경영학박사학위논문

Essays on Human Resource Investment in Internal Control

-내부통제에 대한 인적자본 투자에 관한 연구-

2013 년 6 월

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지도교수 최 종 학

이 논문을 경영학박사 학위논문으로 제출함

2013 년 4 월

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경영학과 경영학전공

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ABSTRACT

Essays on Human Resource Investment in Internal Control

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This study consists of two essays on human resource investment in internal control. Korean listed firms are required to disclose the information on human resource investment in internal control over financial reporting.

The first essay, entitled to “Human Resource Investment in Internal Control over Financial Reporting and Earnings Quality”, investigates how the internal control personnel are related to earnings quality measured by discretionary accruals. Sections 302 and 404 of Sarbanes-Oxley Act require firms to evaluate effective internal control system over financial reporting and disclose any material weaknesses in the system. Since its passage, various studies have investigated internal control-related issues. However, most of the studies share common limitation that they only distinguish the effectiveness of internal control by internal control weakness (ICW) disclosure. Even though the effectiveness of internal control system would vary across firms not disclosing internal control weakness, no study have investigated this issue because of the lack of the appropriate proxies. The first essay investigates whether firm’s investment in human resource in internal control is related to earnings quality. This

study measures a firm's human resource investment in internal control over financial reporting by the percentage of the employees involved in internal control implementation (henceforth IC personnel) using Korean listed firm data. The IC personnel are employees who are responsible for monitoring and detecting any possible fraud or irregularities through established internal control system. I find that IC personnel are negatively related with signed discretionary accruals. The results suggest that IC personnel are positively related to earnings quality representing that IC personnel can capture the effectiveness of internal control over financial reporting. The findings provide valuable insights into the role of human resource investment in the effectiveness of internal control.

The second essay, entitled to "Human resource investment in internal control and investment efficiency: Evidence from Korea", examines the relation between human resource investment in internal control over financial reporting and investment efficiency at firm level and department level. Korean listed firms are mandated to report the number of internal control personnel and I use the ratio of IC personnel to total employees as a proxy for a firm's human resource investment in internal control system. I find that the proportion of IC personnel are negatively related to over-investment and not significantly related to under-investment. I also finds that firms with internal control weakness are associated with over-investment but not with under-investment. This study contributes to the prior literature by directly examining the role of human resource investment in internal control and efficient resource allocation. The findings of this paper are valuable to stakeholders because they provide a lesson that consideration on

human resource investment in internal control or existence of internal control weakness is informative to evaluate a firm's investment decision especially when the firm is financially unconstrained.

Keywords: Internal control system; Earnings quality; Investment efficiency; Internal control personnel; Internal control weakness

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Essay 1
Human Resource Investment in Internal Control over Financial Reporting and Earnings Quality

I. Introduction

This study investigates the relation between earnings quality measured by the magnitude of signed discretionary accruals and human resource investment in internal control over financial reporting in both firm- and individual department-level. After the passage of the Sarbanes-Oxley Act (SOX) which require firms to evaluate effective internal control system and disclose any material weaknesses in their systems, researchers have investigated various issues related to internal control.[1] These include the market's response to disclosure of internal control weaknesses (Beneish et al. 2008; Hammersley et al. 2008; Ogneva et al. 2007), cross-sectional determinants of weak internal control (Ashbaugh-Skaife et al. 2007; Doyle et al. 2007a), and relation between internal control weaknesses and financial reporting quality (Ashbaugh-Skaife et al. 2008; Doyle et al. 2007b) and audit fees (Hogan and Wilkins 2008; Hoitash et al. 2008; Raghunandan and Rama 2006). However, all of the above-mentioned studies focus on the small set of firms that report internal control weaknesses. Those studies distinguish the effectiveness of a firm's internal control over financial reporting only by indicator variable – a firm reporting internal control weakness, or a firm not reporting internal control weakness. Even though the effectiveness

[1] Before the enactment of SOX, the disclosure of weaknesses in internal control was only required when firms filed Form 8-K with respect to auditor changes (Krishnan 2005).

of internal control would vary across firms not reporting ICW, the studies treat them as homogeneous group. The few studies that focus on firms in general, not just firms having internal control weaknesses versus the other firms, are Krishnan et al. (2008) and Choi et al. (2013). Krishnan et al. (2008) examine the initial costs for firms to comply with Section 404 of SOX, including audit, internal labor, and non-audit expenses. The study gives descriptive statistics on firms' initial spending for the establishment of internal control system and factors associated with these costs. However, most of the prior studies, including the study of Krishnan et al. (2008), focus on firm-level internal control and do not separately examine the internal control in each department levels within the firm. Because the firm-level internal control is the combined set of department-level internal controls and not all the departments are equally important in determining firm-level strength of internal control, the examination for department-level internal control could be important to provide valuable insights to us. Choi et al. (2013) find that the proportion of IC personnel is negatively associated with the likelihood that the firm reports an ICW and the increase in IC personnel is positively associated with ICW remediation. The study provides evidence that human resource investment in internal control contribute to establish effective internal control system.

This study focuses on the human resource investment in internal control and its effect on earnings quality with all firms that have or have not the weakness, in both firm- and department-level. Although spending for the initial establishment of internal control, as examined by Krishnan et al. (2008), could be related to how internal control functions improve earnings quality, it is likely that the actual implementation of internal control is a more important factor in determining the effect rather than the initial costs to establish internal control. For example, even though a firm may spend millions of dollars to establish internal control, if the completed control system is not well staffed and monitored regularly and effectively, its influence on the firm's earnings quality may be only minimal or superficial. In contrast, if a firm invest in internal control-related human resource and assign more employees to internal control-related tasks, it may be easier for firms to identify or prevent intentional or unintentional accounting errors and irregularities. Choi et al. (2013) provide evidence that human resource investment in internal control is negatively associated with the likelihood to report internal control weakness. As a result, I expect that the earnings quality would increase as the firm's human resource investment in internal control increases.

In this study, a firm's human resource investment in internal control is measured by the percentage of the "employees who are in charge of the task for

the implementation of internal control" to the "total number of employees working in the firm" following Choi et al. (2013). If a firm has more IC personnel who are responsible for monitoring and detecting any possible fraud or irregularities through established internal control system, it is possible that the firm's internal control system will be stronger and better implemented. Consistent with this argument, Ge and McVay (2005) note that inadequate staffing and resources is the most common reason for internal control weaknesses. Doyle et al. (2007b) also suggest that a strong internal control environment in a firm can limit both intentionally biased accruals and unintentional errors in accrual estimation.[2] As a result, more investment in human resource on internal control could result in higher earnings quality.

The data used in this study are collected from the Korea Stock Exchange (KSE). The Korean Financial Supervisory Service (FSS, the equivalent of the Securities and Exchange Commission in the U.S.) issued a guideline on internal control system (which is similar to SOX) in September 2002, requiring every listed firm to report its number of IC personnel. The guideline specifies that firms separately report the number of total employees and IC personnel in six categories: accounting department, audit committee, board, finance department, information technology and system (ITS) department, and other departments, if

[2] In a similar spirit, Ashbaugh-Skaife et al. (2008) argue that firms with adequate internal control are more able to determine reliable accrual amounts, resulting in less noisy and more reliable financial information.

any.[3] The data are disclosed in the "Report on the operation of internal control system" which is a part of the firm's annual report.

Data on the number of IC personnel are not available in any country that I am aware of other than Korea. Thus, the Korean data allow us to analyze the effect of the human resource investment in internal control on earnings quality. The Korean economy is ranked fourth in Asia, behind of Japan, Hong Kong and just behind Singapore. In summary, Korean economic situation is thus comparable to most developed countries. In addition, the regulations on internal control introduced in Korea are almost identical to SOX, but the actual enforcement of the regulation could be weaker.[4] As a result, I believe that the findings of this study will have valuable implications for other countries with similar strength of legal regime. Even for the U.S. for which the legal regime is the strongest in the world, the findings in this study could be useful to understand the effect of IC personnel in both firm- and department-level.

[3] The category "other" includes other departments that are related to internal control function. The finance department includes the treasury department. The audit committee and board are the members of the audit committee and board that are responsible for internal control. Because there are only a few members who are in the audit committee or board and responsible for internal control (mostly only one or two members), with little variation across firms, in subsequent empirical analyses, I do not use these two departments.

[4] A similar issue on the effect of regulation versus execution or implementation is discussed in various prior studies. For example, Bhattacharya and Daouk (2002) argue that rather than the letter of the law, the enforcement of the law is a more important factor in determining the actual market behavior. Ball et al. (2003) also report that the quality of accounting information is less dependent on the letter of accounting standards and disclosure rules, and more dependent on their enforcement mechanisms.

My findings are summarized as follows. First, I document that a firm's level of signed discretionary accruals, which proxies for the inverse of earnings quality, decreases as the percentage of IC personnel to total employees increases. This implies that firms tend to report higher quality (i.e., more income-decreasing and less income-increasing) accounting information as investment in human resource on internal control increases. Second, I find that the proportions of IC personnel in accounting, finance, and ITS departments are related to the level of discretionary accruals, whereas the proportions of IC personnel in other departments are not.[5] This finding suggests that these three departments are mostly responsible for the earnings quality of a firm and that well-staffed IC personnel in those departments can enhance earnings quality. In contrast, the proportion of other employees working in the same three departments that do not engage in internal control-related functions are not significantly related to discretionary accruals, suggesting that the findings are not driven by other correlated omitted variables, but by the proportion of IC personnel. These results are robust when I perform various analyses to control for potential endogeneity issue for the proportion of IC personnel at the firm-level or at the individual department-level. Further analyses reveal that the more income-decreasing and

[5] This finding supports the rationale of the FSS to require the separate disclosure of IC personnel in those three departments, whereas the IC personnel in the other departments are usually combined. These three departments are the ones that directly related to the implementation of internal control system.

less income-increasing accounting method choices of firms having more proportion of IC personnel is due to conservative accounting choices rather than due to aggressive income smoothing by firms recording very high level of earnings or firm's behavior of taking a big bath by firms recording very low level of earnings.

Although my findings provide valuable insights into the human resource investment in internal control, I admit that I am not able to rule out other possible correlated omitted variables, measurement error, or endogeneity as alternative explanations for my findings. Subject to these caveats, this study contributes to the related literature and regulators in various ways. First, this paper provides evidence that human resource investment affects earnings quality. The information on the number of IC personnel is only available in Korea as far as I know. In particular, my findings suggest that IC personnel are an important factor influencing the effectiveness of internal control that is incremental to executive-level governance mechanisms such as CEO, CFO, board, or audit committee characteristics found to be associated with earnings quality in prior studies (e.g., Beasley 1996; Klein 2002; Li et al. 2010). Second, this study provide evidence that the disclosure of IC personnel information could be informative for information users such as investors, analysts, and auditors to evaluate the effectiveness of internal control over financial reporting and the

quality of accounting numbers. Finally, this study contributes to the literature by demonstrating an important factor that influences the existence of ICWs and earnings quality, thus complementing the findings in prior studies (e.g., Abbott et al. 2010; Ashbaugh-Skaife et al. 2007; Doyle et al. 2007a, 2007b).

My study contributes to accounting regulators, investors, firms, and academics in the following ways. First, there have been only a few studies at the general firm-level and no study on the department-level on the effect of the establishment of the internal control system. Following the findings in this study, regulators in other countries may consider requiring the disclosure of the number of IC personnel in each department. The information could be useful for investors to evaluate the quality of monitoring mechanism in the internal control system as well as the quality of accounting information of firms, which is the output of the system. Firms that want to strengthen their internal control also can learn from this study how to enhance the effect of internal control system. Finally, this study contributes to the literature by demonstrating an important factor that influences earnings quality.

The remainder of the paper is structured as follows. In the section 2, I summarize prior literatures related to internal controls, and develop research hypothesis. In the section 3, I briefly explain the measurement of earnings quality and model specification. The fourth section presents the sample and

descriptive statistics. The section 5 presents the empirical results. The last section concludes the paper.

II. Literature Review and Hypotheses Development

2.1 Prior literature on the internal control

Section 302 of SOX requires that chief executive officers (CEOs) and chief financial officers to certify the financial statements, including the effectiveness of the internal control over financial reporting, and to disclose any material changes in internal control. Section 404 of SOX has two main parts. Section 404(a) describes managements' responsibility for maintaining an adequate internal control structure and procedures for financial reporting, as well as responsibility for assessing the effectiveness of the system. Section 404(b) describes auditors' responsibility for attesting to managements' report on the internal control assessment.

Since the data on the internal control weaknesses became available following the enactment of the Sections 302 and 404, there have been many studies investigating issues related to internal control. For example, studies find that the stock price of firms with internal control problems drops significantly at the time of disclosure of the problem (Beneish et al. 2008; Hammersley et al. 2008; Ogneva et al. 2007). Beneish et al. (2008) report an

abnormal return of -1.8 percent at the time of the disclosure. Similarly, Hammersley et al. (2008) report an abnormal return of -0.95 percent at the time of the disclosure under Section 302. Researches also find that IC weakness is related to the cost of debt (Costello and Wittenberg-Moerman 2011; Dhaliwal et al. 2011; Kim et al. 2011). In regard to the investment or operational efficiency of the firms, it is reported that ICW firms are inefficient compared to the firms without ICW problem. Cheng et al. (2013) find that ICW firms are more likely to over-invest (under-invest) when financial constraint is loose (strict). Feng et al. (2012), Goh et al. (2013), and Kim et al, (2013) provide evidence that ICW firms operates inefficiently. Other line of research investigates the cross-sectional determinants of internal control weaknesses (Ashbaugh-Skaife et al. 2007; Doyle et al. 2007a; Ge and McVay 2005). These studies show that firms with smaller size, more complex operations, recent changes in organization structure, financial distress and less investment in internal control systems are more likely to have weaknesses in internal control.

There are a few studies that investigate the association between problems in internal control and earnings quality. Ashbaugh-Skaife et al. (2008) and Doyle et al. (2007b) report that the firms with weaknesses in internal control have lower earnings quality. In addition, Raghunandan and Rama (2006) report that audit fees increased by a dramatic 86 percent in year 2004 following the

enactment of Section 404 and the audit fees of firms with internal control weaknesses were 43 percent higher than those without such problems.[6] Using the sample on Section 302 disclosures, Hogan and Wilkins (2008) report similar audit fee differences in the year prior to disclosure of internal control weakness between a sample of firms that disclosed weakness and a sample that did not report such weakness.[7]

However, these studies are all prone to a limitation: they focus on the difference between firms with internal control weaknesses and firms without weaknesses or focus only on the firms that have weakness. Although these studies provide explanations for the differences and their effects, the differences within the majority of firms that do not report internal control weakness and their effects on earnings quality are not examined in prior studies. Managers (or auditors) disclose the existence of the internal control weakness only when the level of weakness is over certain threshold. Thus, in the prior studies, the firms that do not disclose internal control weakness are all treated homogeneous, whereas there must be some differences in the quality of internal control system among them. In contrast, the firms that report the existence of internal control

[6] The study of Ashbaugh-Skaife et al. (2008) compares 1,281 observations with problems in internal control with 6,497 observations without such problems. Doyle et al. (2007b) also use a large sample of 705 observations with internal control problems and 3,280 observations without such problems. In addition, Raghunandan and Rama (2006) use 660 observations. Among them, 58 firms have weaknesses in internal control.

[7] Hoitash et al. (2008) report a similar fee difference in the first year of implementation of Section 404 of SOX.

weakness are required to disclose the types and severity of the weakness. Thus, prior studies mostly focus on these firms and examine how the types and severity of weakness influence various factors. To my knowledge, Choi et al. (2013) is the only study which investigates the differences in effectiveness of IC system for the firms not reporting ICW. They find that more IC personnel is negatively related to the possibility to report ICW. However, the study does not directly investigate the effect of IC personnel on earnings quality.

This study is intended to overcome the limitation in prior studies. I use all firms that have or do not have internal control weakness as my sample and examine how the human resource investment in internal control is related to the earnings quality. Furthermore, I investigate the effect of internal control in department-level, which expands Choi et al. (2013)'s findings. Thus, I believe that the findings of this study provide supportive evidence on the necessity of disclosing IC personnel and the importance of IC personnel in internal control system.

2.2 Hypotheses development

Krishnan et al. (2008) report that initial average costs to comply with SOX Section 404 amounted to more than US$2 million, including audit, internal labor, and non-audit fees. For firms that breakdown audit and other costs, the initial average audit fees were around US$0.8 million, whereas the average of

other fees was around US$1 million (Raghunandan and Rama 2006). These statistics clearly show that firms made significant investments following the SOX in the establishment of internal control.

However, large initial spending for the establishment of internal control system does not guarantee a proper functioning of the system on an ongoing basis. Even with a system that costs million dollars, firms may override the system and intentionally distort its output (i.e., accounting information), as suggested by Ashbaugh-Skaife et al. (2008). To guarantee proper or strong functioning of the system, it needs to be staffed adequately and monitored closely on a continuous basis. COSO Internal Control, Integrated Framework (1992), which is the most widely-used framework on the internal control not only in the U.S. but also around the world, emphasizes that having a sufficient number of internal control personnel is critical to establish effective internal control system. PCAOB staff audit practice alert No. 3 (2008) also addresses regulator's concern that the lack of internal control personnel would lead to deterioration in internal control. Ge and McVay (2005) also argue that lack of qualified personnel is closely related to weak internal control. For example, Ge and McVay (2005) argue that inadequate accounting resources, such as a lack of qualified accounting personnel, underpin the majority of internal control weakness. They find that issues in training, often described as having inadequate qualified staffing and resources, are the second

common type of deficiency, following account-specific deficiencies. The criteria prescribed by Section 302 of SOX also include “personnel weaknesses” as one of the categories of internal control weaknesses. Personnel weakness category includes lack of adequate training and resources. Such weaknesses could be related to the number of IC personnel because an adequate number of personnel would enable the firm to have sufficient resources, provide appropriate education, and alleviate any personnel weaknesses. Many other criteria included in Section 302 are also indirectly related to the number of IC personnel. For example, many problems, such as inadequate or lack of timely reviews, incomplete account analysis, untimely preparation of account reconciliations, inadequate control over non-routine transactions, lack of documentation of control procedures and IT systems, and inadequate segregation of duties, could be due, in part or in full, to insufficient manpower to observe and implement the system. Choi et al. (2013) support the prior argument reporting that the proportion of IC personnel to total employees is negatively related to ICW disclosure. Thus, I argue that the number of IC personnel is a very important factor for determining the strength of internal control over financial reporting. Even in an extreme case where top managers attempt to manipulate accounting numbers to report higher net income, if there are a lot of IC personnel, it could be more difficult for the top managers to persuade the personnel to cooperate or to avoid being caught.

I examine the association between this proxy and earnings quality. My formal research hypothesis is:

H: All other things being equal, earnings quality is positively associated with the human resource investment in internal control.

I use the magnitude of discretionary accruals (signed value) as a proxy for earnings quality. The measure is used by Ashbaugh-Skaife et al. (2008) to show the relation between internal control weaknesses and earnings quality and many other prior studies in various issues (Becker et al. 1998; DeFond and Subramanyam 1998; Kasznik 1999). For example, Heninger (2001) report that the magnitude of discretionary accruals is positively associated with the chance of auditor litigation. In addition, DeFond and Subramanyam (1998) report that conservative discretionary accrual choices by incumbent auditors motivates auditor dismissal by client firms, and that the subsequent auditor allows more aggressive discretionary accruals. These studies all suggest that the magnitude of signed discretionary accruals is related to earnings quality.

III. Measurement of Variables and Model Specification

3.1 Measurements of earnings quality

I use the magnitude of signed discretionary accruals as a proxy for earnings quality because Hribar and Nichols (2007) suggest the use of the absolute value of discretionary accruals can bias tests in favor of rejecting the null hypothesis of no earnings management, whereas signed discretionary accruals lead to more conservative tests. This measure is used by Ashbaugh-Skaife et al. (2008) to show the relation between ICWs and earnings quality and also has been used in many other studies (e.g., Becker et al. 1998; DeFond and Subramanyam 1998). By using the signed value of discretionary accruals, the expression of high earnings quality implies more conservative (or less aggressive) accounting choices in this study.

Specifically, I estimate the cross-sectional version of the modified Jones model (Dechow et al. 1995) and calculate discretionary accruals. The discretionary accruals are adjusted for performance by forming 20 portfolios by ROA in each year (or 10 portfolios by ROA in each industry) and then subtracting the median discretionary accruals for a corresponding portfolio matched on ROA from unadjusted discretionary accruals. As an alternative measure of discretionary accruals, I include *ROA* (return on assets) as an additional explanatory variable to adjust for firm performance when I estimate

modified Jones model (Kothari et al. 2005).[8] I denote this measure of discretionary accruals by *DA* and use it as a proxy for earnings quality.

3.2 Empirical Model to Test the Effect of IC Personnel on Earnings Quality

To test Hypothesis, I estimate the following equation (1):

$$DA_{it} = a_0 + a_1 RIC_{it} + a_2 NRIC_{it} + a_3 LNTA_{it} + a_4 GROWTH_{it} + a_5 LEV_{it}$$
$$+ a_6 CFO_{it} + a_7 LAG\_ACC_{it} + a_8 BIG4_{it} + a_9 LOSS_{it} + a_{10} ISSUE_{it}$$
$$+ a_{11} STCF_{it} + a_{12} KOSDAQ_{it} + a_{13} BOARDSIZE_{it} + a_{14} BDINDEP_{it}$$
$$+ a_{15} OWN\_FOREIGN_{it} + a_{16} OWN\_LARGEST_{it} + a_{17} CHAEBOL_{it}$$
$$+ industry\ and\ year\ indicators + \varepsilon_{it} \quad -----(1)$$

where for firm i in year t:

DA_{it}	=	performance-matched discretionary accruals, as defined in above section;
RIC_{it}	=	either *RIC_SUM1*, *RIC_SUM2*, *RIC_ACC*, *RIC_FIN*, *RIC_ITS*, or *RIC_OTH*;
$NRIC_{it}$	=	either *NRIC_SUM1*, *NRIC_SUM2*, *NRIC_ACC*, *NRIC_FIN*,

[8] There are many studies that use modified Jones-type models in Korean settings (Kim and Yi 2006, 2009; Kim et al. 2007; Choi et al. 2010, 2011). These prior studies provide evidence that the models capture cross-sectional differences in earnings quality in Korea as they do in the U.S. After excluding financial and utility firms, there are 48 two-digit industries. I require that at least 20 firms exist for each industry in each sample year. As a result, there are 20 to 21 industries per year.

		NRIC_ITS, or *NRIC_OTH*;
RIC_SUM1 (*NRIC_SUM1*)	=	ratio of IC personnel (non-IC personnel) to total employees in the firm;
RIC_SUM2 (*NRIC_SUM2*)	=	ratio of IC personnel (non-IC personnel) to total employees in the firm, excluding other departments;
RIC_ACC/FIN/ITS/ OTHER (*NRIC_ACC/FIN/ITS/ OTH*)	=	ratio of IC personnel (non-IC personnel) in the accounting/finance/ITS/other department of the firm to total employees in the firm;
$LNTA_{it}$	=	natural log of total assets;
$GROWTH_{it}$	=	change in sales, scaled by lagged total assets;
LEV_{it}	=	ratio of total liabilities to total assets;
CFO_{it}	=	cash flow from operations, scaled by lagged total assets;
LAG_ACC_{it}	=	lagged total accruals, scaled by total assets; and
$BIG4_{it}$	=	an indicator variable that takes the value of 1 if the auditor is one of the Big 4 firms, and 0 otherwise;
$LOSS_{it}$	=	an indicator variable that takes the value of 1 if the firm reports a loss for the year, and 0 otherwise;
$ISSUE_{it}$	=	an indicator variable that takes the value of 1 if the firm raises equity during the year, and 0 otherwise;
$STCF_{it}$	=	standard deviation of cash flow from operation divided by lagged total assets, calculated from t-5 through t;
$KOSDAQ_{it}$	=	an indicator variable that takes the value of 1 if the firm is listed on the KOSDAQ market, and 0 otherwise;
$BOARDSIZE_{it}$	=	natural log of the number of board members;
$BDINDEP_{it}$	=	the natural log of one plus the proportion of independent board members;
$OWN\_FOREIGN_{it}$	=	ownership percentage of foreign investors; and
$OWN\_LARGEST_{it}$	=	ownership percentage of the largest shareholder (including family members and other related parties) of the firm.
$CHAEBOL_{it}$	=	an indicator variable that takes the value of 1 if the firm is

affiliated
with a business group called a Chaebol, and 0 otherwise.

I use *DA* as the proxy for earnings quality and test the hypothesis both at the firm level and each department level. The proxies for the human resource investment in internal control over financial reporting are defined following Choi et al. (2013). To test the hypothesis at the firm level, I develop *RIC_SUM1*, and *RIC_SUM2*. *RIC_SUM1* is defined as the total number of IC personnel in accounting, finance, ITS, and other departments, scaled by total employees working in the firm. *RIC_SUM2* represents the sum of the IC personnel in accounting, finance, and ITS departments, scaled by total number of employees in the firm. The difference between *RIC_SUM1* and *RIC_SUM2* is that *RIC_SUM2* do not include the IC personnel in other departments. To control for the concern that the members who are in these departments but not engage in internal control (hereinafter non-IC personnel) might have affect to earnings quality, I develop *NRIC_SUM1* and *NRIC_SUM2* variables. *NRIC_SUM1* is the sum of the non-IC personnel in accounting, finance, ITS, and other departments, scaled by total employees working in the firm. In other words, *NRIC_SUM1* is defined as the difference between the ratio of the total number of employees working in these four departments and *RIC_SUM1*. *NRIC_SUM2* is similarly

defined[9]. I repeat the tests using alternative measures representing human resource investment in internal control in Section 5.

The effect of IC personnel might vary across departments. For example, IC personnel in accounting department could be more strongly related to earnings quality. To compare the effect of IC personnel in different departments within the firm, I develop the ratio of IC personnel in four different departments following Choi et al. (2013): accounting (*RIC_ACC*), finance (*RIC_FIN*), ITS (*RIC_ITS*), and others (*RIC_OTH*). The variables are defined as the proportion of IC personnel in each department to total employees in the firm. Similarly, I define *NRIC_ACC*, *NRIC_FIN*, *NRIC_ITS*, and *NRIC_OTH* as the number of non-IC personnel working in accounting, finance, ITS, and other departments, respectively, divided by the total number of employees of the firm.

