(2.11)**	**(1.71)**	**(−0.10)**
CONTROLS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,016	1,016	1,016	788	562	471	471	471	346	235
Adj R^2	0.15	0.14	0.12	0.12	0.11	0.57	0.57	0.41	0.61	0.46

(The table is continued on the next page.)

TABLE 8 (continued)

Panel B: Logged audit hours (*Low_HR*) as interaction variable

	Dependent variable = *PMDA* < 0					Dependent variable = *MISSTATE*				
Variables	*LEoY Review PRT_HR*	*LEoY PRT__HR*	*LEoY SEN_HR*	*LEoY JUN_HR*	*LEoY NonAud EXPT_HR*	*LEoY Review PRT_HR*	*LEoY PRT_HR*	*LEoY SEN_HR*	*LEoY JUN_HR*	*LEoY NonAud EXPT_HR*
Constant	−0.016	−0.004	−0.068**	−0.025	−0.027	−5.359***	−5.183***	−5.764***	−6.065***	−4.678**
	(−0.57)	(−0.14)	(−1.99)	(−0.81)	(−0.65)	(−3.43)	(−3.26)	(−3.59)	(−3.38)	(−2.05)
BUSY	**−0.002**	**−0.006**	**−0.004**	**−0.005**	**0.001**	**0.533***	**0.566****	**0.892*****	**0.858****	**0.994****
	(−0.45)	**(−1.29)**	**(−0.65)**	**(−0.95)**	**(0.19)**	**(1.79)**	**(1.99)**	**(2.85)**	**(2.45)**	**(2.30)**
Low_HR	**−0.004**	**−0.011**	**−0.011**	**−0.002**	**0.009**	**−0.070**	**−0.039**	**0.547**	**0.298**	**0.175**
	(−0.68)	**(−1.77)**	**(−1.46)**	**(−0.23)**	**(1.11)**	**(−0.19)**	**(−0.10)**	**(1.44)**	**(0.62)**	**(0.31)**
BUSY× Low_HR	**0.002**	**0.010**	**0.015***	**0.007**	**−0.008**	**−0.167**	**−0.243**	**−0.050**	**−0.395**	**−0.496**
	(0.35)	**(1.46)**	**(1.79)**	**(0.74)**	**(−0.83)**	**(−0.39)**	**(−0.55)**	**(−0.50)**	**(−0.74)**	**(−0.82)**
CONTROLS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	545	545	545	422	327	1,016	1,016	1,016	788	562
Adj. R^2/ Pseudo R^2	0.53	0.53	0.30	0.62	0.48	0.05	0.05	0.05	0.07	0.08

Notes: The table shows the regression results for equation (3), which examines the effect of the reduction in time spent by auditors at each rank during busy seasons on audit quality. *Low ratio* (*Low_HR*) is an indicator variable set equal to one if the end-of-year auditor-hours proportion (hour) at each rank is below the median in each size quintile, and zero otherwise. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively. *Z*-statistics are shown in parentheses for the logistics regression with the dependent variable *MISSTATE*, and *t*-statistics for the OLS regression with the discretionary accruals being the dependent variables. Refer to Appendix 3 for variable definitions. Bold text indicates variable of interest.

TABLE 9 The effects of busy-season audits on interim audits

Variables	*INTERIM*	*INTERIM_ratio*	*LINTERIM_HR*
Constant	0.113*	0.076	−0.176
	(1.96)	(1.03)	(−0.56)
BUSY	**0.006**	**0.005**	**−0.030**
	(0.18)	**(0.74)**	**(−1.07)**
SIZE	−0.008	0.000	−0.011
	(−0.43)	(0.01)	(−0.75)
LEV	−0.146	−0.042**	0.060
	(−1.60)	(−2.43)	(0.82)
ROA	−0.091	−0.101**	−0.785***
	(−0.37)	(−2.15)	(−3.93)
MTB	0.016	0.001	0.028**
	(1.17)	(0.51)	(2.56)
LOSS	0.068	−0.005	−0.002
	(1.37)	(−0.58)	(−0.06)
NSUB	0.003	−0.003	0.112***
	(0.16)	(−0.73)	(6.26)
EXPORT	0.047	0.028**	0.082
	(0.73)	(2.33)	(1.61)
FIRST	0.052	−0.006	0.032
	(0.96)	(−0.54)	(0.74)
TENURE	0.004	0.000	0.003
	(0.68)	(0.38)	(0.57)
Industry dummy	Yes	Yes	Yes
Audit Firm dummy	Yes	Yes	Yes
Observations	1,016	1,016	1,016
Adj. R^2	0.02	0.02	0.20

