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The focus of the *China Journal of Accounting Research* is to publish theoretical and empirical research papers that use contemporary research methodologies to investigate issues about accounting, finance, auditing and corporate governance in China, the Greater China region and other emerging markets. The Journal also publishes insightful commentaries about China-related accounting research. The Journal encourages the application of economic and sociological theories to analyze and explain accounting issues under Chinese capital markets accurately and succinctly. The published research articles of the Journal will enable scholars to extract relevant issues about accounting, finance, auditing and corporate governance relate that to the capital markets and institutional environment of China.



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- supply an abstract of about 120 words, stating the study's findings, sample and methodology in that order.
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An essay on conceptualization of issues in empirical accounting research

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ABSTRACT

Empirical research in accounting has lately focused much on sophisticated statistical methodology and econometrics and relatively less on conceptualization of the issues concerned. This essay is written to highlight the conceptualization of the issues as an important ingredient of empirical research in accounting. I present two methods of conceptualization – the single-entity approach and the game theoretic approach. I give several examples in accounting research to explain the conceptualization process. I hope that this essay will fill a much needed void in the research process in accounting and restore the balance between conceptualization and methodology.

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1. Introduction

This essay, as the title indicates, deals with the conceptual and philosophical aspects of accounting and auditing research. It is deliberately written to focus on aspects of accounting research that do not concern statistics, statistical methodology, and econometrics. I am motivated to write this essay because younger researchers, especially Ph.D. students, have begun to view the process of research and publication as a mechanical production process deploying a sophisticated statistical methodology, whereas the selection and conceptualization of the issues get relatively less focus. Continuing this trend might make accounting research more focused on narrow topics that are amenable to statistical analysis while ignoring the larger issues that

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need to be resolved for meaningful progress in accounting thought. My concern is similar to that of Johnstone (2013) who bemoans a similar progression in finance research thus:

- “Research students might once have discovered such issues for themselves, through curiosity and unstructured background reading, but the modern way of PhD research is much narrower and usually involves a substantial commitment of time and thought to learning statistical techniques, and how to implement them using different software packages, and to cleaning, merging and reconstructing large data files. There is obviously less time and appetite for philosophical critique, out of which potential research outcomes are no doubt less ‘safe’ than those from a well-conceived empirical investigation.”

In this essay, I address the above concern by identifying the important ingredients of relevant empirical research in accounting and giving several examples of how to conceptualize issues that are currently being researched in the field. In the interest of setting expectations from this essay, it is important for me to state that I do not present much original work of my own here. I also do not fully develop the models that I present here. My purpose is to highlight the importance of conceptualization in empirical accounting research and show that it is possible to do so with some thought and basic common-sense-driven logic. In particular, it does not need extensive quantitative theoretical modeling (though such a development is welcome) to have a conceptual framework for empirical research.

1.1. The purpose of accounting research and the definition of conceptualization

What really is the purpose of accounting research? Accounting practice is more than 10,000 years old (Dickhaut et al., 2010; Waymire and Basu, 2007) and has developed as part of the cultural and social organization of human beings. In its essence, accounting is the process of measuring, keeping records, and reporting transactions and performance by the more informed players in organizations to less-informed players who might control the resources. The codification of the double entry system by Pacioli has helped the field to adapt to the growing organizational complexity of both business and non-business entities as well as interactions among them. In the context of such development, Ronen (2012) speaks of the objective of accounting research as “helping to set accounting policy that maximizes social welfare by improving resource allocation.” The implication of this objective is that accounting research should offer guidance to policy makers based on both theoretical and empirical research. It is therefore important to relate empirical research (the focus of this essay) to social policy to claim relevance.

How can empirical accounting research benefit social policy? We need to identify feasible information exchanges that can direct resources controlled by less-informed parties to their maximally productive uses. Such a task requires the accounting system to examine among others (i) the organizational forces that create information differences – say, between managers and investors or between managers and regulators; (ii) the incentives of the informed parties (managers, auditors) to transmit information to the less-informed but more endowed parties (investors who hold capital, regulators who hold policy-making power); and (iii) the accountability and protection of the resources while in use or otherwise – the governance issue. Such examination requires theoretically supported assumptions on human behavior as individuals and in teams as well as theoretically supported assumptions about market behavior in situations where individuals might not have the power to affect most outcomes. These assumptions naturally derive from known evidence in the psychology literature (individual behavior), sociology (team behavior), and economics literature (individual and team behavior under institutional constraints and market behavior). We refer to these assumptions as “maintained hypotheses.” I later discuss their role in framing research questions in accounting. While theoretical research might provide some clues on how different policy prescriptions, reporting conventions, and voluntary disclosures might affect resource allocation in different organizational contexts (different ownership and capital structures), empirical research serves to verify whether these theoretical predictions hold and if they do not, whether the theory needs to be refined.

I define “conceptualization of the issue” of a research project to mean the identification of the underlying assumptions (the maintained hypothesis) and the logical process of linking the potential outputs to inputs. I define “methodology” as the selection of statistical techniques and packages to examine the relation between

input proxies and output proxies. The interpretation of the result is determined by the conceptualization of the issue and the maintained hypothesis. All these aspects are essential ingredients of relevant accounting research.