A set of control variables that can influence discretionary accruals are also included in the model.[10] I include *LNTA* to control for the effect of firm size on accruals. Prior studies (e.g., Myers et al. 2003), and several Korean studies (e.g., Cho et al. 2009) report that signed abnormal accruals are positively associated with firm size. *GROWTH* is included to control for firm growth. *LEV*

[9] Following Choi et al. (2013), I use the percentage of IC personnel because the actual number is closely related to the total number of employees and firm size. To rule out the possibility that measurement error distort the results, I perform various sensitivity analyses using alternative measures for IC personnel in Section 5.

[10] I do not include "audit opinion" as a control variable since few observations among my sample firm-years receive a non-standard opinion. If I remove these observations or include an indicator variable for a non-standard opinion, my results are qualitatively similar to tabulated results.

is included because prior studies have documented that financially distressed companies report large negative accruals (Becker et al. 1998). I include *CFO* to control for the negative correlation between accruals and cash flows. Following Ashbaugh et al. (2003), I include lagged total accruals (*LAG_ACC*) to control for the reversal of accruals over time. I include *BIG4* to control for potential differences between firms audited by Big 4 and non-Big 4 auditors. *LOSS* is included to control for poor performance and also for different incentives of loss-reporting firms. I include *ISSUE* because equity-issuing firms may have more incentives to manage earnings (Teoh et al. 1998). *STCF* is included to control for volatility of operations (Hribar and Nichols 2007). I include *KOSDAQ* to control for any difference in earnings quality across stock exchanges. Finally, I include a comprehensive set of corporate governance variables. Specifically, I include two board characteristics which are board size (*BDSIZE*) and board independence (*BDINDEP*) because boards of directors have a primary responsibility to oversee the firm's financial reporting process. I also include largest shareholder's ownership (*OWN_LARGEST*) and chaebol dummy (*CHAEBOL*) because Kim and Yi (2006) document that business group affiliation and ownership structure affect earnings management for Korean firms. In addition, because Park et al. (2009) report that foreign shareholders prefer income-increasing accounting

choices that result in higher earnings and thus greater dividends, I include *OWN_FOREIGN*.

IV. Sample and Descriptive Statistics

I collect data on IC personnel of Korean listed firms by hand. The sample period is from 2002 to 2008. The Korean Financial Supervisory Service requests all Korean listed firms disclose information on IC personnel from 2002 fiscal year. Thus, the IC personnel data first became available in 2002. The financial data are collected from KIS-VALUE database (equivalent to COMPUSTAT in the U.S.). Panel A of Table 1 presents total sample size by year and stock exchange. The number of observations in year 2002 and 2003 are small compared to other subsequent years because the information on IC personnel and board was not fully available in these early years as reported in Panel B. Panel B describes the steps how to reach the final sample in detail. I exclude observations in financial, real estate, and utility industries. I also exclude firm-year observations where total assets or sales is less than 2 billion Korean Won (equivalent to $1.6 million) or total employees is less than 20. The final sample size used for testing the hypothesis is 6,681 firm-year observations.

[Insert Table 1 around here]

Table 2 presents descriptive statistics on IC personnel in each department for the total sample. Panel A of Table 2 reports the total number of employees in each department. On average, 6.35 employees are belongs to accounting department (*ACC*), and 3.3, 4.5, and 3.2 employees are working in finance, ITS, and other departments, respectively. The sum of the employees in these four departments (*SUM1*) is 17.4 at the mean. *SUM2* represents the sum of the employees less those in other departments. Panel B reports the number of IC personnel in each department. The mean of the number of IC personnel working in the accounting department (*IC_ACC*), finance (*IC_FIN*), ITS (*IC_ITS*), and other departments (*IC_OTH*) is 5.09, 2.33, 2.22, and 1.63, respectively. The sum of the IC personnel in these four departments (*IC_SUM1*) represents that there are about 11 IC personnel per firm.

The descriptive statistics for the ratio of IC personnel and non-IC personnel to total employees are presented in Panel C and D of Table 2. The mean of the ratio of IC personnel working in accounting, finance, ITS and other departments is 2.1%, 1.1%, 0.9% and 0.7% of total employees, respectively. The mean of the ratio of total non-IC personnel to total employees (*NRIC_SUM1*) is 2.3%, which represents the proportion of the personnel in these four departments

but not involved in internal control related work to total employees of the firm. The number of total employees is reported in the bottom row.[11]

[Insert Table 2 around here]

Table 3 reports descriptive statistics on the variables included in the regressions. The mean of *DA* is -0.1% of lagged total assets with a standard deviation of 9.5%. The size of sample firms (*LNTA*) is 25.34 on average, which is equivalent to 101 billion Korean Won. Since other variables are self-explanatory, I do not explain the variables for brevity.

[Insert Table 3 around here]

V. Empirical Results

5.1 Regression Analyses for Hypothesis

Table 4 reports the results of estimating regression equation to test the research hypothesis. Throughout the paper, reported ordinary least square (OLS) regression results use heteroskedasticity-robust standard errors clustered by firm.

[11] Note here that the number of total employees is different from the value of *SUM1* reported in Panel A of Table 2. *SUM1* is the summation of the number of employees in the accounting, finance, ITS, and other departments. The other departments imply other possibly internal control-related departments, not all the other departments in the company.

Column (1) of Table 4 presents the results of regressing signed discretionary accruals (*DA*) on the aggregated proportion of IC and non-IC personnel working in the firm (*RIC = RIC_SUM1* and *NRIC = NRIC_SUM1*). The coefficient on *RIC_SUM1* (-0.081) is negative and significant (*t*-value = -3.97). This indicates that, as a greater proportion of employees are involved in internal control functions, firms tend to report more conservative (i.e., less income-increasing or more income-decreasing) discretionary accruals. When I exclude the IC personnel in other departments (*RIC_SUM2*), the results do not change, as reported in Column (2). While the proportion of IC personnel is significantly related to discretionary accruals, the proportion of non-IC personnel (*NRIC*) is not associated with discretionary accruals in the firm level. This indicates that IC personnel working within a firm are significantly associated with accruals quality, but employees working at the same firm in non-IC functions are not.

[Insert Table 4 around here]

Columns (3) through (6) of Table 4 report the results of regressing discretionary accruals on the ratio of IC personnel in each department. The coefficient on *RIC_ACC* (-0.185) in Column (3) is significantly negative (*t*-value = -3.57). The corresponding results for finance and ITS departments are

presented in Columns (4) and (5). The coefficients on *RIC_FIN* and *RIC_ITS* are significantly negative. On the other hand, the IC personnel in other departments (*RIC_OTH*) are not associated with discretionary accruals. The coefficients on *NRIC* in Columns (3) through (6) are insignificant, except for *NRIC_ACC* and *NRIC_FIN*, generally supporting the findings in Columns (1) and (2) that the proportion of non-IC employees does not significantly affect the earnings quality of a firm. However, in accounting and finance departments, it seems that both IC and non-IC personnel are related to earnings quality. [12]

With respect to control variables, most of the significant coefficients are consistent with evidence reported in prior research. One exception is the result for *BIG4*. The coefficient on *BIG4* is positive, though the Pearson correlation between *BIG4* and *DA* is negative. It implies that the Korean Big 4 auditors do not play a significant monitoring role in restricting accruals after controlling for other factors.[13]

[12] When hand-coding the IC personnel data, I noted instances in which firms report that all members in a department are IC personnel, which could be legitimate but may also overstate the ratio of IC personnel. Firms may have an incentive to over-report the number of IC personnel even though the likelihood of mis-reporting is low given possible penalties. If a firm decides to over-report the IC personnel, the maximum number of IC personnel that a firm can report is equal to the total number of personnel working in the department. To test the sensitivity of my results to possible mis-reporting, I repeat the analyses without these observations where 100% of the employees of the department are reported as IC personnel. Untabulated results are all qualitatively similar to the tabulated results. This analysis suggests that my results are likely to be robust to this potential data accuracy issue, but I still admit that the accuracy of data could be a limitation of this study.

[13] This is consistent with previous evidence in Korea that Big 4 auditors do not play a role in restricting income increasing earnings management (e.g., Park et al. 1999; Goh et al. 2009).

In summary, I find consistent evidence that the proportion of IC personnel is positively associated with accruals quality. These results are not only statistically significant but also economically significant. For example, an interquartile change of IC personnel (*RIC_SUM2*) from Q1 to Q3 is associated with a decrease in *DA* of as much as 0.37% of lagged assets.[14] Given that the mean of total accruals is 2.6% of lagged assets (see *LAG_ACC* in Table 3), the magnitude of the decrease in *DA* associated with IC personnel corresponds to about 14% of total accruals.

An alternative way to examine the effect of IC personnel on earnings quality is to examine income-increasing and income-decreasing accruals separately. If more IC personnel decrease unintentional errors, or constrain both extreme income-increasing and extreme income-decreasing (i.e., big bath) behavior, it is expected that both income-increasing and income-decreasing abnormal accruals would be smaller (closer to zero), which would make it hard to find results using signed accruals. However, if more IC personnel play a role in decreasing opportunistic earnings overstatement (or increasing conservative accounting treatment), one should observe a negative relation between IC

Alternatively, it can be related to a recent finding by Lawrence et al. (2011) that client characteristics, not auditor characteristics, are the reasons for previous findings attributed to Big 4 auditors. Alternatively, the Pearson correlation between *DA* and *BIG4* is negative and significant, suggesting that the positive coefficient on *BIG4* is observed only after controlling for other factors.

[14] Interquartile change (0.051 - 0.016) × coefficient on *RIC_SUM2* (-0.105) = -0.0037.

personnel and signed income-increasing and income-decreasing discretionary accruals subsamples. An alternative explanation for my findings would be that IC personnel constrain income-increasing behavior but do not constrain extreme income-decreasing behavior. To explore this issue, I perform separate (untabulated) analyses with income-increasing and income-decreasing accruals subsamples. Empirical results support the explanation of less aggressive, or more conservative, accounting choices. For example, the coefficient on *RIC_SUM1* is negative and significant for the income-increasing accruals subsample (-0.041; *t-value* = -1.70) as well as for the income-decreasing accruals subsample (-0.100; *t-value* = -4.12). Except for the case when *RIC_OTH* is used as a dependent variable, I find that the results are more significant and coefficients are more negative when income-decreasing accruals are used. In summary, my general conclusion that more IC personnel are related to more conservative accounting choices does not change with these additional findings.

5.2 Conservative Accounting or Downward Earnings Management?

I interpret the empirical findings in Table 4 (and untabulated results on income-increasing and income-decreasing subsamples) as evidence that more IC personnel are related to more conservative accounting and thus higher earnings quality. However, I note that more income-decreasing discretionary accruals can indicate either conservative reporting or downward earnings management,

thereby suggesting an alternative explanation. To disentangle these two explanations, I identify a subset of the sample in which managers are more likely to manage earnings downward. For example, Healy (1985) and McNichols and Wilson (1988) document that managers have incentives to manipulate earnings downward either when they fail to arrive at a certain threshold of earnings (i.e., taking a big bath) or when their performance is above a certain threshold (i.e., earnings smoothing), so that they can increase next period's earnings. If IC personnel impact manager's ability to manage earnings downward to smooth income or to take a big bath, I should find a significant association only for the firms for which pre-managed earnings are above (below) a certain upper bound (lower bound), i.e., when earnings are extreme. For other firms for which pre-managed earnings are above a lower bound but below an upper bound, there should be no significant association. Following the procedures suggested by Gul et al. (2009), I calculate pre-managed earnings by (income – discretionary accruals) and select firms within the top and bottom 10 percent of pre-managed earnings to represent extreme earnings. I perform the analyses separately for these subsets of firms with extreme earnings and other firms in the middle 80 percent.[15] The empirical results are reported in Table 5.

[15] When I use the top and bottom 15/20/25 percent rather than 10 percent or repeat my analyses by using industry-mean adjusted pre-managed earnings, the results are all qualitatively similar to the tabulated results.

[Insert Table 5 around here]

In Table 5, I report only the results when the variable of interest is either *RIC_SUM1* or *RIC_ACC* for brevity. The results in Table 5 clearly show that the significantly negative association between discretionary accruals and IC personnel documented in Table 4 is observed in all subsamples regardless of the level of pre-managed earnings. The significant negative association for the middle 80 percent group is consistent with conservative accounting behavior whereas the significant negative association for the top and bottom 10 percent group could be consistent with either conservative behavior or income smoothing/'big bath' behavior. Overall, I conclude that the evidence is more consistent with conservative accounting choices given the negative and significant association for the middle 80 percent group of firm-years; however I cannot rule out the explanation that more IC personnel are effective at constraining income-increasing behavior but possibly not income smoothing or big-bath behavior.

5.3 Changes in IC Personnel

To more directly examine concerns of the PCAOB (2008) about changes in IC personnel, and also to address concerns about potential correlated omitted variables, I examine the effect of changes in the IC personnel ratio on the

changes in discretionary accruals. The change analysis is known to be less subject to correlated omitted variable concerns and thus provides a powerful test to examine the hypothesis. The change analysis is also motivated by other studies on firm-specific internal controls (Ashbaugh-Skaife et al. 2008, 2009; Bedard et al. 2011; Feng et al. 2009; Goh 2009; Johnstone et al. 2011).

I examine whether changes in the ratio of IC personnel (*RIC* variables) are related to the change in discretionary accruals (Δ*DA*). I calculate the year-to-year change in all independent variables (I use the same variables as those used in Table 4). For the *BIG4* indicator variable, I define three different variables to capture auditor changes between or within Big 4 and non-Big 4 auditors (*SAME_TIER*, *DOWNGRADE*, and *UPGRADE*). The empirical findings reported in Table 6 are very similar to those reported in Table 4. For example, the coefficient on Δ*RIC_SUM1* (-0.144) is negative and significant.[16] The coefficients on the change in *NRIC (*Δ*NRIC*) are never significant. Among control variables, increased firm size (*ΔLNTA*), increased growth (*ΔGROWTH)*, increased cashflow volatility (*ΔSTCF*), and ownership changes (*ΔOWN_FOREIGN* and *ΔOWN_LARGEST*), are significantly associated with a

[16] This change specification with changes in discretionary accruals as the dependent variable is similar to previous studies (e.g., Geiger and North 2006). The negative and significant coefficient on *ΔRIC_SUM1* implies that if firms appoint more (less) IC personnel in a year compared with the level of IC personnel in an immediately preceding year, the firm is likely to report less (more) income-increasing or more (less) income-decreasing accruals in the year compared with the level of discretionary accruals in the prior year. Thus, the earnings quality improves (deteriorates) as IC personnel increase (decrease).

greater discretionary accruals. Increase in leverage (*ΔLEV*), decreased cashflow (*ΔCFO*), and turning to loss (*ΔLOSS*) is negatively associated with the amount of discretionary accruals. In summary, the change analyses documented in Tables 6 support the argument that a higher ratio of IC personnel is associated with higher earnings quality.

[Insert Table 6 around here]

5.4 Additional Tests

Endogeneity Issue

To provide further evidence that the results are not driven by endogeneity, I perform two additional analyses. First, I perform a two-stage regression by using industry average of IC personnel measured at the first year of the sample period as an instrumental variable.[17] The results are qualitatively similar to those tabulated. Second, I examine whether accruals prior to the enactment of the regulation on internal controls are related to IC personnel. The rationale is as follows. The Korean regulations require firms to establish formal internal control systems beginning in 2001 and to report the data on the IC

[17] We also use an indicator variable of foreign sales as an additional instrument. To evaluate the validity of our instruments in the first stage, we checked the partial R^2 and partial F-test statistics of our instruments and the results of over-identifying restriction tests (Larcker and Rusticus 2010). The statistics show that our instruments are sufficiently correlated with potentially endogenous *RIC* variables but uncorrelated with the error term.

personnel beginning in 2002. Thus, if firms with relatively lower levels of discretionary accruals self-select to appoint more IC personnel in 2001 (i.e., they are well-governed firms), it is possible that the ratio of IC personnel measured after the disclosure of the information could be related to the magnitude of discretionary accruals in, or before, 2000. However, the analyses reveal no significant association. The results are very clear in suggesting that the documented findings begin in 2002 when Korean firms established internal control functions, thus supporting the main findings.

Alternative Measurement of Investment in IC Personnel

I use the proportion of IC personnel to total employees as a proxy for human resource investment in internal control and investigate the relation to earnings quality measured by discretionary accruals. I repeat the test using alternative variables which also capture the human resources. Following Choi et al. (2013), first, I substitute the ratio of IC personnel to total employees for the logged value of the number of IC personnel in the regression and additionally include the logged value of the number of total employees to control for the size of employees. Second, I repeat the analyses using the natural log transformation of the *RIC* and *NRIC* measures (log[1+ *RIC* or *NRIC*]). Third, I adjust *RIC* and *NRIC* variables by subtracting year-industry mean value of those variables to

control for year and industry effects. The empirical results (not tabulated) do not qualitatively different from the main regression.

I also perform separate regressions for firms with *RIC* above and below the industry median, and I find that the incremental effect of *RIC* is generally greater for the firm-level and accounting department *RIC* when the level of IC personnel is below the industry median (i.e., the magnitude of the coefficient is greater).

KSE listed firms versus KOSDAQ listed firms

In the main regression, the total sample includes firms listed in Korean Stock Exchange and KOSDAQ market. Since KOSDAQ market requires less strict rule compared to KSE market, the relation between IC personnel and discretionary accruals could be different by the market. Even though I control for the different characteristics of the markets by including dummy variable which classifies listed markets (*KOSDAQ*), it is based on the assumption that the listed market only affect directly to the dependent variable. Thus, I separately repeat the test for the observations in each market. The results are tabulated in Table 7. As presented in the table, the results do not significantly different from the result for the total sample. IC personnel is negatively related to discretionary accruals in both market observations.

[Insert Table 7 around here]

Quantity versus Quality of IC Personnel

This study investigates the association between proportion of IC personnel to total employees and discretionary accruals, which only focuses on the quantity of IC personnel. However, not only the quantity, but also the quality of IC personnel would have influence on financial reporting quality. To study this issue, I create a proxy for the quality of IC personnel and add it to the main regression equation. I develop a composite variable for IC quality (*ICPQuality*) following Choi et al. (2013). I assign one point for the existence of CPA working for corporation and another one point for the firms whose IC personnel's average experience exceeds sample median experience of the given year and industry. *ICPQuality* is the sum of these two components and takes value of 0, 1, or 2.

I re-estimate the regression equation including the *ICPQuality* as an additional variable. Table 8 represents the results of the regression. For the sample of firm-years with available experience data, I find that the coefficient on *ICPQuality* is significantly negative at the firm level (coefficient = -0.003 and *t*-value = -1.90) as well as in the accounting department (coefficient = -0.003 and *t*-value = -2.04). However, the coefficients in the analyses for other departments

are not significant. The result shows that the variable, *ICPQuality*, captures IC personnel quality even though it is crude measure and that IC personnel quality is significantly related to discretionary accruals even after controlling for IC personnel quantity variables. The results on the ratio of IC personnel do not change qualitatively in any cases.[18] In summary, I find limited evidence that the quality as well as the quantity of IC personnel is related to the earnings quality.

[Insert Table 8 around here]

VI. Conclusion

I study the effect of human resource investment in internal control over financial reporting on the earnings quality. COSO framework (1992), PCAOB alert (2008), and prior researches emphasize the importance of having sufficient number of personnel who involve in internal control related work. However, no study directly investigated the relation between human resource investment in internal control and earnings quality because it is difficult to capture the level of

[18] In the regression comparable to Table 5, we find a significant result for the *ICPQuality* variable among the top 10% and middle 80% groups (*t*-value = -1.78 and -2.57, respectively), but an insignificant result for the bottom 10% group. Thus, the levels regression results comparable to those reported in Tables 5 and 6 suggest that the IC personnel quality is reflected in the level of discretionary accruals in general. In contrast, the results for year-by-year change analyses yield an insignificant coefficient for the change in *ICPQuality*. The change variable is zero for about 85% of firm-years which may be causing this insignificance.

investment in human resource in internal control. This paper empirically examines the question using unique Korean data. Korean listed firms are required to report the information on the employees involving in IC related work. Using the data, Choi et al. (2013) find that the ratio of the IC personnel to total employees is negatively related to the likelihood to report IC weakness. Expanding Choi et al. (2013), this paper moves the focus on earnings quality and finds that the IC personnel ratio is negatively related to discretionary accruals.

The finding of the paper suggests that the effectiveness of internal control system varies across firms even though they do not report internal control weakness. Human resource investment in internal control affects the effectiveness of internal control system and increases earnings quality. Also the paper provides evidence that disclosing information on IC personnel would help financial report users to evaluate the quality of financial numbers.

This paper has some limitations. First, the results may not be generalizable to other countries because of the institutional differences. Second, endogeneity problem cannot be ruled out. It is possible that firms which care more about reporting quality hire more IC personnel and report earnings more conservatively. Third, the definition of IC personnel is not clear and may lead to measurement error which distorts the empirical result.

In spite of the limitations, this study is valuable for regulators, investors, and other stakeholders because the information on IC personnel reflect earnings quality. They can consider the human resource investment in internal control as an additional proxy to evaluate the quality of earnings of a firm. Also this study support the effectiveness of regulation which mandates firms to report information on IC personnel.

APPENDIX
AN EXAMPLE OF THE DISCLOSURE OF IC PERSONNEL

The following table shows the disclosure of Samsung Engineering Co., Ltd. on IC personnel for the fiscal year ending December 31, 2006. This information is contained in the "Report on the operation of internal control system," which is a part of the firm's annual report. The first column shows the number of employees working in each department, and the second column reports the number of employees who are in charge of the task for the implementation of internal control in each department. The third column shows how many CPAs are working in each department. In the case of Samsung Engineering Co., Ltd., one of the board members is the CPA. The fourth column shows the ratio of CPA to the number of IC personnel. The last column presents the average working experiences of IC personnel in months.

Department	① Total employees	② IC personnel (A)	③ CPAs (B)	④ Ratio of CPAs (B/A×100)	⑤ Average Experiences of IC personnel (in months)
Audit (Committee)	1	1	-	-	224
Board of Directors	7	2	1	50%	94
Accounting	17	5	-	-	124
Finance	7	3	-	-	74
ITS	13	6	-	-	94
Others	-	-	-	-	-

The other section of the annual report of Samsung Engineering Co., Ltd. shows that the total number of employees as of December 2006 is 2,109. The next table presents how I construct *RIC* and *NRIC* variables as follows;

variables	Calculation	Variables	Calculation
RIC_ACC	5/ 2,109 = 0.0024	*NRIC_ACC*	(17-5)/ 2,109 = 0.0057
RIC_FIN	3/ 2,109 = 0.0014	*NRIC_FIN*	(7-3) /2,109 = 0.0019
RIC_ITS	6/ 2,109 = 0.0028	*NRIC_ITS*	(13-6)/ 2,109 = 0.0033
RIC_OTH	0/ 2,109 = 0	*NRIC_OTH*	0/ 2,109 = 0
RIC_SUM1	(5+3+6+0)/ 2,109 = 0.0066	*NRIC_SUM1*	(12+4+7+0). 2,109 = 0.0109
RIC_SUM2	(5+3+6)/ 2,109 = 0.0066	*NRIC_SUM2*	(12+4+7)/ 2,109= 0.0109

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TABLE 1
Sample Composition

Panel A: Number of Observations by Year and Stock Exchange

	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Total**
KSE	341	387	432	439	444	453	431	2,927
KOSDAQ	251	375	513	605	654	692	664	3,754
Total firm-year observations	592	762	945	1,044	1,098	1,145	1,095	6,681

Panel B: Steps to Final Sample

	All listed Firms	less financial, real estate, utility industry	less tiny firms (*TA* < 2 bil. *SALE*<2 bil)	*RIC* available	*DA* available (at least 20 obs. in industry)	*LARGEST, MB* available	Board available	Studentised residual < 3
2002	1,814	1,797	1,702	832	700	621	596	592
2003	1,812	1,793	1,703	1,022	878	806	763	762
2004	1,790	1,768	1,670	1,252	1,078	1,012	952	945
2005	1,757	1,735	1,659	1,329	1,104	1,071	1,071	1,043
2006	1,755	1,732	1,662	1,383	1,145	1,122	1,121	1,097
2007	1,744	1,723	1,655	1,418	1,186	1,171	1,170	1,146
2008	1,732	1,710	1,601	1,396	1,152	1,114	1,113	1,096
Total	12,404	12,258	11,652	8,632	7,243	6,917	6,786	6,681

This table shows the number of firm-year observations by year and stock exchange for the sample used to test the hypothesis. I exclude firms in the financial and utilities industries. KSE is Korean Stock Exchange and KOSDAQ is Korean Securities Dealers Automated Quotations.