Notes: The table shows the results of the regression model examining the effect of busy-season audits on interim audits. The measures *INTERIM*, *INTERIM_ratio*, and *LINTERIM_HR* represent interim dummy, interim ratio, and logarithm of interim hours, respectively. The *t*-statistics (in parentheses) are based on robust standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed tests. Refer to Appendix 3 for variable definitions. Bold text indicates variable of interest.

Alternative measures of busy seasons

As discussed previously, we classify an audit engagement as occurring during a busy season if 70 percent or more of the fieldwork period overlaps with the busy-season period. Untabulated results show that the coefficient on *BUSY* is also positive and significant using alternative cutoff points (60 and 80 percent) to classify busy-season audits.[26]

Alternative measures of busy dates

In the main analysis, we focus on the ratio of the number of engagements on a given date to the audit firm's total number of clients and use 20 percent as our benchmark to classify the busy-season dates. With this cutoff point, the typical busy season for post-fiscal-year-end audits occurs over a period of about three weeks, which is quite close to the clustering interval of clients in Table 2. We use a 25 or 30 percent cutoff as our benchmark in this supplementary analysis. The proportion of

26. As sensitivity analyses, we re-run the regression model in equation (1) with ***PMDA*** as dependent variable and vary the cutoff point from 30 to 80 percent. We find that the coefficient on *BUSY* remains statistically significant at the 5 percent level when the cutoff point is 40 percent and above. The coefficient on *BUSY* has *p*-values 0.071/0.043/ 0.021 /0.010/0.004 for 30/40/50/60/80 percent cutoff point.

TABLE 10 The effects of interim audits on the association between busy-season audits and audit quality

Panel A: Interim dummy (*INTERIM*) as the interaction variable

	Dependent variable			
Variables	*ABDA*	*PMDA* > 0	*PMDA* < 0	*MISSTATE*
Constant	0.098***	0.087**	−0.056	−8.213***
	(3.23)	(2.54)	(−1.63)	(−4.05)
BUSY	**0.027****	**0.021***	**−0.023***	**1.852****
	(2.55)	**(1.94)**	**(−1.96)**	**(2.56)**
INTERIM	**0.005**	**0.001**	**−0.010**	**0.524**
	(0.90)	**(0.18)**	**(−1.60)**	**(1.35)**
BUSY×INTERIM	**−0.012***	**−0.005****	**0.017**	**−0.929****
	(−1.89)	**(−2.21)**	**(0.69)**	**(−2.07)**
CONTROLS	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Observations	1,016	471	545	1,016
Adj R^2/Pseudo R^2	0.15	0.46	0.33	0.09

Panel B: Size-adjusted interim hour ratio (*INTERIM_ratio*) as the interaction variable

	Dependent variable			
Variables	*ABDA*	*PMDA* > 0	*PMDA* < 0	*MISSTATE*
Constant	0.105***	0.089**	0.075**	−7.502***
	(3.54)	(2.57)	(2.06)	(−3.85)
BUSY	**0.008****	**0.014*****	**−0.003**	**0.434***
	(2.13)	**(3.43)**	**(−0.66)**	**(1.84)**
INTERIM_ratio	**0.050***	**0.013**	**0.088*****	**2.579**
	(1.81)	**(0.45)**	**(2.68)**	**(1.33)**
BUSY×INTERIM_ratio	**−0.075****	**−0.028***	**−0.100****	**−4.229***
	(−2.16)	**(−1.74)**	**(−2.28)**	**(−1.81)**
CONTROLS	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Observations	1,016	471	545	1,016
Adj. R^2/Pseudo R^2	0.15	0.46	0.33	0.09

Panel C: Size-adjusted log interim hour (*LINTERIM_HR*) as the interaction variable

