Can audit effort (hours) reduce a firm's cost of capital? Evidence from South Korea

Abstract

In this paper, we examine the relationship between audit effort measured as audit hours and a firm's weighted average cost of capital (WACC). Using a sample of Korean listed firms, we hypothesize a bi-directional relationship between WACC and audit effort based on audit 'supply'/audit 'demand' theory. We find that after controlling for known determinants of firm risk, additional audit hours reduce a firm's WACC. In our additional analysis, we continue to find that WACC reduces with audit hours based on risk partitioning for i) Big4 clients/investment grade (IG) firms and ii) Non-Big4 clients/non-investment grade (NonIG) firms. However, we find the reduction in WACC occurs at a lower rate for the less risky group compared to the riskier group. We interpret that market participants consider Big4 clients/IG firms to have lower risk, and thus, the marginal effect of greater audit hours in enhancing audit quality (reducing audit risk) is lower for Big4 clients/IG firms compared to Non-Big4 clients/NonIG firms. Taken together, our findings that audit hours (effort) reduce WACC suggest audit hours signal audit quality to investors.

Keywords: audit effort, WACC, audit demand theory, audit supply theory

1. Introduction

Following recent infamous accounting scandals[1], the demand for audit quality has increased in the United States, Europe, and Asia. However, in the literature, audit quality is considered a binary concept based on DeAngelo's (1981) assertion that audits are designed to detect breaches in a firm's financial reporting systems. To enhance audit quality, DeFond and Zhang (2014) surmise that audit quality should move beyond a simple binary function to capture the effect of audit effort on a firm's innate characteristics and financial reporting quality. In this study we examine the relationship between weighted average cost of capital (WACC) and the amount of audit effort (hours) required to complete an audit based on the assumption that incremental audit effort provides valuable insights about a firm's audit quality, internal control and reporting systems. We posit that the relationship between audit effort and WACC requires robust analysis to demonstrate how market participants perceive audit risk in relation to firm risk. Using a sample of Korean listed firms, we perform a battery of tests to examine whether audit effort influences WACC. We then conduct additional analyses after dividing our sample into Big4/Non-Big4, investment grade (IG)/non-investment grade (NonIG), and KOSPI/KODAQ (Korean stock exchange) samples. Our study is unique because audit effort, the number of audit hours a firm requires to complete an audit is only publicly available in a handful of countries2; thus, we develop this study to provide insights about what audit hours can signal to market participants based on Big4/Non-Big4, IG/NonIG and KOSPI/KOSDAQ status.

[1] Enron scandal 2001, WorldCom scandal 2002, Lehman Brothers scandal 2008 etc.
[2] Finland (Niemi, 2005), Japan (Fukukawa et al., 2006).

We surmise that audit effort influences a client firm's WACC. However, previous empirical findings are somewhat mixed as reporting 1) positive (Deis and Giroux, 1992; O'Keefe et al., 1994) and negative (Jung, 2016; Caramanis and Lennox, 2008) relationship between audit effort and firm risk based on Simunic's audit supply and demand theories (1980). We therefore offer a bi-directional hypothesis based on the two opposing theories. First, audit firms have an incentive to minimize reputational damage and litigation risk (Dye, 1993; Webber et al., 2008), and thus, audit firms have an incentive to demand that sufficient audit effort is included into audit contracts to ensure that a client's financial reporting and internal control system are robust (audit supply theory). Thus, an audit firm's incentives to reduce business risk (increasing audit hours) can be interpreted by market participants as a signal of audit risk and impounded into a firm's WACC. Secondly, an opposing view is that additional audit hours have the potential to reduce a firm's WACC. Managers have an incentive to signal robust financial reporting quality and may therefore demand additional effort from auditors (audit demand theory). Likewise, shareholders are likely to demand additional audit effort to reduce agency problems and legitimize the activities of management. Furthermore, external stakeholders may also demand increased audit effort to reduce financial reporting information asymmetry. Therefore, there is a strong possibility that additional audit effort can reduce a firm's WACC by demonstrating that financial statements are a genuine representation of business operations and that financial reporting is robust.

We have several motivations to conduct this study. Firstly, due to data unavailability, the audit hour (effort) literature is limited. However, South Korea is a unique case study to capture the relationship between audit hours and WACC because South Korea is one of very few countries that require completed audit hours to be listed on annual reports; therefore, it is possible to ascertain whether audit hours influence how market participants including banks, investors and capital lenders perceive audit/firm risk in specific situations using a Korean sample. Secondly, we question whether Big4/Non-Big4, IG/NonIG and KOSPI/KOSDAQ status is an intervening variable that influences the relationship between audit effort and WACC, after controlling for key determinants of audit risk including size, business risk, performance and ownership structure. There is the potential that audit effort influences WACC. However, Big4/Non-Big4, IG/NonIG and KOSPI/KOSDAQ listing may have an incremental effect on a firm's WACC based on how market participants perceive audit effort in relation to the riskiness of a specific group. Third, there is an increasing pivot towards the international harmonization of accounting principles/standards to enhance the comparability of annual reports (Ghio and Verona, 2015; Carneiro and Rodrigues, 2017; Corbella, and Florio, 2010). However, political and cultural convergence allows variations in financial reporting. We are motivated to demonstrate that regardless of geographical location, audit hours can enhance reporting transparency and quality to provide insights for policymakers.

To capture the relationship between audit hours and WACC, we conduct empirical analysis using 10,704 firm year observations between 2002 and 2014 in Korea. Our results can be interpreted as follows. First, we find that after controlling for known key determinants, audit hours have a negative effect on a firm's WACC suggesting that if an audit firm exerts additional audit effort, a client will enjoy lower WACC. When we divide WACC into cost of equity (COE) and cost of debt (COD), we continue to find consistent results. Furthermore, we find that WACC reduces with audit effort for both less risky groups (Big4 clients/IG firms) and risky groups (Non-Big4 clients/NonIG firms). However, the reduction in WACC occurs at a lower rate for the less risky group compared to riskier groups. We interpret that Big4 clients/IG firms signal to the market that they have lower business/audit risk by group association, and thus, the marginal effect of greater audit hours in reducing risk is lower for Big4 clients/IG firms compared to Non-Big4 clients/NonIG firms. Finally, we partition our sample into larger and smaller firms, we

continue to find that WACC reduces with audit hours, but the reduction level based on market size is indifferent between two groups. Taken together, the results provide robust evidence that audit effort influences a firm's capital costs.