TABLE 2
Descriptive Statistics for IC Personnel in Each Department

	Mean	Standard Deviation	Q1	Median	Q3
Panel A: Number of employees in each department					
ACC	6.353	12.911	3	4	6
FIN	3.319	4.693	1	2	4
ITS	4.480	9.594	1	2	5
OTH	3.245	13.833	0	0	3
SUM1	17.397	27.731	7	11	18
SUM2	14.152	20.685	6	9	15
Panel B: Number of IC personnel in each department					
IC_ACC	5.086	12.456	2	3	5
IC_FIN	2.334	3.117	1	2	3
IC_ITS	2.222	7.677	1	1	2
IC_OTH	1.631	11.539	0	0	1
IC_SUM1	11.273	23.722	5	7	11
IC_SUM2	9.642	17.676	4	6	10
Panel C: Ratio of IC personnel to total employees					
RIC_ACC	0.021	0.021	0.007	0.014	0.027
RIC_FIN	0.011	0.014	0.003	0.007	0.014
RIC_ITS	0.009	0.011	0.002	0.006	0.012
RIC_OTH	0.007	0.017	0	0	0.007
RIC_SUM1	0.047	0.048	0.018	0.033	0.059
RIC_SUM2	0.041	0.040	0.016	0.029	0.051
Panel D: Ratio of non-IC personnel to total employees					
NRIC_ACC	0.005	0.011	0	0	0.007
NRIC_FIN	0.004	0.009	0	0	0.004
NRIC_ITS	0.007	0.016	0	0	0.009
NRIC_OTH	0.007	0.043	0	0	0.002
NRIC_SUM1	0.023	0.053	0	0.010	0.028
NRIC_SUM2	0.016	0.028	0	0.007	0.022
Total employees in the firm	706	3,363	107	215	476

Panel A reports descriptive statistics for the number of employees in four departments. *ACC*, *FIN*, *ITS*, and *OTH* represents the total number of employees working in accounting, finance, information technology and systems (ITS), and other departments, respectively. *SUM1* is the sum of the number of employees in these four departments, and *SUM2* is the sum of the number of employees in accounting, finance, and ITS departments. Panel B reports the number of employees who engage in internal control functions ("IC personnel"). *IC_ACC*, *IC_FIN*, *IC_ITS*, and *IC_OTH* represent the number of IC personnel in accounting, finance, ITS, and other departments, respectively. *IC_SUM1* (*IC_SUM2*) is the sum of IC personnel in these four (three) departments. Panel C (D) reports the ratio of IC personnel (non-IC personnel) to the total number of employees working in the firm. *RIC_ACC*, *RIC_FIN*, *RIC_ITS*, and *RIC_OTH* (*NRIC_ACC*, *NRIC_FIN*, *NRIC_ITS*, and *NRIC_OTH*) represent the proportion of IC personnel (non-IC personnel) in accounting, finance, ITS, and other departments, respectively, to total employees in the firm. *RIC_SUM1* and *RIC_SUM2* (*NRIC_SUM1* and *NRIC_SUM2*) are the sum of these four and three variables, respectively. The statistics are based on 6,681 firm-year observations for firms listed on the KSE and KOSDAQ for the sample period 2002-2008.

TABLE 3
Descriptive Statistics

	Mean	Standard Deviation	Q1	Median	Q3
Descriptive Statistics					
DA	-0.001	0.095	-0.052	-0.004	0.048
LNTA	25.341	1.350	24.409	25.070	25.986
GROWTH	0.089	0.302	-0.038	0.060	0.195
LEV	0.421	0.197	0.265	0.422	0.567
CFO	0.046	0.131	-0.013	0.049	0.111
LAG_ACC	-0.026	0.144	-0.081	-0.022	0.034
BIG4	0.543	0.498	0	1	1
LOSS	0.251	0.433	0	0	1
ISSUE	0.223	0.416	0	0	0
STCF	0.117	0.132	0.052	0.080	0.128
KOSDAQ	0.562	0.496	0	1	1
BOARDSIZE	1.632	0.387	1.386	1.609	1.946
BDINDEP	0.213	0.128	0.182	0.223	0.288
OWN_FOREIGN	0.069	0.126	0.000	0.007	0.077
OWN_LARGEST	0.341	0.183	0.204	0.331	0.465
CHAEBOL	0.117	0.321	0	0	0

This table reports descriptive statistics for the samples for discretionary accrual analysis. The sample is 6,681 firm-year observations for firms listed on the KSE and KOSDAQ for the period 2002-2008. *DA* is the performance-adjusted discretionary accruals. *LNTA* is the natural log of total assets. *GROWTH* is change in sales, scaled by lagged total assets. *LEV* is the ratio of total liabilities to total assets. *CFO* is cash flow from operations, scaled by lagged total assets. *LAG_ACC* is lagged total accruals, scaled by total assets. *BIG4* is an indicator variable that takes the value of 1 if the auditor is one of the Big 4 firms, and 0 otherwise. *LOSS* is an indicator variable that takes the value of 1 if the firm reports a loss for the year, and 0 otherwise. *ISSUE* is an indicator variable that takes the value of 1 if the firm raises equity during the year, and 0 otherwise. *STCF* is the standard deviation of *CFO*, calculated over from t-5 through t. *KOSDAQ* is an indicator variable that takes the value of 1 if the firm is listed on the KOSDAQ, and 0 otherwise. *BOARDSIZE* is the natural log of the number of board members. *BDINDEP* is the natural log of one plus the proportion of independent board members. *OWN_FOREIGN* and *OWN_LARGEST* are the ownership of foreign investors and the largest shareholder (including families and other related parties), respectively. *CHAEBOL* is an indicator variable that takes the value of 1 if the firm is affiliated with a business group called a Chaebol, and 0 otherwise.

TABLE 4
Results of OLS Regression of Discretionary Accruals on IC Personnel

		Dependent variable = *DA*					
RIC =		*RIC_SUM1*	*RIC_SUM2*	*RIC_ACC*	*RIC_FIN*	*RIC_ITS*	*RIC_OTH*
NRIC =		*NRIC_SUM1*	*NRIC_SUM2*	*NRIC_ACC*	*NRIC_FIN*	*NRIC_ITS*	*NRIC_OTH*
	Predicted	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	?	-0.074***	-0.066***	-0.066**	-0.079***	-0.086***	-0.103***
		(-2.90)	(-2.58)	(-2.57)	(-3.13)	(-3.47)	(-4.15)
RIC	(-)	-0.081***	-0.105***	-0.185***	-0.212***	-0.305***	-0.077
		(-3.97)	(-4.07)	(-3.57)	(-3.15)	(-3.51)	(-1.51)
NRIC	?	0.003	-0.038	-0.165**	-0.228**	0.025	0.020
		(0.24)	(-1.25)	(-2.37)	(-2.31)	(0.51)	(1.29)
LNTA	(+)	0.005***	0.005***	0.005***	0.005***	0.006***	0.006***
		(5.31)	(5.03)	(4.99)	(5.54)	(5.88)	(6.46)
GROWTH	(+)	0.022***	0.022***	0.022***	0.022***	0.022***	0.022***
		(6.98)	(7.03)	(7.08)	(7.05)	(6.98)	(6.97)
LEV	(-)	-0.020***	-0.020***	-0.020***	-0.019***	-0.020***	-0.019***
		(-4.91)	(-4.90)	(-4.81)	(-4.57)	(-4.83)	(-4.51)
CFO	(-)	-0.673***	-0.674***	-0.674***	-0.673***	-0.672***	-0.671***
		(-58.45)	(-58.53)	(-58.68)	(-58.64)	(-58.14)	(-58.41)
LAG_ACC	(-)	0.007	0.007	0.007	0.007	0.007	0.007
		(1.07)	(1.05)	(1.05)	(1.09)	(1.02)	(1.04)
BIG4	(-)	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
		(2.74)	(2.74)	(2.73)	(2.79)	(2.85)	(2.85)
LOSS	(-)	-0.062***	-0.062***	-0.062***	-0.062***	-0.062***	-0.062***
		(-30.92)	(-31.03)	(-30.95)	(-31.09)	(-31.04)	(-30.84)
ISSUE	(+)	-0.003	-0.002	-0.002	-0.003	-0.003	-0.003
		(-1.31)	(-1.26)	(-1.20)	(-1.35)	(-1.41)	(-1.44)
STCF	(+)	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002
		(-0.16)	(-0.11)	(-0.13)	(-0.14)	(-0.22)	(-0.28)
KOSDAQ	(+)	0.005**	0.005**	0.005**	0.005**	0.005**	0.005**
		(2.48)	(2.49)	(2.42)	(2.54)	(2.46)	(2.41)
BOARDSIZE	(-)	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***	-0.008***
		(-3.31)	(-3.31)	(-3.29)	(-3.37)	(-3.37)	(-3.45)

BDINDEP	(-)	0.003 (0.43)	0.003 (0.44)	0.003 (0.42)	0.003 (0.43)	0.003 (0.37)	0.002 (0.29)
OWN_FOREIGN	(+)	0.010 (1.25)	0.010 (1.28)	0.010 (1.24)	0.010 (1.27)	0.010 (1.28)	0.010 (1.26)
OWN_LARGEST	(+)	0.015*** (3.66)	0.014*** (3.65)	0.014*** (3.65)	0.015*** (3.70)	0.015*** (3.81)	0.015*** (3.85)
CHAEBOL	(-)	-0.005* (-1.72)	-0.005* (-1.68)	-0.005* (-1.66)	-0.005* (-1.81)	-0.005* (-1.86)	-0.006** (-1.97)
Year/industry indicators		Included	Included	Included	Included	Included	Included
Adjusted R^2 (%)		70.65%	70.68%	70.67%	70.66%	70.63%	70.54%
N		6,681	6,681	6,681	6,681	6,681	6,681

This table reports the regression estimates of performance-adjusted discretionary accruals (*DA*) on the ratio of IC personnel to total employees (*RIC*). *RIC* is either *RIC_SUM1*, *RIC_SUM2*, *RIC_ACC*, *RIC_FIN*, *RIC_ITS*, or *RIC_OTH*. See Tables 2 and 3 for the definition of variables. Observations identified as outliers by Belsley et al. (1980) are excluded from the sample. The sample is the 6,681 firm-year observations of firms listed on the KSE and KOSDAQ for the period 2002-2008. All t-statistics (in parentheses) are calculated using a clustering procedure to correct for serial correlation within a cluster (a firm) and White's (1980) method to correct for heteroskedasticity. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively, in two-tailed tests.

TABLE 5
Results of Regression of Discretionary Accruals on IC Personnel using the Classification Based on Pre-Managed Earnings

		Dependent variable = *DA*					
		Top 10%		Middle 80 %		Bottom 10%	
RIC =		*RIC_SUM1*	*RIC_ACC*	*RIC_SUM1*	*RIC_ACC*	*RIC_SUM1*	*RIC_ACC*
NRIC =		*NRIC_SUM1*	*NRIC_ACC*	*NRIC_SUM1*	*NRIC_ACC*	*NRIC_SUM1*	*NRIC_ACC*
	Predicted	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	?	-0.079	-0.069	-0.033	-0.028	-0.026	0.001
		(-0.83)	(-0.71)	(-1.29)	(-1.08)	(-0.26)	(0.01)
RIC	(-)	-0.122***	-0.384***	-0.055***	-0.125***	-0.105*	-0.311***
		(-2.94)	(-3.15)	(-2.73)	(-2.58)	(-1.83)	(-2.25)
NRIC	?	0.011	0.048	0.002	-0.105	0.039	-0.225
		(0.44)	(0.21)	(0.14)	(-1.61)	(1.15)	(-0.97)
LNTA	(+)	0.004	0.004	0.004***	0.004***	0.007*	0.006
		(1.17)	(1.05)	(3.75)	(3.52)	(1.73)	(1.51)
GROWTH	(+)	0.037***	0.037***	0.019***	0.019***	0.003	0.003
		(3.82)	(3.74)	(5.93)	(5.97)	(0.39)	(0.40)
LEV	(-)	-0.085***	-0.086***	-0.018***	-0.018***	-0.026**	-0.025**
		(-5.15)	(-5.20)	(-4.16)	(-4.09)	(-2.06)	(-2.02)
CFO	(-)	-0.537***	-0.534***	-0.699***	-0.699***	-0.553***	-0.556***
		(-15.12)	(-15.08)	(-52.30)	(-52.20)	(-21.92)	(-21.77)
LAG_ACC	(-)	-0.016	-0.016	0.002	0.003	0.009	0.008
		(-0.96)	(-0.99)	(0.35)	(0.39)	(0.69)	(0.57)
BIG4	(-)	0.004	0.004	0.002	0.002	0.025***	0.025***
		(0.78)	(0.81)	(1.51)	(1.50)	(4.43)	(4.44)
LOSS	(-)	-0.093***	-0.091***	-0.060***	-0.060***	-0.157***	-0.156***
		(-4.35)	(-4.31)	(-30.48)	(-30.53)	(-18.60)	(-18.32)
ISSUE	(+)	0.021***	0.021***	0.000	0.000	-0.027***	-0.027***
		(2.92)	(2.95)	(-0.05)	(0.02)	(-4.59)	(-4.60)
STCF	(+)	-0.023	-0.023	-0.003	-0.003	0.015	0.014
		(-0.99)	(-1.03)	(-0.37)	(-0.32)	(1.16)	(1.13)
KOSDAQ	(+)	0.011*	0.012*	0.004**	0.004**	-0.008	-0.009
		(1.72)	(1.85)	(2.24)	(2.18)	(-1.08)	(-1.19)
BOARDSIZE	(-)	-0.004	-0.004	-0.006***	-0.006***	-0.008	-0.008

		(-0.46)	(-0.42)	(-2.70)	(-2.68)	(-0.99)	(-0.92)
BDINDEP	(-)	0.016	0.015	0.006	0.006	0.009	0.011
		(0.68)	(0.66)	(0.89)	(0.87)	(0.44)	(0.51)
OWN_FOREIGN	(+)	0.044**	0.044**	0.012*	0.012*	0.011	0.013
		(2.34)	(2.41)	(1.73)	(1.70)	(0.26)	(0.29)
OWN_LARGEST	(+)	0.026*	0.026*	0.009**	0.009**	0.023	0.022
		(1.92)	(1.92)	(2.27)	(2.23)	(1.39)	(1.35)
CHAEBOL	(-)	-0.010	-0.011	-0.002	-0.001	-0.002	-0.003
		(-0.69)	(-0.75)	(-0.60)	(-0.54)	(-0.20)	(-0.26)
Year/industry Indicators		Included	Included	Included	Included	Included	Included
Adjusted R^2 (%)		58.11%	58.28%	59.48%	59.50%	74.15%	74.25%
N		668	668	5,345	5,345	668	668

This table reports the regression estimates of performance-adjusted discretionary accruals (*DA*) on the ratio of IC personnel to total employees (*RIC*). *RIC* is either *RIC_SUM1*, *RIC_SUM2*, *RIC_ACC*, *RIC_FIN*, *RIC_ITS*, or *RIC_OTH*. Pre-managed earnings are calculated by (income – discretionary accruals). Based on the rank of pre-managed earnings, I divide the sample to three subsamples (top 10%, middle 80% and bottom 10%). See Table 2 and 3 for the definition of variables. The sample is the 6,681 firm-year observations of firms listed on the KSE and KOSDAQ for the period 2002-2008. All t-statistics (in parentheses) are calculated using a clustering procedure to correct for serial correlation within a cluster (a firm) and White's (1980) method to correct for heteroskedasticity. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively, in two-tailed tests.

TABLE 6
Results of OLS Regression of Changes in Discretionary Accruals on Changes in IC Personnel

	Dependent variable = *ΔDA*					
ΔRIC =	*ΔRIC_SUM1*	*ΔRIC_SUM2*	*ΔRIC_ACC*	*ΔRIC_FIN*	*ΔRIC_ITS*	*ΔRIC_OTH*
ΔNRIC =	*ΔNRIC_-SUM1*	*ΔNRIC_-SUM2*	*ΔNRIC_-ACC*	*ΔNRIC_-FIN*	*ΔNRIC_-ITS*	*ΔNRIC_-OTH*
	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	-0.017***	-0.017***	-0.017***	-0.017***	-0.017***	-0.017***
	(-5.74)	(-5.75)	(-5.72)	(-5.85)	(-5.83)	(-5.81)
ΔRIC	-0.144**	-0.140*	-0.299***	-0.113	-0.257	-0.330*
	(-2.19)	(-1.72)	(-1.94)	(-0.54)	(-1.10)	(-1.73)
ΔNRIC	-0.008	0.007*	-0.026	0.045	0.040	-0.075
	(-0.12)	(0.08)	(-0.11)	(0.16)	(0.22)	(-0.43)
ΔLNTA	0.026***	0.026***	0.026***	0.026***	0.026***	0.027***
	(4.77)	(4.80)	(4.77)	(4.92)	(4.90)	(4.94)
ΔGROWTH	0.019***	0.020***	0.019***	0.020***	0.019***	0.020***
	(5.47)	(5.47)	(5.45)	(5.49)	(5.46)	(5.49)
ΔLEV	-0.063***	-0.062***	-0.062***	-0.061***	-0.062***	-0.062***
	(-4.75)	(-4.69)	(-4.72)	(-4.63)	(-4.68)	(-4.69)
ΔCFO	-0.956***	-0.956***	-0.956***	-0.956***	-0.956***	-0.956***
	(-72.84)	(-72.82)	(-72.81)	(-72.81)	(-72.80)	(-72.76)
ΔLAG_ACC	-0.089***	-0.089***	-0.089***	-0.089***	-0.089***	-0.089***
	(-11.01)	(-10.97)	(-11.00)	(-10.98)	(-10.95)	(-11.06)
SAME_TIER	0.000	0.000	0.000	0.000	0.000	0.000
	(0.36)	(0.36)	(0.38)	(0.37)	(0.37)	(0.34)
UPGRADE	0.004	0.004	0.004	0.004	0.004	0.004
	(0.85)	(0.85)	(0.85)	(0.81)	(0.82)	(0.81)
DOWNGRADE	0.007	0.007	0.007	0.007	0.007	0.007
	(1.62)	(1.62)	(1.63)	(1.60)	(1.62)	(1.60)
ΔLOSS	-0.046***	-0.046***	-0.046***	-0.046***	-0.046***	-0.046***
	(-20.79)	(-20.75)	(-20.73)	(-20.72)	(-20.74)	(-20.74)
ΔISSUE	0.003	0.003	0.003	0.003	0.003	0.003
	(1.10)	(1.12)	(1.14)	(1.13)	(1.10)	(1.12)
ΔSTCF	0.048*	0.047*	0.047*	0.048*	0.048*	0.048*
	(1.77)	(1.76)	(1.76)	(1.78)	(1.76)	(1.78)

ΔBOARDSIZE	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
	(-1.46)	(-1.48)	(-1.49)	(-1.49)	(-1.49)	(-1.49)
ΔBDINDEP	0.000	0.001	0.001	0.001	0.001	0.001
	(0.04)	(0.05)	(0.05)	(0.07)	(0.06)	(0.09)
ΔOWN_FOREIGN	0.049***	0.049***	0.048***	0.049***	0.048***	0.048***
	(2.94)	(2.95)	(2.92)	(2.97)	(2.96)	(2.96)
ΔOWN_LARGEST	0.020***	0.020***	0.020***	0.020***	0.020***	0.020***
	(2.79)	(2.80)	(2.81)	(2.79)	(2.82)	(2.81)
ΔCHAEBOL	0.002	0.002	0.002	0.002	0.002	0.002
	(0.36)	(0.36)	(0.35)	(0.41)	(0.40)	(0.42)
Year/industry Indicators	Included	Included	Included	Included	Included	Included
Adjusted R^2	71.58%	71.56%	71.57%	71.54%	71.55%	71.56%
N	4,971	4,971	4,971	4,971	4,971	4,971

This table reports the regression estimates of changes in performance-adjusted discretionary accruals (Δ*DA*) on changes in the ratio of IC personnel to total employees (*ΔRIC*). *ΔRIC* is either *ΔRIC_SUM1*, *ΔRIC_SUM2*, *ΔRIC_ACC*, *ΔRIC_FIN*, *ΔRIC_ITS*, or *ΔRIC_OTH*. *ΔNRIC* is the change of non-IC personnel to total employees. *ΔNRIC* is either *ΔNRIC_SUM1*, *ΔNRIC_SUM2*, *ΔNRIC_ACC*, *ΔNRIC_FIN*, *ΔNRIC_ITS*, or *ΔNRIC_OTH*. *SAME_TIER* is equal to 1 if the firm changed its auditor within the same tier auditor (e.g., within Big 4), and 0 otherwise. *DOWNGRAD*E (*UPGRADE*) is equal to 1 if the firm changed its auditor from a Big 4 (non-Big 4) auditor to a non-Big 4 (Big 4) auditor), and 0 otherwise. Other control variables are defined as the change between t-1 and t. See Table 2 and 3 for the definition of variables. Observations identified as outliers by Belsley et al. (1980) are excluded from the sample. The sample is the 4,971 firm-year observations with all available change variables. All t-statistics (in parentheses) are calculated using a clustering procedure to correct for serial correlation within a cluster (a firm) and White's (1980) method to correct for heteroskedasticity. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively, in two-tailed tests.

TABLE 7
Panel A: Results of OLS Regression of Discretionary Accruals on IC Personnel for KSE Listed Firms

		Dependent variable = *DA*					
RIC =		*RIC_SUM1*	*RIC_SUM2*	*RIC_ACC*	*RIC_FIN*	*RIC_ITS*	*RIC_OTH*
NRIC =		*NRIC_SUM1*	*NRIC_SUM2*	*NRIC_ACC*	*NRIC_FIN*	*NRIC_ITS*	*NRIC_OTH*
	Predicted	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	?	-0.017	-0.002	-0.007	-0.008	-0.032	-0.044
		(-0.59)	(-0.06)	(-0.24)	(-0.29)	(-1.17)	(-1.65)
RIC	(-)	-0.063**	-0.111**	-0.197**	-0.340***	-0.107	0.050
		(-2.02)	(-2.48)	(-2.03)	(-3.17)	(-0.69)	(0.99)
NRIC	?	-0.021	-0.100**	-0.202*	-0.234	-0.148	-0.010
		(-1.18)	(-2.31)	(-1.93)	(-1.56)	(-1.31)	(-0.86)
LNTA	(+)	0.003***	0.003**	0.003**	0.003**	0.004***	0.004***
		(2.79)	(2.38)	(2.52)	(2.55)	(3.44)	(3.78)
GROWTH	(+)	0.017***	0.017***	0.017***	0.017***	0.017***	0.016***
		(3.05)	(3.19)	(3.16)	(3.14)	(3.06)	(3.00)
LEV	(-)	-0.012**	-0.012**	-0.013**	-0.011**	-0.011**	-0.010**
		(-2.31)	(-2.42)	(-2.50)	(-2.21)	(-2.13)	(-1.97)
CFO	(-)	-0.705***	-0.707***	-0.706***	-0.706***	-0.704***	-0.703***
		(-34.17)	(-34.45)	(-34.64)	(-34.43)	(-34.01)	(-34.29)
LAG_ACC	(-)	0.002	0.003	0.003	0.003	0.001	0.002
		(0.18)	(0.24)	(0.24)	(0.28)	(0.12)	(0.14)
BIG4	(-)	0.004**	0.004**	0.004**	0.004**	0.005**	0.005**
		(2.24)	(2.22)	(2.29)	(2.16)	(2.33)	(2.41)
LOSS	(-)	-0.047***	-0.047***	-0.047***	-0.047***	-0.047***	-0.047***
		(-17.63)	(-17.76)	(-17.62)	(-17.92)	(-17.84)	(-17.77)
ISSUE	(+)	-0.000	-0.000	-0.000	-0.000	-0.001	-0.001
		(-0.17)	(-0.13)	(-0.07)	(-0.15)	(-0.24)	(-0.20)
STCF	(+)	-0.037	-0.036	-0.036	-0.036	-0.036	-0.036
		(-1.50)	(-1.51)	(-1.52)	(-1.52)	(-1.48)	(-1.45)
BOARDSIZE	(-)	-0.004	-0.005*	-0.004	-0.005	-0.005*	-0.005
		(-1.58)	(-1.65)	(-1.57)	(-1.60)	(-1.68)	(-1.61)
BDINDEP	(-)	-0.006	-0.006	-0.006	-0.006	-0.007	-0.008
		(-0.61)	(-0.57)	(-0.62)	(-0.59)	(-0.71)	(-0.78)

OWN_FOREIGN	(+)	0.009 (1.22)	0.010 (1.29)	0.009 (1.18)	0.010 (1.28)	0.010 (1.31)	0.010 (1.27)
OWN_LARGEST	(+)	0.010** (2.00)	0.010* (1.93)	0.010** (1.99)	0.010* (1.91)	0.011** (2.14)	0.012** (2.20)
CHAEBOL	(-)	-0.001 (-0.32)	-0.001 (-0.27)	-0.001 (-0.25)	-0.001 (-0.25)	-0.002 (-0.52)	-0.002 (-0.54)
Year/industry indicators		Included	Included	Included	Included	Included	Included
Adjusted R^2 (%)		71.3%	71.4%	71.4%	71.4%	71.3%	71.2%
N		2,927	2,927	2,927	2,927	2,927	2,927

Panel B: Results of OLS Regression of Discretionary Accruals on IC Personnel KOSDAQ Firms

		Dependent variable = *DA*					
RIC =		*RIC_SUM1*	*RIC_SUM2*	*RIC_ACC*	*RIC_FIN*	*RIC_ITS*	*RIC_OTH*
NRIC =		*NRIC_SUM1*	*NRIC_SUM2*	*NRIC_ACC*	*NRIC_FIN*	*NRIC_ITS*	*NRIC_OTH*
	Predicted	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	?	-0.220***	-0.214***	-0.212***	-0.230***	-0.234***	-0.253***
		(-5.03)	(-4.84)	(-4.69)	(-5.31)	(-5.53)	(-5.98)
RIC	(-)	-0.080***	-0.097***	-0.172***	-0.149*	-0.347***	-0.112*
		(-3.54)	(-3.43)	(-3.06)	(-1.93)	(-3.61)	(-1.80)
NRIC	?	0.016	-0.013	-0.101	-0.253**	0.064	0.035
		(0.92)	(-0.37)	(-1.14)	(-2.05)	(1.27)	(1.52)
LNTA	(+)	0.011***	0.011***	0.011***	0.011***	0.011***	0.012***
		(6.26)	(6.07)	(5.90)	(6.51)	(6.75)	(7.13)
GROWTH	(+)	0.008**	0.008**	0.008**	0.008**	0.008**	0.008**
		(2.47)	(2.48)	(2.48)	(2.49)	(2.48)	(2.44)
LEV	(-)	-0.025***	-0.025***	-0.024***	-0.024***	-0.026***	-0.024***
		(-4.39)	(-4.34)	(-4.21)	(-4.07)	(-4.45)	(-4.12)
CFO	(-)	-0.670***	-0.670***	-0.670***	-0.669***	-0.669***	-0.668***
		(-50.22)	(-50.30)	(-50.24)	(-50.30)	(-50.02)	(-50.04)
LAG_ACC	(-)	0.008	0.008	0.008	0.008	0.007	0.008
		(0.99)	(0.98)	(0.98)	(1.01)	(0.93)	(0.99)
BIG4	(-)	0.003	0.003	0.003	0.003	0.003	0.003
		(1.25)	(1.25)	(1.22)	(1.32)	(1.34)	(1.31)
LOSS	(-)	-0.074***	-0.074***	-0.074***	-0.074***	-0.074***	-0.074***
		(-27.79)	(-27.81)	(-27.75)	(-27.85)	(-27.75)	(-27.70)
ISSUE	(+)	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
		(-0.73)	(-0.71)	(-0.67)	(-0.78)	(-0.82)	(-0.80)
STCF	(+)	0.002	0.002	0.002	0.002	0.002	0.001
		(0.29)	(0.29)	(0.27)	(0.21)	(0.24)	(0.19)
BOARDSIZE	(-)	-0.009***	-0.009***	-0.010***	-0.010***	-0.010***	-0.010***
		(-2.75)	(-2.74)	(-2.76)	(-2.84)	(-2.76)	(-2.86)
BDINDEP	(-)	0.002	0.002	0.002	0.002	0.001	0.001
		(0.18)	(0.20)	(0.20)	(0.24)	(0.17)	(0.11)
OWN_FOREIGN	(+)	0.036**	0.036**	0.037**	0.037**	0.035**	0.037**

		(2.35)	(2.35)	(2.38)	(2.38)	(2.26)	(2.39)
OWN_LARGEST	(+)	0.018***	0.018***	0.018***	0.019***	0.019***	0.019***
		(3.03)	(3.06)	(3.03)	(3.14)	(3.16)	(3.10)
CHAEBOL	(-)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.004
		(-0.77)	(-0.78)	(-0.75)	(-0.78)	(-0.79)	(-0.73)
Year/industry indicators		Included	Included	Included	Included	Included	Included
Adjusted R^2 (%)		71.9%	71.9%	71.9%	71.9%	72.0%	71.9%
N		3,755	3,755	3,755	3,755	3,755	3,755

This table reports the regression estimates of performance-adjusted discretionary accruals (*DA*) on the ratio of IC personnel to total employees (*RIC*). *RIC* is either *RIC_SUM1*, *RIC_SUM2*, *RIC_ACC*, *RIC_FIN*, *RIC_ITS*, or *RIC_OTH*. See Tables 2 and 3 for the definition of variables. Observations identified as outliers by Belsley et al. (1980) are excluded from the sample. The sample is the 6,681 firm-year observations of firms listed on the KSE and KOSDAQ for the period 2002-2008. All t-statistics (in parentheses) are calculated using a clustering procedure to correct for serial correlation within a cluster (a firm) and White's (1980) method to correct for heteroskedasticity. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively, in two-tailed tests.