1.2. The current framework of empirical research in accounting

The “real world” for which we seek betterment as researchers is typically very complex. There are myriads of interacting systems and subsystems (the subsystem in accounting – part of the economic eco-system – might be seen as a composite interacting set of the second level of subsystems – accounting standard-setting system, standards enforcement system, the legal system, the auditing system, the governance system, the regulatory framework and the political system; each second level subsystem consists of a number of interacting third level subsystems – for example, the auditing subsystem can be construed as comprising of audit education, auditor certification, competition between auditors in the jurisdiction, the auditing standards and the standard-setting system) each with several observable and unobservable, dynamically changing, uncertain variables that constitute the real world. Current accounting research has adopted the (western) philosophy of reductionism, wherein the researchers seek to understand parts of the system and then examine how they interact. This “bottom-up” approach differs from the Eastern philosophies that emphasize holism where the overall system is studied first and each subsystem derives its purpose from the overall system. Further, in the reductionist philosophy, we seek to limit our examination to a manageable number of observable variables – and assume that the effects of other potential (omitted) variables are either inconsequential or get randomized in the analysis. This process of reducing the scope of analysis to a limited number of variables is referred to as “modeling” and the hypothesized relationship is referred to as a “model”.

For the current framework in accounting, I borrow from Ronen (2012). First, I distinguish between normative and descriptive models. Normative models aid decision-makers by restricting the set of choices that they need to consider in making decisions, whereas descriptive models examine the current choices and identify the relationships that exist between those choices and the context in which those choices were made. Most empirical research in accounting falls in the “descriptive” category. A particular subset of descriptive empirical accounting research is known as “positive accounting research.” Positive accounting research has a theoretical base in the contractual view of firms – that every firm is a nexus of contracts. Managerial actions are explained in a framework where managers are assumed to be acting in their self-interest and are characterized by rational expectations within the confines of their contractual stipulations. Note that positive accounting researchers do not claim to “prescribe” behavior, and therefore, this kind of research is part of the descriptive category. The ultimate difference between normative and descriptive research has been questioned (Churchman, 1961). One could also argue that normative prescriptions are seen as “rational” by management students and managers who will conform to that behavior in making the prescriptions actually descriptive in practice over time (Ghoshal, 2005).

Ronen (2012) explores accounting research in the framework given in Fig. 1.

In this framework, rational-expectations modeling is placed in the northwest cell where managers and investors are viewed as economically rational players acting in their self-interest with no behavioral biases. Most of the studies that fall in this cell are analytical studies. Empirical studies that show no deviation from market efficiency and no economic irrationality on the part of managers are difficult to publish because of the “lack of contribution.” Hence, we hardly find any published empirical–archival or empirical–experimental accounting studies that do not find deviations from expected behavior.

Studies that find *opportunistic* earnings management seem to assume that markets do not see through such opportunism. If they did, the stock price would not respond to managed earnings and if the stock price did not respond, the manager would not undertake the cost and effort involved in managing earnings. Therefore, these studies fall in the category where managers are considered rational but investors are either naive or do not care enough to see through the managed earnings. (Note that *informative* earnings management falls in the cell where both managers and investors are modeled as rational.) A particular naiveté that is often attributed to investors is called “Functional Fixation”. Believers in functional fixation assume that investors focus on reported earnings (and other financial statement numbers) but do not consider how that earnings number is derived. Unexplained anomalies such as accruals anomaly (Sloan, 1996)

Managers Markets (Investors)	WISE <i>(Enlightened self-interest maximizers – conforming to individual rationality as currently understood in the Economics literature – Homo Economicus)</i>	FOOLISH <i>(Managers exhibit behavioral deviations from individual rationality and/or bounded rationality)</i>
WISE <i>(Conforming to the Market Efficiency Hypothesis)</i>	Analytical equilibrium modeling Tests of models with rational parties Signaling, optimal compensation, optimal performance measures etc.	Tests of market efficiency with respect to accounting numbers The market sees through attempts to manipulate accounting numbers Value relevance: association tests
FOOLISH <i>(Investors exhibit behavioral biases and/or bounded rationality which is not overcome by market forces. As a result, the market might not conform to the Market Efficiency Hypothesis)</i>	Pernicious earnings management, pernicious smoothing Accounting-market anomalies: accruals anomaly, price-earnings ratios, price-CFO ratios etc.	Difficult to test: Management does not attempt to fool the market, when in fact the market could be fooled.

Figure 1. A Conceptualization Framework (from Ronen, 2012 – the notation in *italics* are added by me).

are often attributed to such fixation on the part of investors. As Ronen (2012) points out, the law and courts in the US (and most countries) have held the view that managers can fool investors. Based on this view, they have sought to constrain managerial reporting – under the notion of “protecting the uninformed investor”, presumably from smart and manipulative managers.

The northeast cell where the market is assumed to be efficient but managers are not fully rational is populated by several early “event-study” accounting papers such as Ball and Brown (1968). The logic in these studies runs thus: the market is efficient and prices move only when there is unanticipated information (news); therefore, to the extent that accounting earnings changes are associated with changes in market returns, there is information content in accounting. By implication, any report that moves the market is informative and any report that is discarded by the market is non-informative. Managing the earnings report is fruitless because the market sees through and disregards these changes and only a naïve manager would still try to manage the report.

The trend in empirical research in accounting is to explore deviations from market efficiency (behavioral biases of investors) or to explore the behavioral biases of managers. In the southeast cell, the researcher assumes that both investors and managers are driven by behavioral biases. There are few empirical studies that do this, because of the lack of consensus on behavioral theories that predict specific deviations for both investors and managers.

The above framework presents the overarching maintained assumptions underlying most of the empirical studies in accounting. In the next section, I discuss the role of maintained hypothesis in conceptualizing a research question. In Section 3, I explain the conceptualization of research questions using a single-entity approach. In Section 4, I discuss the conceptualization of research questions using game theoretic models where the focal entity is modeled as one of two or more strategic players. Conclusions are given in the last section.