Our study makes several important contributions. Firstly, we demonstrate that audit effort has explanatory power to explain WACC. Our results suggest that audit effort in hours (input) can be considered as a direct/key measure of audit quality (output). Based on the efficient market hypothesis, capital providers have an incentive to monitor all relevant firm information to analyse investment risk. We show that audit hour information is captured by market participants and impounded into a client firm's capital costs. Therefore, audit hour information that is rare internationally can be considered useful for numerous stakeholders, but unavailable in most countries. Secondly, we contribute to the literature by providing insights about both audit demand and audit supply theory perspectives (Simunic, 1980). There are two potential directional relationships between audit effort and firm risk, with audit fee literature suggesting that audit/business risk increases with audit fees (effort), consistent with audit supply theory. However, our results demonstrate that capital providers require additional compensation from firms with low contracted audit hours, supporting the logical underpinnings of audit demand theory.

Third, we contribute to the literature by demonstrating that market participants perceive the audit quality of Big4/IG firms differently compared to Non-Big4/NonIG firms. We find that additional audit hours supplied to Big4/IG firms will lower borrowing costs to a lesser extent compared to additional audit hours provided to Non-Big4/NonIG that can be considered as having higher levels of business risk. The results contribute to the literature by demonstrating i) how market participants perceive risk and audit quality for specific groups and ii) how audit hours can mitigate firm risk in specific situations based on group partitioning. Thus, our study is likely of interest to regulators, audit firms and market participants who question the relationship between audit hours, audit quality and perceived firm risk. Given that audit effort is shown to influence a market participant's perception of risk, we surmise that including exerted audit hours on annual reports would improve financial statement information quality. Furthermore, legislators may choose to pass regulation to mandate that all firms list audit hours on annual reports in the spirit of the international harmonization of accounting standards. The paper proceeds as follows. In section 2, we review literature and develop our hypotheses. In section 3, we develop our research design and define our proxies. Section 4 provides the results of empirical analysis. In section 5 we perform additional analyses. Section 6 concludes.

2. Literature review and hypothesis development

2.1 Literature review

In the United States, following infamous financial crises and defaults, the demand for audit information has increased. Audit firms are now expected to evaluate whether a firm's financial reporting adheres not only to accounting principles/policies, but also the spirit in which they were intended. The PCAOB (2010) also requires audit firms to evaluate qualitative evidence to assure that financial statements are consistent with the expectations of GAAP, rather than being simply technically compliant. In Europe, the demand for audit quality has also been increasing. From June 2016, the mandatory audit firm rotation policy has been implemented to reduce audit risk, based on the auditor entrenchment hypothesis. In South Korea, the demand for audit quality has also increased following high profile reports of accounting mismanagement at

numerous Chaebols (large Korean multinationals) in the 2000s3. Whilst there is increasing demand for enhanced audit quality internationally, academic studies interpret accounting quality to be a variation of DeAngelo's (1981) definition: 'the market-assessed joint probability that a given auditor will both detect a breach in the client's accounting system and identify the breach'. DeAngelo's binary audit quality definition considers the outcome of an audit as having one of two results, either successfully or unsuccessfully identifying audit/financial reporting system breaches. However, critics argue that this theoretical framework does not provide insights about the marginal influence of audit effort in enhancing audit quality. DeFond and Zhang (2014) consider that audit quality should be defined as 'greater assurance that the financial statements faithfully reflect the firm's underlying economics, conditioned on its financial reporting system and innate characteristics'. This modern audit quality definition suggests that greater audit effort (hours) can have an incremental assurance effect in enhancing audit quality. Based on the assumption that audit hours has the potential to enhance audit quality, academic tension exists whether market participants interpret audit effort/hours as a measure of firm risk.

Simunic (1980) suggests that the level of audit effort contracted by a client is i) dependent on a client's demand for audit services to enhance financial reporting quality (audit demand theory) and ii) constrained by an audit firm's incentive to reduce reputational damage and litigation risk (audit supply theory). Audit demand theory implies that stakeholders demand audit effort for four reasons. Firstly, additional audit effort can add value to a firm's internal business reporting quality to improve decision-making processes and strategic planning (DeFond and Zhang, 2014). Secondly, there is evidence to suggest that voluntary audits reduce a firm's cost of debt (Kim et al., 2011; Minnis, 2011). Furthermore, there is evidence that additional audit effort reduces the potential for a firm to suffer a downgrading of its credit ratings (Lennox and Pittman, 2011). Thus, the literature suggests that management may demand additional audit effort because additional substantive and control tests can be considered an assurance signalling mechanism that financial reporting and audit quality is robust, adding value to market participants. Thirdly, moral hazard problems arise because of the information asymmetry that exists between managers and external stakeholders (Watts, 1977; Watts and Zimmerman, 1983). Dopuch et al. (1986) suggest that because of the existence or even the perception of agency problems, management and shareholders can demand that action take place to reduce information asymmetry. The external monitoring provided by an audit is shown to reduce agency problems between management and shareholders (Jensesn and Meckling, 1976; Caramanis and Lennox, 2008; Lobo and Zhao, 2013). Therefore, management and shareholders can demand additional effort to improve financial reporting accuracy and reduce agency problems. Fourthly, external information users such as creditors dislike information asymmetry and thus have strong incentives to demand external monitoring to minimize the financial reporting information asymmetry (Houqe et al., 2017).

In contrast with audit demand theory, audit supply theory implies that the supply of audit effort is influenced by an audit firm's incentive to reduce litigation risk, and potential reputational damage (Dye, 1993; Skinner and Srinivasan, 2012). In Germany, following an audit failure of one of KPMG's clients, KPMG's remaining clients experienced share price declines which had a negative influence on KPMG's reputation (Webber et al., 2008). Audit firms are recognized as having developed numerous strategies to reduce audit risk. For instance, audit firms can avoid litigation risk by choosing to drop riskier clients (Bockus and Gigler, 1998;

[3] High profile accounting mismanagement has been identified at Chaebols including SK Global, Kia, Daewoo Korea Air (see Choi et al., 2017).

Hackenbrack and Hogan, 2005; Shu, 2000). However, the strategy that underpins the logic of audit supply theory is that audit firms can minimize business risk by demanding a fee premium for bearing additional audit risk. Countless studies suggest that audit fees increase with firm-specific risk (Morgan and Stocken, 1998; Felix et al., 2001; Hogan and Wilkins, 2010; Cahan et al., 2008; Simunic and Stein, 1996) including earnings management (Kinney Jr. et al., 2004; Abbott et al., 2006; Gul et al., 2003), unethical business practices (Lyon and Maher, 2005) and poor credit ratings (Gul and Goodwin, 2010). Overall, the audit fee literature suggests that audit fees (effort) increase with a combination of audit/business risk, which captures the premium demanded by audit firms based on litigation, and reputational threats. However, it is well documented in infamous financial collapses including Enron that audit fees were collected by audit firms but audit effort was not exerted. Therefore, we surmise that high audit fees may not always be a plausible proxy for audit effort. We consider audit hours to be a more felicitous proxy for audit effort because audit hours capture the levels of control and substantive tests that have been conducted to validate financial reporting quality. Thus, effort hours (input) can be considered a direct measurement of audit effort which has a direct effect on audit quality (output), whereas audit fees can be considered a risk premium regardless of audit effort input exerted.

