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Article

Does Engagement Partners' Effort Affect Audit Quality? With a Focus on the Effects of Internal Control System †

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† This paper is based on my Ph.D. dissertation.

Abstract: An audit team includes engagement partners, CPAs, and staff. Among them, partners play a vital role in performing tasks that require expertise and experience, such as analyzing and understanding the industry, and supervising the overall audit process. In detail, the partners establish an audit plan, determine the overall audit time, provide the audit input ratio of the engagement team, and review the audit reports. This study examines for association between the partner's audit hour ratio and audit quality depending on the client firms' characteristics. Although the role of partners is important, the information about partner audit hours is limited. However, the Korean government requires audit firms to disclose the partner hour information in the audit report starting in the 2014 fiscal year. By the disclosure, it is possible to examine the association between partner audit hours and audit quality. In this study, the information on partner audit hour is hand-collected from the firms' business reports. Using 6340 observations from 2014 to 2017, the partner audit hour ratio is associated with audit quality, under the characteristics of client firms. Firms' risks are adopted for client characteristics, and we focused on the operation of internal control. The internal control operation level is measured by the following: (1) the ratio of internal control personnel and (2) experience of the internal control personnel in the accounting and IT departments. The result suggests that for the firms where internal control is not effectively operated, partners make more effort to enhance audit quality.

Keywords: partner's audit hour ratio; audit quality; internal control system

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1. Introduction

This study is to test the impact of partners' audit efforts on audit quality. On 28 May 2014, the External Audit Act in South Korea was amended to make it obligatory for external auditors to disclose supplemental documents describing the details of auditors' work. This amendment was made in response to the increasing number of requests for information about the various aspects of the external auditor's process. In detail, under the amended External Audit Act, the audit hours of engagement partners are disclosed in the audit report, making it possible to investigate whether the efforts of engagement partners enhance the audit quality. The role of partners is vital in the course of auditing because engagement partners are responsible for oversight of the overall audit and tone of the audit, which leads to audit quality.

At the same time, the U.S. Public Company Accounting Oversight Board (PCAOB) has emphasized the role of engagement partners by forcing their names to appear on the audit report. In addition, PCAOB suggested that calculating the hours that partners and managers devote to an engagement and how they spend such time, as a percentage of total engagement hours, can serve as a measure of effort of key personnel, as well as the amount of supervision provided to the staff. This suggests that the role of engagement partners is vital in providing higher audit quality.

The most prominent definition of audit quality is the joint probability that errors could be detected and reported (DeAngelo 1981). The probability of detecting errors is related to

the auditors' competence, and the possibility of reporting error depends on the auditors' professional skepticism and independence. In other words, the auditors are responsible for identifying and reporting critical errors in the conformity of preparing a financial statement that a client company may have committed. The definition of DeAngelo (1981) of high audit quality was extended by Carcello and Nagy (2002) to include the process of performing an audit. They suggest that a high level of auditing confirms not whether the financial statements of the company are technically compliant with GAAP, but rather how well the financial statements reflect the company's economic situation.

The purpose of this paper is to analyze the usefulness of engagement partners' efforts to affect audit quality positively. In the prior literature, research on audit time was carried out using only total audit time or the proprietary data of certain audit firms. The use of total audit time by itself is limited in that it cannot identify the experience of audit participants, differences in expertise, and differences in incentives by position. Additionally, using proprietary data limited to certain firms, it may be hard to generalize the result. However, we manually collected the data of the exact time spent by the engagement partners and analyzed if there is any relationship with audit quality. Using 6340 data of engagement partner hours, we find that the audit efforts of engagement partners increase the audit quality. Engagement partners are expected to have expertise in the field and control the tone of the whole audit procedure. Thus, audit quality increases if the experienced or expert engagement partners make more efforts by spending more time. We test the moderation effect of the internal control (IC) system of the audited firms.

We also analyze the operating effectiveness of IC system on the relationship between engagement partner's audit effort and audit quality. The IC system is the most representative control mechanism when assessing firms' control risk. The information of IC human resources, such as the number of IC personnel and their working experiences, is exclusively disclosed in South Korea. When the firms are equipped with a higher number of IC personnel and their high working experiences, the engagement partner will infer that the firms are operating effectively and low in control risk (Na and Choi 2009).

The research makes the following contributions. First, this study can examine whether the role of the partner positively affects audit quality improvement. Note that the Korean Financial Supervisory Commission has approved an amendment on auditing standards in accordance with the International Financial Reporting Standards. Hence, this study uses the internal accounting personnel in charge as an ex-ante measurement for the level of internal control. Rather than the audit result, the internal accounting personnel in charge is the preliminary measurement for internal control quality pre-determined before the audit. Therefore, in the case of a company with low internal control risk owing to a sufficient workforce for internal accounting, an efficient external auditor reduces the audit time for a substantive audit.

2. Material and Methods

2.1. Theoretical Fundamentals

2.1.1. Prior Research on Audit Quality

DeAngelo (1981) offers the classic definition of audit quality, namely, the combination of the ability to detect potential errors and the ability to report them. This definition can be subdivided as follows. The discovery of potential errors means the extent of the auditor's effort and the latter refers to the auditor's purpose, expertise, and independence. In other words, the probability of detecting errors in the course of the audit process refers to the proper usage of audit input effort, while reporting possible errors refers to an appropriate audit response.

However, DeAngelo's (1981) definition has a limitation in that it does not include the circumstances of the client firms. In recent years, audit quality has been redefined by a number of studies to emphasize audit procedures and their input factors. Defond and Zhang (2014) expand the definition to incorporate the role of the auditor and define higher audit quality as providing high assurance that the financial statements faithfully reflect the firms' under-

lying financials and innate characteristics. However, this definition does not incorporate input and the process of audit quality.