2. The role of maintained hypothesis

Conceptualization of a research question is done in a framework that is shaped by an assumed theoretical basis that will not be explicitly tested in the paper. This underlying theory² is referred to as the *maintained hypothesis* and is usually accepted well enough to not need a defense in the study. As an example, consider the case where you empirically examine the effect of an accounting standard – expensing of research and development expenditure – on the decision of how much to spend on research and development. Two possible maintained hypotheses are possible. First, let *Functional Fixation* be the maintained hypothesis. Under this assumption, the investors are unable to fully understand the valuation implications of the research and development expenditure and depend on the reported accounting income to derive their valuation. Under this maintained hypothesis, the following claims could be made: (i) firms with high research and development expenditures that are immediately expensed will be undervalued; (ii) allowing capitalization will increase their reported income and make investors increase their valuations of the firms. Anticipating this, managers will be more reluctant to undertake research and development expenditures in the former case (expensing) but less so in the latter case (capitalization). These claims allow us to hypothesize that under the maintained hypothesis of functional fixation, having an expensing rule for R&D expenditures will depress the R&D activities undertaken by research-based firms under that regime. Allowing capitalization will correspondingly boost R&D expenditure. However, if the maintained hypothesis is the *efficient market hypothesis*, we cannot use the above argument in our conceptualization. Investors will properly evaluate the research and development expenditure irrespective of whether the amount is expensed or capitalized or partially capitalized. However, under this assumption, we could invoke signaling implications to explain why allowing partial capitalization might be useful. Allowing such capitalization could provide managers with the means of communicating their successes in R&D projects in a credible manner without incurring significant proprietary costs. As a result, investors, using signals can better evaluate firms than if either expensing or capitalization were mandated. As you can see from this discussion, the *same empirical result is theoretically supported in two different ways depending on the maintained hypothesis chosen to explain it*. It is important to mention that the maintained hypothesis of functional fixation generally needs greater justification than the maintained hypothesis of efficient markets.

The maintained hypothesis could be different in different contexts. For example, the political setting and the economic infrastructure in China are such that most of the capital resources are controlled by the State. The maintained hypothesis of free markets has limited applicability in China. A private firm operating in the Chinese market might well depend on political connections and influence to gain access to capital and resources rather than appealing to investors by being transparent. In fact, exposure of political connections and extra-legal dealings could expose the connected individual and the firm to extreme penalties, and therefore, it might be in the interest of both parties to be opaque. The maintained hypothesis here is one of political rent-seeking rather than the free market economy.

The maintained hypothesis allows us to hypothesize the predicted behavior of the entity in question as well as the behavior of the environment in which the entity is situated. In the next section, I will discuss the case where the environment is characterized by uncertainty but is not modeled to consist of strategic players. In the subsequent section, I discuss the case where the environment consists of strategic players.

² Normally, the term “hypothesis” is a tentative idea awaiting confirmation or falsification whereas “Theory” is a hypothesis that has been confirmed overwhelmingly by evidence. In contrast, an axiom is an assumption that is generally held to be true, without confirmation. A fact is generally accepted as true, whether it is proved or not. For example, the existence of human beings is held to be true (and is accepted without proof or evidence) – a fact. How human beings have come into being is, on the other hand, a theory – the theory of evolution – a hypothesis that is supported by overwhelming evidence (see Dawkins, 2009 – Chapter 1 – for a discussion of these terms). A maintained hypothesis is in between a hypothesis and a theory but is assumed without explicit testing as the basis for examining the research question on hand. Efficient Market Hypothesis, Utility theory, Prospect theory and Functional Fixation are examples of maintained hypotheses for most accounting studies.

3. Conceptualization of accounting and auditing research problems using a single-entity approach: the loss function

The concept of loss function is borrowed from Statistics and Decision theory where it is defined as a function that maps an event onto a real number intuitively representing some “cost” associated with the event. We use the notion quite broadly here to represent any situation where we could represent a trade-off faced by an entity in choosing a parameter by the entity’s total cost of choosing it at different levels. We normally use this mental model of trade-off when the entity faces an uncertain environment but not when it faces one or more strategic players.

3.1. Example 1: Auditor loss function and auditing standards

This example is developed using a simple auditor loss function but a more advanced analysis has been done in Ye and Simunic (2012). Consider the problem of audit standard-setting where the standard requires a minimum (floor) effort from the auditor. We view the effort of the auditor broadly to include the audit hours that are spent, specialist skills brought to bear, investments in technology, and other costs incurred on the audit. In that sense, the audit effort modeled in the loss function is for all practical purposes, a proxy for audit quality. Conceptualization of this issue proceeds as follows:

- (i) How does the auditor choose effort in the absence of standards but within the current legal framework?
- (ii) What effect does a standard have on this effort? When does a particular standard affect the auditor’s effort and when does it not affect the auditor’s effort?

We model the direct cost of the audit – the expected cost that the auditor incurs in delivering the audit $c(a)$ – as a function of the audit effort a . We model it as a cost that is increasing at an increasing rate – similar to most cost functions, i.e., $c'(a) > 0$ and $c''(a) > 0$. The countervailing cost is the expected aggregate cost of litigation. The cost of litigation follows a joint distribution of the probability that the auditor will be sued by a plaintiff and the distribution of the (i) penalties and cost that might be imposed on the auditor; (ii) the opportunity cost of lost future business because of the potential loss of reputation; and (iii) the cost of preparing for the defense or arbitration. We expect this cost $l(a)$ to decrease in auditor effort at a decreasing rate, i.e., $l'(a) > 0$ and $l''(a) > 0$. In the absence of any standards, the auditor will minimize $c(a) + l(a)$. If the continuity and differentiability assumptions hold, this will happen at a point a^* where $c'(a^*) = 0$. Consider an auditing standard that can precisely require the auditor to put in an effort a' . The standard will be effective in the range (a^*, a^{max}) where a^{max} is defined by the equation $c(a^{max}) = c(a^*) + l(a^*)$ but not outside that range. The reason is that if the regulated effort is less than a^* , the auditor still minimizes the total cost at a^* (higher than the regulated value of the effort) and if the regulated effort is more than a^{max} , the auditor takes the risk of violating the standard and is still better off supplying the effort a^* . This is illustrated in Fig. 2.