The audit hour (effort) literature is limited due to data unavailability because only a handful of countries currently require firms to list audit hours on annual reports. Simunic (1980) demonstrates a positive relationship between firm risk factors and audit effort proxied by audit hours. Deis and Giroux (1992) show that audit hours can be an acceptable surrogate for audit quality for government institutions with increased audit hours increasing audit risk and reducing brand value. O'Keefe et al. (1994) demonstrate that audit hours increase with characteristics that are likely to increase firm-level risk including business complexity, size and volatility, again using government institutions. However, Caramanis and Lennox (2008) demonstrate that publicly listed firms with lower levels of earnings management demand or are likely to have experienced higher audit effort in hours, compared to firms with higher levels of earnings management. Jung (2016) shows that audit hours reduce an investor's firm risk perceptions. Thus, the literature is mixed. Earlier studies suggest that additional audit hours are increasing with firm risk. However, there is also evidence that additional audit hours reduce audit risk by providing assurance that a firm's financial statements reflect a true and fair view of its underlying economics. The results can be interpreted in two ways: i) either firms demand audit effort in hours to reduce risk to improve financial reporting systems and reduce agency problems or ii) audit firms insist that riskier clients secure sufficient audit hours.

We consider the relationship between audit effort and weighted average cost of capital (WACC) to be a well-designed experiment for capturing the relationship between audit effort and firm risk because WACC is the average minimum expected rate a firm must pay to secure capital based on the expected returns of profit-maximizing market participants (bondholders, shareholders, creditors and other capital providers), calculated based on the risk/return expectations of both debt and capital holders. Cost of debt is the estimated value of a firm's borrowing from banks and bondholders. COD is issued by banks and similar financial institutions in the form of credit ratings, loans, etc. Banks and credit rating agencies are shown to be effective monitors of firm risk (Francis et al., 2005; Bharath, 2008); thus, a firm's COD is expected to be increasing with a capital provider's perceptions of firm risk. COE is estimated using the capital asset pricing model (CAPM). CAPM has been developed to demonstrate a positive linear relationship between risk and market returns (Markowitz, 1952; Sharpe, 1964; Lintner, 1965; Black, 1973), with recent studies improving the predictive validity of the model by including size and market-to-book ratio (Fama and French, 1992), the momentum factor of stocks (Carhart, 1997) and profitability and investment proxies (Fama and French, 2016).

Market participants are shown to use all available forms of information when issuing capital costs and may therefore consider audit quality to be incrementally informative and impound this value into the borrower's equity costs. Taken together, because audit effort information is available and is known to market participants in South Korea, it is very likely that WACC (COE and COD) has the potential to increase or decrease based on how market participants interpret the effect of audit hours on audit quality.

2.2 Institutional background

We specifically use a Korean dataset to establish a link between WACC and audit effort because whilst South Korea has experimented with numerous audit policies to enhance audit quality, a policy that has endured and is rare internationally is the policy that mandates that audit hours be recorded on annual reports as a rule. Prior to 1982, under the Auditor Designation Rule, legislators assigned audit firms to clients. In 1982, legislators introduced the Free Auditor Engagement Rule, which provided client firms with the opportunity to self-select audit firms. Following the 1997 Asian financial crisis, weak legislation was shown to have a negative effect on reporting quality (LaPorta, 1997). Therefore, two new rules were introduced: i) clients were expected to retain audit firms for three years and ii) rotate audit partners every five years. However, during this period, there was evidence of collusion between clients and audit firms causing high profile financial collapses including Daewoo, one of the largest publicly traded companies in South Korea. In 2000, an analysis of firm bankruptcies by the Securities Supervisory Board found that one third of financial firm financial collapses were a result of earnings management not identified by auditors. Thus, there was increasing pressure on the audit profession to enact audit policies to restore public confidence.

To enhance audit quality, Korean legislators identified two audit policies. I) Following the enactment of the Sarbanes-Oxley Act in 2002, the Mandatory Audit Firm Rotation policy was established in 2006. The rule was expected to raise audit quality by reducing potential collusion and familiarity between audit firms and clients. However, the policy was ceased in 2010 with evidence suggesting that the loss of client knowledge reduced audit quality (Choi et al., 2017; Mali and Lim, 2018). II) In 2001, Korean legislators also mandated that audit effort in hours be included on annual reports so that audit quality information can be captured by legislators and market participants. The policy remains in place in 2020.

2.3 Hypothesis development

Credit rating agencies, banks and capital providers amongst other market participants are shown to be effective monitors of risk (Bharath, 2008; Francis et al., 2005). Due to the availability of audit hour information in South Korea, audit hours may be an intervening variable that influences perceived riskiness, and thus WACC, based on the assumption that audit effort has a direct effect on audit quality. In the limited audit hour literature, there is evidence that audit hours are increasing with firm risk (Deis and Giroux, 1992; O'Keefe et al., 1994) which would suggest that audit hours could have a positive effect on WACC. However, recent evidence shows that additional audit hours reduce firm risk (Jung, 2016; Caramanis and Lennox, 2008), suggesting a negative relationship. We illustrate both possible relationships in Figure 1. There is the potential that audit effort has a positive influence (increases) on WACC based on audit supply theory, which surmises that audit firms have a strong incentive to minimize reputational damages and litigation threats (DeFond and Zhang, 2014). Clients with high (low) business risk (audit quality) could have an incentive to reduce audit effort because additional audit hours are a financial outgoing that acknowledges weaknesses in reporting systems. However, in such

situations, an audit firm would use it's time and resources effectively to mandate that audit effort be written into the audit contracts of 'riskier' clients as a prerequisite of accepting an audit or to prevent a resignation. As a result, market participants would interpret additional hours as an audit firm's efforts to reduce audit risk; thus, increased audit effort (hours) may be interpreted as increased audit/firm risk, resulting in higher WACC.

<Insert Figure 1 approximately here>

On the other hand, we hypothesize it is more likely that additional audit hours have a negative influence (reduces) on WACC, based on market participants interpreting audit effort as follows: i) An audit is a series of interviews, substantive tests and control tests. The information provided by an external audit can therefore enhance a client's internal controls for business planning. Additional audit hours can be interpreted by market participants as a signal that audit controls are robust, financial reporting quality is high and a firm's financial statements reflect business activities. Thus, audit effort in hours (input) can be perceived as a signal of audit quality (output) by capital providers, thus impounded into borrowing costs. ii) A firm is likely to pay higher WACC if capital providers consider that governance systems are weak or if agency problems exist. The literature shows that additional audit effort can reduce agency problems (Caramanis and Lennox, 2008; Lobo and Zhao, 2013) suggesting additional audit hours can reduce the potential for management to work in their own self-interest. iii) whilst audit demand /supply should be at equilibrium, recent high-profile accounting scandals show that audit firms may accommodate clients by receiving audit fees but not conducting audit tests (hours) (Asthana, 2009). Whilst audit fees can be interpreted as the indirect incentives of audit effort, audit hours are likely to infer the level of audit tests completed by audit firms to enhance audit quality independent of determinants that can influence audit fees including potentially close relationships between auditors and clients. Thus, audit hours can be considered a direct driver for 'audit effort' by market participants.