O'Keefe et al. (1994) suggest that using a simple sum of hours may lead to a loss of information and a loss of statistical efficiency in estimating the effects of changes in client characteristics. Therefore, audit quality should depend on the legal and institutional situation or relationship of the client and the audit firm. In addition, Gaynor et al. (2016) define a higher quality audit as one that provides a higher level of assurance in which the auditor obtains sufficient and appropriate evidence that the financial statements faithfully represent the firm's underlying financials.

2.1.2. Prior Research on Partners

The audit team includes engagement partners, CPAs, and staff. Among them, engagement partners are responsible for audit planning and conducting overall audits, while CPAs and staff perform duties on site and are involved in more time-consuming work. The Public Company Accounting Oversight Board (PCAOB) (2015) announced an Audit Quality Indicator (AQI), suggesting that the proportion of upper-level auditor input is one applicable indicator for measuring audit quality. The AQI suggests that measuring the hours that partners, managers, and quality reviewers devote to an engagement, as well as when they spend such hours, as a percentage of total engagement hours, it is possible to measure the effort of key personnel as well as the amount of supervision provided to staff.

Furthermore, the PCAOB presents the ratio of audit team as the AQI and emphasizes the partner's oversight role in the audit and audit team. Sufficient time to oversee the work of audit staff is typically critical to audit quality. Studies on partners thus far have assumed that the partner is the most experienced group and is responsible for supervising the overall audit process.

Partners play a vital role in performing tasks that require expertise and experience, such as analyzing and understanding the industry, and supervising the overall audit process. In detail, the partners establish an audit plan, determine the overall audit time, provide the audit input ratio of the engagement team, and review the audit reports. Partners also play a significant role in the formation of audit opinion, and thus, if a lawsuit is filed against the auditing firm, the partner in charge is usually held responsible. Despite the importance of partners and their role in auditing, little is known about how the partner's time relates to audit quality in practice. This is because it is difficult to determine the partner's time, as it is derived from the internal data of audit firms. Previous studies claim that it is possible to add more audit time from partners with considerably more experience and greater expertise to analyze the audit risk of high-risk clients, and to lower such audit risk to an appropriate level (Hackenbrack and Knechel 1997; Bell et al. 2008).

Sohn and Lee (2007) use proprietary data on partners and examine the association between disaggregated audit input and audit risk or audit quality. The analysis results show that partners spend time on clients with high profitability but find no consistent relationship between audit time input and audit time. Pae and Yoo (2001) report that an increased possibility of lawsuits leads to greater effort by partners. In other words, in response to increased litigation risk, auditors have proactive motivation to spend more audit resources in order to avoid audit failures. Bell et al. (2008) and Johnstone and Bedard (2001) indicate that it is critical to allocate high-performance auditors to firms with high audit-related risks. Therefore, if there is a shortage of supply of such auditors, audit becomes riskier. Ryu et al. (2015) show that discretionary accruals differ according to the role of rank-specific audit hours. In detail, associate-level audit hours are negatively associated with absolute discretionary accruals, while senior associate-level and manager-level audit hours decrease income-increasing accruals. Kim (2020) examines the audit partner's effort and accounting transparency and those relationships are more pronounced in Big Four audited firms. In this study, partner's effort has accounting information usefulness in measuring accounting transparency. Hossain et al. (2017) examine members of audit teams, which consist of senior auditors, assistant auditors and other professional staff, and audit

quality. The result indicates that the number of senior auditors increases the audit quality, while the number of assistant auditors and professional staff on the team does not significantly affect audit quality. It is believed that senior auditors have more knowledge and skills than other members. It may improve their judgement and make decisions inclined to audit quality improvement. Yun and Jung (2021) examine whether partner audit hours affect audit quality in accordance with the firm life cycle, suggested by Dickinson (2011). They divide groups by the firm life cycle and find that increased partner audit hours have discriminatory impacts on audit quality. The find a negative association between partner audit hours and discretionary accruals in growth stages because of the inherent risks embedded in the firm.

2.1.3. Prior Research on Internal Control System

When the audit starts, the scope of the audit work depends on the firm's risks. Therefore, it is referred to as audit risk, suggested by the Public Company Accounting Oversight Board (PCAOB) (2010) and the Statement of Auditing Standards (SAS) No. 107 (American Institute of Certified Public Accountants (AICPA) 2006). The audit risk is a joint probability of inherent, control, and detection risk. Inherent risk and control risk are defined as the risk of material misstatement (RMM), caused by the natural situation of the firm. Specifically, inherent risk is referred to as the firms' risk due to its industry, characteristics, situation, manager's integrity, experiences, and turnover. Control risk is the managers' effort to control or reduce inherent risk. Thus, as the managers' efforts, defined as control risk, increase, the auditors should reduce the detection risk to an acceptable level of overall audit risk by increasing substantive testing.

We focus on the firm's control risk, and the operation of the IC system usually assesses it. Human resource characteristics of IC systems are the indicators to assess the level of IC systems' operating effectiveness. The Committee of Sponsoring Organizations emphasizes the role of personnel in accomplishing a company's financial reporting objectives. A lack of personnel in the internal control function may adversely affect the adequate segregation of duties, independent reconciliations, and management review. Ge and McVay (2005) report that using insufficiently trained employees in the accounting department is a factor in the incidence of internal control weakness. Fargher and Gramling (2005) report that improved training of existing staff members, more personnel, and education can solve problems with internal controls. Human resources are often considered when assessing the effectiveness of the IC system. The finance and accounting departments are components of the system that perform their duties related to financial statements (Lee and Kim 2020).