	Dependent variable			
Variables	*ABDA*	*PMDA* > 0	*PMDA* < 0	*MISSTATE*
Constant	0.106***	0.116***	0.09**	−7.129***
	(3.44)	(2.79)	(2.43)	(−3.62)
BUSY	**0.008****	**0.016*****	**−0.002**	**0.443***
	(2.40)	**(3.06)**	**(−0.44)**	**(1.91)**
LINTERIM_HR	**0.004**	**0.013**	**0.013***	**−0.297**
	(0.75)	**(1.37)**	**(1.75)**	**(−0.78)**
BUSY×LINTERIM_HR	**−0.005***	**−0.021****	**−0.003**	**0.569**
	(−1.69)	**(−2.04)**	**(−0.35)**	**(1.26)**
CONTROLS	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes

(The table is continued on the next page.)

TABLE 10 (continued)

Panel C: Size-adjusted log interim hour (*LINTERIM_HR*) as the interaction variable

Variables	Dependent variable			
	ABDA	*PMDA* > 0	*PMDA* < 0	*MISSTATE*
Observations	1,016	471	545	1,016
Adj. R^2/Pseudo R^2	0.15	0.35	0.33	0.08

Notes: The table shows the effect of interim audits on the association between busy-season audits and audit quality. The measures *INTERIM*, *INTERIM_ratio* and *LINTERIM_HR* represent interim dummy, interim ratio, and logarithm of interim hours, respectively. The *t*-statistics are based on robust standard errors adjusted for heteroscedasticity. *, **, and *** denote significance at the 0.10, 0.05, and 0.01 levels, respectively. *Z*-statistics are shown in parentheses for the logistics regression with the dependent variable *MISSTATE*, and *t*-statistics for the OLS regression with the discretionary accruals being the dependent variables. Refer to Appendix 3 for variable definitions. Bold text indicates variable of interest.

clients audited during the busy season becomes 50.2 percent under the 25 percent cutoff and 32.4 percent under the 30 percent cutoff, as opposed to 65.8 percent when we use 20 percent as the cut-off point. We repeat our analyses with 25 percent and 30 percent as the cutoff points and find, in untabulated analyses, that our results are not sensitive to these alternative cutoff points.

Cross-sectional test associated with the extent of busyness

Using alternative proxies for busy seasons, *BUSY50* (an indicator variable equal to one if the end-of-year external audit fieldwork period overlaps with busy-season audits by 50 percent or more, and zero otherwise) and *OVERLAP* (a continuous variable that captures the overlap ratio of end-of-year audit fieldwork with audit firms' busy seasons), we conduct a cross-sectional test to assess whether the extent to which busy seasons influence audit quality is proportional to the extent to which a fieldwork period overlaps with a busy-season period. Our untabulated results show that *BUSY50* and *BUSY50*×*OVERLAP* are positively associated with *ABDA*, *PMDA* > 0, and *MISSTATE*. These results suggest that audit quality during busy-season audits deteriorates more as the overlap increases.

The differing effect of workload imbalance on audit quality for Big 4 and non-Big 4 auditors

Big 4 audit firms have greater resources than non-Big 4 firms, so we analyze whether Big 4 audit firms outperform smaller audit firms in handling busy-season audits. Our untabulated results show that for the dependent variables *ABDA*, *PMDA* > 0, and *MISSTATE*, the coefficients on *BUSY* are significantly positive for all Big 4 and non-Big 4 audit firms. Therefore, workload imbalance affects both Big 4 and non-Big 4 firms similarly.[27]

7. Conclusion

We investigate whether workload imbalance impairs audit quality and how auditors adapt to workload imbalance. We examine potentially dysfunctional responses, such as reducing auditor-hours spent by key audit personnel, and potentially beneficial responses, such as the use of interim audits. We find that firms audited during busy seasons (our proxy for workload imbalance) have greater abnormal accruals

27. It is pertinent to compare these findings with those of Bills et al. (2016), who examine the effect of office growth on audit quality. They find that the adverse effect of office growth on audit quality (proxied by discretionary accruals) remains significant for the Big 4 audit firm sample in five out of eight specifications and is nonsignificant for the remaining three specifications. Our results indicating no difference in Big 4 audit firms' ability to adapt to workload imbalance tie in with the former specifications, but the findings are contrary to the latter specifications suggesting no adverse effect for Big 4 firms. We note that Bills et al. (2016) use changes in fees and assets over long windows as proxies for workload, which are arguably noisier than our use of changes in audit engagements over a short period of several weeks.