TABLE 8
Results of OLS Regression of Discretionary Accruals on IC Personnel Controlling for ICP Quality

		Dependent variable = *DA*					
RIC =		*RIC_SUM1*	*RIC_SUM2*	*RIC_ACC*	*RIC_FIN*	*RIC_ITS*	*RIC_OTH*
NRIC =		*NRIC_SUM1*	*NRIC_SUM2*	*NRIC_ACC*	*NRIC_FIN*	*NRIC_ITS*	*NRIC_OTH*
	Predicted	(1)	(2)	(3)	(4)	(5)	(6)
INTERCEPT	?	-0.070***	-0.061**	-0.061**	-0.075***	-0.083***	-0.099***
		(-2.78)	(-2.43)	(-2.39)	(-3.03)	(-3.42)	(-4.10)
RIC	(-)	-0.084***	-0.112***	-0.198***	-0.241***	-0.302***	-0.088*
		(-4.19)	(-4.39)	(-3.77)	(-3.51)	(-3.38)	(-1.71)
NRIC	?	0.003	-0.040	-0.157**	-0.237**	0.018	0.020
		(0.25)	(-1.33)	(-2.27)	(-2.43)	(0.37)	(1.22)
ICPQuality	(-)	-0.003*	-0.002	-0.003**	0.001	-0.001	0.002
		(-1.90)	(-1.35)	(-2.09)	(0.68)	(-0.41)	(1.17)
LNTA	(+)	0.005***	0.005***	0.005***	0.005***	0.006***	0.006***
		(5.19)	(4.85)	(4.80)	(5.36)	(5.80)	(6.32)
GROWTH	(+)	0.009***	0.009***	0.009***	0.010***	0.009***	0.009***
		(3.15)	(3.19)	(3.18)	(3.22)	(3.16)	(3.11)
LEV	(-)	-0.017***	-0.016***	-0.016***	-0.015***	-0.016***	-0.014***
		(-4.04)	(-4.00)	(-3.92)	(-3.60)	(-3.85)	(-3.48)
CFO	(-)	-0.671***	-0.672***	-0.672***	-0.671***	-0.670***	-0.669***
		(-58.52)	(-58.57)	(-58.71)	(-58.53)	(-58.13)	(-58.36)
LAG_ACC	(-)	0.012*	0.012*	0.012*	0.013*	0.012*	0.012*
		(1.83)	(1.83)	(1.79)	(1.89)	(1.80)	(1.81)
BIG4	(-)	0.004**	0.004**	0.004**	0.004***	0.004***	0.004***
		(2.52)	(2.50)	(2.44)	(2.58)	(2.65)	(2.61)
LOSS	(-)	-0.064***	-0.064***	-0.064***	-0.064***	-0.064***	-0.064***
		(-31.36)	(-31.41)	(-31.35)	(-31.51)	(-31.40)	(-31.27)
ISSUE	(+)	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
		(-1.55)	(-1.47)	(-1.46)	(-1.50)	(-1.60)	(-1.63)
STCF	(+)	-0.008	-0.008	-0.008	-0.008	-0.009	-0.009
		(-1.11)	(-1.03)	(-1.09)	(-1.02)	(-1.14)	(-1.15)
KOSDAQ	(+)	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**
		(2.08)	(2.09)	(2.03)	(2.22)	(2.10)	(2.05)

BOARDSIZE	(-)	-0.008*** (-3.61)	-0.008*** (-3.60)	-0.008*** (-3.61)	-0.008*** (-3.61)	-0.008*** (-3.63)	-0.008*** (-3.71)
BDINDEP	(-)	0.002 (0.24)	0.002 (0.24)	0.002 (0.26)	0.001 (0.20)	0.001 (0.12)	0.000 (0.02)
OWN_FOREIGN	(+)	0.009 (1.15)	0.009 (1.17)	0.009 (1.13)	0.009 (1.10)	0.009 (1.11)	0.009 (1.08)
OWN_LARGEST	(+)	0.016*** (3.91)	0.016*** (3.92)	0.016*** (3.87)	0.016*** (3.93)	0.016*** (4.06)	0.017*** (4.09)
CHAEBOL	(-)	-0.005* (-1.86)	-0.005* (-1.84)	-0.005* (-1.78)	-0.005* (-1.91)	-0.005** (-1.98)	-0.006** (-2.07)
Year/industry indicators		Included	Included	Included	Included	Included	Included
Adjusted R^2 (%)		70.6%	70.6%	70.6%	70.6%	70.5%	70.4%
N		6,412	6,412	6,412	6,412	6,412	6,412

This table reports the regression estimates of performance-adjusted discretionary accruals (*DA*) on the ratio of IC personnel to total employees (*RIC*). *RIC* is either *RIC_SUM1*, *RIC_SUM2*, *RIC_ACC*, *RIC_FIN*, *RIC_ITS*, or *RIC_OTH*. See Tables 2 and 3 for the definition of variables. Observations identified as outliers by Belsley et al. (1980) are excluded from the sample. The sample is the 6,681 firm-year observations of firms listed on the KSE and KOSDAQ for the period 2002-2008. All t-statistics (in parentheses) are calculated using a clustering procedure to correct for serial correlation within a cluster (a firm) and White's (1980) method to correct for heteroskedasticity. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively, in two-tailed tests.

Essay 2
Human resource investment in internal control and investment efficiency: Evidence from Korea

I. Introduction

After the passage of Sarbanes and Oxley Act (2002), regulators require managers to design and establish effective internal control system and assert their evaluation on the effectiveness of their internal control system. Also, auditors are mandated to express their opinion on the effectiveness of internal control over financial reporting. Using the managers and auditors evaluation on the effectiveness of internal control system, researchers examine various issues related to weaknesses in internal control system (hereafter, ICW). However, most of studies focus on the causes and results of ICW and pay less attention to the inside user's perspective. Although operation effectiveness and efficiency is one of the three objectives of internal control suggested by COSO framework (the Committee of Sponsoring Organizations of the Treadway Commission – Integrated Framework 1992), which is the most extensively used framework among internal control frameworks, little is known about the relation between ICW and the efficient resource allocation of the firm.

Theoretically, a firm has to invest until the marginal utility of investment equals the marginal cost of investment. However, market frictions such as moral hazard and adverse selections disturb efficient resource allocation process. These problems would be more pervasive if a firm does not provide high quality financial report. Prior literatures find that low quality financial reporting is related to inefficient investment (Biddle et al. 2009) and ICW firms, which are

reported to have low quality of financial information (Ashbaugh-Skaife et al. 2008; Chan et al. 2008; Cho and Yu 2006; Doyle et al. 2007a) and weak corporate governance system (Hoitash et al. 2009), operate and invest inefficiently (Cheng et al. 2013; Feng et al.2012; Goh and Kim 2013).

This paper examines the relation between the effectiveness of internal control system measured by human resource investment in internal control and investment efficiency. Specifically, I test whether the proportion of personnel who involve in internal control related work affects investment efficiency. I expect that having enough internal control personnel (hereafter, IC personnel) can mitigate the problems and increase firm's investment efficiency. IC personnel are critical in internal control because segregation of duties, timely review, and appropriate monitoring can be achieved by those workers. Firms with more IC personnel are less likely to disclose ICW and increase in IC personnel is positively related to ICW remediation (Choi et al. 2013). IC personnel are also positively related to earnings quality (Lee 2013). Additionally, I examine whether ICW is related to investment efficiency because Korean institutional environment is different from that of U.S.. (e.g. .Korean auditors provide review opinion rather than audit opinion and Korea is regarded as a country with weak legal system).

To investigate whether IC personnel is positively related to efficient investment, I predict investment amount of a firm following McNichols and Stubben's (2008) model and test whether IC personnel prevent firms to less deviate from the expected level of investment compared to other firms. I find that IC personnel are negatively related to over-investment but do not find evidence that IC personnel prevent under-investment. Consistent with this finding, I observe significant and positive relation between ICW and over-investment but do not observe significant relation between ICW and under-investment.

When I use Biddle et al. (2009) and Cheng et al. (2013) methodology to test the relation between ICW and investment efficiency, the findings are consistent. Biddle et al. (2009) expect that firms increase (decrease) investment according to their cash and debt amounts. If a firm has large (small) cash balance and small (large) debt amount, the firm would invest more (less). I find that ICW firms invest more than non-ICW firms when they are financially unconstrained. Specifically, among firms with abundant cash holdings and low leverage, ICW firms invest even more than other firms. However, under the opposite setting where the amount of cash holdings is low and leverage is high, I do not find consistent evidence that ICW firms invest less than other firms. In summary, I document that ICW is associated with over-investment but not under-investment. These findings are robust when I control for accounting quality, extreme

investment, and endogeneity. In an additional test, I examine whether firms that are to report ICW in one of the three upcoming years tend to over- or under-invest in the current year, based on the assumption that internal control of ICW firms may be weak even before they disclose the existence of ICW. I consistently find that those firms over-invest even before the disclosure of ICW.

This paper directly investigates whether the efficiency of firm resource allocation is achieved by effective internal control proxied by IC personnel and ICW. I find that effective internal control (more IC personnel and non-ICW) are negatively associated with over-investment, but not under-investment. This paper has contribution because it empirically tests whether effective internal control helps firm to achieve efficient resource allocation. Prior studies only distinguish firms by ICW disclosure and treat non-ICW firms as a homogeneous group. Thus the results of prior papers provide limited evidence on the merits of effective internal control system. This study expands our understanding of the effective internal control system. Moreover, the findings of this paper provide important implications to investors, practitioners and regulators. The results suggest that the managers in firms with weak internal control system are more likely to maximize their own welfare (e.g. empire building) rather than pursue firm value maximization. Also, investors can consider the proportion of IC personnel when they make investment decision. It is necessary to carefully monitor and evaluate

the investment decision of low IC personnel firms or ICW firms when they have enough financial resources.

The limitation of this paper is that poor financial reporting quality and weak corporate governance mechanism, which are related to IC personnel and ICW may not completely be controlled to prevent their effects on investment efficiency. However, the implication of the paper is still valid. The availability of information on the IC personnel and auditor's review on the effectiveness of internal control are useful for the investors, while it is difficult for investors to evaluate a firm's financial reporting quality or corporate governance.

The remainder of the paper is organized as follows. Section 2 documents institutional background and reviews relevant prior literatures on internal control weakness and investment efficiency. Section 3 develops testable hypotheses concerning the relation between IC personnel (or ICW) and over- or under-investment. Section 4 describes the research design. Section 5 discusses the data and section 6 provides empirical results with additional analyses. Section 7 concludes the paper.

II. Institutional background and literature reviews

2.1. Institutional background

As the Sarbanes-Oxley Act (SOX) was enacted in 2002 resulting from a series of accounting scandals in the late 1990s and early 2000s, it significantly

changed the U.S. financial reporting environment including the regulations on internal control. For instance, SOX section 302 requires managers to evaluate and report the effectiveness of the internal control, and section 404 mandates external auditors to provide an opinion on the manager's assertion on the effectiveness of internal control over financial reporting from 2004. Along with the passage of SOX, the guidance on the establishment, maintenance, and evaluation of the internal control system is specified in PCAOB (Public Company Accounting Oversight Board) Auditing Standard No. 2, [19] which depends on COSO Internal Control – Integrated Framework about the details of internal control. COSO internal control framework is a widely-used framework not only in the U.S. but also around the world to establish and evaluate internal control system of organizations.[20]

[19] Auditing Standard No. 5 supersedes Auditing Standard No. 2 from 2007.

[20] The following excerpts from Standard No. 2 and 5 evidently state their reliance on COSO framework regarding internal control system.

Auditing Standard No.2 describes that "*14. In the United States, the Committee of Sponsoring Organizations ("COSO") of the Treadway Commission has published Internal Control - Integrated Framework. Known as the COSO report, it provides a suitable and available framework for purposes of management's assessment. For that reason, the performance and reporting directions in this standard are based on the COSO framework. Other suitable frameworks have been published in other countries and may be developed in the future. Such other suitable frameworks may be used in an audit of internal control over financial reporting. Although different frameworks may not contain exactly the same elements as COSO, they should have elements that encompass, in general, all the themes in COSO. Therefore, the auditor should be able to apply the concepts and guidance in this standard in a reasonable manner*".

Auditing Standard No. 5 also states that *"SEC rules require management to base its evaluation of the effectiveness of the company's internal control over financial reporting on a*

COSO is a nonprofit organization supported by the five private sector organizations, including the American Accounting Association (AAA), the American Institute of Certified Public Accountants (AICPA), Financial Executives International (FEI), the Institute of Management Accountants (IMA), and the Institute of Internal Auditors (IIA). COSO develops and provides frameworks and guidance on enterprise risk management, internal control and fraud deterrence.[21] COSO framework describes three objectives of internal control which are achieving effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws and regulations. While SOX section 302 and 404 mainly regulate internal control over financial reporting, it shares the objectivities of internal control.[22]

The Korean Financial Supervisory Service (FSS) adopted a set of regulations similar to SOX, which is often referred to as 'K-SOX' (Choi et al. 2012). The "Act on External Audit of Stock Companies" (the "External Audit Act") was amended to include regulations on internal control system in reference to SOX section 302 and 404. The act mandates firms to maintain effective

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suitable, recognized control framework … For example, … the COSO report provides such a framework"

[21] see www.coso.org for more information

22 PCAOB Auditing Standard No. 2 reveals that COSO perspective on internal control over financial reporting would not only achieve the reliability of financial reporting but also the other two objectives, which are efficiency and effectiveness of operations and compliance with laws and regulations.

internal control system, statutory auditors (or audit committees) to evaluate the effectiveness of internal control system and report weaknesses to the board of directors, and external auditors to assess internal control and express their review opinion separately from the audit opinion. Korean actions differ from U.S. regulations in that they require Korean auditors to provide a review report which gives lower level of assurance, while U.S. regulations require U.S. auditors to provide attestations that express an audit opinion on the internal control system. In June 2005, the Operating Committee of Internal Control over Financial Reporting in Korea issued the Best Practice Guideline for Internal Control over Financial Reporting in reference to COSO framework. The guideline provides an integrated framework for Korean companies to design and operate an effective internal control system and to evaluate the effectiveness of the system (Choi et al. 2012). In summary, Korean regulators adopt similar regulations and internal control framework to those of the U.S.'s.

2.2. Internal control personnel, internal control weakness and earnings quality

Human resource investment in internal control is critical to establish effective internal control over financial reporting. To guarantee proper or strong functioning of the system, it needs to be staffed adequately and monitored closely on a continuous basis. COSO Internal Control, Integrated Framework

(1992), which is the most widely-used framework on the internal control not only in the U.S. but also around the world, emphasizes that having a sufficient number of internal control personnel is critical to establish effective internal control system. PCAOB staff audit practice alert No. 3 (2008) also addresses regulator's concern that the lack of internal control personnel would lead to deterioration in internal control. Ge and McVay (2005) also argue that lack of qualified personnel is closely related to weak internal control. The criteria prescribed by Section 302 of SOX also include "personnel weaknesses" as one of the categories of internal control weaknesses. Personnel weakness category includes lack of adequate training and resources. Such weaknesses could be related to the number of IC personnel because an adequate number of personnel would enable the firm to have sufficient resources, provide appropriate education, and alleviate any personnel weaknesses. Many other criteria included in Section 302 are also indirectly related to the number of IC personnel. For example, many problems, such as inadequate or lack of timely reviews, incomplete account analysis, untimely preparation of account reconciliations, inadequate control over non-routine transactions, lack of documentation of control procedures and IT systems, and inadequate segregation of duties, could be due, in part or in full, to insufficient manpower to observe and implement the system. Choi et al. (2013) support the prior argument reporting that the proportion of IC personnel to total

employees is negatively related to ICW disclosure. I find that the ratio of IC personnel is positively related to earnings quality measured by signed discretionary accruals in the first essay of the dissertation. In summary, the papers provide evidence that human resource investment in internal control is closely related to the effectiveness of internal control and earnings quality of the firm that do not report ICW.

2.3. Internal control weaknesses and efficiency in operation and investment

COSO framework assures that effective internal control lead to efficient resource allocation in the firm. Supporting this argument, Cheng et al. (2013) provide evidence that ICW firms under-invest when they are financially constrained and over-invest when they are not financially constrained. The inefficient investment behavior is observed in the year prior to ICW disclosure, but disappears after the disclosure. The finding shed light on the casual relation between ICW and investment efficiency. Feng et al. (2012) find that ICW firms related to lower inventory turnover and higher likelihood and magnitude of inventory impairment. Goh and Kim (2013) also find negative relation between ICW disclosure and operational efficiency measurement using frontier analysis. Kim et al. (2013) examine whether ICW has implication for cost behavior and report that ICW is positively associated with SG&A cost-stickiness. These

researches support the notion that effective internal control system improves firm's operation and investment efficiency.

The researches suggest that two channels can affect the association between ICW and operation and investment efficiency. First, information asymmetry between managers and investors may lead to inefficient investment. Second, managers in ICW firms are more likely to make inefficient investment because their decision making is based on the low quality internal financial information.

III. Hypothesis development

Theoretically, a firm begins to invest in projects with highest net present value (NPV) and moves to the project with the second highest NPV. This course of action continues until the marginal benefit of capital investment equals the marginal cost of capital. Modigliani and Miller (1958) show that investment depends only on investment opportunities in perfect capital market and Tobin (1969) and Hayashi (1982) show that Q ratio can represents investment opportunities. However, analytical and empirical studies predict and find evidence that not only the investment opportunity but also firm's financial constraint affects the investment magnitude (Stein 2003). For example, the existence of information asymmetry between managers and investors leads to moral hazard and adverse selection and disturbs efficient resource allocation

which results in positive relation between financial resource and investment amount.

Under moral hazard, managers have incentive to invest all available funds which not coincide with investors' interest (Jensen 1986; Jensen and Meckling 1976). As the information asymmetry between managers and investors increases, it is more likely for managers to make decision to maximize their own benefit, not to maximize firm value by over-investment (e.g., empire building)[23].

When adverse selection exists, managers have more information and they are likely to timely issue new shares when the firm is over-valued. Managers also have incentive to borrow if they have private information that the possibility of default is higher than interest rate (Myers and Majluf 1984; Myers 1984; Greenwald, Stigliz and Weiss 1984). Thus, investors interpret capital raise as a bad news and hesitate to invest and firms cannot fully invest in the positive NPV projects when they are financially constrained.

One solution to relieve information asymmetry between management and investors is financial reporting. One of the main objectives of financial reporting is to inform present and potential investors and help them to assess future cash flows. As a result, high quality financial reporting helps investors to write better

[23] Moral hazard also can be related to under-investment. Manager's who prefer quiet life do not want change previous decision because it takes effort to make difficult decision. They just continue existing project which result in over- and under-investment (Bertand and Mullainathan 2003). Aggarwal and Samwick (1999) argue that manager's laziness can lead to under-investment.

contracts, evaluate manager's fiduciary responsibility, and prevent manager's opportunistic behaviors. Thus, the extent to which information asymmetry can be alleviated depends on the quality of the reporting.

However, when a firm' internal control over financial reporting gets weaker, the reliability and relevance of financial reporting of the firm will decrease and the possibility that investors fail to monitor and evaluate manager's decision making increases. Researchers find that firms with ineffective internal control have lower quality financial information (Ashbaugh-Skaife et al. 2008; Doyle et al. 2007; Lee 2013) and information asymmetry problem is more pervasive for those firms. Biddle and Hilary (2006) find that accounting quality proxies are negatively associated with investment-cashflow sensitivities, which indicates that investors reluctant to finance for firms with lower accounting quality. Biddle et al. (2009) report that firms with lower accounting qualities involve in both over- and under-investment activities, and Chen et al. (2011) also document that financial reporting quality positively affects investment efficiency using international dataset. Cheng et al. (2013) find evidence that ICW firms without financial constraint over-invest and those with financial constrain under-invest.

The discussion above about ICW and investment efficiency is based on information asymmetry. Aside from the problems from information asymmetry represented by moral hazard and adverse selection, it is still possible that

inaccurate financial information produced in firms with ineffective internal control system disturbs managers to make right decision and thus lead to inefficient investment. Feng et al. (2009) find that ICW firm managers make less accurate guidance on the future firm performance (i.e., management earnings forecast). They argue that guidance based on poor-quality inputs will be less accurate even if managers have no incentive to pursue their own benefit on the cost of investor's wealth. Their finding implies that firms with ineffective internal controls would produce inaccurate, untimely, or stale internal report (Kim et al. 2012). Thus, the managers relying on inaccurate or incomplete information would face more difficulties when evaluating investment opportunities, and be more prone to making wrong decision on investment. Kim et al. (2012) document that ICW firms are more cost-sticky, which is consistent that managers in weak internal control firms would make inefficient investment. McNichols and Stubben (2008) report that managers of the firms that misstate financial statements tend to over-invest during the misreporting periods. Their finding also suggests that weak internal control firms are more vulnerable to inefficient investment because they make decision based on the poor quality information. Appendix A presents excerpts from review reports that serve as reasons why auditors have judged the firms to have inefficient internal control

with regard to financial reporting. The listed reasons are expected to exacerbate moral hazard, adverse selection, and poor quality internal reporting.

In summary, the above mentioned findings suggest that information asymmetry between firms and capital investors lead to frictions represented by moral hazard and adverse selection. These frictions result in over- and/or under-investment of the firm. In addition, manager's reliance on inaccurate and incomplete internal financial information would be associated with investment inefficiency. However, the findings of the papers are limited to ICW firms which are the extreme case of ineffective internal control. The impact of effective internal control system on investment efficiency is not investigated for the firms that do not disclose ICW. Since the effectiveness of internal control would vary across firms, I expect that firms having more effective internal control system invest more efficiently compared to those with less effective internal control system. Specifically, I measure the effectiveness of internal control over financial reporting using human resource investment in internal control. Human resource investment in internal control measured by the proportion of the IC personnel to total employees is positively related to earnings quality (Lee 2013) and negatively related to the likelihood to report ICW (Choi et al. 2013). The increase of IC personnel is positively associated with the remediation of ICW.

These researches support the use of the proportion of IC personnel as a proxy for the effectiveness of internal control system.

I hypothesize that firms with larger IC personnel deviate less from the expected investment level, which means they do not over-invest and under-invest considering other factors which affect investment amount. The two hypotheses are as follows:

H1a: In over-investment sample, firms with larger human resource investment deviates less from the expected investment level.

H1b: In under-investment sample, firms with larger human resource investment deviates less from the expected investment level.

Also, I test whether ICW firms are more likely to deviate from the expected investment level. In addition, I examine if ICW firms under-invest when financially constrained and over-invest when not constrained. The relation between ICW firm and investment efficiency is investigated by Cheng et al. (2013) using U.S. data. However, the result cannot be generalized because Korea has different institutional backgrounds. For example, Korean auditors express review opinion on internal control over financial reporting, whereas U.S. auditors provide audit opinion. In addition, considering the finding that the

degree of legal enforcement in Korea is relatively weaker compared to those in other developed countries (La Porta et al. 1997), the effect of the variation in the effectiveness of internal control in Korean firms could be different from that of U.S. Thus, I examine following hypotheses using Korean data.

H2a: In over-investment sample, firms with ICW deviates more from the expected investment level.

H2b: In under-investment sample, firms with ICW deviates more from the expected investment level.

IV. Research design

I hypothesize that ineffective internal control firms proxied by lower IC personnel ratio and ICW disclosure are not only more likely to over-invest but also more likely to under-invest compared to other firms. I execute tests using conventional methodology which predicts investment amount using Tobin's Q and cashflow and examine over- or under-investment by measuring the amount that deviates from the expected investment level (McNichols and Stubben 2008).