Studies on the IC system are mostly performed in the Korean background due to its data availability. Choi et al. (2013) report that companies with a high ratio of personnel handling internal accounting management to the total number of employees have a low possibility of reporting weaknesses in the internal control system, and the level of discretionary accruals that overstate profit is also low. In addition, companies with experienced internal accounting personnel and a high level of accounting knowledge have a lower possibility of possessing weakness and short audit time as well as a lower level of audit fee. In other words, if the weight of personnel for internal accounting management increases, they will perform the work efficiently, resulting in improved quality of the financial report.

Ryu et al. (2012) attempt to subdivide the state of internal accounting personnel quantitatively and qualitatively to prove the effectiveness of the internal control system through the occurrence of audit errors. The authors discover that the probability of accounting error occurrence decreases as the weight of the number of internal accounting personnel to the total number of employees becomes higher, and their average career months increase. From this result, the authors find that when a company has a sufficient number of internal accounting personnel, an appropriate division of labor occurs, and timely review and monitoring of accounting function can be executed, resulting in effective internal control.

At the same time, the working experiences of internal control personnel are a vital factor in deciding audit hours. Collectively, internal control personnel constitute the primary internal control functionality, and internal control personnel with proper training provide an efficient function of internal control. Asare and Wright (2012) report that an increase in internal control personnel quality or an increased level of expertise in internal control operation may affect the year-end audit hours and generally affect audit hours when considering allocation by rank. Ge and McVay (2005) suggest that improving the professionalism of internal accounting personnel in the context of internal accounting management operations is related to audit quality. The nature of internal accounting personnel helps executives assess internal control risks, design internal control systems, and effectively manage accounting departments (Pizzini et al. 2015). Additionally, Chang et al. (2019) investigate the link between the quality of the internal audit function and the operation and compliance of IC system. They find that the staff's level of education and working experiences of members affect the quality of IC function.

Therefore, when a firm has enough experiences, the auditors consider the firm to have low control risk, leading to efficient audit work (Public Company Accounting Oversight Board (PCAOB) 2005) and reduced audit hours (Pizzini et al. 2015). Chae et al. (2012) confirm that the higher the number of average career months of internal accounting personnel, the higher the credit rating received by the company. They explain that the internal control system plays an oversight role over management and this, in turn, gives a positive influence on credit rating. Bae and Kwon (2015) confirm that as the number of average career months of internal accounting personnel increases, the probability of asset embezzlement significantly decreases. This can be interpreted as a result of appropriate prevention of inducement to embezzlement by strictly safeguarding operating assets as the expertise of internal accounting personnel increases.

By considering the average number of career months of internal accounting management personnel in each department as control risk, the intention is to review the relationship between audit quality and the weight of audit time acknowledged as control risk by the external auditor when there is a low average career level. Notably, this study expects that partners that supervise the management of overall audit planning and processes and review the audit report consider the low number of average career months of internal accounting management personnel in each department as a control risk and increase the weight of year-end audit hours more than other companies do.

2.2. Hypothesis Development

The engagement partners are responsible for the overall audit plan and process, while CPA and staff devote more effort to time-consuming work, such as checking account balances (Ryu et al. 2015). The situation of each client firm is different, and therefore, the audit plan, evidence, and level of audit risk differ, which differ by the industry and nature of the business. After assessing risks, the auditors should establish an appropriate audit plan to reduce the audit risk to an acceptable or lower level.

For example, in the fashion-sensitive apparel industry or the electricity industry, which are technologically advanced, there is a high possibility of rapid obsolescence of inventory assets. In addition, the leasing and insurance industry requires specific financial reporting systems and regulations. The auditors have a high risk of audit failure if they do not properly understand the nature of the transactions or industry characteristics inherent in a particular industry. Therefore, the auditor should understand the industry characteristics of the company and evaluate audit risk according to such characteristics.

In the case of firms with diverse business units or many unique transactions that the auditors are unfamiliar with, there is a high probability that the auditor will need to identify analytical challenges. Therefore, it is predicted that the partners will plan for the situation they will confront.

Hypothesis 1 (H1). *There is a positive association between partner's audit hour ratio and audit quality.*

To achieve or restore investor confidence and to ensure transparent financial reporting after financial scandal, such as those of Enron and WorldCom, the Sarbanes–Oxley Act was introduced in the United States, highlighting the importance of internal control as a means to improve financial reporting quality. In 2001, Korean regulators introduced a requirement for firms to report the current status of internal control on a regular basis to the board of directors or internal auditors.

In addition, the Korean Financial Supervisory Service requires all listed firms to disclose how they operate internal control-related systems in their annual reports. All firms listed on the Korean Stock Exchange should disclose the total number of employees engaged in the implementation of internal control, and the number of internal control personnel working for certain departments related to the internal control function, including the accounting department and the information technology and systems (IT) department. In addition, it is necessary to disclose the average work experience of the personnel engaged in the implementation of internal controls by departments, measured in months.

Prior studies suggest that lack of internal control personnel is likely to lead to a weak internal control system, thereby increasing audit risk. The audit risk model suggested by the Public Company Accounting Oversight Board (PCAOB) (2010) and the Statement on Auditing Standards No. 107 (American Institute of Certified Public Accountants (AICPA) 2006) is the product of three risk types: inherent risk, control risk, and detection risk. As control risk increases, auditors should reduce detection risk by increasing their substantive testing in order to achieve a desirable level of overall audit risk. If there are insufficient internal control personnel and thus, a weak internal control system, the auditors expect a high audit risk for the firm. If the auditors are not able to obtain the required help from internal control personnel, they cannot conduct audits efficiently and spend more time waiting for responses and working on the audit (Asare and Wright 2012; Pizzini et al. 2015).