The advantage of this simple conceptualization is that we can draw inferences on a number of propositions. Consider the following:

- (i) If the aggregate expected litigation cost $l(a)$ increases everywhere in a by a constant amount k , the range of effectiveness of the effort regulation increases. [It is simple to see that a^* is not changed but the new upper bound of the range, $c(a_1^{max}) = c^{-1}[c(a^*) + l(a^*) + k] = c^{-1}[k + c(a^{max})] > a^{max}$, where $c^{-1}[\cdot]$ represents the inverse cost function as shown in Fig. 2a.
- (ii) A larger auditor faces a higher probability of litigation and the assessed penalty for audit failure is likely to be larger. Therefore, for a larger auditor, $l'(a)$ is lower (more negative) than for a smaller auditor. If we assume that the cost of providing the same effort is not likely to be significantly different compared to smaller auditors in the same jurisdiction, the optimal effort a^* for the larger auditor is higher. Therefore, larger auditors, in the absence of regulation, are expected to provide higher effort leading to higher quality audits.

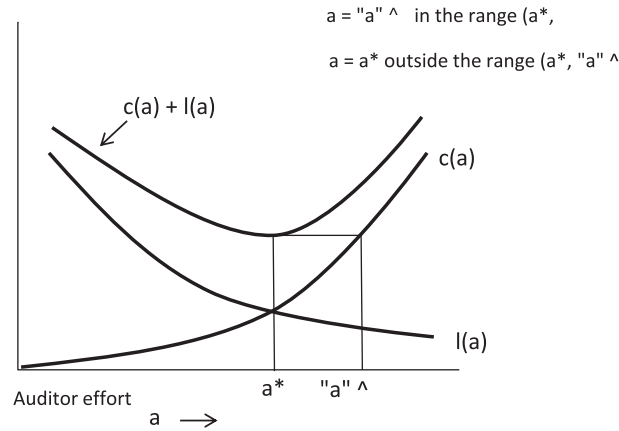


Figure 2. Auditing Standard & Auditor Loss Function.

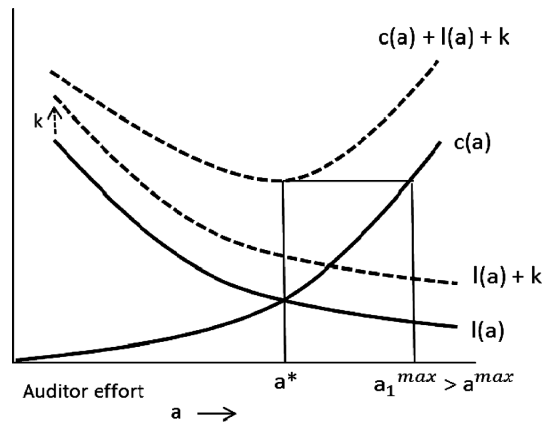


Figure 2a. Effect of increase in $l(a)$ on the range of effectiveness.

- (iii) Because the optimal effort is higher for larger auditors (denote the optimal for larger auditor as a_{Large}^* and for smaller auditor as a_{Small}^{ast}), the minimal audit effort standard could be positioned between the two, i.e., $a_{Large}^* \geq a' > a_{Large}^*$. This will increase the quality of audits by smaller auditors but not affect the higher quality audits of larger auditors. In other words, auditing standards are aimed more at smaller auditors to ensure that they provide audit of adequate quality.
- (iv) In legal regimes such as the US where the litigation costs are higher, the optimal audit effort is higher, *ceteris paribus*.
- (v) In jurisdictions where it is very costly to improve audit quality (effort) [could be because not many auditors are trained well; the independence of auditors cannot be assured; there is no support from the governance structure], the first derivative $c'(a)$ is higher and this decreases the optimal audit quality.

Many of the above propositions are not obvious unless the conceptualization using the auditor loss function is made. In other words, even having this simple conceptualization can improve the understanding of the effect of standard setting on audit quality. Ye and Simunic (2012) consider two dimensions of auditing standards: toughness which is akin to the minimum effort level alluded to above; and vagueness which is the uncertainty in the enforcement of the standard resulting mostly from the vagueness in the language of the standard. In that case, they show that if the toughness of the audit standard requires effort from the auditor above the (otherwise) optimal level, the auditor would prefer a vague standard over a precise standard.

3.2. Example 2: Optimal disclosure and competition

A very basic disclosure model is one that trades off the benefits of disclosure with the proprietary costs that reduce the competitive disadvantage. For example, disclosing detailed information about a new product could convey relevant information to investors in assessing the future growth of the firm but it could also be exploited by competitors to copy some of the features and thereby reduce the competitive advantage of the firm releasing the information. The decrease in competitive advantage will be a reduction of firm value for investors. Let $f_I(d)$ represent the benefit to the investor arising from the additional information disclosed, d . We model it as a function that increases in d at a diminishing rate, i.e., $f_I'(d) > 0; f_I''(d) < 0$. The cost to the investor because the firm loses some of its competitive advantage is modeled as $g_I(d)$ that is increasing at an increasing rate with d , i.e., $g_I'(d) > 0; g_I''(d) > 0$. The optimal disclosure d_I demanded by the investor satisfies $f_I'(d_I) = g_I'(d_I)$. This is seen in Fig. 3 below.