4.1. Deviation from predicted amount of investment

I identify under- and over-investment as investment that deviates from the expected investment amount. Prior studies assume linear relation between

investment and Tobin's Q (Tobin 1969; Hayashi 1982). Abel and Eberly (2002) show that the relationship between investment and Tobin's Q is not linear, but a function of Tobin's Q. McNichols and Stubben (2008) developed a model that incorporates Abel and Eberly's (2002) finding. Following McNichols and Stubben (2008), I predict expected amount of investment using the equation (1) for each industry and year.

$$INV_{i,t} = \alpha + \beta_1 Q_{i,t-1} + \beta_2 Q\_QRT2_{i,t-1} + \beta_3 Q\_QRT3_{i,t-1} + \beta_4 Q\_QRT4_{i,t-1} + \beta_5 CFO_{i,t} + \beta_6 TAGROWTH_{i,t-1} + \beta_7 INV_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

$Q_{i,t-1}$ is defined as total assets plus market value of equity minus book value of equity, all scaled by total assets. $Q\_QRT2_{i,t-1}$ equals $Q_{i,t-1}$ multiplied by a dummy variable which equals 1 if $Q_{i,t-1}$ is in the second quartile of its industry-year distribution. $Q\_QRT3_{i,t-1}$ and $Q\_QRT4_{i,t-1}$ are defined in the same way. Cashflow from operation scaled by average total assets, $CFO_{i,t}$, is included to control for internal financing capability. $TAGROWTH_{i,t-1}$ measures the growth in total assets and included to mitigate potential measurement error in Tobin's Q. It defined as the natural log of total assets at the end of year t-1 divided by total assets at the end of year t-2. Prior period investment, $INV_{i,t-1}$ is also included to mitigate omitted variable problem and to measure residual investment as an

increment to the persistent portion of the prior investment (McNichols and Stubben 2008).

I estimate equation (1) for each industry-year and predict expected level of investment. Then I sort firms yearly into quartiles based on the amount of the residual investment. As a result, firm-year observations that have the most negative residual investment are in the bottom quartile, and are classified as under-investing cases. Observations in the top quartile have most positive residuals and are classified as over-investing cases. Two quartiles in the middle are classified as benchmark group. I create two subsamples. Observations in the top (bottom) and middle two quartiles are classified as over- (under-) investment group. Then I estimate regression model for each subsamples to test whether effective internal control hinder firms to deviate from the expected amount of investment. Additionally, I perform logistic regression to test whether firms with ineffective internal control system are more likely to be in either the top or bottom quartiles.

$$\begin{aligned} UNEXP\_INV_{i,t+1} \quad &= \beta_0 + \beta_1 RIC_{i,t+1} + \beta_2 NRIC_{i,t+1} + \sum \gamma_j Control_{j,i,t} \\ \text{or } Logit(EXT\_INV_{i,t+1}) \quad &+ YearDummies + IndustryDummies + \varepsilon_{i,t+1} \end{aligned} \tag{2}$$

UNEXP_INV is the amount of the unexpected investment which is the difference between actual investment and predicted investment by equation (1). The measure for investment (*INV*) incorporates both capital and non-capital investment. Specifically, *INV* is the sum of capital expenditures, research and development expenditures, and acquisitions minus sales of PPE, scaled by lagged total assets in a given firm-year. *EXT_INV* is a dummy variable indicating whether firms are in the top or bottom quartile based on unexpected investment. For over- (under-) investment subsample, *EXT_INV* takes the value of 1 if the observation is in the top (bottom) quartile. The variable *RIC* indicates the proportion of internal control personnel to total employees. *NRIC* is included to control for the impact of non-internal control related workers. Detailed explanations on *RIC* (*NRIC*) variables are provided in Table 2. *CONTROL* represents a set of control variables. I control for size (*LNTA*), market-to-book ratio (*MB*), bankruptcy risk (*ZSCORE*), tangibility (*TNG*), industry leverage (*INDK*), and dividend payment (*DIV*). Cashflow volatility (*STDCFO*) and sales volatility (*STDSALES*) are controlled because prior study report the importance of controlling for operating volatility when unsigned discretionary accruals is used in the model (Hribar and Nichols 2007; Liu and Wysocki 2007). I control for investment volatility (*STDINV*) to mitigate the possibility that the investment efficiency measure merely captures fluctuations of investment. Operating

business cycles (*OPRCLE*) used in Biddle et al. (2009) is also controlled for. To distinguish markets, I include a dummy variable (*KOSDAQ*). Since investment amount is closely related to the internal financial resources and debt amount, I control for cash (*CASH*) and leverage (*LEV*). I include industry fixed effects to control for industry-specific shocks to investment and include year fixed effects to control for cross-sectional correlations. I estimate the coefficients and t-values using ordinary least squares clustering at firm level to control for heteroskedasticity and serial-correlation (Gow et al. 2010; Petersen 2009; Thompson 2011).

To test the hypotheses 2a and 2b, I adjust the model by replacing *RIC* and *NRIC* variable to *ICW*. I repeat the test described above using ICW dummy variable.

$$\begin{aligned} UNEXP\_INV_{i,t+1} \quad &= \beta_0 + \beta_1 ICW_{i,t+1} + \sum \gamma_j Control_{j,i,t} \\ \text{or } Logit(EXT\_INV_{i,t+1}) \quad &+ YearDummies + IndustryDummies + \varepsilon_{i,t+1} \end{aligned} \tag{3}$$

4.2. Investment and financial constraints

Biddle et al. (2009) investigate the relation between financial reporting quality and investment efficiency and find that higher financial reporting quality prevents firms from over-investment when they are financially unconstrained and from under-investment when they are financially constrained. Cheng et al.

(2013) report consistent evidence for firms reporting ICW using similar method. To test H2a and H2b, I use the empirical model developed by Biddle et al (2009) and Cheng et al. (2013) to sustain consistency and comparability. The concept behind the model is that firms would normally increase (decrease) investment as financial constraints become relieved (exacerbated). To capture the financial constraint, I define the measure, *OVERI*, which is a composite variable of leverage decile rank and cash decile rank. (Biddle et al. 2009; Cheng et al. 2013). I estimate the following model.

$$\begin{aligned} INV_{i,t+1} = {} & \beta_0 + \beta_1 ICW_{i,t+1} + \beta_2 ICW_{i,t+1} * OVERI_{i,t} + \beta_3 OVERI_{i,t} \\ & + \sum \gamma_j Control_{j,i,t} + YearDummies + IndustryDummies + \varepsilon_{i,t+1} \end{aligned} \quad (4)$$

OVERI is the variable that captures the magnitude of financial constraint. *OVERI* ranges from zero to one, where zero indicates the most severe financial constraint. *OVERI* is increasing in the availability of financial resources, and becomes one when the firm is least likely to have financial constraints. Specifically, I rank firms into deciles based on their cash balance. Next, I create another decile ranks based on the leverage multiplied by minus one. By multiplying minus one and leverage before making decile ranks, firms in the higher rank in leverage decile have smaller debt and are likely to invest more.

Thus, the higher decile ranks of cash and leverage, the more likelihood of over-investment. I average those two ranked values and re-scale it to range between zero to one. As a result, firms with the lowest amount of cash balance and highest amount of debt will have zero value of *OVERI* and they are considered to be the firms that most likely to suffer from financial constraints and under-invest as a result. In contrast, firm-year observations that *OVERI* equals one are those that are highly likely to over-invest because they have enough cash and low leverage. Denis and Sibilkov (2010) support the use of the measure, *OVERI*, by finding that the relation between investment and cash holding is more sensitive to the financially constrained firms. They documents that those financially distressed firms dismiss profitable investment opportunities because they do not have enough cash to fund the projects. *ICW* is a dummy variable that equals one if a firm reports internal control weaknesses, and zero otherwise.

Regarding the H2b, I anticipate negative sign on *ICW* (i.e., $\beta_1 < 0$). That is, when the firm is lack of financial resources and under-investment is most likely (i.e., *OVERI* = 0), firms with ICW invest even less than non-ICW firms. The H2a predicts that ICW firms over-invest when they are financially unconstrained. I test this prediction by examining whether the sum of the coefficient on *ICW* (β_1) and the coefficient on the interaction term of *ICW* and *OVERI* (β_2) is greater than zero (i.e., $\beta_1 + \beta_2 > 0$). The coefficient β_2 captures the incremental effect of ICW

on investment as financial constraints gets weaker and over-investment becomes more likely. Thus, $\beta_1 + \beta_2$ captures the relation between ICW and investment of firms with the highest amount of cash and lowest amount of debt.

Prior literatures find that financial reporting quality itself affects investment efficiency (Biddle and Hilary 2006; Biddle et al. 2009; Chen et al. 2011). As discussed above, the inefficient investment decision could be wholly driven by the low quality financial information rather than the effect of internal control weaknesses. To test the incremental effect of ICW on investment efficiency after controlling for the quality of financial reporting, I estimate additional model, using the same variables included in model (4) and additionally including unsigned discretionary accruals measure based on Kothari et al. (2005) and the interaction term of unsigned discretionary accruals and *OVERI*. I expect the effect of ICW on investment remains significant.

To avoid concerns regarding the self-selection issue of ICW firms, I use Heckman (1979) procedure. In the first stage, I model the probability of ICW using variables introduced in Ashbaugh-Skaife et al. (2007; 2009), Doyle et al. (2007b), Goh and Li (2011) and estimate inverse Mill's ratio. In the second stage, I additionally control for the inverse of Mill's ratio in equation (4). When I estimate the second stage, I exclude a few variables which were included in the first stage to satisfy exclusion restriction (Lennox et al. 2012). Specifically, I

estimate the following probit model in the first stage and estimate model (4) again including inverse Mill's ratio to control for endogeneity. I discuss the details in section 5.2.

$$\begin{aligned} ICW_{i,t} = {} & \beta_0 + \beta_1 \log MV_{i,t} + \beta_2 \log AGE_{i,t} + \beta_3 MB_{i,t} + \beta_4 LOSS_{i,t} + \beta_5 FORSALE_{i,t} \\ & + \beta_6 SGROWTH_{i,t} + \beta_7 INVAR_{i,t} + \beta_8 ZSCORE_{i,t} + \beta_9 BIG4_{i,t} \\ & + YearDummies + IndustryDummies + \varepsilon_{i,t} \end{aligned} \quad (5)$$

I execute additional tests using decile ranks of *INV* (*INV_RANK*) as a dependent variable because it is possible that extreme values of *INV* result in distorted parameters even though all the continuous variables are winsorized at the 1 percent and 99 percent levels. The impact of outliers would be mitigated when the dependent variable is *INV* decile ranks.

V. Sample

5.1. Sample selection

The sample to test hypotheses H1a and H1b consists of 5,924 firm-year observations from fiscal year 2002 to 2008. The observations consist of publicly traded companies in Korean stock market, which are KRX and KOSDAQ. I use TS2000 dataset provided by 'Korean Listed Companies Association' for accounting data and DataGuide Pro for stock market data. I collected the data on

internal control weaknesses from DART (Data Analysis, Retrieval and Transfer System) website.[24] The sample period begins in the fiscal year 2002 because the regulatory authorities initiate to mandate firms provide the information on the internal control personnel. I exclude observations in financial, real estate, and utility industries. I also exclude firm-year observations where total assets or sales is less than 2 billion Korean Won (equivalent to $1.6 million) or total employees is less than 20. To be in the sample, the observations should have no missing value for all variables included in the regression model.

The sample used to test hypotheses H2a and H2b are 7,458 firm-year observations from fiscal year 2005 to 2010. The sample period begins in the fiscal year 2005 because the regulatory authorities initiate to mandate auditors provide their assessment on the internal control of the client from the starting fiscal year subsequent to 1st April 2004 and the standard guidance on the internal control system is provided in 2005.[25] The inconsistency of sample periods is because of the availability of variables that should be hand-collected

Distribution for the each samples are tabulated in Table 1 by fiscal year. In Panel A, the numbers of observations in year 2002 to 2004 are small compared to other subsequent years because the information on IC personnel

[24] See http://dart.fss.or.kr for more information.

[25] Before the External Audit Act was amended to incorporate internal control regulation, rules on internal control system existed based on temporary law, but it was perfunctory (Park et al. 2011).

was not fully available in these early years. In Panel B, Final sample consists of 7,458 firm-year observations. 213 firm-year observations report ICW and the rest 7,245 observations do not report ICW. In 2008, the proportion of internal control weakness arrives at a peak of about 4.1% of the sample year observations. Subsequent to 2008, the numbers of ICW firms drop during the sample periods. In sum, firms reporting internal control weakness take about 2.9% of the total sample.

[Insert Table 1 around here]

5.2. Descriptive statistics

The definitions of variables are tabulated in Table 2 and descriptive statistics for IC personnel in each department are presented in Panel A of Table 3. Panel B reports summary statistics for control variable used to test H1a and H1b. Descriptive statistics for sample to test H2a and H2b are also provided in Panel C and D. All the continuous variables are winsorized at the 1 percent and 99 percent levels to mitigate the effect of outliers.

Panel A of Table 3 presents descriptive statistics on IC personnel in each department for the total sample. On average, 6.4 employees are belongs to accounting department (*ACC*), and 3.5, 4.6, and 3.0 employees are working in finance, ITS, and other departments, respectively. The sum of the employees in

these four departments (*SUM1*) is 18.3 at the mean. *SUM2* represents the sum of the employees less those in other departments. Regarding the number of IC personnel in each department, the mean of the number of IC personnel working in the accounting department (*IC_ACC*), finance (*IC_FIN*), ITS (*IC_ITS*), and other departments (*IC_OTH*) is 5.02, 2.43, 2.11, and 1.32, respectively. The sum of the IC personnel in these four departments (*IC_SUM1*) represents that there are about 11.1 IC personnel per firm.

[Insert Table 2 around here]

[Insert Table 3 around here]

The descriptive statistics for the ratio of IC personnel and non-IC personnel to total employees are as follows. The mean of the ratio of IC personnel working in accounting, finance, ITS and other departments is 1.9%, 1.0%, 0.8% and 0.6% of total employees, respectively. The mean of the ratio of total non-IC personnel to total employees (*NRIC_SUM1*) is 2.2%, which represents the proportion of the personnel in these four departments but not

involved in internal control related work to total employees of the firm. The number of total employees is reported in the bottom row.[26]

Panel B reports descriptive statistics on the variables included in the regressions to test H1and H1b.

[Insert Table 4 around here]

The variable *INV* has large differences between mean and median statistics, and the standard deviation is also large. It indicates that the distribution of *INV* is right-skewed. The negative value of *INV* indicates the existence of firm-year observations that the investment cash inflow exceeds the investment cash outflow, which means that the amount of sold assets is larger than that of purchased assets. At the mean (median), firms invest 4.84 (3.14) percent of total assets. Average firm at the first quartile invest 1.01 percent of the total assets, and those at the third quartile invest 6.99 percent of total assets. The mean (median) value of *LOG_TA*, defined as the log of the total assets measured in millions of KRW at the end of the fiscal year, is 11.78 (11.50) which is

[26] Note here that the number of total employees is different from the value of *SUM1* reported in Panel A of Table 2. *SUM1* is the summation of the number of employees in the accounting, finance, ITS, and other departments. The other departments imply other possibly internal control-related departments, not all the other departments in the company.

equivalent to 130.6(98.7) billion KRW.[27] On average, 26 percent of firms have experienced loss in net income. The mean (median) value of *ZSCORE* for entire firm is 1.19 (1.21).

Summary statistics for sample to test H2a and H2b are tabulated in Panel C and Panel D. At the mean (median), firms invest 5.49 (3.32) percent of total assets. The amount of investment is much smaller for ICW firms. Panel D of Table 3 shows that ICW firms invest about 4 (1.9) percent of total assets at the mean (median). The investment amount at the first quartile is 0.38 and 4.65 percent to total assets at the third quartile. The differences in the summary statistics of *INV* between entire observations and ICW observations indicate that ICW firms invest less than non-ICW firms on average. *OVERI* of total sample ranges from 0 to 1 as designed. In case of ICW firm, mean and median value of *OVERI* are lower than those of total sample, which are consistent with the prior studies that ICW firms tend to be more financially constrained firms. The mean (median) value of *LOG_TA*, defined as the log of the total assets measured in millions of KRW at the end of the fiscal year, is 11.71 (11.44). Firms reporting ICW are smaller in size than other firms. The mean (median) value of *LOG_TA* is 10.53 (10.36). On average, 29 percent of firms have experienced loss in net

[27] Before I winsorize and exclude financial industry firms, the mean value of total assets was over 1 trillion won. However, when I exclude financial industry in the sample, the size reduced to about 400 billion won. After I winsorize the total assets at the 1 percent and 99 percent levels, the mean value of total assets drastically reduced to about 110 billion won.

income, while 85 percent of ICW firms report loss. *ZSCORE* of ICW sample is evidently lower than that of entire sample. The mean (median) value of *ZSCORE* for entire firm is 1.02 (1.13), whereas the value for ICW sample is -1 (-0.96). These characteristics of ICW firms are consistent with the findings of other studies that firms with ICW tend to be smaller, less profitable, and more financially distressed than other firms (Doyle et al. 2007; Ge and McVay 2005; Lee et al. 2007a; Shin 2007).

Pearson correlations for sample to test H2a and H2b are tabulated in Table 4. All correlations that significantly different from zero at 0.05 level based on two-sided test are presented with star. *INV* is positively correlated with *MB* which represents firms with greater growth opportunities tend to invest more. Investment in the year t+1 is significant and positively correlated with *OVERI*, which support the methodology of this paper. The correlation between *INV* and *OVERI* indicates that firms with high cash and low leverage at the end of the year t, tend to invest more in the next year. *ICW* is negatively correlated with investment and size. The positive correlations of *ICW* with *STDCFO*, *STDSALE*, and *STDINV* also show that ICW firms are more volatile. The correlations of *ICW* with *CFO_SALE* and *LOSS* indicate that ICW firms are less profitable than others.

VI. Empirical results

6.1. Internal Control Personnel and Investment Efficiency

A line of research on investment efficiency predicts expected investment amount using Tobin's Q and cashflow and test whether a firm's investment amount deviates from the prediction (McNichols and Stubben 2008; Richardson 2006). I use the investment expectation model described in the section 4.1. equation (1), developed by McNichols and Stubben (2008). This model incorporates Abel and Eberly's (2002) finding that the relation between investment and Tobin's Q is not linear. I estimate the model for each industry and year and identify under- and over-investment. The negative (positive) value of residual indicates the investment amount of the firm is smaller (larger) than the expected investment amount and the firm appears to under-invest (over-invest).

[Insert Table 5 around Here]

Table 5 presents the results of the tests which use the residuals of investment expectation model as dependent variable. For each year, I divide the sample into quartiles based on the amount deviates from the expected investment level. The observations in the bottom quartile are classified as under-investing cases and those in the top quartile are classified as over-investing cases. The middle two quartiles are classified as benchmark. I test whether IC personnel

tend to reduce over-investment (under-investment) using observations in the top (bottom) and middle quartiles.

Panel A in the table 5 provides the OLS regression results for the over-investment group. The results for relation between firm level human resource investment in internal control are presented in column (1) and (2). The estimations of the regression for each department level are provided in column (3) through (6). In column (1), the coefficient on the *RIC_SUM1* (-4.420) is significantly negative (t-value = -2.10) which indicates that firms with more IC personnel are less likely to over-invest and less deviate from the expected level of investment. In column (2), the coefficient on the *RIC_SUM2* (-5.650) is also negative and significant (t-value = -2.05). While both the coefficients on *NRIC_SUM1* and *NRIC_SUM2* are negative, they are not statistically significant. This is the evidence that IC personnel are positively related to efficient investment rather than non-IC personnel in the firm level. Column (3) tabulates the results for the tests whether IC personnel in the accounting department reduce over-investment. The coefficient on the *RIC_ACCNG* in column (3) is negative and statistically significant, and that of *NRIC_ACCNG* is also negative and significant. The results indicate that the workers in accounting department reduce over-investment regardless of whether they are involved in internal control related works or not. The signs on coefficient on *RIC* variables in finance

department, IT service department, and other department are negative as I expected. But they are not statistically significant. The results are consistent with the hypothesis H1a of this paper. Interestingly, the coefficient on the unsigned discretionary accruals, *ABSDA*, is positive and significant. It indicates that firms with higher absolute amount of discretionary accruals over-invest compared to the other firms. This finding is consistent with Biddle et al. (2009) that high financial reporting quality reduces over- and under-investment.

The empirical results discussed so far are for the over-investment group of which unexpected investment amount are in the top and middle two quartiles. To examine hypothesis H1b, I repeat the previous test using under-investment group. I construct sample that unexpected investment amount are in bottom and middle two benchmark quartiles. Panel B of Table 5 reports the estimation results.

The coefficients on *RIC* are not statistically significant. The results suggest that the ratios of IC personnel are not related to under-investment. It does not support the hypothesis that IC personnel prevent under-investment and lead to more efficient investment. The coefficients on *ABSDA* are negative and significant which imply that firms with large unsigned discretionary accruals tend to under-invest.

[Insert Table 6 around here]

Because the models use the amounts of residuals of investment equation as dependent variables, it is to be concerned that the results of Panel A in Table 5 could have been affected by outliers of the unexpected investment amounts. To rule out the possibility, in additional tests, I test whether more IC personnel firms are less likely to be in the top quartile and bottom quartile. The observations in the top and middle quartiles are used for the over-investment test, and those in the bottom and middle quartiles are used for the under-investment test. Specifically, in the over-investment test, the dependent variable defined as one if the observations are in the top quartile, and zero if the observations are in the middle quartiles. In the under-investment test, the dependent variable defined as one if the observation is in the bottom quartile, otherwise zero.

Panel A of Table 6 presents the results for logistic regression tests for over-investment. In the firm level test, the negative coefficients on the *RIC_SUM1* (coefficient = -1.621 and t-value = -1.69 in column (1), and *RIC_SUM2* coefficient = -2.019 and t-value = -1.70 in column (2)) implies that firms having more IC personnel are less likely to be in the top quartile representing over-investment. The coefficient on the *RIC_ACCNG* is also negative and statistically significant meaning that IC personnel in accounting department prevent firms to be in the over-investment group. In consistent with the previous regression result,

NRIC_ACCNG is negatively related to the possibility to be in excessive investment quartile.

Panel B provides the logistic regression estimation result for the under-investment group. In the test, *RIC* variables are not statistically significant which coincide with the finding of Table 5. In summary, the results of Table 5 and Table 6 support the hypothesis that firms with larger human resource investment is negatively related to over-investment. However, I do not find consistent evidence that IC personnel reduce under-investment. The results partially support the findings of prior literatures that IC personnel increase the effectiveness of internal control over financial reporting (Choi et al. 2013; Lee 2013) and effective internal control lead to efficiency investment. To further investigate the investment efficiency and internal control, I examine whether ICW firms in Korea is related to over- or under-investment (H2a and H2b).

6.2. ICW and Investment Efficiency: Heckman procedure

Firms reporting ICW are not randomly distributed. Firms with internal control weaknesses are likely to be systematically different from other firms and this may lead to suspicious results. Prior literatures investigating determinants of ICW find that ICW firms are relatively in bad financial conditions in terms of loss, leverage, z-score and are related to other characteristics such as size, growth,

and complexity (Ashbaugh-Skaife et al. 2007; Doyle et al. 2007; Ge and McVay 2005).

These characteristics of ICW firms are also related to the investment decision. Especially, because financial condition is closely related to the amount of investment (Myers 1977), self-selection bias is inevitable. Two econometrical methodologies, propensity score matching and Heckman (1979) procedure, are commonly used in accounting research to control for the endogeneity issue. Propensity score matching method is used when the determinants of selection are observable, whereas Heckman procedure is used in the presence of unobservable determinants of selection or when it is too costly to collect determinants. Heckman procedure controls the selection bias by inverse Mill's ratio (Heckman 1979; Lennox et al. 2012, Tucker 2011). Because I think that ICW firms have unobservable factors such as manager's ability, integrity and corporate governance, and observable but costly factors to collect such as number of outside board, board meetings, existence of financial or accounting expertise in board of directors, I use Heckman methodology. In the first stage of the two-stage least squares analysis, I build and estimate a probit model that estimates the probability of internal control weakness. The model, featuring ICW as a function of variables suggested by prior studies such as Ashbaugh-skaife et al. (2007, 2009), Doyle et al. (2007b), and Goh and Li (2011), is presented in the equation

(5) in the section 4.2. In the second step, I use the same independent variables as the equation (4) and additionally include inverse Mill's ratio estimated in the first-stage model.

[Insert Table 7 around Here]

It is important to satisfy exclusion restriction in the use of Heckman procedure. The excluded variable has to be closely related to the dependent variable in the first stage, and should not be related to the second stage dependent variable (Lennox et al. 2012). I include Big4 dummy variable in the first-stage model and exclude it in the second-stage model. It is documented that Big4 auditors are closely related with reporting internal control weakness (Ashbaugh-Skaife et al. 2007; Ge and McVay 2005, Lee et al. 2007a) but is exogenous to the amount of investment. These features make Big4 dummy as an appropriate variable for the exclusion restrictions (Lennox et al. 2012). Panel A in table 7 provides the first stage result. In the first stage model, the coefficient on Big4 dummy variable is significant and positive which is consistent with the finding of prior papers. In the second stage, inverse Mill's ratio is included with other variables used in equation (4). Panel B presents the results for the estimation of the second stage model. t-values are adjusted for heteroscedasticity

and time series dependence. Specifically, I estimate the coefficients and t-values clustering by firms and controlling year fixed effect because firm observations are 7,458 while time period is only 5 years (Gow et al. 2010; Petersen 2009; Thompson 2011).

The coefficients on the inverse Mill's ratio are significant, which indicate potential self-selection effects. I find that the coefficients on *OVERI* are positive and statistically significant in all four columns. The significant and positive coefficients on *OVERI* indicate that as the availability of financial resources increases, firms increase investment amount.