and misstatements (our proxies for audit quality). In terms of how auditors respond to busy-season audits, we find no difference in the end-of-year auditor-hours spent as a proportion of total auditor-hours, although we find evidence of adjustments in the labor mix. On average, audit firms reduce the hours worked by senior auditors, as well as the mix or proportion of auditor-hours worked by senior auditors relative to end-of-year auditor-hours across all ranks. While the hours spent by engagement partners, review partners, and junior auditors do not vary according to busy-season audits, there is an increase in the mix or proportion of hours spent by these auditors.

In addition, we demonstrate that greater involvement of senior auditors and junior auditors mitigates the deterioration in audit quality during busy seasons. We find no significant association between the time spent on interim audits and busy-season audits. We also provide evidence that a higher proportion of time spent by auditors during interim audits can attenuate the deterioration in audit quality during busy seasons.

We contribute to the auditing literature by providing evidence on how, depending on auditors' responses to workload imbalances, audit quality can either decrease (e.g., when a response involves a reduction in senior-auditor hours) or increase (e.g., when a response involves varying the use of interim audits). We also introduce a novel and more refined measurement of workload imbalances at the engagement level. We contribute to the literature by providing evidence that workload imbalances, when measured using more refined proxies, impair audit quality. Our finding that lower audit quality caused by busy-season audits is associated with the hours spent by senior auditors lends some support to the PCAOB's view that the hours invested in an audit is an operational input indicator of audit quality (PCAOB 2013). In addition, to the best of our knowledge, this study is the first to consider the effect of interim audits and their role in moderating the effects of busy seasons on audit quality.

Our study is subject to several limitations. First, our data is from Korea, and there could be jurisdictional, country, and cultural differences that may prevent the generalization of our results to other regimes/countries. Second, due to data constraints, we cannot evaluate the impact of workload imbalances on the quality of private company audits. The coping strategies of private company auditors, which have a weaker demand for high-quality audits, may be different. Finally, examining the number of audit engagements within a given time window for each individual partner and senior/junior auditor may more accurately capture the effects of workload imbalances on audit quality. More detailed data on individual auditors' engagements would allow us to address this issue.

Appendix 1

Illustration of detailed disclosure on external audit execution

<table>
<tr><th colspan="2" rowspan="2">Types of auditors / Numbers of staff and hours</th><th rowspan="2">Quality reviewer</th><th colspan="3">Auditors</th><th rowspan="2">Nonaudit experts</th><th rowspan="2">Total</th></tr>
<tr><th>Partner</th><th>Senior auditor</th><th>Junior auditor</th></tr>
<tr><td colspan="2">Number of team members engaged</td><td>7</td><td>1</td><td>59</td><td>7</td><td>36</td><td>110</td></tr>
<tr><td rowspan="3">Input hours</td><td>Quarter and interim review</td><td>73</td><td>276</td><td>17,929</td><td>1,490</td><td>4,674</td><td>24,442</td></tr>
<tr><td>Audit</td><td>76</td><td>166</td><td>13,114</td><td>1,011</td><td>4,572</td><td>18,969</td></tr>
<tr><td>Total</td><td>149</td><td>442</td><td>31,073</td><td>2,501</td><td>9,246</td><td>43,411</td></tr>
</table>

Notes: Unit is number of people or auditor-hours. * Nonaudit experts in tax, valuation, or other nonaudit services are used to assist an auditor in obtaining appropriate audit evidence.
Source: 2014 Audit report of Samsung Electronics.