The manager, on the other hand, is likely to have a different perspective. The benefits that accrue directly to the manager by disclosing more information derive from the additional compensation that he might get when firm value for the investor becomes higher. This benefit is smaller than the benefit to the investor and also increases at a slower pace than for the investor. The propriety cost of competitive disadvantage is likely to be higher because unlike the investor, the manager cannot diversify the risk of the loss without changing jobs. It is also likely that the proprietary cost of the manager increases faster than that for the investor. As a result, denoting the benefits and costs for managers by functions $f_m(d)$ and $g_m(d)$ respectively, we note that $f_I'(d) > f_m'(d)$ and $g_I'(d) < g_m'(d) \forall d$ which results in an optimal disclosure d_m that is lower than the disclosure d_I demanded by the investor.

Some of the propositions that follow from this conceptualization are:

- (i) In a setting where proprietary costs are high, the optimal disclosure demanded by investors is low.
- (ii) In settings where the disclosure does not result in competitive disadvantage – could persuade competitors to even withdraw from the market or reduce capacity – investors demand higher disclosure
- (iii) In settings where managers’ compensations are not tied to firm value, the first derivative, $f_m'(d)$ is smaller compared to the benefits to the investor and managers are likely to supply much lower disclosure relative to what is demanded by investors.
- (iv) In highly competitive settings where the first mover advantage is very valuable, investors demand less disclosure.
- (v) In settings where managers have invested significant human capital into new product development and other projects, the proprietary cost to the manager of disclosing the details would be very high. Therefore, managers would supply much lower disclosure than what is demanded by investors.
- (vi) In a high litigation environment such as the US, managers might face high litigation costs if there is discovery of delay in (bad news) disclosures. In effect, the benefit of disclosure for managers becomes higher, i.e., $f_m(d)$ and $f_m'(d)$ are high. This results in more (and early) disclosure of bad news (Skinner, 1994)

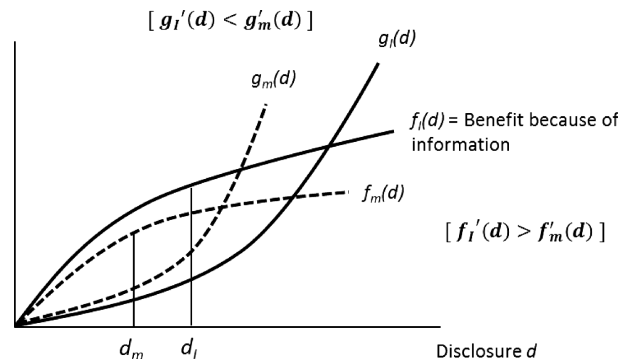


Figure 3. Disclosure from investors’ and managers’ viewpoints.

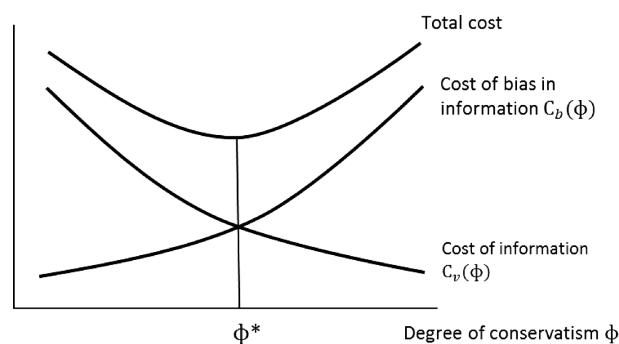


Figure 4. Trade-off in conservatism.

3.3. Example 3: Optimal degree of conservatism

Accounting conservatism has been defined in modern accounting literature as the accountant's tendency to require a higher degree of verification for good news compared to bad news (Basu, 1997; Watts, 2003a,b).³ At the most extreme, all expenditures could be recognized as expenses, resulting in no recognized assets on the balance sheet. It is obvious that such an extreme form of conservatism does not exist in the current practice of accounting. By recognizing future losses and other expenditures while deferring future gains and revenues, the reported income becomes biased. Such a bias is costly because an auditor-certified deferred gains and revenues might be more useful to the investor in valuing the firm than the good news obtained from non-accounting sources. However, such verification is costly and at the optimum, the firm needs to trade off the cost of verification against the cost of bias introduced by conservative reporting. We describe the degree of conservatism as φ and model the cost of verification as $c_v(\varphi)$. The cost of verification decreases as the report becomes more conservative, but it decreases at a diminishing rate. This means that $c'_v(\varphi) < 0$ and $c''_v(\varphi) > 0$. We also model the cost of bias in the information $c_b(\varphi)$ to be increasing in φ at an increasing rate, i.e., $c'_b(\varphi) > 0$ and $c''_b(\varphi) > 0$. The optimal level of conservatism demanded by investors is found at a point φ^* where $c'_v(\varphi^*) + c'_b(\varphi^*) = 0$. This is shown in Fig. 4.

Investor demand for conservatism can be conceptualized based on the above trade-off. As an example, consider the difference between high- and low-technology firms. High-technology firms and high growth firms have very uncertain futures. This increases the direct cost and the risk of verifying any news about the future. For example, verifying that inventory does not lose value till they are sold in a few months' time would be more difficult in a high-technology firm than say in a firm that manufactures farm equipment. Therefore, the cost of verification and its rate of decrease are both higher, i.e., $c'_v(\varphi^*)$ is lower (more negative). This makes the optimal conservatism for high-tech firms, φ_{HT}^* higher than that for similar low tech firms, φ_{LT}^* . Optimally, investors demand conservative reports from high growth and/or high-tech firms that are characterized by greater uncertainty. This trade-off is shown in Fig. 4a.