After controlling for the potential self-selection problem using inverse Mill's ratio, the coefficients on *ICW*OVERI* are significantly positive. Importantly, joint significance test results for the second hypothesis generally support the hypothesis that firms with ICW tend to over-invest in settings where over-investment is likely.[28] For example, in column (2) in Panel B, the sum of the coefficient on *ICW* and *ICW*OVERI* is 2.942, which means ICW firms invests 2.942 percent to total assets more than other firms. Considering the mean value of investment is 5.49 percent to total assets, this is a significant amount. The coefficients on *ICW* are negative but not statistically significant and the other

[28] When I additionally include KOSDAQ dummy variable which distinguishes markets and OPINION dummy, which equals one in case of unclean opinion and zero otherwise, in the first stage regression, the second stage results do not differ from the results of original model.

two-stage estimates are consistent with those reported in prior studies (Biddle et al. 2009; Cheng et al. 2013).[29]

It is possible that the significant coefficient on *ICW*OVERI* in column (1) may be driven by the low quality financial reporting of ICW firms rather than internal control weaknesses. Incorrect financial information rather than ICW may distort managers' decision and make them inefficiently invest. Thus, it is necessary to test whether ICW has incremental effect on investment efficiency after controlling for financial reporting quality. To control for the effect of low quality financial reporting on the investment inefficiency, I include unsigned abnormal accruals based on the performance matched modified Jones model (Kothari et al. 2005) and interaction term of *OVERI* and unsigned abnormal accruals. Result presented in column (2) of Panel B in Table 7 shows that the coefficient on *ICW*OVERI* remains positive (5.034) and statistically significant (t-value = 1.93) after controlling for the effect of low quality financial reporting on the investment decision. Moreover, the result of the joint significance test for $\beta_1 + \beta_2 > 0$ is significant (p-value = 0.0598), supporting the hypothesis 2Ha that

[29] Lennox et al. (2012) point out that an absence of exclusion restrictions in the first stage can lead to severe multicollinearity problem in the second stage and it would distort the estimation of coefficients of the variables in the second stage model. Although I use Big4 dummy in the first stage and exclude it in the second stage to satisfy the exclusion restriction, I check for the multicollinearity in the second stage. The VIF scores are less than 5, which is less than the conventional cutoff point of 10. The VIF score results lessen the concern that the regression results might be far too sensitive to provide reliable and robust inferences.

ICW firms tend to over-invest when they have affluent capital and over-investment is likely. However, the coefficient on *ICW* (-2.092) is insignificant (t-value = -1.48) consistently.

Column (3) and column (4) of Panel B in Table 7 present regression results when the dependent variables are decile ranks of investment. Descriptive statistics of *INV* indicate that the proxy is skewed to the right, which may drive the positive coefficients on the *OVERI* and *ICW*OVERI*. To control for the effect of extreme positive amount of investment variable on the coefficient estimates, I make a decile ranks of *INV*, (i.e., *INV_RANK*). Even after controlling for the effect of extreme values in investment amounts, the results are still consistent with the previous findings, showing that the results are not driven by the extreme values of investment.

In summary, the coefficients on *ICW* are negative but not statistically significant, and the coefficients on *ICW*OVERI* ,as reported in the second to the bottom row, are significant and positive. Generally, the sum of the coefficients on *ICW* and *ICW*OVERI* are significant and positive. The results imply that ICW firms are not more prone to under-investment than non-ICW firms in settings where under-investment is likely. However, ICW firms tend to over-invest when they have large cash balance and low leverage. The asymmetric investment patterns of ICW firm by the level of financial constraint are consistent after

controlling for the quality of financial reporting, extreme amount of investment, and self-selection issue.

6.3. Additional Tests

6.3.1. Over- (Under-) investment by sources of financial constraint

This paper finds that firms with weak internal control system proxied by low internal control personnel ratio and ICW tend to over-invest but not under-invest. To further investigate whether internal control personnel mitigate over-invest when the firm is not financially constrained, I execute additional tests. To investigate the effect of IC personnel on investment activities by the source of financial constraint, I create quintiles by cash holding (*CASH*), cash from operation (*CFO*), and leverage (*LEVERAGE*) multiplied by minus 1, respectively. The observations in the top quintile represent firms with abundant financial resources, while those in bottom quintile are those highly financially constrained. I repeat the main test used to examine H1a and H1b using sub-samples. Panel A of Table 8 tabulate the results for the firms which is likely to not suffer from financial constraint. I present results for firm level IC personnel (*RIC_SUM1*, *RIC_SUM2*) for brevity. Internal control personnel reduce investment when a firm has large amount of cash. I do not find significant relation for large cashflow and low leverage cases. It implies that IC personnel seem to prohibit managers to spend cash that the firm holds internally. Panel B provides results

for firms with high financial constraints and likelihood to under-invest. IC personnel are not significantly related to investment in any cases. The results are consistent with the findings of this paper that effective internal control prevents over-investment but not under-investment.

[Insert Table 8 around here]

6.3.2. ICW and deviation from expected investment amount

To investigate whether ICW is related to investment efficiency, I follow Biddle et al. (2009) methodology. I adopt alternative methodology which is used to test H1a and H1b. Table 9 presents the results of the tests which use the residuals of investment expectation model as dependent variable. Panel A in the table 9 provides the OLS regression results. Column (1) and (2) are the results when I use the top and middle quartile observations to test over-investment of ICW firms. In column (1), the coefficient on the *ICW* (0.961) is significantly positive (t-value = 1.82) which indicates that the investment amount of ICW firms more positively deviate from expected level of investment. In column (2), the coefficient on the *ICW* (1.071) is also positive and significant (t-value = 1.73). This is the evidence that ICW firms are more likely to over-invest compared to

the benchmark firms. Column (3) and (4) tabulate the results for the tests whether ICW firms' investment amounts deviate more negatively from the expected level of investment using bottom and middle quartile observations. The coefficients on the *ICW* in column (3) and (4) are negative and not statistically significant, indicating that there is no difference in the deviation from expected investment amount between ICW firms and other benchmark firms. The results are consistent with previous findings of this paper. When I use quartile ranks of the deviation from expected investment as dependent variable to mitigate the effect of outliers and test whether ICW firms are more likely to be in the top quartile and bottom quartile, the results are consistent with the prior findings (Panel B in Table 9). The results consistently support that firms with bad financial reporting quality are more likely to be in the most over-investment group.

[Insert Table 9 around here]

6.3.3. Firm investment activities prior to reporting ICW

ICW firms may have internal control problem before auditors assess that their clients have weaknesses in internal control over financial reporting. To test whether ICW firms invest inefficiently prior to ICW disclosure, I define dummy variable *ICW3* which equals one if auditor discloses ICW in one of the upcoming

three years, and zero otherwise. I repeat the OLS regression and Heckman two stage procedures and find that the coefficients on *ICW3*OVERI* are also significant and positive. Also, the sum of the coefficients on *ICW* and *ICW3*OVERI*, as reported in the second to the bottom row, are significant for Heckman two stage regression, which suggest that ICW firms may have problems in internal control before reporting ICW and do not efficiently allocate resources during the periods. This finding provides additional evidence to the earlier results.

[Insert Table 10 around Here]

VII. Conclusion

To achieve effectiveness and efficiency of operation is one of the three objectives of internal control stated by COSO Internal Control Integrated Framework which is the most widely used framework for internal control. Also, having a sufficient number of internal control personnel is critical to establish effective internal control system (Choi et al. 2013; COSO framework 1992; Ge and McVay 2005; PCAOB staff audit practice No.3. 2008). However, no study has provided direct empirical support for the relation between internal control personnel and efficient resource allocation in a firm. This paper examines the relation between internal control personnel and investment efficiency and

provides evidence that internal control personnel are negatively related to over-investment. This study also investigates whether ICW is negatively related to investment efficiency and finds consistent results that those ICW firms tend to over-invest, but not under-invest.

The findings provide important implication that IC personnel contribute to establish effective internal control system and prevent firms excessively invest. Although prior studies report that ICW firms invest and operate inefficiently, the tests are limited to the ICW firms which are extreme case of weak internal control system. On the other hands, because the human resource investment in internal control captures the effectiveness of internal control system (Choi et al, 2013; Lee 2013), it provides opportunity to study the effect of internal control on investment when firms do not report ICW.

This study sheds new light on the effect of having a sufficient number of internal control personnel. They establish effective internal control system and prevent firms from over investment. The findings provide important implications to investors, practitioners and regulators. This paper warns that stakeholders should more cautiously review and monitor the investment decision for the firms with low internal control personnel or ICW.

Even though the test results are robust when I control for financial reporting quality, extreme values, and endogeneity, the results of this paper are subject to

the limitation that the relation between IC personnel (or ICW) and over- (under-) investment could be driven by other factors that have not been appropriately controlled for in the model since IC personnel (or ICW) is related to low quality financial reporting and weak corporate governance. In spite of this potential limitation, this paper is still implacable to stakeholders by showing that disclosure of information on IC personnel and expression of auditor's review on the internal control over financial reporting, which is easily accessible, provide information about the efficiency of the resource allocation of the firm.

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APPENDIX A

The following examples are excerpts from the review report on internal control over financial reporting of Korean firms which have ICW. The statements show that ICW firms are more likely to suffer from moral hazard and adverse selection problem. Also, it is expected that internal financial information which managers use when they make decisions would be deteriorated by the weaknesses. The examples below provide grounds for such concerns.

회사는 원재료의 출고 및 기록에 관하여 충분하고 적합한 통제절차를 운영하지 않고 있습니다.이러한 미비점은 정확한 원가계산이 이루어지지 않거나 재고자산 계정에 적절히 기록되지 아니할 수 있는 중요한 취약점을 의미합니다.
This firm does not operate on sufficient and appropriate control systems with regard to delivering and documenting raw materials. This deficiency is a material weakness which may result in inaccurate calculation of production cost or erroneous recording of inventory account.

회사 재고시스템으로부터의 원가계산기초자료 산출과정에 대한 통제절차가 일부 미비하여 원가계산이 지연되고 있습니다
The calculation of production cost is being delayed because of the deficiency in control process for obtaining the basic inputs for calculating production cost from the inventory system.

회사 영업시스템에서의 매출채권 잔액에 대한 주기적인 대조 확인 통제절차가 일부 미비하여 매출채권 금액 확정이 지연되고 있습니다.
Determining the amount of account receivables is being delayed because of the deficiency in regular check on balance of account receivables from sales system of the company.

회사는 투자의사결정에 관하여 충분하고 적합한 통제절차를 운영하지 않고 있습니다. 이러한 미비점은 주식교환, 합병, 분할 등의 회사의 존속에 중대한 영향을 미치는 의사결정사항의 실패로 막대한 손실이 발생될 수 있는 중요한 취약점을 의미합니다.

This firm does not have a sufficient and appropriate control system regarding investment decision. This deficiency is a material weakness, since failure of decisions related to stock exchange, M&A, spin-off, etc. may lead to huge losses which threaten the sustainability of the firm.

감사(또는 감사위원회)의 활동과 기능이 충분하지 않고 적절하지 않습니다. 이러한
미비점은 자산의 관리 및 보호에 대한 통제 절차에 중요한 취약점이 있음을 의미합니다.

The activities and functions of auditor (or audit committee) are insufficient and inappropriate. This deficiency indicates a material weakness in the control system on managing and guarding assets of the firm.

회계의 기록 및 보고에 대한 적절성을 검토하고 점검하는 통제절차가 충분하지 않고 적절하지 않습니다. 이러한 미비점은 회계정보에 대한 내부검증절차에 중요한 취약점이 있음을 의미합니다.

The control process to review and examine accounting recognition and presentation is insufficient and inadequate. This deficiency indicates the existence of material weakness in the internal control system to examine accounting information.

TABLE 1
Number of Observations

Panel A: Number of Observations to Test H1a & H1b

	2002	2003	2004	2005	2006	2007	2008	Total
Total	387	656	753	927	1,073	1,061	1,067	5,924

Panel B: Number of Observations to Test H2a & H2b

Fiscal Year	non-ICW firms	ICW firms	Total	% of ICW firms
2005	1,039	20	1,059	1.9%
2006	1,179	51	1,230	4.1%
2007	1,238	47	1,285	3.7%
2008	1,246	53	1,299	4.1%
2009	1,255	24	1,279	1.9%
2010	1,288	18	1,306	1.4%
Total	7,245	213	7,458	2.9%

Panel A of this table shows the number of firm-year observation by year which is used to test hypotheses H1a and H1b. Panel B of this table shows the number of firm-year observations by year and stock exchange for the sample used to test the hypotheses H2a and H2b. I exclude firms in the financial and utilities industries. KSE represents Korean Stock Exchange and KOSDAQ represents Korean Securities Dealers Automated Quotations.

TABLE 2
Variable Definitions

INV = the sum of research and development expenditure, capital expenditure, and acquisition expenditure less decrease in tangible assets and lease assets, all scaled by lagged total assets and multiplied by 100. Capital expenditure is the sum of cash outflow from increase in tangible assets and lease assets.

UNEXP_INV = the unpredicted amount of *INV* estimated by equation (1)

RIC = either *RIC_SUM1, RIC_SUM2, RIC_ACC, RIC_FIN, RIC_ITS,* or *RIC_OTH*;
NRIC = either *NRIC_SUM1, NRIC_SUM2, NRIC_ACC, NRIC_FIN, NRIC_ITS,* or *NRIC_OTH*;
RIC_SUM1 (*NRIC_SUM1*) = ratio of IC personnel (non-IC personnel) to total employees in the firm;
RIC_SUM2 (*NRIC_SUM2*) = ratio of IC personnel (non-IC personnel) to total employees in the firm, excluding other departments;
RIC_ACC/FIN/ITS/OTHER (*NRIC_ACC/FIN/ITS/OTH*) = ratio of IC personnel (non-IC personnel) in the accounting/finance/ITS/other department of the firm to total employees in the firm;

ICW = an indicator variable that equals one if auditor reports that the firm has weaknesses in internal control over financial reporting, and zero otherwise
OVERI = The average of a ranked decile of *CASH* and that of *LEVERAGE**(-1), adjusted to range from 0 to 1.
CASH = the ratio of cash and cash equivalent to total assets
LEVERAGE = the ratio of total liabilities to total assets

LNTA = the log of total assets

MB = the ratio of the market value of common equity to book value of total equity

STDCFO = standard deviation of the ratio of cash flow from operations to average total assets from years t-5 to t-1

STDSALES = standard deviation of the ratio of sales to average total assets from years t-5 to t-1

STDINV = standard deviation of *INV* from years t-5 to t-1

ZSCORE = Altman Z-score (Altman 1968) that proxies for a firm's financial condition, which is calculated by following formula.
ZSCORE = [3.3* continuing income and loss before income taxes+ sales + 0.25*Retained earnings + 0.5*(current assets – current liabilities)] / total assets
TNG = the ratio of PPE, which is tangible assets less land and construction in-progress, to total assets
LARGEST = the percentage of shares held by largest shareholder including families and other related parties

FOREIGN= the percentage of shares held by foreign investors

INDK = mean of the ratio of non-current liabilities to total assets by industry

CFOSALE= the ratio of cash flow from operations to sales

DIV = an indicator variable that equals one if the firm paid a dividend, and zero otherwise

OPRCLE = the log of the sum of account receivables to sales and inventory to cost of goods sold multiplied by 360

LOSS = an indicator variable that equals one if net income is negative, and zero otherwise

KOSDAQ = an indicator variable that equals one if the firm is listed on the KOSDAQ market, and zero otherwise

TABLE 3
Descriptive Statistics

Panel A: Descriptive Statistics for IC Personnel to Test H1a and H1b

	Mean	Standard Deviation	Q1	Median	Q3
Number of employees in each department					
ACC	6.40	6.07	3	5	7
FIN	3.50	3.67	1	2	4
ITS	4.64	5.83	1	3	6
OTH	2.98	5.50	0	1	4
SUM1	18.26	18.71	8	12	21
SUM2	14.88	14.54	7	10	16
Number of IC personnel in each department					
IC_ACC	5.02	5.44	2	3	6
IC_FIN	2.43	2.77	1	2	3
IC_ITS	2.11	2.48	1	1	2
IC_OTH	1.32	2.30	0	0	2
IC_SUM1	11.13	11.10	5	8	12
IC_SUM2	9.70	9.68	4	7	11
Ratio of IC personnel to total employees					
RIC_ACC	1.95%	2.08%	0.68%	1.29%	2.41%
RIC_FIN	1.02%	1.32%	0.24%	0.61%	1.27%
RIC_ITS	0.83%	1.03%	0.22%	0.53%	1.09%
RIC_OTH	0.63%	1.43%	0.00%	0.00%	0.63%
RIC_SUM1	4.47%	4.73%	1.63%	3.05%	5.42%
RIC_SUM2	3.81%	3.89%	1.44%	2.63%	4.70%
Ratio of non-IC personnel to total employees					
NRIC_ACC	0.51%	1.02%	0.00%	0.00%	0.64%
NRIC_FIN	0.35%	0.75%	0.00%	0.00%	0.43%
NRIC_ITS	0.62%	1.12%	0.00%	0.00%	0.88%
NRIC_OTH	0.58%	1.86%	0.00%	0.00%	0.31%
NRIC_SUM1	2.19%	3.86%	0.00%	0.99%	2.77%
NRIC_SUM2	1.51%	2.42%	0.00%	0.71%	2.11%
Total employees in the firm	895.13	3839.17	124	254	561

Panel B: Descriptive Statistics of Variables to Test H1a and H1b

Variable	Mean	Standard Deviation	Q1	Median	Q3
INV	4.84	7.52	1.01	3.14	6.99
LNTA	11.78	1.39	10.81	11.50	12.44
MB	1.18	1.20	0.47	0.80	1.38
STDCFO	0.08	0.05	0.04	0.07	0.10
STDSALES	0.21	0.18	0.09	0.15	0.26
STDINV	6.23	6.84	1.87	3.84	8.03
ZSCORE	1.19	0.82	0.79	1.21	1.65
TNG	0.18	0.13	0.08	0.15	0.25
LARGEST (%)	25.38	13.69	15.30	22.80	33.33
FOREIGN (%)	7.38	12.48	0.06	1.00	9.22
INDK	0.13	0.03	0.11	0.12	0.13
CFOSALE	0.03	0.16	-0.01	0.05	0.10
DIV	0.68	0.47	0.00	1.00	1.00
OPRCLE	4.76	0.60	4.41	4.79	5.14
LOSS	0.26	0.44	0.00	0.00	1.00
KOSDAQ	0.46	0.50	0.00	0.00	1.00
CASH	0.06	0.07	0.01	0.04	0.08
LEV	0.44	0.20	0.28	0.44	0.59

Panel C: Descriptive Statistics for Variables to Test H2a & H2b

Variable	Mean	Standard Deviation	Q1	Median	Q3
INV	5.49	7.15	1.04	3.32	7.52
ICW	0.03	0.17	0	0	0
OVERI	0.49	0.24	0.28	0.5	0.67
LNTA	11.71	1.39	10.77	11.44	12.35
MB	1.45	1.50	0.61	0.97	1.66
STDCFO	0.08	0.06	0.04	0.07	0.11
STDSALES	0.22	0.18	0.09	0.16	0.28
STDINV	5.31	4.69	1.87	3.75	7.27
ZSCORE	1.02	1.05	0.64	1.13	1.60
TNG	0.16	0.13	0.07	0.13	0.23
LARGEST (%)	25.63	13.97	15.26	23.10	33.43
FOREIGN (%)	6.56	11.60	0.09	0.93	7.35
INDK	0.11	0.02	0.10	0.11	0.12
CFOSALE	-0.01	0.27	-0.03	0.04	0.10
DIV	0.62	0.49	0	1	1
OPRCLE	4.74	0.65	4.39	4.78	5.15
LOSS	0.30	0.46	0	0	1
KOSDAQ	0.56	0.50	0	1	1

Panel D: Descriptive Statistics for Variables of ICW firms to Test H2a & H2b

Variable	Mean	Standard Deviation	Q1	Median	Q3
INV	3.97	7.66	0.38	1.92	4.65
OVERI	0.39	0.26	0.17	0.39	0.56
LNTA	10.53	0.91	9.91	10.36	11.04
MB	3.01	2.96	0.93	1.69	3.62
STDCFO	0.13	0.08	0.06	0.10	0.18
STDSALES	0.30	0.21	0.13	0.25	0.40
STDINV	6.01	5.29	2.20	3.97	8.18
ZSCORE	-1.00	1.73	-2.27	-0.96	0.43
TNG	0.13	0.13	0.03	0.09	0.19
LARGEST (%)	17.36	12.16	8.48	13.60	22.79
FOREIGN (%)	3.13	7.44	0.06	0.49	2.33
INDK	0.11	0.02	0.10	0.11	0.12
CFOSALE	-0.48	0.61	-0.85	-0.25	-0.02
DIV	0.10	0.30	0	0	0
OPRCLE	4.69	0.79	4.26	4.71	5.25
LOSS	0.85	0.36	1	1	1
KOSDAQ	0.80	0.40	1	1	1

Panel A reports descriptive statistics for the number and ratio of employees in four departments. ACC, FIN, ITS, and OTH represents the total number of employees working in accounting, finance, information technology and systems (ITS), and other departments, respectively. SUM1 is the sum of the number of employees in these four departments, and SUM2 is the sum of the number of employees in accounting, finance, and ITS departments. *IC_ACC*, *IC_FIN*, *IC_ITS*, and *IC_OTH* represent the number of employees who engage in internal control functions ("IC personnel") in accounting, finance, ITS, and other departments, respectively. *IC_SUM1* (*IC_SUM2*) is the sum of IC personnel in these four (three) departments. *RIC_ACC*, *RIC_FIN*, *RIC_ITS*, and *RIC_OTH* (*NRIC_ACC*, *NRIC_FIN*, *NRIC_ITS*, and *NRIC_OTH*) represent the proportion of IC personnel (non-IC personnel) in accounting, finance, ITS, and other departments, respectively, to total employees in the firm. *RIC_SUM1* and *RIC_SUM2* (*NRIC_SUM1* and *NRIC_SUM2*) are the sum of these four and three variables, respectively. Panel B reports descriptive statistics for the samples for IC personnel and investment efficiency analysis. The sample is 5,924 firm-year observations for firms listed on the KSE and KOSDAQ for the period 2002-2008. Panel C of this table presents descriptive statistics of variables used in the ICW and investment efficiency analysis. The sample covers 7,458 firm years with available data for the period 2005-2010. Panel D of this table presents descriptive statistics of variables for ICW firms

used in the ICW and investment efficiency analysis. The sample covers 213 firm year observations reporting ICW. Q1 (Q3) is the lower (upper) quartile of the respective distribution. Refer to Table 2 for detailed definitions of these variables. All continuous variables are winsorized at the 1 percent and 99 percent level.

TABLE 4
Pearson Correlation Matrix for Variables of ICW firms to Test H2a & H2b

	INV	*ICW*	*OVERI*	*LNTA*	*MB*	*STDCFO*	*STDSALES*	*STDINV*	*ZSCORE*
ICW	-0.0635*	1							
OVERI	0.0627*	-0.0670*	1						
LNTA	0.0171	-0.1573*	-0.0859*	1					
MB	0.0888*	0.1532*	-0.0962*	-0.1424*	1				
STDCFO	-0.0066	0.1148*	-0.0284*	-0.2813*	0.2275*	1			
STDSALES	-0.0029	0.0955*	-0.0168	-0.2204*	0.1500*	0.4783*	1		
STDINV	0.1431*	0.0285*	-0.0573*	-0.2406*	0.1083*	0.2311*	0.2301*	1	
ZSCORE	0.1584*	-0.2968*	0.1806*	0.2444*	-0.2523*	-0.1882*	-0.0114	-0.0981*	1
TNG	0.1789*	-0.0615*	-0.2383*	0.1874*	-0.0714*	-0.2141*	-0.1596*	0.2258*	0.0505*
LARGEST	0.0186	-0.1091*	0.0520*	0.0544*	-0.0621*	-0.0530*	-0.0103	-0.015	0.2311*
FOREIGN	0.0481*	-0.0503*	0.1214*	0.4748*	0.0494*	-0.1082*	-0.0938*	-0.1158*	0.1560*
INDK	-0.0397*	-0.0266*	-0.0848*	0.3222*	-0.0880*	-0.1536*	-0.1308*	-0.1100*	0.0899*
CFOSALE	0.1439*	-0.2742*	0.1221*	0.2400*	-0.1854*	-0.2498*	-0.1547*	-0.0319*	0.5224*
DIV	0.1237*	-0.2025*	0.1584*	0.3576*	-0.2558*	-0.2804*	-0.1942*	-0.1183*	0.4793*
OPRCLE	-0.015	-0.0048	-0.0542*	-0.1122*	-0.01	-0.0158	-0.1468*	0.005	-0.1422*
LOSS	-0.1558*	0.2248*	-0.1870*	-0.2965*	0.2022*	0.2118*	0.1450*	0.1059*	-0.6084*
KOSDAQ	0.0645*	0.0914*	-0.0315*	-0.5672*	0.1592*	0.3251*	0.2766*	0.3255*	-0.1582*

	TNG	*LARGEST*	*FOREIGN*	*INDK*	*CFOSALE*	*DIV*	*OPRCLE*	*LOSS*	*KOSDAQ*
TNG	1								
LARGEST	0.0493*	1							
FOREIGN	0.0731*	0.0349*	1						
INDK	0.1948*	-0.0159	0.1484*	1					
CFOSALE	0.1632*	0.1804*	0.1324*	0.0330*	1				
DIV	0.1052*	0.1418*	0.1983*	0.1555*	0.3380*	1			
OPRCLE	-0.1344*	-0.0605*	-0.0956*	-0.0688*	-0.1184*	-0.0475*	1		
LOSS	-0.0446*	-0.1540*	-0.1715*	-0.0936*	-0.4034*	-0.5175*	0.0450*	1	
KOSDAQ	-0.1513*	-0.0244*	-0.2798*	-0.4381*	-0.1300*	-0.2638*	0.0401*	0.2049*	1

This table reports Pearson correlations for the test variables which are used for ICW and investment efficiency analysis. See Table 2 for the definitions of the variables. The symbol * denotes significance at the 1% levels in two-tailed tests.