Overall, we conjecture that additional audit hours can be considered a signalling strategy to demonstrate robust audit quality. We suggest that market participants including debt and equity providers perceive audit effort in hours as an incrementally informative measurement of audit quality. Therefore, it is likely that the level of audit hours required to complete an audit influences WACC, especially in South Korea because audit hour information (the main driver and key determinant of audit quality) is publicly available. Based on the above, we develop the following hypothesis:

H1: Audit (hours) effort influences (reduces) a firm's weighed average cost of capital.

Next, we question whether group membership including Big4/Non-Big4 can affect WACC (IG/NonIG and size comparisons are conducted as additional analyses). Various studies demonstrate that Big4 auditors provide higher audit quality compared to Non-Big4 auditors (DeAngelo, 1981; Becker et al., 1998; Khurana & Raman, 2004; Behn et al., 2008; Lisic et al., 2015). Big4 audit firms are considered to have superior audit quality to that of Non-Big4 firms for three reasons. First, Big4 firms are less likely to be income dependent on clients and thus, they are less likely to impair their independence. Second, Big4 audit firms have higher incentives to reduce litigation risk and avoid reputational damage (DeAngelo, 1981; Basu et al., 2001). Third, Big4 auditors have developed "Big4's expertise" as a result of robust auditing systems and experience. Thus, as suggested in previous studies, Big4 clients may have lower WACC compared to Non-Big4 clients based on auditor specification (Chen et al., 2011; Mansi et al., 2004).

However, there is evidence that based on business size, complexity and firm risk measures such as leverage, clients select Big4 auditors to benefit from their expertise (Pittman and Fortin, 2004). Thus, audit effort can have an incrementally different effect on WACC for Big4 and Non-Big4 groups. We hypothesize that additional audit hours (effort) that are provided by Non-Big4 firms can reduce WACC to a greater extent compared to audit effort provided by Big4 firms for the following reasons: i) As audit effort increases for Non-Big4 clients, WACC has the potential to reduce to a larger extent than it does for Big4 clients because Big4 firms have the power to impart audit effort into contracts. Income-dependent Non-Big4 firms are less likely to have the power to negotiate audit contracts due to potential opinion shopping threats. Thus, when additional substantive and control tests (effort) are provided by a Non-Big4 auditor, the additional audit hours (input) can be seen as a client's strategy to enhance audit quality (output), and mutually beneficial to both parties. ii) Because the audit quality of Big4 audit firms is higher compared to Non-Big4 firms, the initial selection of a Big4 auditor is a signal of robust audit quality. However, because the audit quality of Non-Big4 audit firms is lower, incrementally increasing audit hours can be interpreted as reducing audit risk to a greater extent for Non-Big4 clients compared to Big4 clients. Based on the above, we develop the following hypothesis:

H2: Increasing audit effort by Big4 auditors has a different effect on a firm's cost of capital compared to increasing effort by Non-Big4 auditors.

3. Research design

3.1 Model Specification

First, we compute weighted average cost of capital in equation (1). There are other well-known plausible proxies for firm risk such as systematic beta, leverage and bankruptcy proxies such as Altman Z score. However, the main purpose of our study is to examine whether WACC decreases with audit hours because minimizing WACC is a primary objective of a firm's accounting/finance function. WACC is the weighted combination of cost of debt in equation (2) and cost of equity in equation (3) estimated using CAPM. To estimate WACC, we multiply both COE and COD with the weightings in equation (4) and (5) to aggregate our values consistent market values. We provide details of how WACC is calculated below:

WACC = Cost of debt * Weight1 + Cost of equity * Weight2 (1)

Cost of debt = (Bank loan interest expenses + Corporate bond interest + Loss on corporate bond retirement – Gain on corporate bond retirement + interest on construction capital)/(Short-term corporate bond + Short-/long-term borrowings including bank loans + Current maturities of long-term debt - Other current maturities of long-term debt + Long-term corporate bond + Financial lease liabilities + Asset backed debt + Liabilities without preference) (2)

Cost of equity (CAPM) = $R_f + \beta_i * MP_i$, (3)

where

R_f : the average interest rate on 3-year treasury bond (the risk-free rate of interest),

β_i : the market beta, calculated using equally weighted index (EWI),

MP_i : market premium; we use 3.3%, following the Korea Stock Exchange report, a value used in previous studies in Korea

Our weightings are values suggested by the Korean stock exchange (KRX). The COD weighting is the average IBDC (interest-bearing debts for cost) divided by IBDC plus AMC (average annual market capitalization of common and preferred stock) in equation (4). The weighting for COE is AMC divided by IBDC and AMC in equation (5). The purpose of the weighting is to estimate the risk-free rate consistent with established research. For clarity, we list the weighing below:

$$\text{Weight1} = \text{IBDC} / (\text{IBDC}+\text{AMC}) \quad (4)$$

$$\text{Weight2} = \text{AMC} / (\text{IBDC}+\text{AMC}) \quad (5)$$

Audit effort is proxied by the natural logarithm of audit hours. As explained in our hypothesis, we predict a negative relationship between audit effort and WACC based on audit demand theory, but do not rule out a positive relationship based on supply theory.

<Insert Table 1 approximately here>

Model:

$$\begin{aligned}\text{WACC}_{i,t} = {} & \beta_0 + \beta_1\text{Audit\_effort}_{i,t} + \beta_2\text{Size}_{i,t} + \beta_3\text{Big4}_{i,t} + \beta_4\text{Market\_risk}_{i,t} + \beta_5\text{Lev}_{i,t} + \\ & \beta_6\text{Loss}_{i,t} + \beta_7\text{EM}_{i,t} + \beta_8\text{CFO}_{i,t} + \beta_9\text{Crating}_{i,t} + \beta_{12}\text{BigOwn}_{i,t} + \beta_{13}\text{Foreign}_{i,t} + \\ & \text{ID} + \text{YD} + \varepsilon_{i,t} \quad (6)\end{aligned}$$

In Table 1, we explain how we estimate our control variables and explain their potential relationships with WACC. Firm size is likely to have a negative relationship with WACC because larger firms have the ability to absorb potential financial shocks and thus pay lower WACC. Next, we use a dummy variable that takes the value of 1 if a client is audited by a Big4 firm, 0 otherwise. The Big4 dummy has the potential to be positively or negatively associated with WACC. Big4 clients may pay lower WACC based on the 'Big4 effect'. However, Big4 clients that are more highly leveraged and complex compared to Non-Big4 firms may pay higher WACC. Next, we proxy for business risk (full definitions are listed in Table 1). We expect WACC to be increasing with market risk, indebtedness, earnings management and financial loss because all variables are established financial indicators known to influence firm risk and a firm's borrowing costs. We proxy for financial performance using a firm's cashflow from operations and credit ratings1. We expect that a firm with higher cash flow will be considered less risky compared to firms with weaker cash flow. We also expect that Korean firms with lower credit ratings to be less risky consistent with firms with higher credit ratings having more robust operational systems.