If the company has enough internal accounting personnel, and appropriate division of labor is performed, it is possible to obtain the proper timeliness for accounting issues (Choi et al. 2013). Therefore, the more staff in charge of internal control operations, the fewer the audit hours. Shin et al. (2016) report that as the ratio of internal control operation personnel increases, the audit report lag becomes shorter, indicating efficient audit work. Choi et al. (2013) find that it is highly likely to report a material weakness on internal control as the ratio of internal control increases. These results can be interpreted as follows: firms with sufficient internal control personnel are considered as having low control risk, which affects the final opinion on the audit report.

Considering work from different positions, the audit hours by rank, especially partner's auditing time ratios, could differ based on the level of internal controls. More internal control personnel help auditors conduct audits more efficiently. For example, more available internal control personnel can provide information requested by the auditor more quickly, reducing auditors' waiting time and speeding up the audit process.

Poor internal controls are usually associated with insufficient allocation of resources to accounting controls. Specifically, they find that material weaknesses in relation to internal controls are often related to deficient revenue-recognition policies, lack of segregation of duties, deficiencies in the end-of-period reporting process and accounting policies, and inappropriate account reconciliation. As control risk increases, auditors should reduce detection risk by increasing their substantive testing in order to achieve a desirable level of overall audit risk, which results in lower level of audit quality.

Hypothesis 2 (H2). *The positive association between partner's audit hour ratio and audit quality is more pronounced as inherent risk increases.*

3. Result

3.1. Sample

The detailed disclosure of audit conduct started in 2014 in Korea. Thus, the sample period of this study is limited to four fiscal years from 2014 to 2017. Details of partners' audit efforts measured in audit hours spent are hand-collected from audit report supplements, as presented in Table 1. The regulation and financial statement characteristics applied in the financial and insurance industry are different from non-financial and insurance industries. Therefore, we exclude financial and insurance industries for the data comparability (Chae et al. 2012; Ryu et al. 2018). In addition, observations with missing variables for the regression analysis are removed from the sample. All the control variables are winsorized at the top 1% and bottom 1%. The procedure results in 6340 firm-year observations.

Table 1. Sample selection.

Distribution of Sample	Number of Observations
Initial sample	8020
(-) Financial institutions	(692)
(-) Non-December 31 fiscal year-end firms	(152)
(-) Impairment of capital companies	(234)
(-) Firms without partner audit hour and internal control operation data	(602)
Final sample	6340

Table 1 presents the sample distribution used for this analysis. The initial sample is 8020, but the following firms are excluded from the analysis: financial institutions (692), firms whose fiscal year does not end on 31 December (152), companies with impaired capital (234), and firms without partner audit hours and internal control operations data (602). In the end, a sample of 6340 firm-year observations remain for the analysis.

Table 2 presents the sample distribution. Panel A presents the distribution of sample by year, showing a gradual increase. Panel B presents the industry distribution by sample, and the manufacture of electronic components, computers, radios, televisions, and communication equipment and apparatuses, the highest sample distribution of all.

Table 2. Data distribution.

Panel A. Year Distribution					
Year	2014	2015	2016	2017	Total
Number of Observation	1465	1599	1619	1697	6340

Panel B. Industry Distribution			
Industry Name	N	Industry Name	N
Manufacture of Food Products	2	General Construction	109
Fishing Industry	15	Professional Contractor by	51
Coal, Crude Oil and Natural Gas Mining	3	Motor Vehicles and Parts Sales Business	4
A Nonmetallic Mineral Mining; Excluding for Fuel	7	Wholesale and Commodities Broker	386
Manufacture of Food Products	168	Automotive; Other than the Retail Industry	106
Manufacture of Drink Products	41	Transportation by Land and by Pipeline	48
Manufacture of Tobacco Products	4	Water Transportation	17
Manufacture of Textile, Except Apparel	48	Air Transport Business	13
Leather shoes, Bags, and Manufacturing	11	Storage and Transport Service	20
Wood Processing and Wooden Products Manufacturing; Except Furniture	16	Lodging Industry	2
Manufacture of Pulp, Paper and Paper Products	103	The Restaurant and Pub Industry	5

Table 2. *Cont.*

Panel B. Industry Distribution			
Printing and Reproduction of Recorded Media	8	Book Industry	343
Manufacturing of Coke, Briquettes and Oil Refining	19	Motion Picture, Video and Television Program Production, Sound Recording and Music Publishing Activities	80
Manufacture of Chemical and Chemical Products except Pharmaceuticals and Medicinal Chemicals	426	Broadcasting Industry	44
Manufacture of Pharmaceuticals, Medicinal Chemicals and Botanical Products	376	Networking Business	48
Manufacture of Rubber and Plastic Products	154	Computer Programming, Consultancy and Related Activities	89
Manufacture of Other Non-metallic Mineral Products	120	Information Service Activities	95
Manufacture of Motor Vehicles, Trailers and Semitrailers	274	Estate Agency	15
Metal Products Manufacturing; Excluding Mechanical and Furniture	166	Real Estate; Other than Leasing Companies	7
Manufacture of Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses	893	Business Research and Development	56
Manufacture of Medical. Precision and Optical Instruments, Watches and Clocks	186	Professional Services	295
Electrical Equipment Manufacturing	188	Architectural, Engineering and Other Technology Services	69
Other Machinery and Equipment Manufacturing	519	Other Professional, Scientific and Technical Services	18
Automobile and Trailer Manufacturing	329	Landscape Architecture Services and Facilities Management Business	4
Other Transportation Equipment Manufacturing	77	Business Support Services	62
The Furniture Making Industry	27	Educational Services Industry	36
Other Products Manufacturing	35	Creative, Arts and Entertainment Services	12
Electricity, Gas, Steam and Air Conditioning	36	Sports and Entertainment Services	28
Collection and Transport of Waste, Processing and Material	19	Other Individual Services	4
Environmental Cleanup and Restoration	4	Total	6340