TABLE 5
OLS Regression Results for IC personnel and Investment Efficiency Test

Panel A: IC Personnel and Over-investment

VARIABLES	(1) *SUM1*	(2) *SUM2*	(3) *ACCNG*	(4) *FIN*	(5) *ITS*	(6) *OTHER*
RIC	-4.420**	-5.650**	-13.112***	-11.815	-10.646	-3.260
	(-2.10)	(-2.05)	(-2.61)	(-1.56)	(-1.15)	(-0.50)
NRIC	-2.918	-2.385	-23.155***	1.903	3.457	-5.180
	(-1.42)	(-0.63)	(-2.84)	(0.16)	(0.42)	(-1.14)
ABSDA	5.586***	5.623***	5.764***	5.573***	5.522***	5.465***
	(3.64)	(3.66)	(3.76)	(3.63)	(3.59)	(3.56)
LNTA	-0.314***	-0.310***	-0.337***	-0.276**	-0.262**	-0.256**
	(-2.71)	(-2.66)	(-2.87)	(-2.42)	(-2.34)	(-2.28)
MB	0.381***	0.382***	0.382***	0.382***	0.383***	0.384***
	(3.89)	(3.90)	(3.91)	(3.92)	(3.93)	(3.93)
STDCFO	1.495	1.420	1.657	1.321	1.253	1.344
	(0.71)	(0.68)	(0.79)	(0.63)	(0.60)	(0.64)
STDSALES	-1.155*	-1.146*	-1.134*	-1.158*	-1.188*	-1.203*
	(-1.81)	(-1.80)	(-1.77)	(-1.82)	(-1.86)	(-1.88)
STDINV	0.057***	0.058***	0.058***	0.058***	0.059***	0.058***
	(3.38)	(3.41)	(3.45)	(3.44)	(3.44)	(3.39)
ZSCORE	-0.077	-0.068	-0.086	-0.037	-0.026	-0.025
	(-0.46)	(-0.41)	(-0.51)	(-0.22)	(-0.16)	(-0.15)
TNG	3.466***	3.509***	3.342***	3.638***	3.684***	3.680***
	(3.51)	(3.55)	(3.37)	(3.71)	(3.79)	(3.78)
LARGEST (%)	-0.002	-0.003	-0.002	-0.002	-0.002	-0.002
	(-0.37)	(-0.39)	(-0.35)	(-0.37)	(-0.38)	(-0.32)
FOREIGN (%)	-0.004	-0.004	-0.005	-0.005	-0.004	-0.004
	(-0.50)	(-0.52)	(-0.58)	(-0.56)	(-0.53)	(-0.52)
INDK	-0.603	-0.818	-0.863	-0.648	-0.735	-0.563
	(-0.11)	(-0.14)	(-0.15)	(-0.11)	(-0.13)	(-0.10)
CFOSALE	0.497	0.497	0.509	0.554	0.534	0.596
	(0.62)	(0.62)	(0.64)	(0.70)	(0.67)	(0.75)
DIV	-0.028	-0.029	-0.069	-0.020	-0.018	-0.020
	(-0.12)	(-0.12)	(-0.29)	(-0.08)	(-0.08)	(-0.08)
OPRCLE	-0.484**	-0.477**	-0.505***	-0.447**	-0.443**	-0.440**
	(-2.53)	(-2.50)	(-2.64)	(-2.36)	(-2.34)	(-2.33)
LOSS	-0.707***	-0.706***	-0.718***	-0.694***	-0.690***	-0.680***
	(-2.97)	(-2.97)	(-3.02)	(-2.92)	(-2.90)	(-2.87)
KOSDAQ	0.739***	0.742***	0.730***	0.760***	0.757***	0.748***
	(2.82)	(2.83)	(2.80)	(2.89)	(2.87)	(2.86)
CASH	1.809	1.804	1.757	1.812	1.817	1.840
	(1.18)	(1.18)	(1.15)	(1.18)	(1.19)	(1.20)
LEV	-0.552	-0.559	-0.606	-0.510	-0.512	-0.454
	(-0.98)	(-1.00)	(-1.09)	(-0.92)	(-0.90)	(-0.81)

Constant	6.120***	6.071***	6.651***	5.310**	5.084**	4.917**
	(2.75)	(2.70)	(2.97)	(2.44)	(2.38)	(2.34)
Observations	4,327	4,327	4,327	4,327	4,327	4,327
R-squared	0.061	0.061	0.062	0.060	0.060	0.060

Panel B: IC Personnel and Under-investment

VARIABLES	(1) *SUM1*	(2) *SUM2*	(3) *ACCNG*	(4) *FIN*	(5) *ITS*	(6) *OTHER*
RIC	0.081	-0.046	-1.001	-1.269	0.337	2.620
	(0.06)	(-0.03)	(-0.32)	(-0.29)	(0.06)	(0.56)
NRIC	-0.551	-0.157	-10.738	-7.137	10.029**	-1.405
	(-0.33)	(-0.06)	(-1.61)	(-0.84)	(2.05)	(-0.32)
ABSDA	-2.863***	-2.871***	-2.806***	-2.831***	-2.922***	-2.861***
	(-2.70)	(-2.71)	(-2.66)	(-2.68)	(-2.74)	(-2.69)
LNTA	0.256***	0.256***	0.239***	0.247***	0.266***	0.261***
	(3.77)	(3.72)	(3.47)	(3.64)	(3.99)	(3.94)
MB	-0.282***	-0.281***	-0.282***	-0.283***	-0.277***	-0.281***
	(-4.36)	(-4.35)	(-4.36)	(-4.38)	(-4.29)	(-4.34)
STDCFO	1.916	1.899	2.020	1.914	1.834	1.912
	(1.44)	(1.43)	(1.53)	(1.45)	(1.38)	(1.44)
STDSALES	-0.773*	-0.765*	-0.798*	-0.771*	-0.730*	-0.775*
	(-1.85)	(-1.85)	(-1.93)	(-1.87)	(-1.76)	(-1.87)
STDINV	-0.029**	-0.029**	-0.029**	-0.029***	-0.028**	-0.029***
	(-2.58)	(-2.58)	(-2.56)	(-2.60)	(-2.55)	(-2.59)
ZSCORE	0.355***	0.355***	0.348***	0.348***	0.354***	0.358***
	(3.09)	(3.06)	(3.02)	(3.03)	(3.07)	(3.16)
TNG	-0.239	-0.236	-0.313	-0.266	-0.212	-0.206
	(-0.39)	(-0.39)	(-0.52)	(-0.44)	(-0.35)	(-0.34)
LARGEST (%)	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***
	(-2.74)	(-2.74)	(-2.75)	(-2.79)	(-2.71)	(-2.71)
FOREIGN (%)	-0.009*	-0.009*	-0.009*	-0.009*	-0.009*	-0.009*
	(-1.80)	(-1.79)	(-1.84)	(-1.80)	(-1.81)	(-1.80)
INDK	-2.347	-2.376	-2.304	-2.319	-2.264	-2.420
	(-0.56)	(-0.56)	(-0.54)	(-0.55)	(-0.54)	(-0.57)
CFOSALE	-0.672	-0.676	-0.675	-0.672	-0.664	-0.658
	(-1.18)	(-1.19)	(-1.20)	(-1.19)	(-1.17)	(-1.17)
DIV	-0.027	-0.027	-0.047	-0.026	-0.024	-0.026
	(-0.17)	(-0.16)	(-0.28)	(-0.16)	(-0.14)	(-0.16)
OPRCLE	0.175	0.176	0.160	0.165	0.183	0.181
	(1.35)	(1.36)	(1.24)	(1.29)	(1.41)	(1.41)
LOSS	-0.496**	-0.495**	-0.500***	-0.496**	-0.500***	-0.495**
	(-2.56)	(-2.56)	(-2.58)	(-2.56)	(-2.59)	(-2.56)
KOSDAQ	0.083	0.084	0.083	0.083	0.104	0.086
	(0.51)	(0.51)	(0.50)	(0.51)	(0.64)	(0.52)
CASH	1.262	1.253	1.245	1.252	1.196	1.276
	(1.37)	(1.36)	(1.35)	(1.36)	(1.29)	(1.39)
LEV	-0.778**	-0.781**	-0.815**	-0.774**	-0.800**	-0.772**
	(-2.09)	(-2.09)	(-2.18)	(-2.09)	(-2.15)	(-2.09)
Constant	-4.803***	-4.808***	-4.462***	-4.610***	-5.027***	-4.914***
	(-3.62)	(-3.50)	(-3.22)	(-3.55)	(-3.79)	(-3.86)

Observations	4,292	4,292	4,292	4,292	4,292	4,292
R-squared	0.071	0.071	0.071	0.071	0.071	0.071

Panel A and Panel B of this table reports the OLS regression estimates of the effect of internal control personnel on the deviation from expected investment amount calculated by model (1) following McNichols and Stubben (2008). I sort firms yearly into quartiles based on the amount of the residual investment. As a result, firm-year observations that have largest magnitude of negative residual investment are in the bottom quartile, and are classified as under-investing cases. Observations in the top quartile have largest magnitude of positive residuals and are classified as over-investing cases. Two quartiles in the middle are classified as benchmark group. Panel A provide results of estimations for the firms in top and middle quartiles which referred to as over-investment group, Panel B present results of estimation for the samples in bottom and middle quartiles which represents under-investment group. Column (1) and (2) are results when firm level IC personnel are used (*RIC_SUM1, RIC_SUM2, NRIC_SUM1, NRIC_SUM2*). Column (3) to (6) represents the results for IC personnel in each department. The continuous variables are winsorized at the 1 % and 99 % levels in order to control for outliers. The standard errors are adjusted for time-series dependence by clustering on each company (Gow et al. 2010; Peterson 2009; Thompson 2011). Refer to Table 2 for detailed definitions of the variables. The symbols ***, **, and * indicate significant difference at the 1, 5, 10 percent level (two-tailed), respectively.

TABLE 6
Logit Regression Results for IC personnel and Investment Efficiency Test

Panel A: IC Personnel and Over-investment

VARIABLES	(1) *SUM1*	(2) *SUM2*	(3) *ACCNG*	(4) *FIN*	(5) *ITS*	(6) *OTHER*
RIC	-1.621*	-2.019*	-4.948**	-3.835	-3.458	-0.167
	(-1.69)	(-1.70)	(-2.17)	(-1.16)	(-0.92)	(-0.06)
NRIC	-1.262	0.083	-7.327*	1.803	3.767	-4.314**
	(-1.23)	(0.05)	(-1.80)	(0.35)	(1.09)	(-2.08)
ABSDA	2.444***	2.443***	2.512***	2.420***	2.400***	2.381***
	(4.36)	(4.35)	(4.48)	(4.32)	(4.27)	(4.26)
LNTA	-0.135***	-0.130***	-0.142***	-0.120***	-0.115**	-0.115***
	(-2.96)	(-2.85)	(-3.07)	(-2.66)	(-2.56)	(-2.60)
MB	0.144***	0.145***	0.144***	0.145***	0.146***	0.146***
	(4.13)	(4.17)	(4.16)	(4.19)	(4.22)	(4.19)
STDCFO	0.494	0.427	0.518	0.409	0.374	0.456
	(0.56)	(0.49)	(0.59)	(0.47)	(0.43)	(0.52)
STDSALES	-0.271	-0.261	-0.264	-0.269	-0.273	-0.294
	(-1.02)	(-0.98)	(-0.99)	(-1.01)	(-1.02)	(-1.11)
STDINV	0.018***	0.019***	0.019***	0.019***	0.019***	0.018***
	(3.22)	(3.28)	(3.30)	(3.30)	(3.32)	(3.22)
ZSCORE	0.069	0.076	0.066	0.087	0.091	0.086
	(1.10)	(1.20)	(1.04)	(1.40)	(1.46)	(1.40)
TNG	1.673***	1.685***	1.625***	1.726***	1.730***	1.743***
	(4.61)	(4.63)	(4.43)	(4.77)	(4.81)	(4.84)
LARGEST (%)	0.000	0.000	0.000	0.000	-0.000	0.000
	(0.04)	(0.00)	(0.06)	(0.01)	(-0.02)	(0.10)
FOREIGN (%)	0.007*	0.007*	0.006*	0.007*	0.007*	0.007*
	(1.89)	(1.88)	(1.82)	(1.87)	(1.87)	(1.87)
INDK	0.448	0.378	0.305	0.421	0.461	0.420
	(0.17)	(0.15)	(0.12)	(0.16)	(0.18)	(0.16)
CFOSALE	0.356	0.353	0.353	0.371	0.361	0.394
	(1.25)	(1.24)	(1.24)	(1.32)	(1.28)	(1.40)
DIV	-0.090	-0.088	-0.099	-0.088	-0.087	-0.091
	(-0.93)	(-0.91)	(-1.02)	(-0.91)	(-0.90)	(-0.93)
OPRCLE	-0.072	-0.068	-0.078	-0.058	-0.057	-0.057
	(-0.99)	(-0.94)	(-1.08)	(-0.80)	(-0.79)	(-0.78)
LOSS	-0.119	-0.116	-0.122	-0.114	-0.112	-0.109
	(-1.13)	(-1.10)	(-1.16)	(-1.08)	(-1.06)	(-1.03)
KOSDAQ	0.274***	0.276***	0.269**	0.282***	0.284***	0.278***
	(2.60)	(2.61)	(2.55)	(2.67)	(2.68)	(2.64)
CASH	0.627	0.626	0.600	0.632	0.638	0.655
	(1.09)	(1.09)	(1.05)	(1.10)	(1.12)	(1.15)
LEV	-0.141	-0.143	-0.159	-0.124	-0.125	-0.110
	(-0.62)	(-0.63)	(-0.71)	(-0.55)	(-0.55)	(-0.49)

Constant	0.511	0.425	0.691	0.177	0.085	0.104
	(0.58)	(0.48)	(0.77)	(0.20)	(0.10)	(0.12)
Pseudo R^2	0.0346	0.0341	0.0351	0.0338	0.0339	0.0344
Observations	4,333	4,333	4,333	4,333	4,333	4,333

Panel B: IC Personnel and Under-investment

VARIABLES	(1) *SUM1*	(2) *SUM2*	(3) *ACCNG*	(4) *FIN*	(5) *ITS*	(6) *OTHER*
RIC	0.388	1.143	1.730	3.796	3.651	-1.252
	(0.46)	(1.11)	(0.90)	(1.36)	(1.04)	(-0.46)
NRIC	-0.076	2.761*	8.294**	8.376*	1.149	-2.577
	(-0.09)	(1.86)	(2.48)	(1.83)	(0.35)	(-1.26)
ABSDA	1.650***	1.594***	1.591***	1.589***	1.646***	1.650***
	(2.95)	(2.85)	(2.84)	(2.84)	(2.94)	(2.95)
LNTA	-0.146***	-0.130***	-0.131***	-0.131***	-0.142***	-0.156***
	(-3.60)	(-3.17)	(-3.21)	(-3.27)	(-3.59)	(-4.00)
MB	0.224***	0.225***	0.224***	0.226***	0.224***	0.224***
	(6.72)	(6.77)	(6.73)	(6.80)	(6.74)	(6.71)
STDCFO	0.321	0.259	0.226	0.294	0.307	0.314
	(0.39)	(0.32)	(0.28)	(0.36)	(0.37)	(0.38)
STDSALES	0.060	0.083	0.088	0.072	0.072	0.058
	(0.25)	(0.35)	(0.37)	(0.30)	(0.30)	(0.24)
STDINV	0.007	0.007	0.007	0.007	0.007	0.007
	(1.18)	(1.24)	(1.18)	(1.26)	(1.16)	(1.22)
ZSCORE	-0.014	-0.005	-0.007	-0.003	-0.011	-0.027
	(-0.23)	(-0.08)	(-0.12)	(-0.05)	(-0.18)	(-0.45)
TNG	0.742**	0.800**	0.806**	0.788**	0.758**	0.685**
	(2.23)	(2.40)	(2.42)	(2.38)	(2.29)	(2.07)
LARGEST (%)	0.004*	0.005*	0.004*	0.005*	0.004*	0.005*
	(1.75)	(1.81)	(1.75)	(1.85)	(1.76)	(1.81)
FOREIGN (%)	0.008**	0.008**	0.008**	0.008**	0.008**	0.008**
	(2.28)	(2.29)	(2.35)	(2.30)	(2.28)	(2.26)
INDK	-2.011	-2.001	-2.061	-2.060	-1.905	-1.930
	(-0.72)	(-0.72)	(-0.74)	(-0.74)	(-0.68)	(-0.69)
CFOSALE	0.360	0.374	0.364	0.350	0.373	0.353
	(1.34)	(1.39)	(1.35)	(1.30)	(1.39)	(1.31)
DIV	0.043	0.050	0.059	0.042	0.044	0.041
	(0.46)	(0.54)	(0.64)	(0.46)	(0.48)	(0.44)
OPRCLE	-0.123*	-0.109	-0.110	-0.109	-0.120*	-0.135*
	(-1.69)	(-1.49)	(-1.51)	(-1.50)	(-1.65)	(-1.85)
LOSS	0.232**	0.234**	0.236**	0.233**	0.233**	0.227**
	(2.26)	(2.29)	(2.30)	(2.28)	(2.28)	(2.22)
KOSDAQ	-0.026	-0.020	-0.023	-0.026	-0.023	-0.027
	(-0.27)	(-0.20)	(-0.23)	(-0.26)	(-0.24)	(-0.28)
CASH	-0.533	-0.551	-0.533	-0.543	-0.530	-0.539
	(-0.95)	(-0.99)	(-0.95)	(-0.97)	(-0.95)	(-0.96)
LEV	0.364*	0.375*	0.394*	0.358*	0.375*	0.337
	(1.76)	(1.82)	(1.91)	(1.74)	(1.81)	(1.64)
Constant	0.887	0.537	0.584	0.581	0.774	1.114
	(1.05)	(0.63)	(0.69)	(0.70)	(0.93)	(1.37)
Pseudo R^2	0.0395	0.0402	0.0406	0.0404	0.0396	0.0400

Observations	4,285	4,285	4,285	4,285	4,285	4,285

This table reports the logistic regression estimates of the effect of internal control personnel on the deviation from expected investment amount calculated by model (1) following McNichols and Stubben (2008). I sort firms yearly into quartiles based on the amount of the residual investment. As a result, firm-year observations that have largest magnitude of negative residual investment are in the bottom quartile, and are classified as under-investing cases. Observations in the top quartile have largest magnitude of positive residuals and are classified as over-investing cases. Two quartiles in the middle are classified as benchmark group. Panel A and Panel B presents the logistic regression estimates to test whether IC personnel are more likely to be in top or/and bottom quartile. In Panel A (Panel B), the dependent variable is a dummy variable which equals 1 if a firm's residual investment is in the top (bottom) quartile of its yearly distribution, otherwise zero. Panel A provide results of estimations for the firms in top and middle quartiles which referred to as over-investment group, Panel B present results of estimation for the samples in bottom and middle quartiles which represents under-investment group. Column (1) and (2) are results when firm level IC personnel are used (*RIC_SUM1*, *RIC_SUM2*, *NRIC_SUM1*, *NRIC_SUM2*). Column (3) to (6) represents the results for IC personnel in each department. The continuous variables are winsorized at the 1 % and 99 % levels in order to control for outliers. The standard errors are adjusted for time-series dependence by clustering on each company (Gow et al. 2010; Peterson 2009; Thompson 2011). Refer to Table 2 for detailed definitions of the variables. The symbols ***, **, and * indicate significant difference at the 1, 5, 10 percent level (two-tailed), respectively.

TABLE 7
Heckman Two-Stage Procedure for ICW and Investment Efficiency Test

Panel A : First stage (Probit model)

VARIABLES	***ICW***
LNMV	-0.272***
	(-6.36)
LNAGE	-0.008
	(-0.13)
MB	0.099***
	(4.97)
LOSS	0.316***
	(3.36)
SGROWTH	0.028
	(0.46)
INVAR	-0.325
	(-1.28)
ZSCORE	-0.338***
	(-10.85)
BIG4	0.349***
	(4.51)
CONSTANT	0.505
	(0.97)
Industry FE	YES
Year FE	YES
Observations	7,244
Pseudo R^2	0.3355

Panel B : Second Stage

VARIABLES	(1) *INV*	(2) *INV*	(3) *INV_RANK*	(4) *INV_RANK*
ICW	-1.668	-2.092	-0.384	-0.464
	(-1.44)	(-1.48)	(-1.12)	(-1.13)
ICW*OVERI	3.675*	5.034*	1.286**	1.439*
	(1.77)	(1.93)	(2.04)	(1.87)
OVERI	2.312***	1.820***	1.046***	0.788***
	(4.46)	(2.68)	(5.60)	(3.09)
ABSDA		1.097		-0.385
		(0.40)		(-0.46)
ABSDA*OVERI		2.651		1.227
		(0.54)		(0.80)
LNTA	0.003	0.087	-0.010	0.058
	(0.02)	(0.55)	(-0.19)	(1.06)
MB	0.787***	0.811***	0.297***	0.304***
	(9.10)	(7.77)	(10.35)	(8.80)
STDCFO	4.117*	4.287*	0.899	0.821
	(1.79)	(1.65)	(1.08)	(0.90)
STDSALES	-0.302	-0.156	0.122	0.146
	(-0.45)	(-0.21)	(0.49)	(0.54)
STDINV	0.124***	0.115***	0.038***	0.037***
	(4.32)	(3.68)	(3.82)	(3.39)
ZSCORE	0.668***	0.521***	0.281***	0.283***
	(3.99)	(2.58)	(5.13)	(4.22)
TNG	10.579***	10.419***	5.018***	4.649***
	(8.41)	(7.51)	(11.59)	(9.80)
LARGEST	-0.019**	-0.019**	-0.008***	-0.008**
	(-2.42)	(-2.18)	(-2.75)	(-2.36)
FOREIGN	0.007	0.005	0.006	0.007
	(0.69)	(0.42)	(1.36)	(1.57)
INDK	6.370	6.470	0.582	0.318
	(0.90)	(0.85)	(0.19)	(0.09)
CFOSALE	1.067**	1.761***	0.479***	0.780***
	(2.34)	(3.45)	(3.08)	(4.24)
DIV	0.978***	0.950***	0.413***	0.361***
	(3.62)	(3.24)	(4.13)	(3.40)
OPRCLE	0.321*	0.279	0.230***	0.239***
	(1.71)	(1.36)	(3.25)	(3.09)
LOSS	-1.422***	-1.571***	-0.592***	-0.614***
	(-5.22)	(-5.31)	(-5.92)	(-5.65)
KOSDAQ	1.563***	1.515***	0.148	0.129
	(4.85)	(4.20)	(1.17)	(0.92)
IMR	0.558*	0.579*	0.421***	0.328***
	(1.90)	(1.72)	(4.47)	(3.06)
CONSTANT	-5.030**	-5.593**	-0.298	-0.651

	(-2.41)	(-2.31)	(-0.38)	(-0.72)
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm Cluster	YES	YES	YES	YES
Observations	7,413	6,358	7,413	6,358
Joint Significance (p-value)	**0.1128**	**0.0598**	**0.0251**	**0.0446**
Adjusted R^2	0.127	0.127	0.218	0.223

This table reports Heckman two-stage procedure results. Panel A of this table tabulate the probit regression estimates following Ashbaugh-Skaife et al. (2007; 2009), Doyle et al. (2007b), Goh and Li (2011). The model tests the likelihood that firms might have internal control weaknesses. *LNMV* is the natural log of the market value of common equity. *LNAGE* is the natural log of the one plus firm's age in months (calculated from the foundation of the firm). *MB* is the ratio of the market value of common equity to book value of total equity. *LOSS* is an indicator variable that equals 1 if the firm reports a loss for the year, and 0 otherwise. *SGROWTH* is the ratio of change in sales over lagged sales. *INVAR* is the sum of the inventory and account receivables scaled by total assets. *ZSCORE* is the Altman's (1968) z-score measure that proxies for a firm's financial condition. *BIG4* is an indicator variable which equals 1 if the auditor is one of the Big 4 firms, and 0 otherwise.
Panel B presents the results for the second stage of Heckman procedure. Inverse Mill's ratio is included in the second stage to control for endogeneity of reporting internal control weakness. Other control variables are the same with those used in other tests. See Table 2 for the definitions of the variables. The symbols ***, **, and * indicate significant difference at the 1, 5, 10 percent level (two-tailed), respectively.