Managers, however, personally incur a very small part, if at all, of the verification costs. The cost of bias is borne by investors. Conservatism could be costly to managers if their compensation depends on accounting income because deferring good news will also defer their compensation. In the absence of any restriction, managers will perhaps choose unbiased reporting of good news and perhaps withhold some of the bad news – resulting in an aggressive report. The “supply” of conservatism by managers will be lower than the demand for conservatism by investors. The cost of conservatism for the unrestricted manager is shown in Fig. 4b. In

³ We have adopted the notion of conditional conservatism – the conservative practice of recognizing bad news and losses while deferring good news and gains. Unconditional conservatism, on the other hand, is independent of the news. A standard that requires research expenditures to be expensed is unconditionally conservative. On the other hand, a rule such as lower of cost or market for inventories is conditionally conservative in that any impairment of inventory value is recognized but increases in inventory value are deferred till the inventory becomes part of sales.

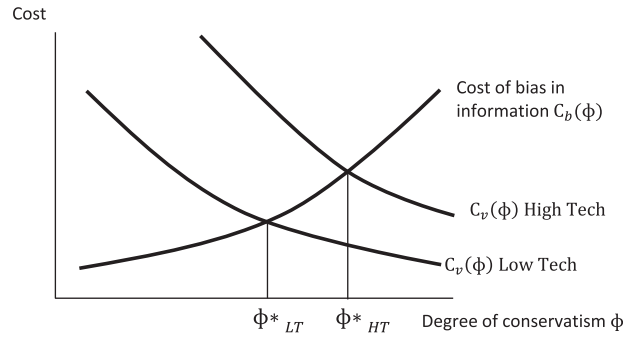


Figure 4a. Conservatism demanded in high and low tech firms.

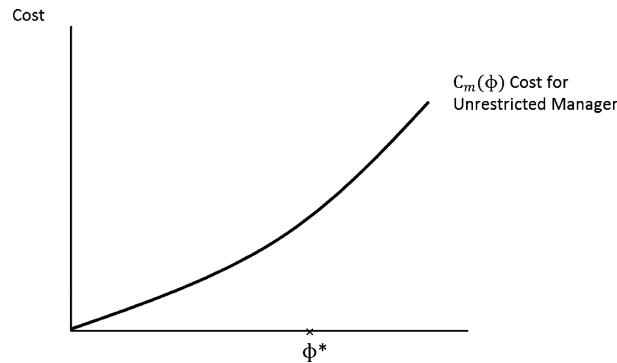


Figure 4b. Cost of conservatism for the unrestricted manager.

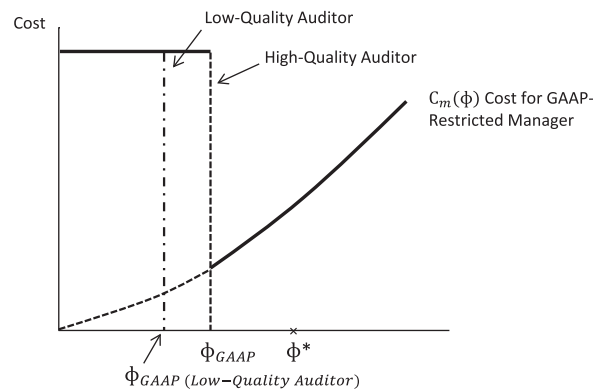


Figure 4c. Cost of conservatism for the GAAP-restricted manager—different audit quality settings.

the absence of restrictions, there is no corresponding benefit, and therefore, managers find the optimum in the lowest degree of conservatism.

This conceptualization shows that if investors' demand for conservatism is to be satisfied, it needs to be imposed on managers. GAAP does this by requiring managers to comply with conservative accounting rules and having a third-party auditor audit the report. If the auditor is strict and GAAP is followed, the minimum conservatism will be set at ϕ_{GAAP} . If the auditor is lax, GAAP might not be strictly enforced and the manager might supply a level of conservatism, $\phi < \phi_{GAAP}$. In the case of most firms, $\phi_{GAAP} \leq \phi'$. If that is not the case, i.e., if $\phi_{GAAP} > \phi'$, the conservatism deployed by managers will be forced to be higher than that demanded by investors, which is a sub-optimality caused by onerous GAAP regulations. However, when $\phi_{GAAP} \leq \phi'$, the

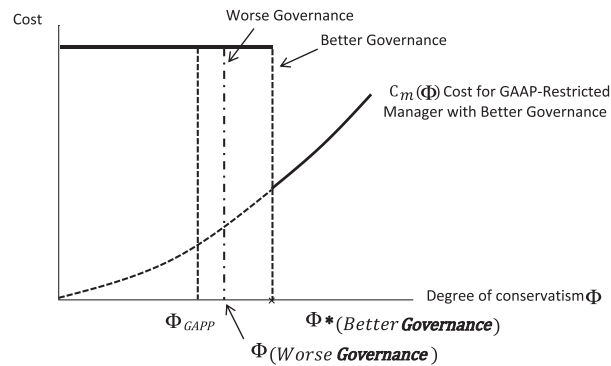


Figure 4d. Cost of conservatism for the manager under different governance settings.

minimum conservatism supplied by the manager can be increased by independent boards that uphold investor rights and would institute internal procedures to satisfy the investors' demand. These trade-offs are shown in Figs. 4b–d.