The corporate governance literature demonstrates that board composition, committee independence, CEO-board chair duality and number of board meeting per year amongst others can be considered robust measures of firm governance. However, the data is only available for a limited number of firms through the Korea Corporate Governance Service. Thus, we proxy for governance using ownership structures including i) largest shareholder ownership and ii) foreign shareholder ownership. Based on Korean literature, the association between the

percentage ownership of the largest shareholder and WACC can be negative based on the largest domestic shareholder being involved in decision making (Lim and Mali, 2018). The relationship between WACC and foreign ownership may be positive or negative. Foreign shareholders are likely to demand higher corporate governance. However, foreign owners may lack local business-specific knowledge to implement operational strategies. Finally, we include year and industry dummy variables to control for industry and firm fixed effects.

3.2 Sample selection

The sample selection process is shown in Panel A, Table 2. Initially we download financial and audit data for all firms listed on the KRX (Korean stock exchange) from 2002-2014 using the KISS Value and TS2000 databases (23,648 firm year observations). Both databases can be considered similar to international databases including OSIRIS and WRDS. After we delete the observations of financial firms and a handful of firms without the data required to estimate WACC, our firm year observations are reduced to 14,464. A further 3,760 firms were deleted because audit hours or necessary control variable information was not available leaving a final sample of 10,704 observations. In Panel B, we provide the raw values for audit hours from 2002 to 2014. Average audit hours have increased every year, suggesting that there is an increasing demand for audit services. In Panel C, we list the mean weighted average cost of capital for KRX firms. In general, we find that the WACC of Korean listed firms decreased from 2002 to 2014. From 2002 to 2009, in all but one year (2004), the mean WACC is higher than the sample average (6.61), whereas from 2010-2014, WACC is lower compared to the sample average. The results show over the period of 2002 to 2014, audit hours increased but WACC decreased.

<Insert Table 2 approximately here>

4. Empirical results

4.1 Descriptive statistics

In Table 3, section (1), we show descriptive statistics including WACC, audit effort and other independent variables. In sections (2) and (3), we provide descriptive statistics for clients that are audited by Big4 and Non-Big4 auditors. In section (4), we perform mean/median difference t/z tests for both samples. In section (4), the mean/median difference tests show that clients audited by Big4 auditors are expected to have lower WACC (-3.79, t value) compared to Non-Big4 clients, consistent with our expectations. We find that Big4 clients are larger (42.72), have higher market risk (2.05) and leverage (3.94), suggesting more complex financial systems. We also find that Big4 clients are less likely to be loss making (-8.13), are less likely to engage in earnings management (-5.18) and have higher cash performance (6.53). Client firms can choose to acquire the service of Big4/Non-Big4 audit firms regardless of credit rating levels. We find that more client firms below the investment grade threshold select to be audited by Big4 audit firms. We interpret that NonIG firms that desire to improve credit ratings, may strategically choose to improve earnings/audit quality through the audit experience of Big4 firms. We find that Big4 clients have a larger percentage shareholding and more international ownership. Finally, we show that clients audited by Big4 auditors require more audit effort compared to Non-Big4 clients (35.09). The results are consistent with larger, more complex clients demanding higher effort to improve reporting quality to legitimize business activities.

<Insert Table 3 approximately here>

In Table 4, we list Pearson correlations, our results of interest are listed in column 1. We find that a firm's WACC is negatively correlated with audit effort (0.19). The results demonstrate that as audit effort increases WACC decreases. We find that larger clients audited by Big4 audit firms are expected to pay lower WACC using pairwise associations. All business risk proxies (market risk, leverage, loss and earnings management) are positive, showing that WACC increases with risk. We find that cash flow from operations has a negative relationship with WACC as expected. We also find a negative relationship between credit ratings and WACC suggesting that that firms with higher credit ratings are expected to pay lower capital costs. We find a negative relationship between WACC and BigOwn suggesting that higher percentage ownership decreases WACC consistent with large shareholders being involved in decision making which can be perceived as reducing firm risk. For a dichotomous categorical variables or continuous variable, it is common to use a Pearson's correlation, however, in our main model, we have the two 0/1-coding categorical variables 1) Big4, and 2) Loss. To provide correlations for the two dummy variables, we use a polychromic correlation. Our untabulated polychromic correlation matrix consistently shows that the two dummy variables; 1) Big4, and 2) Loss are significantly negatively correlated (Coeffi/Rho -0.13, S.e. 0.01).

<Insert Table 4 approximately here>

4.2 Multivariate analysis

In Table 5, we provide the results of OLS regression to establish the relationship between audit effort and WACC. We predict a bi-directional relationship based on the belief that market participants can interpret audit effort differently in different situations. We find that after controlling for known determinants of WACC, the relationship between audit hours and WACC is highly negatively statistically significant (parameter -0.32 t value -25.32). We show a 1% increase in audit effort is associated with 0.0032 (= parameter -0.32/100) decrease in WACC. Because WACC is a percentage (%), we interpret a 1% increase in audit hours decreases WACC by 0.0032%. Our results show that increased audit effort effectively reduces a client firm's WACC. The result allows us to accept our first hypothesis. We interpret that management demand additional audit effort to signal to market participants that financial reporting quality is robust and financial statements are a true representation of their business activities. Furthermore, audit demand theory would suggest that sufficient audit effort was exerted to reduce agency problems and reduce the ability of management to act in their own self-interest. Thus, we surmise that market participants interpret audit effort as a signal of audit (firm) risk and impound this information into capital costs. However, our results must be interpreted with caution. Since the average audit hours are close to 600 hours in our sample, the results indicate that 6 additional audit hours decrease WACC by only 0.0032%. In other words, even if total audit hours increase by 100% increase, WACC will decrease only by 0.32%. Compared to the U.S., audit fees in Korea are relatively low after controlling for client size difference. We suggest that if the additional audit costs for increasing audit hours (600 hours) are smaller than decrease in WACC, the results become meaningful. We infer that additional cost for requiring additional audit hours in South Korea is relatively low. We conjecture whether our results are economically meaningful or not depends on audit fees per hour.