TABLE 8
IC personnel and Investment Efficiency by Financial Constraint

Panel A: IC Personnel and Over-investment for Financially Unconstrained Firms

	High *CASH*		High *CFO*		Low *LEV*	
VARIABLES	*SUM1*	*SUM2*	*SUM1*	*SUM2*	*SUM1*	*SUM2*
RIC	-10.084**	-13.924**	-3.078	-8.892	-0.030	1.223
	(-2.07)	(-2.24)	(-0.58)	(-1.27)	(-0.01)	(0.23)
NRIC	-14.550***	-21.481***	-1.201	-8.149	-4.320	0.653
	(-3.18)	(-3.06)	(-0.23)	(-0.98)	(-0.85)	(0.09)
ABSDA	4.978	5.319	-0.399	-0.184	2.550	2.314
	(1.41)	(1.50)	(-0.13)	(-0.06)	(0.59)	(0.53)
LNTA	-0.015	-0.030	0.034	-0.044	0.265	0.326
	(-0.06)	(-0.13)	(0.13)	(-0.17)	(0.95)	(1.17)
MB	-0.353*	-0.343*	-0.227	-0.233	-0.350	-0.366
	(-1.96)	(-1.90)	(-1.09)	(-1.11)	(-1.05)	(-1.10)
STDCFO	-1.040	-0.545	-4.304	-4.007	4.380	4.452
	(-0.24)	(-0.13)	(-0.90)	(-0.84)	(0.77)	(0.79)
STDSALES	-1.898	-1.941	-1.834	-1.894	-2.847	-2.921
	(-1.17)	(-1.18)	(-1.22)	(-1.27)	(-1.51)	(-1.53)
STDINV	0.040	0.038	0.063	0.059	0.032	0.034
	(1.18)	(1.10)	(1.36)	(1.28)	(0.85)	(0.92)
ZSCORE	0.388	0.406	-0.347	-0.366	0.640	0.681
	(1.05)	(1.09)	(-0.78)	(-0.84)	(1.34)	(1.41)
TNG	0.284	0.465	5.499**	5.384**	-1.346	-1.316
	(0.10)	(0.16)	(2.02)	(1.98)	(-0.48)	(-0.47)
LARGEST (%)	-0.014	-0.015	-0.023	-0.023	0.002	0.001
	(-1.02)	(-1.11)	(-1.50)	(-1.53)	(0.12)	(0.08)
FOREIGN (%)	-0.023	-0.024	0.013	0.013	0.004	0.004
	(-1.50)	(-1.57)	(0.74)	(0.75)	(0.26)	(0.26)
INDK	12.517	12.532	7.746	6.637	13.084	13.690
	(1.02)	(1.02)	(0.48)	(0.41)	(0.56)	(0.58)
CFOSALE	-2.893	-3.068*	2.652	2.610	-0.082	-0.090
	(-1.59)	(-1.70)	(1.30)	(1.28)	(-0.05)	(-0.06)
DIV	-0.334	-0.276	0.423	0.399	-0.997	-1.025
	(-0.59)	(-0.48)	(0.72)	(0.67)	(-1.54)	(-1.58)
OPRCLE	0.043	0.004	-0.841	-0.869*	0.283	0.320
	(0.10)	(0.01)	(-1.63)	(-1.68)	(0.64)	(0.71)
LOSS	-0.902	-0.818	-1.327*	-1.355*	-0.485	-0.454
	(-1.36)	(-1.24)	(-1.91)	(-1.95)	(-0.68)	(-0.64)
KOSDAQ	1.023	1.085	1.941***	1.907***	1.904***	1.952***
	(1.54)	(1.61)	(3.49)	(3.43)	(2.95)	(2.98)
CASH	3.981	3.936	0.811	1.061	3.967	3.690
	(1.07)	(1.06)	(0.25)	(0.33)	(1.33)	(1.23)
LEV	-0.417	-0.415	0.400	0.367	8.088**	8.117**

	(-0.34)	(-0.34)	(0.26)	(0.24)	(2.15)	(2.16)
Constant	-3.831	-3.445	-0.063	1.476	-9.327	-10.461
	(-0.85)	(-0.77)	(-0.01)	(0.28)	(-1.49)	(-1.63)
Observations	1,022	1,022	1,149	1,149	1,110	1,110
R-squared	0.080	0.078	0.112	0.114	0.072	0.072

Panel B: IC Personnel and Under-investment for Financially Constrained Firms

	Low *CASH*		Low *CFO*		High *LEV*	
VARIABLES	*SUM1*	*SUM2*	*SUM1*	*SUM2*	*SUM1*	*SUM2*
RIC	-3.295	-5.488	-2.757	-3.492	3.831	-1.215
	(-0.83)	(-1.08)	(-0.64)	(-0.67)	(0.55)	(-0.15)
NRIC	0.506	3.436	-5.756	-7.512	-3.455	-1.478
	(0.10)	(0.41)	(-1.38)	(-1.05)	(-0.69)	(-0.16)
ABSDA	-0.593	-0.547	0.711	0.727	-0.525	-0.531
	(-0.15)	(-0.14)	(0.21)	(0.22)	(-0.16)	(-0.16)
LNTA	-0.142	-0.155	-0.522*	-0.501*	-0.043	-0.074
	(-0.62)	(-0.67)	(-1.80)	(-1.76)	(-0.19)	(-0.32)
MB	0.064	0.069	0.222	0.223	0.399**	0.401**
	(0.33)	(0.35)	(1.23)	(1.24)	(2.23)	(2.24)
STDCFO	4.611	4.499	4.071	4.126	-1.501	-1.611
	(0.90)	(0.88)	(0.92)	(0.93)	(-0.31)	(-0.33)
STDSALES	-1.462	-1.465	-0.896	-0.851	-2.904**	-2.886**
	(-1.24)	(-1.26)	(-0.67)	(-0.64)	(-2.05)	(-2.01)
STDINV	0.006	0.007	-0.013	-0.013	0.033	0.034
	(0.15)	(0.17)	(-0.41)	(-0.40)	(0.90)	(0.91)
ZSCORE	0.282	0.274	0.733**	0.744**	0.209	0.169
	(0.80)	(0.78)	(2.16)	(2.19)	(0.51)	(0.41)
TNG	3.445*	3.423*	-1.643	-1.693	1.205	1.051
	(1.90)	(1.90)	(-0.74)	(-0.75)	(0.59)	(0.52)
LARGEST (%)	-0.008	-0.008	-0.014	-0.015	-0.016	-0.016
	(-0.56)	(-0.58)	(-0.96)	(-1.01)	(-1.17)	(-1.17)
FOREIGN (%)	0.004	0.004	0.008	0.009	0.006	0.006
	(0.19)	(0.16)	(0.38)	(0.40)	(0.32)	(0.29)
INDK	-0.580	-0.886	2.837	2.986	-12.170	-12.706
	(-0.04)	(-0.07)	(0.18)	(0.19)	(-1.10)	(-1.15)
CFOSALE	0.564	0.652	-2.097	-2.081	0.974	0.882
	(0.34)	(0.39)	(-1.49)	(-1.47)	(0.57)	(0.52)
DIV	0.494	0.492	-0.301	-0.316	-0.814**	-0.815**
	(1.03)	(1.01)	(-0.57)	(-0.59)	(-2.08)	(-2.08)
OPRCLE	-0.206	-0.204	0.053	0.066	0.010	-0.020
	(-0.55)	(-0.55)	(0.13)	(0.17)	(0.02)	(-0.04)
LOSS	-1.393**	-1.396**	-0.914	-0.886	-1.475***	-1.478***
	(-2.55)	(-2.55)	(-1.52)	(-1.48)	(-2.93)	(-2.93)
KOSDAQ	0.307	0.306	0.348	0.371	0.778	0.800
	(0.54)	(0.54)	(0.57)	(0.61)	(1.32)	(1.36)
CASH	67.249	65.462	-0.238	-0.269	6.324	6.251
	(1.33)	(1.29)	(-0.07)	(-0.08)	(1.43)	(1.41)
LEV	-1.353	-1.383	-3.142**	-3.161**	-9.759***	-9.733***
	(-1.20)	(-1.24)	(-2.33)	(-2.34)	(-3.50)	(-3.49)
Constant	0.101	0.364	6.263	5.945	7.815	8.535*
	(0.02)	(0.09)	(1.27)	(1.23)	(1.58)	(1.73)

Observations	1,195	1,195	1,124	1,124	1,142	1,142
R-squared	0.076	0.076	0.060	0.059	0.100	0.099

Panel A and Panel B of this table reports the OLS regression estimates of the effect of internal control personnel on the deviation from expected investment amount calculated by model (1) following McNichols and Stubben (2008). I sort firms yearly into quartiles based on the amount of the residual investment. As a result, firm-year observations that have largest magnitude of negative residual investment are in the bottom quartile, and are classified as under-investing cases. Observations in the top quartile have largest magnitude of positive residuals and are classified as over-investing cases. Two quartiles in the middle are classified as benchmark group. The observations in Panel A are the observations in top and middle quartiles which referred to as over-investment group. Column High *Cash*, High *CFO*, and Low *LEVERAGE* presents regression results for firms in top quintile based on *Cash*, *CFO*, and *Leverage**(-1), respectively. Panel B present results of estimation for the samples in bottom and middle quartiles which represents under-investment group. Column Low *Cash*, Low *CFO*, and High *LEVERAGE* presents regression results for firms in bottom quintile based on *Cash*, *CFO*, and *Leverage**(-1), respectively. The continuous variables are winsorized at the 1 % and 99 % levels in order to control for outliers. The standard errors are adjusted for time-series dependence by clustering on each company (Gow et al. 2010; Peterson 2009; Thompson 2011). Refer to Table 2 for detailed definitions of the variables. The symbols ***, **, and * indicate significant difference at the 1, 5, 10 percent level (two-tailed), respectively.

TABLE 9
ICW and Deviation from Expected Investment Level

Panel A: OLS regression

VARIABLES	(1) *OVER_INV*	(2) *OVER_INV*	(3) *UNDER_INV*	(4) *UNDER_INV*
ICW	0.961*	1.071*	-0.266	-0.190
	(1.82)	(1.73)	(-0.61)	(-0.38)
ABSDA		3.827***		-2.191***
		(3.66)		(-2.81)
LNTA	-0.240**	-0.212**	0.193***	0.196***
	(-2.57)	(-2.04)	(3.62)	(3.39)
MB	0.449***	0.459***	-0.232***	-0.271***
	(5.62)	(4.91)	(-5.09)	(-5.50)
STDCFO	3.776**	2.687	-1.160	-0.107
	(1.96)	(1.27)	(-1.00)	(-0.08)
STDSALES	-0.780	-0.768	-0.117	0.054
	(-1.40)	(-1.25)	(-0.34)	(0.14)
STDINV	0.104***	0.096***	-0.042***	-0.037**
	(4.50)	(3.86)	(-2.78)	(-2.26)
ZSCORE	0.279**	0.144	0.161*	0.190*
	(2.39)	(0.97)	(1.80)	(1.83)
TNG	6.015***	5.759***	-2.934***	-2.924***
	(6.69)	(5.84)	(-5.26)	(-4.71)
LARGEST	-0.010*	-0.008	-0.004	-0.003
	(-1.71)	(-1.25)	(-1.05)	(-0.67)
FOREIGN	-0.012	-0.019**	-0.003	-0.001
	(-1.56)	(-2.34)	(-0.58)	(-0.13)
INDK	2.568	3.535	-0.388	-0.920
	(0.39)	(0.55)	(-0.10)	(-0.21)
CFOSALE	-0.052	0.525	-0.530*	-0.781**
	(-0.14)	(1.31)	(-1.82)	(-2.46)
DIV	0.203	0.166	-0.062	-0.175
	(0.90)	(0.67)	(-0.43)	(-1.15)
OPRCLE	0.016	-0.052	0.028	0.097
	(0.11)	(-0.32)	(0.28)	(0.93)
LOSS	-0.508**	-0.609**	-0.406**	-0.490***
	(-2.24)	(-2.49)	(-2.50)	(-2.78)
KOSDAQ	0.286	0.090	0.058	0.138
	(1.15)	(0.32)	(0.38)	(0.83)
CASH	2.881**	2.831**	0.958	0.544
	(2.28)	(2.04)	(1.33)	(0.67)
LEVERAGE	-1.562***	-1.284**	-0.635**	-1.006***
	(-3.13)	(-2.33)	(-2.08)	(-3.02)
CONSTANT	2.635	2.506	-3.371***	-3.365***

	(1.63)	(1.37)	(-3.38)	(-3.02)
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm Cluster	YES	YES	YES	YES
Observations	5,569	4,849	5,567	4,714
Adjusted R^2	0.064	0.064	0.048	0.052

Panel B : Logistic Regression

VARIABLES	(1) ***DOVER***	(2) ***DOVER***	(3) ***DUNDER***	(4) ***DUNDER***
ICW	0.530***	0.510***	0.118	0.025
	(3.06)	(2.62)	(0.66)	(0.12)
ABSDA		0.968**		0.919**
		(2.54)		(2.37)
LNTA	-0.037	-0.012	-0.049	-0.054
	(-0.93)	(-0.28)	(-1.40)	(-1.36)
MB	0.135***	0.140***	0.221***	0.247***
	(5.22)	(4.75)	(8.93)	(8.22)
STDCFO	1.025	0.668	1.881***	1.530**
	(1.39)	(0.84)	(3.01)	(2.14)
STDSALES	-0.140	-0.114	-0.080	-0.099
	(-0.62)	(-0.47)	(-0.41)	(-0.46)
STDINV	0.029***	0.027***	0.020***	0.019**
	(3.78)	(3.17)	(2.68)	(2.40)
ZSCORE	0.094**	0.059	0.139***	0.147***
	(2.02)	(1.07)	(3.14)	(2.75)
TNG	2.556***	2.492***	1.990***	2.083***
	(7.76)	(6.93)	(6.72)	(6.34)
LARGEST	-0.004	-0.004	0.002	0.002
	(-1.51)	(-1.55)	(0.96)	(0.59)
FOREIGN	-0.001	-0.003	0.003	-0.001
	(-0.37)	(-0.81)	(0.84)	(-0.23)
INDK	2.311	1.970	0.700	1.419
	(0.73)	(0.52)	(0.29)	(0.48)
CFOSALE	0.059	0.305*	0.250*	0.332**
	(0.40)	(1.77)	(1.75)	(2.00)
DIV	0.003	-0.017	0.063	0.127
	(0.03)	(-0.18)	(0.76)	(1.38)
OPRCLE	0.040	0.016	0.060	0.056
	(0.65)	(0.23)	(1.11)	(0.91)
LOSS	-0.253***	-0.275***	0.240***	0.282***
	(-2.69)	(-2.73)	(2.80)	(3.02)
KOSDAQ	-0.087	-0.153	-0.216**	-0.267**
	(-0.87)	(-1.39)	(-2.30)	(-2.54)
CASH	0.848**	0.861*	-0.284	-0.360
	(2.00)	(1.83)	(-0.70)	(-0.80)
LEVERAGE	-0.502**	-0.357*	-0.161	-0.071
	(-2.49)	(-1.65)	(-0.88)	(-0.35)
CONSTANT	-1.400**	-1.564*	-1.733***	-1.899***
	(-2.03)	(-1.95)	(-2.94)	(-2.80)
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm Cluster	YES	YES	YES	YES

Observations	5,602	4,876	5,567	4,714
Pseudo R^2	0.0431	0.0463	0.0363	0.0382

Panel A of this table reports the OLS regression estimates of the effect of internal control weakness on the deviation from expected investment amount calculated by model (1) following McNichols and Stubben (2008). I sort firms yearly into quartiles based on the amount of the residual investment. As a result, firm-year observations that have largest magnitude of negative residual investment are in the bottom quartile, and are classified as under-investing cases. Observations in the top quartile have largest magnitude of positive residuals and are classified as over-investing cases. Two quartiles in the middle are classified as benchmark group. Columns (1) and (2) provide results of estimations for the firms in top and middle quartiles and columns (3) and (4) present results of estimation for the samples in bottom and middle quartiles. Panel B presents the logistic regression estimates to test whether ICW firms are more likely to be in under-investment or/and over-investment group than others. *DOVER* (*DUNDER*) is a dummy variable which equals 1 if a firm's residual investment is in the top (bottom) quartile of its yearly distribution, otherwise zero. In other words, *DOVER*=1 (*DUNDER*=1) when a firm is highly likely to over-invest (under-invest). Columns (1) and (2) provide results of estimations for the firms in top and middle quartiles and columns (3) and (4) present results of estimation for the samples in bottom and middle quartiles. The dependent variable *OVER_INV* is the investment amount that deviates from the expected level and vice versa for under-investment sample. *CASH* is the ratio of cash balance to total assets and *LEVERAGE* is the ratio of total debts to total assets. See Table 2 and Table 3 for the definitions of the other variables. The continuous variables are winsorized at the 1 % and 99 % levels in order to control for outliers. The standard errors are adjusted for time-series dependence by clustering on each company (Gow et al. 2010; Peterson 2009; Thompson 2011). The symbols ***, **, and * indicate significant difference at the 1, 5, 10 percent level (two-tailed), respectively.

TABLE 10
Firm Investment Efficiency Prior to Internal Control Weakness Reporting

	(1) OLS	(2) OLS	(3) Heckman	(4) Heckman
VARIABLES	***INV***	***INV_RANK***	***INV***	***INV_RANK***
ICW3	-2.055**	-0.447	-1.931**	-0.387
	(-2.15)	(-1.52)	(-2.01)	(-1.30)
ICW3*OVERI	3.815**	0.934*	4.161**	1.141**
	(2.20)	(1.74)	(2.37)	(2.10)
OVERI	2.225***	1.099***	1.981***	0.989***
	(4.28)	(5.83)	(3.77)	(5.22)
LNTA	0.098	0.066	-0.133	-0.029
	(0.77)	(1.39)	(-0.92)	(-0.57)
MB	0.805***	0.312***	0.771***	0.290***
	(9.27)	(10.82)	(8.95)	(10.12)
STDCFO	3.880*	0.791	4.216*	0.874
	(1.70)	(0.95)	(1.84)	(1.05)
STDSALES	-0.240	0.141	-0.261	0.118
	(-0.35)	(0.57)	(-0.39)	(0.48)
STDINV	0.122***	0.037***	0.124***	0.038***
	(4.24)	(3.67)	(4.31)	(3.75)
ZSCORE	0.760***	0.362***	0.584***	0.261***
	(5.17)	(6.82)	(3.59)	(4.78)
TNG	10.556***	5.033***	10.508***	5.021***
	(8.38)	(11.50)	(8.39)	(11.61)
LARGEST	-0.018**	-0.008***	-0.020**	-0.009***
	(-2.38)	(-2.70)	(-2.53)	(-2.79)
FOREIGN	0.009	0.007	0.006	0.006
	(0.84)	(1.57)	(0.55)	(1.33)
INDK	5.171	-0.085	7.264	0.608
	(0.73)	(-0.03)	(1.03)	(0.20)
CFOSALE	1.146**	0.521***	1.041**	0.470***
	(2.53)	(3.39)	(2.29)	(3.04)
DIV	1.028***	0.458***	0.895***	0.403***
	(3.83)	(4.58)	(3.29)	(4.03)
OPRCLE	0.318*	0.235***	0.327*	0.226***
	(1.71)	(3.33)	(1.76)	(3.22)
LOSS	-1.504***	-0.652***	-1.324***	-0.583***
	(-5.46)	(-6.46)	(-4.87)	(-5.85)
KOSDAQ	1.571***	0.156	1.586***	0.130
	(4.90)	(1.23)	(4.95)	(1.03)
IMR			1.091***	0.475***
			(3.75)	(5.39)
CONSTANT	-4.431**	-0.051	-3.861*	0.011
	(-2.12)	(-0.06)	(-1.84)	(0.01)

Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm Cluster	YES	YES	YES	YES
Observations	7,458	7,458	7,413	7,413
Joint Significance (p-value)	**0.1058**	**0.1548**	**0.0439**	**0.0297**
Adjusted R^2	0.127	0.215	0.129	0.220

This table reports the OLS and Heckman second stage regression estimates to examine whether ICW firms invest inefficiently prior to ICW disclosure. *ICW3* is an indicator variable which equals one if auditor discloses ICW in one of the upcoming three years, and zero otherwise. I repeat the OLS regression and Heckman two stage procedures. OLS regression results are presented in columns (1) and (2), and Heckman second stage regression results are tabulated in columns (3) and (4). The dependent variables in columns (1) and (3) are the amount of investment and those in columns (2) and (4) are the decile rank of the amount of investment. See Table 2 and Table 3 for the definitions of the other variables. The continuous variables are winsorized at the 1 % and 99 % levels in order to control for outliers. The standard errors are adjusted for time-series dependence by clustering on each company (Gow et al. 2010; Peterson 2009; Thompson 2011). The symbols ***, **, and * indicate significant difference at the 1, 5, 10 percent level (two-tailed), respectively

국문초록

내부통제에 대한 인적자본 투자에 관한 연구

본 학위논문은 내부통제에 대한 인적자본 투자의 효과에 대한 두 편의 세부논문으로 구성되어 있다. 국내상장기업은 내부회계관리를 담당하는 인력의 숫자와 경력 등에 관한 사항을 공시하게 되어 있으며 이러한 정보는 다른 국가에서는 공시하지 않는 독특한 정보이다. 기존 내부통제 관련 논문들에서는 내부회계관리제도의 취약성을 공시하는 경우와 공시하지 않는 경우로 내부회계관리제도의 건전성을 측정하였는데, 본 논문은 내부회계관리제도의 건전성을 내부회계관리 담당인력 비율을 사용하여 측정함으로써 내부회계관리제도의 취약성을 공시하지 않는 기업들에 대해서도 내부회계관리제도의 수준에 따른 영향을 검증하였다. 이로서 효과적인 내부회계관리제도가 미치는 영향에 대한 이해를 넓힐 수 있다.

첫번째 논문에서는 내부통제에 대한 인적자본 투자가 기업의 보고이익의 질에 미치는 영향을 연구하였다. 기존 연구들은 내부회계관리제도의 취약성을 보고하는 기업들의 이익의 질이 낮다는 것을 밝혀내었다. 그러나 이들의 연구는 내부회계관리제도의 취약성을 보고하지 않는 기업들의 내부회계관리제도의 수준 차이가 이익의 질에 미치는 영향에 대해서는 알지 못한다는 한계가 있다. 이 논문에서는 내부회계관리 담당인력의 비율을 내부회계관리제도의 효과성에 대한 대용치로 사용하여 내부회계관리 담당인력 비중이 높을수록 재량적 발생액이 감소함을 검증하였다. 기업의 성과에 따라 구분한 각각의 표본들에서도 이러한 관계가 일관되게 나타나 내부회계관리 담당인력은 이익조정이나 Big Bath 보다는 보수적인 이익보고와 관련되어 있다는 것을 확인하였다. 이러한 결과는 Choi et al. (2013)의 발견과 더불어 내부회계관리 담당인원이 기업의 내부통제 수준과 이익의 질에 관련이 있다는 것을 보여주는 것으로서 정보이용자들이 내부회계관리 담당인원의 수에 관한 정보를 통해 보다 효과적인 의사결정을 할 수 있음을

시사한다. 또한 내부회계관리 담당자에 관한 정보를 공시하도록 하는 규정이 실제로 유용함을 나타낸다.

두번째 논문에서는 내부통제에 대한 인적자본 투자가 기업의 투자효율성에 미치는 영향을 연구하였다. 이론에 의하면, 기업의 투자는 투자기회에 의하여 결정되는데, 정보비대칭이 존재하는 경우 대리인 문제나 역선택 문제 등으로 효율적인 투자가 저해된다. 만약 기업의 내부회계관리제도가 잘 구축되어 있다면 기업의 재무보고의 품질이 향상되고 경영자가 의사결정에 이용하는 정보의 적시성과 정확성이 높아져 보다 효율적인 투자가 이루어질 것이다. 분석결과, 내부회계관리 담당인력의 비중이 높을수록 기업이 과잉투자를 하는 경향이 감소함을 확인하였다. 그러나 내부회계관리 담당인력의 비중과 기업의 과소투자 성향에서는 유의미한 관계를 발견하지 못하였다. 내부회계관리제도가 가장 나쁜 형태인 내부회계관리제도의 취약성을 공시하는 기업들의 투자효율성을 추가적으로 살펴본 결과 내부회계관리제도의 취약성을 공시하는 기업들은 과잉투자를 하는 경향을 발견하였다. 그러나 마찬가지로 과소투자 성향은 발견하지 못하였다. 이러한 발견은 효과적인 내부통제가 기업 투자의 효율성과도 관련되어 있다는 것을 보임으로서 투자자나 기타 정보이용자에게 유용하다. 특히 정보이용자들은 재무적인 제약이 덜한 기업들에 대하여 내부회계관리 담당인원의 비율이나 내부회계관리제도의 취약점 보고에 관한 정보를 활용하여 이들이 과잉투자를 할 가능성이 더 높은지를 판단하고 이들에 대한 투자수준이나 모니터링 강화 등을 결정할 수 있을 것이다.

주요어: 내부회계관리제도; 내부통제; 내부통제의 취약성; 이익의 질; 투자효율성; 내부회계관리제도 담당인원
학번: 2009-30132

감사의 글

먼 길을 돌아 낯선 학문의 세계에 발을 담게 되었을 때, 따뜻하게 배려해 주시고 이끌어 주신 최종학 지도교수님께 감사 드립니다. 연구자로서 치밀하고 성실하며, 교육자로서 포용력 있고 성숙하셨기에 곁에서 훌륭한 모범이 되어 주셨습니다. 또한 생각해 보지도 못했던 학문의 길로 인도해 주시고 힘들 때마다 늘 응원하여 주신 곽수근 교수님께 존경과 감사를 드립니다. 이 두분이 계셨기에 인생의 갈림길에서 쉽지 않은 결정을 할 수 있었고 그 길을 묵묵히 걸어갈 수 있었습니다.

논문을 심사해주신 황이석 교수님, 한종수 교수님, 전영순 교수님께도 깊은 감사의 말씀을 올립니다. 이른 아침의 심사 때마다 날카로운 지적과 통찰력 넘치는 조언을 해 주셔서 부족한 논문이 차츰 나아질 수 있었습니다. 교수님들의 혜안에 감탄하면서 계속 발전시켜 나아가야겠다는 마음을 다질 수 있었습니다. 서울대학교에서 아낌없는 지원과 가르침을 주신 이창우 교수님, 정운오 교수님, 안태식 교수님, 백복현 교수님, 신재용 교수님, 황인이 교수님께도 감사의 말씀을 올립니다. 교수님들의 가르침이 어둠 속의 불빛이 되어 갈 길을 인도하여 주셨습니다.

박사과정을 함께 한 동료들에게도 감사의 말씀을 드립니다. 어딜 가도 찾아 볼 수 없을 만큼 뛰어나면서도 친절한 분들과 함께 같은 길을 갈 수 있던 것만으로도 행복했습니다. 같이 토론을 하면서, 식사를 하면서, 이야기를 하면서 수많은 시간을 함께 했습니다. 형, 누나, 친구, 그리고 동생으로서 서로 아껴주고 격려해 주었던 기억들을 깊이 간직하겠습니다. 방 후배로서 많은 것을 도와 주었던 선우혜정, 최아름, 박지훤 양 및 김세일, 오승환 군에게도 감사 드립니다.

이외에 논문작성에 커다란 도움과 조언을 아끼지 않은 영국 랑캐스터 대학의 최선화 교수에게 감사 드립니다. 더욱 노력하여 후배들에게 도움과 힘이 되는 선배가 되도록 다짐합니다. 박사과정 내내 학문적 동료로서, 조언자로서, 말동무로서 함께 해준 김영준 박사과정에게도 고마운 마음을 전하며, 날카로운 통찰과 부단한 노력으로 저를 부끄럽게 하면서도 한결같이 응원을 보내 준 친구 김동우 군에게도 이 자리를 빌어 감사를 드립니다.

박사과정을 마치기까지 모든 과정에 있어서 가족들의 도움은 말로 표현할 수 없습니다. 처음 석사과정에 들어오면서 박사과정을 마칠 때까지 긴 시간을 인내하며 변함없는 사랑을 보여 준 아내 이주희와, 늘 기도로 응원해 주신 장인, 장모님, 어려서부터 지금까지 저의 선택을 믿어 주셨던 아버지, 어머니께 한없는 존경과 감사를 드립니다. 그리고 박사과정을 마치기까지 돌보아주신 하나님께 감사 드립니다. 살아가는 하루하루가 기적 같은 날임을 가슴에 품고 살겠습니다.