Some of the propositions that follow from this conceptualization are:

If GAAP reflects investor demand for conservatism, jurisdictions with stronger enforcement, stronger legal system, and a non-interfering political system will exhibit greater conservatism than other jurisdictions (Bushman and Piotroski, 2006).

Firms with institutional ownership will exhibit higher conservatism because institutional investors are better able than retail investors to impose their demand on managers (Ramalingegowda and Yu, 2012).

4. The use of multiple entity approach to conceptualize problems in accounting and auditing research: game theory

Although the conceptualization of many accounting issues using a single-entity perspective facing trade-offs is useful, it is often not appropriate in situations where the entity faces one or more strategic players who react to the actions of the entity. The trade-off/loss-function approach assumes implicitly that the entity is facing an uncertain environment where the probability distributions facing the entity are not affected by its actions. In contrast, in an environment with strategic players, each player will try to maximize its own self-interest and therefore, for different actions, there will be different reaction functions that determine the resulting equilibrium. In that sense, conceptualization using strategic games could be different and richer than conceptualization using the single-entity framework.

The concept of equilibrium that is most useful in conceptualization of accounting problems in the game-theoretic framework is that of Nash equilibrium. A Nash equilibrium is one in which no player has a unilateral incentive to seek out a different action. On the other hand, the Pareto-optimal solution is one in which it is not possible to improve the payoff of any one of the players without decreasing the payoff of another. The Nash equilibrium could be different from the Pareto-optimal solution. In other words, the players in Nash equilibrium could be better off using a different set of actions but by definition, no player has the incentive to unilaterally deviate from the Nash equilibrium strategy. Such Nash equilibrium would be a dysfunctional Nash equilibrium. A particular class of problems with dysfunctional Nash equilibrium is the Prisoner's dilemma illustrated in the payoff matrix between two players below. There are two parties A and B who cannot credibly communicate (meaning that even if they could communicate and arrive at an agreement to cooperate with each other, there is no ex-post enforcement mechanism to enforce the agreement. As a result, the agreement will be broken at will and such a break will be anticipated correctly by the other party) with each other and have to choose one of the two actions each – Cooperate (C) or Defect (D). The payoffs (Party A payoff, Party B payoff) are given in the corresponding cells of the Table. The notations are R: reward for mutual cooperation; T: Temptation payoff; S: Sucker's payoff; P: Punishment for mutual defection.

		Party B	
		Cooperate (C)	Defect (D)
Party A	Cooperate (C)	(R, R) = (3,3)	(S, T) = (0,5)
	Defect (D)	(T, S) = (5,0)	(P, P) = (1,1)

Consider the payoffs of the choices of Party A if Party B cooperates. A would prefer D over C because $T > R$ (i.e., he can get 5 by defecting, which is higher than the 3 he gets by cooperation). If Party B defects, then also A would prefer D over C because $P > S$ (i.e., he can get 1 by defecting, which is higher than the 0 he gets by cooperation). In this case, *irrespective of B's strategy*, A prefers to defect. This strategy choice is called *dominant strategy*. Because of symmetry, a similar logic applies to B who prefers to defect also. This results in Nash equilibrium (D, D). It is easy to see that the Pareto-optimal choice is (cooperate, cooperate), but that is not Nash equilibrium and will not be deployed. Even if this game is repeated and the two parties agree to alternate between (defect, cooperate) and (cooperate, defect) strategies, each will, on average, get a payoff of 2.5, which is still lower than the Pareto-optimal payoff. [Mixing two strategies using a pre-defined probability will make it a game that allows *randomized* strategies but I will limit this essay to *pure* strategies, because the motivation of the essay is to conceptualize, rather than develop sophisticated models.] Dysfunctional Nash equilibrium will prevail as long as two conditions are satisfied: $T > R > P > S$; $(T + S)/2 < R$. I reiterate that the Prisoner's dilemma is only one class of games where the dysfunctional Nash equilibrium exists and is dominant.

4.1. Implications of dysfunctional Nash equilibrium for accounting research

The first implication of the existence of dysfunctional Nash equilibrium in games is that the optimization carried out using the trade-off and loss functions in Section 1 might not be feasible. This observation goes to the heart of many arguments I have found in papers that implicitly or even explicitly assume that the empirical findings must represent the best strategies for the concerned parties. Unfortunately, this assertion is often incorrect.

The second implication concerns the role of regulation and standard setting. One way of understanding the role of regulation and standard setting (which clearly put restrictions on the workings of the free market) is that they could prevent some dysfunctional Nash equilibrium and thereby nudge the parties towards a Pareto-optimal solution.

I give below some examples of conceptualization using game theory.

4.2. Example: Conceptualization of the auditor–manager game using game theory

The details of the conceptualization of the reporting by managers and the resulting effort and investment that the auditor puts into the engagement at two levels of expected litigation cost are given in Appendix A. The investor is also a player but is not explicitly modeled here to keep the game simple. The investor is assumed to affect the payoff of the auditor through the credibility of financial statements. The manager is modeled as having two choices – reporting truthfully (Honest) or reporting with some manipulation (Dishonest), whereas the auditor has the choice of providing a low or high quality audit. In the auditor loss function modeling given earlier, higher auditor quality increased direct audit costs but decreased the expected loss from litigation and reputation loss that accompany an audit failure. However, if the manager is honest, there is no loss from litigation costs from a low quality audit, but there might be lower credibility for the investor, resulting in lower audit fees (through board negotiations). When the manager is dishonest, and the auditor provides a lower quality audit, there could be litigation costs as well. In other words, the auditor loss function depends on the manager's action and so, the auditor could implement different qualities depending on his expectation of the manager's actions – and the manager's actions could differ based on the manager's expectation of whether the auditor provides a high or low quality audit.