3.2. Research Model

We use the following Equation (1) to test the first hypothesis, that the partners' audit hour ratio significantly influences the audit quality. The dependent variable is audit quality, followed by Kothari et al. (2005). The main independent variable is P, the value of the partner's audit hour divided by the sum of the hours spent by partners, CPA, and staff.

$$\begin{aligned} AQ = \beta_0 + \beta_1 P + \beta_2 Size + \beta_3 Lev + \beta_4 Ocf + \beta_5 Growth \\ + \beta_6 Inv + \beta_7 Loss + \beta_8 New + \beta_9 For + \beta_{10} Large \\ + \beta_{11} Mkt + \beta_{12} AF + \beta_{13} Big + \beta_{14} Vol + \beta_{15} Beta + Ind + Yrd + residual \end{aligned} \quad (1)$$

The control variables of this model are based on the prior literature of audit quality (Myers et al. 2003; Choi et al. 2014). The control variables are the firms' total assets (*Size*), which represent company scale and complexity, the weight of inventory accounts receivable (*Inv*), the debt ratio (*Lev*) to control the effect of financial risk, growth (*Growth*), the cash flow of sales activity (*Ocf*), loss of business (*Loss*), the equity share of the largest shareholder (*Large*) to control differences in corporate governance, and the equity share of foreigners (*For*).

As the company grows in size, it is considered a large corporation. In that case, the internal control system operates effectively, reducing the probability of having distorted financial statements, and audit quality improves (Ryu et al. 2018; Shin et al. 2016). Since inventory or accounts receivable are often used as a means to manipulate profit, and

additional audit work, such as physical observation and checking inquiries, is required, this study adds the ratio of the accounts receivable amount (*Inv*) to represent the weight of inventory and accounts receivable to end-of-year total assets. As the debt ratio (*Lev*) becomes high, the inherent risk of the company also becomes high, and the rationale develops for management to adjust profit. Hence, the auditor intends to expand the audit range in the proofing procedure phase to reduce audit risk (Kang and Lee 2009). As a result, it is expected that there is a negative (-) correlation between the debt ratio (*Lev*) and audit quality. The control variable Loss, which represents whether there is a loss, is an alternative that presents the business risk of the client company. Since O'Keefe et al. (1994) show that as the business risk of the client company increases, audit risk also increases, resulting in the growth of audit effort, these variables are included in the model. Largest, which shows the one-person equity share of the largest shareholder, and Foreign are incorporated into the model based on Niemi (2005), who finds that the client company's corporate governance can affect audit hours. Moreover, as business risk rises, there is a possibility of the company facing litigation risk, resulting in a relative increase in audit risk. Therefore, audit quality can also be lowered. *Vol* and *Beta* are variables explaining the additional areas that financial variables cannot measure. *Vol* refers to the standard deviation of the price–earnings ratio within the last 1 year; it represents the risk (volatility) of the stock. *Beta* is a systematic risk. To control volatility by industry, *Ind* is included. Moreover, *Yrd* is added to manage the volatility of the audit report time difference caused by specific economic conditions and the introduction of policies within that particular year. Variable definitions are presented in Table 3.

Table 3. Definition of variables.

Variables	Definition of Variable
P	Partner audit hour ratio in year t {Partner hour/(Partner hour + Cpa hour + Staff hour)}
IC1	Internal accounting personnel in accounting department in year t
IC2	Internal accounting personnel in IT department in year t
IC3	Average career months of internal accounting personnel in accounting department in year t
IC4	Average career months of internal accounting personnel in IT department in year t
Size	Firm size in year t. (Natural log value of total asset)
Lev	Debt ratio in year t (Total debt/total asset)
Ocf	Sales cash flow in year t (Sales cash flow/Total assets over the previous period)
Growth	Asset growth ratio in year t
Inv	Inventory to total assets in year t, Ratio of accounts receivable amount [(inventory + accounts receivable)/total assets]
Loss	1 if a company with loss in year t, and 0 otherwise
New	1 if the audit is the first-time audit in year t, and 0 otherwise
For	Proportion of ownership held by foreign investors in year t
Large	Proportion of ownership held by the largest shareholder in year t
Mkt	If listed in Kosdaq, Mkti, t = 1
AF	Natural log value of audit fee in year t
Big	1, if the auditor in t period is one of the Big Four accounting firms, otherwise 0
Vol	Volatility of daily price-earnings ratio in year t
Beta	Systematic risk measurement in year t

Equation (2) is a modified regression of Equation (1) by including control risk, assessed by the characteristics of the human resources of IC system, such as the number of IC personnel and their working experiences in each accounting and IT department. IC1 (IC2) denotes the value of the number of internal control personnel in the accounting (IT) department among the employees. IC3 (IC4) represents the natural logarithm of working experiences in the accounting (IT) department. A higher value means an effectively operated IC system. In detail, the firms with a sufficient number of IC systems are low in control risk. The variables of our interest in Equation (2) are interaction terms of P×IC1~4,

indicating the interaction variable between the characteristics of human resources of the IC system in each accounting and IT department and the partner's audit effort.