<Insert Table 5 approximately here>

Interestingly, we find that the relationship between WACC and our Big4 dummy variable is positive (parameter 0.15, t value 5.04) implying that the WACC of client firms audited by Big4 auditors is 0.15% greater than that of firms audited by Non-Big4 auditors. We discuss this finding further in Table 6. Consistent with our previous analysis, our independent variables show the expected sign. Riskier (parameter 2.53, t value 74.51), loss-making firms (parameter 0.59, t value 15.02) with higher leverage (parameter 0.83, t value 9.02) are expected to pay higher WACC. Larger firms (parameter -0.06., t value -4.73) with higher cashflow (parameter -0.64, t value -5.73) and credit ratings (parameter 0.59, t value 15.02) are expected to pay lower capital costs. Firms with higher earnings management are expected to pay higher WACC (parameter 1.57., t value 8.78); the relationship between WACC and large percentage shareholder ownership (foreign ownership) is negative (positive).

5. Additional analysis

5.1 Big4 vs Non-Big4 analysis

In Table 6 column 1, we run regressions for client samples that are audited by Big4 auditors and those not audited by Big4 audit firms to compare if WACC is equal/different for both samples. Our Big4 dummy variable (consistent with Table 5) shows that Big4 clients pay higher WACC compared to Non-Big4 clients (parameter 0.19, t value 1.69). As shown in our descriptive statistics, clients audited by Big4 firms have relatively greater leverage, are larger and more complex, thus are expected to pay higher WACC. Next, we compare the incremental effect of audit effort for both groups in column 1, using the *Effort*Big4* interaction term. We find that WACC reduces with audit effort for both Big4 and Non-Big4 clients. However, the reduction in WACC occurs at a lower rate for Big4 clients compared to non-Big4 clients (parameter 0.05, t value 2.32).

To test whether the audit effort provided by Big4/Non-Big4 firms has a differential effect on WACC, we conduct independent regressions for Big4 and Non-Big4 samples in column 2 and column 3. The coefficients for audit hours in column 2 and 3 for the Big4 and Non-Big4 samples are both highly statistically significant (-0.31, Big4, -0.34, Non-Big4), but the rate of WACC decline is lower for Big4 audit clients compared to Non-Big4 clients indicating that additional audit hours provided by Non-Big4 firms has a greater negative incremental effect on WACC compared to the same audit effort provided by Big4 auditors. Our results can be interpreted as a 1% increase in audit effort reducing WACC by 0.0031% (parameter -0.31/100) for Big4 clients, but 0.0034% (parameter -0.34/100) for Non-Big4 clients.

<Insert Table 6 approximately here>

5.2 Investment grade group vs Non-investment grade group analysis

A credit rating is a credit rating agency's opinion about a firm's ability to survive a business cycle (Boot et al., 2006; Kraft, 2014). Credit ratings have the potential to provide valuable insights about how audit effort is perceived differently by market participants based on default risk status. To provide further evidence regarding the incrementally different association between audit effort and WACC, we divide our samples into groups that are established as having fundamentally different levels of risk in the literature, investment grade (IG) and non-investment grade (NonIG) samples (Kisgen, 2006; Bhojraj and Sengupta, 2003; Ashbaugh-Skaife, Collins and LaFond, 2006; Mali and Lim, 2019). Table 7 provides the results of

regressions for three samples, an IG/NonIG comparison, and separate regressions for IG and NonIG samples. In column 1, our dummy variable *IG* takes the value of 1 (0) for IG (NonIG) firm status. The IG dummy variable is statistically insignificant suggesting IG/NonIG status does not have an intervening influence on WACC (risk) after carefully controlling for firm risk determinants (audit effort, firm size, business risk, performance, governance structure and fixed effect), implying our model is robust. Our variable of interest is the *Effort*IG* interaction term. The positive sign (parameter 0.05, t value 2.17) suggests that the reduction in WACC occurs at a lower rate for less risky IG firms compared to riskier NonIG firms.

<Insert Table 7 approximately here>

Because our model can be considered robust at capturing firm risk, we separate our regressions into IG and NonIG samples to show the incremental effect of credit rating status on WACC in individual regressions. We find a negative relationship between WACC and audit effort for the IG sample (parameter -0.32, t value -26.18). We also find a negative relationship for the NonIG sample (parameter -0.33, t value -13.67). The Coefficients for audit effort in column 2 (column 3) for IG (NonIG) clients are -0.32 (-0.33), and highly statistically significant. The results show that WACC decreases with audit hours for both IG and NonIG groups. However, the reduction in WACC based on a 1% audit hour increase occurs at a lower rate for the IG group (-0.0032%) compared to the NonIG group (-0.0033%). We interpret our findings as follows: IG firms signal to the market that the firm has lower risk based on credit rating status, thus the marginal effect of greater audit hours in reducing audit risk (and thus WACC) is lower for the IG group compared to NonIG group.

5.3 KOSPI vs KOSDAQ analysis

In our previous analyses, we find that group membership influences how market participants perceive the relationship between audit effort and WACC based on Big4/Non-Big4 and IG/NonIG status. Therefore, to test whether group (risk) status is a key measure of how market participants perceive audit risk, we divide our sample into two groups based on market characteristics, not only risk (firms listed on the KOSPI and KOSDAQ stock exchanges). KOSPI (Korea Composite Stock Price Index) is the stock market for large firms across all industries KOSDAQ (Korea Securities Dealers Automated Quotations) is a relatively small stock market mainly for small and medium venture firms with growth potential. There are different qualitative and quantitative requirements for KOSPI and KOSDAQ markets. The listing requirements for KOSDAQ market are lower than for the KOSPI market. The capital size requirement for KOSPI is equity of over KRW 30 billion and over 1 million shares to be listed whereas. For KOSDAQ a shareholder equity of over KRW 3 billion, but there is no requirement for number of shares to be listed. In Table 8, KOSDAQ and KOSPI firms can be considered as firms with different characteristics. The key difference between KOSPI and KOSDAQ firms is that KOSPI firms are larger than KOSDAQ firms.

In our two regressions in columns 2 and 3, we find that audit effort reduces WACC for both KOSPI (parameter -0.36, t value -19.24) and KOSDAQ (parameter -0.27, t value -15.59) firms consistent with previous findings. In the first column, to capture whether KOSPI or KOSDAQ firms have higher additional WACC based on firm size, we include a dummy variable *Market* that takes the value of 1 for KOSPI firms and 0 for KOSDAQ firms. As shown in Table 8, *Market* is statistically insignificant. The results suggest that our risk determinants capture the influence of risk on WACC and that stock exchange membership does not have an influence on

WACC. Our interaction term *Effort*Market* is also insignificant. Taken together, we demonstrate that WACC is lower as a result of audit hours regardless of IG/NonIG, Big4/Non-Big4 or KOSPI/KOSDAQ partitioning. However, the reduction in WACC occurs at a lower rate for less risky samples (IG/Big4) compared to riskier samples (NonIG/Non-Big4). Stock exchange segmentation is shown not to have a marginal effect on WACC adding robustness to our findings.