Appendix 2

Estimating the busy seasons

Calendar date	Number of engagements	Audit firm	Total number of clients	Busy season*
2015-01-21	45	PwC	276	0
2015-01-22	50	PwC	276	0
2015-01-23	49	PwC	276	0
2015-01-26	64	PwC	276	1
2015-01-27	75	PwC	276	1
2015-01-28	77	PwC	276	1
2015-01-29	75	PwC	276	1
2015-01-30	73	PwC	276	1
2015-02-02	82	PwC	276	1
2015-02-03	87	PwC	276	1
2015-02-04	83	PwC	276	1
2015-02-05	92	PwC	276	1
2015-02-06	82	PwC	276	1
2015-02-09	88	PwC	276	1
2015-02-10	97	PwC	276	1
2015-02-11	96	PwC	276	1
2015-02-12	96	PwC	276	1
2015-02-13	91	PwC	276	1
2015-02-16	45	PwC	276	0
2015-02-17	47	PwC	276	0

Notes: *To identify a busy season, we first count the number of engagements of an audit firm on a particular date. If this number is greater than 20 percent of the total number of clients of the audit firm, we define the given date as a busy date. In general, busy dates occur consecutively, so we use the first and last busy dates to demarcate the busy season. In the case of nonconsecutive busy dates, we consider the first and last dates on which the number of clients is at, or exceeds, 20 percent of its total number of clients in order to define the start and end dates of the busy season. In the table, the busy season of PwC Korea can be seen to extend from January 26 to February 13. Using 30 percent as the cutoff point for busy dates, the busy season shortens so that the share of clients audited during the busy season is only 32.4 percent, as opposed to 65.8 percent when we use 20 percent as the cutoff point.

Appendix 3

Variable definitions

Variable	Definition
Audit-quality proxies	
PMDA	Performance-matched discretionary accruals (Kothari et al. 2005)
ABDA	Absolute value of *PMDA*
MISSTATE	An indicator variable equal to one if the annual financial statements are restated or reflect prior-error correction on income statement, and zero otherwise

(The Appendix is continued on the next page.)

Appendix 3 (continued)

Variable	Definition
Test variables	
FIELD_DAY	The number of days required for end-of-year field work
ReviewPRT_num	The number of review partners engaged in an end-of-year audit
PRT_Num	The number of partners engaged in an end-of-year audit
SEN_Num	The number of senior auditors engaged in an end-of-year audit
JUN_Num	The number of junior auditors engaged in an end-of-year audit
NonAudEXPT_Num	The number of nonaudit experts engaged in an end-of-year audit
AUD_HR	Total auditor-hours used for a fiscal year (= *INTERIM_HR* + *EoYAUD_HR*)
INTERIM_HR	The auditor-hours used for planning, risk assessment, quarterly reviews, internal control reviews, etc. *(= AUD_HR − EoYAUD_HR)*
EoYAUD_HR	End-of-year total auditor-hours used for inventory checks, engagement field work, engagement quality-control reviews, preparation and reporting of audit opinions, etc. *(= AUD_HR − INTERIM_HR)*
EoYReviewPRT_HR	End-of-year review partners' hours worked after the fiscal year-end (FYE)
EoYPRT_HR	End-of-year engagement partners' hours after FYE
EoYSEN_HR	End-of-year senior auditors' hours after FYE
EoYJUN_HR	End-of-year junior auditors' hours after FYE
EoYNonAudEXPT_HR	End-of-year nonaudit experts' hours after FYE
EoYAUD_ratio	Size-adjusted end-of-year auditor-hours ratio (= Size-unadjusted *EoYAUD_ratio* – median value of size-unadjusted *EoYAUD_ratio* in each size quintile, where the size-unadjusted *EoYAUD_ratio* is *EoYAUD_HR* ÷ *AUD_HR*)
EoYReviewPRT_ratio	Size-adjusted end-of-year review-partner-auditor-hours ratio (= Size-unadjusted *EoYReviewPRT_ratio* – median value of size-unadjusted *EoYReviewPRT_ratio* in each size quintile, where the size-unadjusted *EoYReviewPRT_ratio* is *EoYReviewPRT_HR* ÷ *EoYAUD_HR*)
EoYPRT_ratio	Size-adjusted end-of-year partner-hours ratio (= Size-unadjusted *EoYPRT_ratio* – median value of size-unadjusted *EoYPRT_ratio* in each size quintile, where the size-unadjusted *EoYPRT_ratio* is *EoYPRT_HR* ÷ *EoYAUD_HR)*
EoYSEN_ratio	Size-adjusted end-of-year senior-auditor-hours ratio (= Size-unadjusted *EoYSEN_ratio* – median value of size-unadjusted *EoYSEN_ratio* in each size quintile, where the size-unadjusted *EoYSEN_ratio* is *EoYSEN_HR* ÷ *EoYAUD_HR)*
EoYJUN_ratio	Size-adjusted end-of-year junior-auditor-hours ratio (= Size-unadjusted *EoYJUN_ratio* – median value of size-unadjusted *EoYJUN_ratio* in each size quintile, where the size-unadjusted *EoYJUN_ratio* is *EoYJUN_HR* ÷ *EoYAUD_HR)*
EoYNonAuditEXPT_ratio	Size-adjusted end-of-year nonaudit-experts-hours ratio (= Size-unadjusted *EoYNonAudEXPT_ratio* – median value of size-unadjusted *EoYNonAudEXPT_ratio* in each size quintile, where the size-unadjusted *EoYNonAuditEXPT_ratio* is *EoYNonAudEXPT_HR* ÷ *EoYAUD_HR)*
BUSY	An indicator variable equal to one if 70 percent or more of an engagement's fieldwork period falls within an audit firm's busy season period, and zero otherwise