$$\begin{aligned} AQ = \beta_0 + \beta_1 P \quad & + \beta_2 IC1 \sim 4 + \beta_3 P \times IC1 \sim 4 + \beta_4 Size + \beta_5 Lev + \beta_6 Ocf \\ & + \beta_7 Growth + \beta_8 Inv + \beta_9 Loss + \beta_{10} New + \beta_{11} For \\ & + \beta_{12} Large + \beta_{13} Mkt + \beta_{14} AF + \beta_{15} Big + \beta_{16} Vol + \beta_{17} Beta \\ & + Ind + Yrd + residual \end{aligned} \tag{2}$$

3.3. Measuring Audit Quality

If it is impossible to measure audit quality as a measured value directly in a market in which differences in audit quality exist, then the market participants select a measurable proxy variable to measure the audit quality. Even in audit work conducted by an external auditor, there are differences in audit quality, but it is impossible to monitor and measure audit quality directly as one value. To measure the audit quality, a proxy variable for that purpose must be selected.

The measurement of audit quality often uses discretionary accruals. Accruals can be divided into non-discretionary accruals determined by the company's financial state and economic environment, and discretionary accruals, which occur by the management's arbitrary adjustment of earnings and opportunistic financial reports. Hence, if a high-quality audit is performed, the management's action of adjusting earnings through discretionary accruals will be reduced.

To limit the shortcomings of the Jones model and the modified Jones model, which measure excessive discretionary accruals for companies with radical business performance, this study measures the discretionary accruals by the performance-matched discretionary accrual measure model of Kothari et al. (2005). The discretionary accrual of the performance-matched discretionary accrual measure model equals the total accrual minus the expectation of non-discretionary accrual that the management cannot control. Total accrual is calculated by subtracting the sales cash flow from accounting earnings. The expectation of non-discretionary accrual is measured using the performance matched discretionary accrual measure model on estimated samples for the last 10 years through cross-sectional regression analysis by industry year.

Kothari et al. (2005) suggest the methods for improving the existing modified Jones model. The first is to add a constant term (b_0) to the modified Jones model, as shown in Equation (3). Since management performance influences the discretionary accruals estimated by the existing modified Jones model, the estimation is performed with one of three options: by using the value less discretionary accruals of a matching company within the same industry with similar returns on total assets; by using that value of a matching company regardless of the industry; or by adding the return on total assets to the modified Jones model. This study verifies the robustness of the result by calculating the discretionary accruals using Equation (3), which is the modified Jones models plus constant term and return on total assets, as suggested by Kothari et al. (2005). The industry classification is undertaken using the first four digits of six industrial codes in a sub-classification of TS2000. If the information of no more than eight companies is available, that particular industry is omitted.

$$\frac{TA}{Asset} = b_0 + b_1 \frac{1}{Asset} + b_2 \frac{(\Delta Sales - AR)}{Asset} + b_3 \frac{PPE}{Asset} + b_4 ROA + residual \tag{3}$$

where,

TA	=	Total accruals, measured as earnings before extraordinary items minus cash flow from operations in year t;
$Asset$	=	Lagged total assets in year t;
$\Delta Sales$	=	Change in net sales in year t;
AR	=	Accounts receivables in year t;
PPE	=	Net property, plant, equipment in year t;
ROA	=	The rate of return on assets in year t.

3.4. Descriptive Statistics and Correlation

Table 4 presents descriptive statistics. *P* is the partner's audit effort during audit engagement, and it shows that the average audit effort spent by partners is 12.5%. *IC1*, the ratio of employees working in the accounting department, has a mean of 0.032, suggesting that about 3% of employees in the accounting department of firms are responsible for internal control. *IC2*, the ratio of employees working in the IT department, has a mean of 0.08%, suggesting that about 0.08% of IT department employees of firms are responsible for internal control. *IC3*, the average work experience in months of personnel in the accounting department, has a mean of 4.598, and *IC4*, the average work experience in months of internal control personnel in the IT department, has a mean of 4.562. The average work experiences in both departments are about the same level.

Table 4. Descriptive statistics.

Variables	Mean	Median	Min	Q1	Q3	Max
AQ	−0.003	0.000	−0.356	−0.044	0.039	0.352
P	0.0125	0.0618	0.0178	0.043	0.186	0.508
IC1	0.030	0.015	0.000	0.007	0.028	0.333
IC2	0.008	0.004	0.000	0.001	0.009	0.100
IC3	4.598	4.663	2.485	4.277	5.004	5.989
IC4	4.562	4.710	1.792	4.220	5.094	5.793
Size	25.871	25.616	23.539	24.961	26.494	30.676
Lev	0.374	0.368	0.033	0.209	0.520	0.864
Ocf	0.041	0.043	−0.243	−0.001	0.089	0.259
Growth	0.025	0.025	−1.103	−0.088	0.129	1.168
Inv	0.269	0.245	0.13	0.146	0.364	0.814
Loss	0.283	0.000	0.000	0.000	1.000	1.000
New	0.222	0.000	0.000	0.000	0.000	1.000
For	0.066	0.021	0.000	0.007	0.074	0.526
Large	0.396	0.391	0.060	0.263	0.514	0.789
Mkt	0.605	1.000	0.000	0.000	1.000	1.000
AF	14.129	15.425	0.000	14.460	15.718	16.067
Big	0.504	1.000	0.000	0.000	1.000	1.000
Vol	0.029	0.026	0.008	0.020	0.036	0.071
Beta	0.797	0.781	−0.104	0.496	1.083	1.830

Variable definitions are presented in Table 3.