<Insert Table 8 approximately here>

5.4 Cost of equity and cost of debt analysis

In Table 9, for further robustness, we list three regressions to estimate the relationship between audit hours with WACC's separated components, i) a firm's cost of debt and ii) a firm's cost of equity. Our variables of interest are the audit effort variables in the COE and COD regressions. We find a negative relationship between audit hours and COE (parameter -0.39, t value -63.72) and COD (parameter -0.15, t value -3.18). The results show that whether capital is issued as debt, equity, shares, bonds, loans or any other financial instrument, market participants consider that additional audit effort reduces WACC, consistent with our main findings.

<Insert ta Table 9 approximately here>

5.5 Auto correlation, heteroscedasticity, multi-collinearity and heterogeneity

Our results consistently show that WACC decreases with audit hours. However, it is possible that our results may be influenced by OLS errors due to auto-correlation, heteroscedasticity, multi-collinearity and heterogeneity. Therefore, we conduct four tests for all OLS regression analyses to add robustness. For brevity, we only report untabulated results. First, we conduct Breusch-Pagan/Cook-Weisberg tests for heteroscedasticity where our null hypothesis is constant variance. We find that a heteroscedasticity problem may exist in our main analysis. To control for potential heteroscedasticity, we use the robust estimator of variance. The estimator is robust to heteroscedasticity based on independent observations and after obtaining robust variance estimates. Based on our untabulated results, we find that WACC reduces with audit effort after controlling for heteroscedasticity, consistent with our main analysis. Second, to control for auto-correlation, we conduct panel data analysis using a GLS estimator for random-effect models. Again, our untabulated results show consistent results with our main analyses. Third, we conduct variance inflation factor (VIF) tests for all analyses. In our untabulated results, mean VIFs for all of our analyses are consistently below 2 demonstrating that our results are free from multi-collinearity problems. Finally, we assume heterogeneity in our data and conduct panel data analysis using both random and fixed-effect models. It is known that the random-effect model is preferred to the fixed-effect model if heterogeneity is anticipated because the random-effect model assumes that there may be different underlying 'true' effects estimated in each trial which are distributed about an overall mean. For robustness we conduct panel data analysis using the fixed-effect model, all results are consistent with our main findings. In summary, our results consistently demonstrate that WACC reduces with audit hours after controlling for possible OLS errors.

5.6 Incremental effect after controlling for audit fees

In our main analysis, we show that audit effort (hours) is negatively associated with WACC. We interpret that audit effort in hours is different from audit fees because audit hours can be considered the direct driver of audit quality. We conjecture that audit fees (the conventional measure of audit effort) should only be considered an indirect driver of audit quality, and thus should be clearly distinguished from audit effort (hours). Because audit hours should be influenced by audit fees to some extent, we do not control for audit fees in the main analysis. However, if audit hours are a more robust measure of audit effort compared to audit fees, we conjecture audit hours should be incrementally informative even after controlling for audit fees. Therefore, we conduct analysis to empirically capture how audit hours are different from/better than audit fees in capturing audit quality/effort. First, we find that audit hours are highly correlated with audit fees based on a Pearson correlation (Coeff. 0.61, p value 0.00). Next, we compare three regression results: 1) audit hour analysis (equation 6), 2) audit fee analysis with audit fees replacing audit hour in equation (6), 3) audit hour and audit fee analysis with both test variables included in equation (6). The results of our independent regression are listed in Table 10. We find that audit fees also have a negative association with WACC (parameter -0.12, t value -3.51). However, the effect of audit hours is more pronounced (parameter -0.32, t value -25.32) in separate audit hour/fee regressions.

<Insert Table 10 approximately here>

We find qualitatively consistent results with our main analysis for audit hours after controlling for audit fees (parameter -0.35, t value -25.77). However, the Coefficient for audit fees shows a positive sign (parameter 0.19, t value 5.54) holding audit hours and the other key WACC determinants constant, suggesting that given increased audit hours are exerted, additionally increased audit fees may be negatively perceived by market participants. The results are consistent with our belief that audit hours are the direct driver of audit/earnings quality whilst audit fees are only the indirect cause of audit quality. Thus, after controlling for audit hours, increased audit fees may be perceived as 1) increased audit risk or 2) a close relationship between auditor and client. Regardless of the specific reason, increasing audit fees have a negative influence on WACC after controlling for audit hours. Based on VIF tests, we find that our results are free from multi-collinearity problems since the mean VIF for all three analyses is less than 2.

5.7 Change analysis, control for firm clustering, financial crisis period

In our main analysis, we use continuous and dummy variables to test our hypotheses. To add further robustness to our main findings, we conduct two different change analyses to discover whether changes in audit hours influence changes in WACC. First, in equation (7) we create a new dependent variable, $\Delta WACC$ (change in WACC) and a new test variable, *ΔAudit_effort* (change in audit hours) to substitute for the existing WACC and *Audit_effort* continuous variables. All other control variables remain the same. We report untabulated results of a statistically significant negative association between *ΔAudit_effort* and $\Delta WACC$ (parameter -0.15, t value 8.21) consistent with previous analysis. The results suggest that when audit effort increases by 1% at period *t* compared to the previous year (period *t-1*) for firm *i,* the firm can reduce WACC by 0.0015 (%) in period *t* compared to the previous year (time *t-1*); consistently implying that audit effort is effective in reducing WACC.

$$\Delta WACC_{i,t} = \beta_0 + \beta_1 \Delta Audit\_effort_{i,t} + \beta_2 Size_{i,t} + \beta_3 Big4_{i,t} + \beta_4 Market\_risk_{i,t} + \beta_5 Lev_{i,t} + \beta_6 Loss_{i,t} + \beta_7 EM_{i,t} + \beta_8 CFO_{i,t} + \beta_9 Crating_{i,t} + \beta_{12} BigOwn_{i,t} + \beta_{13} Foreign_{i,t} + ID + YD + \varepsilon_{i,t} \quad (7)$$

Second, we convert all the variables to change variables (Δ) (e.g. $\Delta WACC_{i,t}, \Delta Audit\_effort_{i,t}, \Delta Size_{i,t}, \Delta Big4_{i,t}$) in equation (8). Our untabulated results suggest that there is also a significant negative association between *ΔAudit_hours* and ΔWACC (parameter -0.16, t value 10.36). Our results suggest that when audit effort increases by 1% at period *t* compared to the previous year (period *t-1*), WACC decreases by 0.0016 (%) at period *t* compared to the previous year (period *t-1*). Overall, we observe qualitatively consistent results using the change analyses, adding robustness of our main findings.