(The Appendix is continued on the next page.)

Appendix 3 (continued)

Variable	Definition
Low_ratio	Indicator variable set equal to one if the proportion of end-of-year auditor-hours at each rank in each size quantile is below the median, and zero otherwise
LEoYAUD_HR	Size-adjusted end-of-year auditor-hours (= Size-unadjusted log of *EoYAUD_HR*– median value of size-unadjusted log of *EoYAUD_HR* in each size quintile)
LEoYReviewPRT_HR	Size-adjusted end-of-year review-partner-auditor-hours (= Size-unadjusted log of *EoYReviewPRT_HR* – median value of size-unadjusted log of *EoYReviewPRT_HR* in each size quintile)
LEoY PRT_HR	Size-adjusted end-of-year partner-hours (= Size-unadjusted log of *EoYPRT_HR* – median value of size-unadjusted log of *EoYPRT_HR* in each size quintile)
LEoYSEN_HR	Size-adjusted end-of-year senior-auditor-hours (= Size-unadjusted log of *EoYSEN_HR* – median value of size-unadjusted log of *EoYSEN_HR*)
LEoYJUN_HR	Size-adjusted end-of-year junior-auditor-hours (= Size-unadjusted log of *EoYJUN_HR* – median value of size-unadjusted log of *EoYJUN_HR* in each size quintile)
LEoYNonAudEXPT_HR	Size-adjusted end-of-year nonaudit-experts-hours (= Size-unadjusted log of *EoYNonAudEXPT_HR* – median value of size-unadjusted log of *EoYNonAudEXPT_HR* in each size quintile)
LINTERIM_HR	Size-adjusted interim hours (= Size-unadjusted log of *INTERIM_HR* – median value of size-unadjusted log of *INTERIM_HR* in each size quintile)
Low_HR	Indicator variable equal to one if the end-of-year auditor-hours at each rank in each size quantile is below the median, and zero otherwise
INTERIM_ratio	Size-adjusted interim-auditor-hour ratio (= Size-unadjusted *INTERIM_ratio* – median value of size-unadjusted *INTERIM_ratio* in each size quintile)
INTERIM	An indicator variable equal to one if *INTERIM_ ratio* is greater than the median within each size quintile, and zero otherwise
Control variables	
SIZE	Ln (total assets)
LEV	Total liabilities ÷ total assets
ROA	Operating income ÷ beginning value of total assets
MTB	Market-to-book ratio
INVREC	(Inventory + receivables) ÷ total assets
EXPORT	Export sales ÷ total sales (percent)
LOSS	One for loss-reporting firms, zero otherwise
SALEGR	Change in sales divided by sales in the prior year
SALEVOL	Standard deviation of sales divided by total assets of the current and prior two years
CFO	Operating cash flows ÷ lagged total assets at year-end
CFOVOL	Standard deviation of CFO for the current and prior two years
ALTMANZ	The Altman *Z*-score which is a measure of the probability of bankruptcy, with a lower value indicating greater financial distress
FIRST	One if it is the first year of an audit engagement, and zero otherwise
BIG	One if the auditor is a Big 4 firm, and zero otherwise
TENURE	Number of consecutive years that a firm has retained the auditor
NSUB	Number of subsidiaries

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