Table 5 presents the Pearson correlation matrix for the main variables used in the tests. As predicted, P_t has a negative association with AQ and is statistically significant.

Table 5. Pearson correlations.

		(1)	(2)	(3)	(4)	(5)	(6)
AQ	(1)	1.000	−0.028	−0.018	−0.022	−0.004	0.001
			0.026	0.141	0.072	0.775	0.952
P	(2)		1.000	0.072	0.063	0.054	−0.028
				<0.0001	<0.0001	<0.0001	0.045
IC1	(3)			1.000	0.688	0.000	−0.041
					<0.0001	0.977	0.003
IC2	(4)				1.000	0.000	−0.035
						0.987	0.010
IC3	(5)					1.000	0.504
							<0.0001
IC4	(6)						1.000

Variable definitions are presented in Table 3.

3.5. Multivariate Analysis

Partner's Audit Hour Ratio and Audit Quality

Table 6 reports the multivariate analysis results examining the first hypothesis using Equation (1). Hypothesis 1 examines whether the partners' efforts affect audit quality positively. The coefficient of the P is significantly negatively at 5% level, suggesting that partners' audit efforts increase audit quality. In addition, the result supports previous research that examined the positive role of partners' efforts. The engagement partners are primarily responsible for the overall audit plan and the process and are expected to have more experiences in the related field of area (Choi et al. 2016). Our result is in line with Bae et al. (2015) that partners play a great role in improving the transparent accounting environment. However, our study has a novelty in utilizing publicly available data, not limited to proprietary data, on listed firms in South Korea and suggests that partners' audit efforts positively affect audit quality.

Table 6. Relationship between partner's audit hour ratio and audit quality.

Variables	Dependent Variable: *AQ*		
	Estimate	t-Value	
Intercept	−0.250	−0.540	***
P	−0.033	−2.400	**
Size	0.011	7.470	***
Lev	−0.055	−7.030	***
Ocf	−0.619	−44.590	***
Growth	0.000	1.000	
Inv	0.064	6.430	***
Loss	−0.114	−33.620	***
New	0.003	0.910	
For	0.007	0.470	
Large	0.048	5.550	***
Mkt	0.016	4.890	***
AF	0.001	0.520	
Big	−0.013	−3.260	***
Vol	−0.397	−3.330	***
Beta	0.010	2.930	***
Ind		Included	
Yrd		Included	
Adj. R^2		0.331	
n		6340	

Note: *** and ** represent significance at the 5 and 10 percent levels, respectively. Variable definitions are presented in Table 3.

Table 7 presents the results of the regressions testing the ratio of internal control personnel at the firm level. The coefficient of *IC1* is significant, but *IC2* is statistically insignificant. *P*IC1* is the interaction variable of the ratio of internal control personnel in the accounting department to total employees in the firm, and the partner's auditing time ratio is statistically significant at the 5% level, suggesting that partners recognize the insufficient internal control personnel in the accounting department as a high control risk and they make more effort during the audit. The result implies that sufficiently experienced internal control personnel help the auditors to complete their audits (Ge and McVay 2005). In other words, if the IC system operates adequately with sufficient or experienced human resources, appropriate segregation of duties and timely review on accounting issues are possible (Choi et al. 2013). The result is in the same vein as that of Lee et al. (2010). Lee et al. (2010) find that a higher number of IC personnel increases the audit fee, implying that the firms interested in the effective operation of the IC system require auditors to perform their audit procedure strictly, resulting in a higher audit fee, which usually leads to higher audit quality (Higges and Skantz 2006; Blankley et al. 2012).

Table 7. Relationship between partner's audit hour ratio and audit quality depending on internal control system. Number of internal control personnel in accounting and IT departments.

Variables	Dependent Variable: *AQ*					
	Estimate	t-Value		Estimate	t-Value	
Intercept	−0.152	−6.550	***	−0.185	−4.2	***
P	−0.035	−3.290	***	−0.032	−2.170	**
IC1	0.003	1.840	*			
*P*IC1*	−0.019	−2.210	**			
IC2				0.002	0.720	
*P*IC2*				−0.048	−2.270	**
Size	0.008	9.820	***	0.007	4.940	***
Lev	0.001	2.810	***	−0.001	−1.310	
Ocf	−0.734	−96.810	***	−0.601	−39.910	***
Growth	0.000	0.310		0.002	0.620	
Inv	0.047	10.260	***	0.073	8.360	***
Loss	−0.048	−26.720	***	−0.108	−31.080	***
New	0.001	0.740		0.000	−0.010	
For	−0.009	−1.070		0.018	1.150	
Large	0.026	5.550	***	0.059	6.570	***
Mkt	0.006	3.850	***	0.012	3.660	***
AF	0.000	−0.390		0.001	1.130	
Big	−0.003	−1.740	**	−0.013	−3.600	***
Vol	−0.359	−5.800	***	−0.793	−6.600	***
Beta	0.004	1.910	*	0.012	3.170	***
Ind		Included			Included	
Yrd		Included			Included	
Adj. R^2		0.656			0.352	
n		6340			6340	

Notes: ***, ** and * represent significance at the 1, 5, and 10 percent level, respectively. Variable definitions are presented in Table 3.