$$\Delta WACC_{i,t} = \beta_0 + \beta_1 \Delta Audit\_effort_{i,t} + \beta_2 \Delta Size_{i,t} + \beta_3 \Delta Big4_{i,t} + \beta_4 \Delta Market\_risk_{i,t} + \beta_5 \Delta Lev_{i,t} + \beta_6 \Delta Loss_{i,t} + \beta_7 \Delta EM_{i,t} + \beta_8 \Delta CFO_{i,t} + \beta_9 \Delta Crating_{i,t} + \beta_{12} \Delta BigOwn_{i,t} + \beta_{13} \Delta Foreign_{i,t} + ID + YD + \varepsilon_{i,t} \quad (8)$$

For further robustness, we conduct additional tests after controlling for firm clustering in the standard errors for all our regressions. We continue to find consistent results after controlling for firm clustering. Finally, we conduct additional analysis to show whether the observed relationship between audit effort and WACC is also more pronounced in the financial crisis period. We fail to find evidence that the relationship between audit effort and WACC is higher/lower using a sample of 1,650 firm-year observations in 2007 and 2008. Our untabulated results show that the Coefficient for audit hours is 0.00 and statistically insignificant (t value 1.06). This may be due to the reduced sample size or audit effort required did not effectively influence WACC during the financial crisis period.

6. Conclusion

Internationally, there is an increasing demand for improved audit quality following recent financial crises, with legislative bodies in the EU, United States and Korea all taking different approaches to ensure that financial reporting is true and fair. This study is unique because it explains how South Korea, one of only a handful of countries that require audit hours to be publicly stated on annual reports can provide insights to legislators. Given the increasing demand for audit quality, we take advantage of a unique Korean dataset to provide evidence whether market participants consider audit effort in hours to be an intervening variable that influences their perception of firm/audit risk. We conjecture that market participants are knowledgeable and are able to interpret audit effort (hours) as a variable that influences audit quality/risk because investors, banks and financial institutions are likely to use all available forms of information when issuing capital. Thus, because investors demand additional compensation for bearing additional risk, audit effort in hours should influence WACC. We suggest a bi-directional relationship between audit effort and WACC based on audit demand and audit supply theories (Simunic, 1980). Based on audit demand theory, audit hours can increase audit quality based on a mutually beneficial relationship between audit firms and clients. Management is likely to demand audit hours to signal to market participants that business activities are genuine through robust financial reporting; shareholders are likely to also demand additional effort in hours to legitimize firm performance, adding value to financial statements. However, based on audit supply theory, audit firms have an incentive to minimize litigation risk and reputational damage. As a result, an audit firm may only remain on an audit contract if sufficient audit effort is supplied. Thus, based on audit supply theory, additional audit effort may be perceived as a sign of increased audit risk.

Our study is important for several reasons. First, our result suggests that after controlling for known risk determinants, as audit hours increase, a firm can expect to pay lower capital costs. The results suggest that additional audit hours reduce a firm's WACC, consistent with audit demand theory. We infer that audit quality may be improved with additional audit hours. However, because audit hour information is not available in most countries, market participants cannot interpret audit hours which suggest a limitation in the comparability of international financial statements. Second, South Korea is one of few countries that require audit hours to be recorded on annual reports. South Korea is a developed country with a strong economy, but it is considered to have a weak legal infrastructure (Woods, 2013). Thus, this South Korean study can be considered an important benchmark case study for audit policy legislation in nations with weak legal infrastructures and developing countries with an incentive to enhance audit quality through enhancing audit transparency.

Third, we find that WACC reduces with audit effort for both less risky (Big4 clients/IG) and risky (Non-big4 clients/NonIG) groups. However, the reduction at which WACC occurs is at a lower rate for the less risky sample. We interpret that Big4 clients/IG firms signal to the market that firm risk is lower as a result of their status as an IG firm or Big4 client. Thus, the marginal effect of greater audit hours in reducing risk is lower for Big4 clients/IG firms compared to riskier Non-Big4 clients/NonIG firms. Therefore, we contribute to the limited audit hour (effort) literature by being the first to demonstrate specific examples where audit effort can have an incrementally different influence on capital costs based on group selection. Fourth, we demonstrate the economic significance of our empirical findings. There is evidence that auditors feel time pressure to conduct high quality audits (Guénin-Paracini, 2014; Lambert et al., 2017) and that audit hours exerted can enhance audit quality (Ettredge, et al., 2014). However, powerful owners can reduce audit effort to improve profit margins or potentially opportunistic reasons (Khan et al., 2015; Niemi, 2005). Whilst a reduction in audit effort can be

considered an economic saving, we find that a 1% increase in audit hours can reduce a firm's capital costs by -0.0032% for our full sample; -0.0031% for Big4 clients, -0.0034% for Non-Big4 clients, -0.0032% for IG clients and -0.0033% for NonIG clients.

Fifth, legislators and audit professionals are heavily engaged in image management by promoting audit quality in an attempt to reinstate legitimacy and to improve the audit profession's tarnished image (Holm and Zaman, 2012). We suggest that governing bodies may consider implementing legislation that requires audit hours to be publicly available on annual reports internationally because; audit hours are shown to be incrementally informative to predict audit risk/quality; the policy already exists in South Korea, and the policy can be considered inexpensive and easy to implement. To conclude, we list a limitation. We estimate WACC using bank loan rates and equity market prices in our main analysis. However, the literature suggests variations to measure capital costs including implied cost of equity (e.g. Gebhardt et al., 2001; Hou et al, 2012). In South Korea, data to compute measures such as analyst forecast for ex-ante cost of capital is not sufficiently available. Thus, we are unable to conduct additional analyses using different measures of cost of equity capital. Future studies may replicate our results using ex-ante cost of capital and other plausible proxies such as analyst forecast data (Easton, 2004, Khurana and Raman 2004).

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[1] Credit ratings are coded as below.

Credit ratings coding

CR	IG/NonIG	Grade	Definition	Moody's	S&P
10	IG	Best grade	Extremely strong	Aaa	AAA
9		High grade	Very strong	Aa1 & Aa2	AA+ & AA
8			Strong	Aa3	AA-

7			Good	A1 & A2	A+ & A
6		Middle grade	Medium	A3	A-
5			Less vulnerable	Baa1 & Baa2	BBB+ & BBB
4		Low grade	More vulnerable	Baa3	BBB-
3	NonIG		Currently vulnerable	Ba & B &Caa	B & C & CCC
2		Poor grade	Highly vulnerable	Ca	C
1			Extremely vulnerable	C	D