Table 8 presents the result of the regressions testing the experience of internal control personnel in each department. *P*IC3* (*IC4*), the interaction variable of partner's auditing time ratio associated with low average work experience in months of the accounting (IT) department, is negatively associated with audit quality. These results together imply that the partners recognize a low number of experienced IC personnel and a low number of internal control personnel as a high control risk, and they increase their efforts to assess the audit risk. Our result suggests that adequate investing in IC personnel lead to a positive result for the organization. This result provides evidence that human resource investment leads to a positive outcome at the organization level.

Table 8. Relationship between partner's audit hour ratio and audit quality depending on internal control system. Average working experience of IC personnel in accounting and IT department.

Variables	Dependent Variable: *AQ*					
	Estimate	t-Value		Estimate	t-Value	
Intercept	−0.127	−6.190	***	−0.136	−4.680	***
P	−0.091	−3.180	***	−0.021	−2.610	***
IC3	0.002	2.030	***			
*P*IC3*	−0.016	−2.760	***			
IC4				0.033	2.090	**
*P*IC4*				−0.171	−1.780	*
Size	0.007	10.820	***	0.007	6.970	***
Lev	0.000	−0.030		0.001	2.180	**
Ocf	−0.777	−83.960	***	−0.821	−83.960	***

Table 8. *Cont.*

Variables	Dependent Variable: *AQ*					
	Estimate	t-Value		Estimate	t-Value	
Growth	0.049	22.470	***	0.000	1.970	**
Inv	0.029	7.520	***	0.056	11.250	***
Loss	−0.037	−24.75	***	−0.050	−24.490	***
New	0.002	1.050		0.001	0.250	
For	0.006	0.970		0.004	0.400	
Large	0.026	6.790	***	0.034	6.340	***
Mkt	0.006	4.540	***	0.004	2.120	**
AF	0.000	−0.560		0.000	−0.310	
Big	−0.005	−3.150	***	−0.003	−1.230	
Vol	−0.139	−2.630	***	−0.455	−6.720	***
Beta	0.002	1.350		0.005	2.160	**
Ind		Included			Included	
Yrd		Included			Included	
Adj. R^2		0.335			0.335	
n		6340			6340	

Note: ***, ** and * represent significance at the 1, 5 and 10 percent levels, respectively. Variable definitions are presented in Table 3.

4. Conclusions

The role of partners who manage and oversee all aspects of the audit team and are responsible for auditing and individual auditing is meaningful (Zerni 2012; Knechel et al. 2013). Investors and regulators and auditees are aware of the importance that partners bring to audits and have shown a great deal of interest in partners. One of the most essential characteristics of the partners is their efforts. Using the unique data of South Korea, in this study, the partners' audit effort is achieved using all the listed firms and investigating whether partners' audit efforts are related to the audit quality. We find that partners' audit efforts affect audit quality positively. At the same time, we consider the effect of a firm's human resource characteristics of the IC system on the relationship between their partners' audit efforts and audit quality. We find that partners' efforts positively affect audit quality in the firm when there is an adequate number of internal control personnel both in the accounting and IT departments. Additionally, partners' efforts increase audit quality in a firm with higher working experiences in the accounting and IT departments.

Our study has a contribution to the extant literature. First, only a few previous studies have examined the relationship between the levels of investment in human resources in charge of IC systems as a proxy for the effectiveness of IC systems. IC system-related previous studies mostly focused on reporting opinion in the IC system, which is based on the dichotomous logic that the IC system differs between the firms that report material weakness and firms that do not. However, the human resource characteristics of IC systems are the criteria confirmed in reviewing or auditing IC systems, while IC opinion is the result of reviewing or auditing the IC system. This study is meaningful in examining the IC system's human resource effect in relation to partner audit hours and audit quality.

Second, it is clear that there is a distinct difference in auditors by rank, but the information on auditors by rank is limited. The previous studies that test the effect of partners are based on the survey or proprietary data only limited to certain firms (O'Keefe et al. 1994; Stein et al. 1994; Mock and Wright 1993; Fukukawa et al. 2011). Thus, this study has a novelty in examining the relationship between the audit quality and partners' audit effort, using the data we manually collected. Moreover, since the data for this study come from publicly available data, the results can be generalized.

There are limitations of our study. Even though this study is significant to fill the gap by investigating the relationship between the effect of partners and audit quality, the definition of partners in the audit report should be more explicit. External auditors are divided into three categories in the audit report: engagement partner, chartered CPA, and

staff. If all groups of CPA are stipulated more in detail, such as working experiences, it may lead to a more interesting result.

For future study, it will be possible to test the effect of COVID-19. COVID-19, with fear of health, is leading to the collapse of global capital markets. Ali et al. (2020) investigate whether there is a difference in daily profitability and volatility between pre- and post-periods of COVID-19. At the same time, the pandemic is altering the auditing trend. For example, in the report from Earnest & Young on 6 October 2020, 8 out of 10 finance and auditing personnel asserted that COVID-19 negatively impacts audit quality. For the future study, it will be meaningful to test the effect of accounting comparability on audit quality, pre- and post-pandemic.

Additionally, the digital audit is receiving attention, as auditing is transferred from traditional audit to contact-free auditing. Thus, the importance of IT technology is emphasized as the need for processing data significantly increases. In addition, the technological modernization of the entire infrastructure is necessary to ensure the continuous operation of the business process (Barykin et al. 2021a). As risks associated with digital technology evolve over time, the criteria of scoring human resources of IC system can be adjusted with reference to the study (Barykin et al. 2021b). Therefore, it will be meaningful if the new criteria assessing the IC system operation are developed and reflected in future studies.

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