In this scenario, when litigation costs are low, the Nash equilibrium is obtained at (Dishonest reporting, Low quality audit) – which points to an implicit collusion between the manager and the auditor. The desired outcome is (Honest, High quality audit) but if the manager is honest, the auditor has an incentive to provide a low quality audit. Further, if the auditor provides a low quality audit, the manager has the incentive to be dishonest. In the example that is given, increasing the litigation cost removes the dysfunctional Nash equilibrium above but replaces it with (Dishonest, High quality audit). If the high quality audit “exposes” the dishonest manager, the manager’s payoff could be modeled as being less under when the manager is dishonest (In the southwest cell, the manager’s payoff could be 100) and this could make the Pareto-optimal solution (Honest, High quality audit) the only Nash equilibrium.

4.3. Example: Conceptualization of opportunistic earnings management as equilibrium in manager–investor game

Recall the argument made earlier in the Introduction that opportunistic earnings management might not be in the equilibrium solution if investors are rational and see through such manipulations by management. In that case, they discount the earnings report and the manager gains nothing by managing earnings – which inevitably leads to the conclusion that opportunistic earnings management requires behavioral deviation from economic rationality on the part of the investor. However, this logic ignores an important aspect of the game. The effort of the manager is not observable, and therefore, it is rational for the investor (principal) to transfer some risk in the output to the manager (agent). Moreover, the output is not observable to the investor but will be known to the manager. The investor could require the manager to report the output but constrain misreporting by an auditing-governance system. The report can be made completely truthful about the output only at an exorbitant cost of audit and governance. At normal governance and audit levels, the manager could manage earnings by reporting high earnings when the actual output is low and to the extent that the audit system does not correct it, the “managed” earnings will be in the final report to the investor. Under reasonable conditions given in Appendix B, it is seen that the equilibrium is reached when the manager manages income but puts in high effort and the investor provides incentive compensation. The two ways in which the investor can get truthful reporting are by (i) providing fixed compensation in which case, the manager does not mind telling the truth but has no incentive to deploy high effort; or (ii) employing a very costly monitoring procedure that ensures truth telling but has a very high deadweight cost. Neither of these solutions is palatable to the investor. The better solution is for the investor to provide incentive compensation that is increasing in the reported outcome and have a moderate governance and auditing system that constrains but does not eliminate earnings management. In equilibrium, the investor fully expects the manager to manage income but is still willing to use the managed income as the basis of incentive compensation. Note that this equilibrium holds even in multi-period settings as long as the effort in a period produces output only in that period and contingent contracts are not feasible. This conceptualization enables us to understand why we observe opportunistic earnings management even within rational modeling of both the manager and the investor.

4.4. Example: Conceptualization of the Analyst-Manager game to explain biases in analyst forecasts and recommendations

In the absence of strategic responses from managers of the firms that they cover, it would be rational for analysts to provide unbiased earning estimates and recommendations to investors. In such equilibrium, the accuracy of the analyst forecast will be normally high and the precision depends on the skill and effort levels of the analyst. However, there is considerable literature on analysts being optimistic or otherwise biased in their earnings forecasts and recommendations of the stock of the firms they cover (Lim, 2001; Das et al., 1998). The game tree given in Appendix C provides the rationale for the bias in analyst forecasts. Consider the case where the prior information on the firm is bad in that it is facing some financial difficulties. The analyst has the choice of being truthful and making a sell recommendation on this stock as well as giving a downbeat prediction of earnings. Alternatively, the analyst could present a rosier

picture than deserved by the firm and not give a sell recommendation. In the former case, the manager is likely to be ruffled because of the increased probability of the firm going bankrupt and thereby wasting the non-diversifiable human capital that the manager has put into the firm. The consequence to the analyst is likely to be reduced access to the manager's and firm's closely held information. On the other hand, if the analyst produces an optimistic forecast, the access to future information is not reduced. This makes it likely that the analyst will choose the latter course and produce an optimistic report. The investor will rationally anticipate this optimism and is not hurt much because he will trim the recommendation of the analyst. In the case where there is no financial difficulty for the firm, the dynamics are different. An optimistic forecast will make it difficult for the manager to beat the estimate and thereby try to maximize his incentive compensation. A non-optimistic forecast will make the process of beating the estimate a little easier for the manager. Therefore, one could expect a rational analyst to provide a non-optimistic forecast for firms that are doing well.

5. Conclusions

This essay has provided two ways of conceptualizing several accounting and audit research problems. The first one is the single-entity approach in which the problem is conceptualized as a trade-off between different costs or the maximization of costs and benefits when the world outside the entity in question is modeled as non-strategic but uncertain. This is a reasonable model if the entity operates in relative isolation or if the environment consists of a large number of players each one of whom has little ability to control the reaction to the actions of the entity. A competitive market is a good example of such an environment. However, in most cases that we encounter in accounting and auditing research, this assumption is not satisfied. There are other entities that are strategic and their reaction is driven by their own self-interest and therefore cannot be modeled as random. In these cases, game theory provides a good framework for conceptualization of the problems. I have provided some examples of conceptualization using these frameworks.

In conclusion, it is my hope that this essay contributes in a small measure to transforming the nature of accounting and auditing research undertaken by Ph.D. students and several younger colleagues. In particular, I hope that the extreme focus on econometrics and statistical reasoning is balanced by a greater conceptualization of the issues in a way that allows the researcher to better interpret and understand empirical results.

Dedication and Acknowledgements

I dedicate this essay to my mentors and fellow students during and after my Ph.D. program in Columbia University in the 1980's in shaping and molding my thinking, in particular to Profs. Joshua Ronen, Kashi Balachandran and Miklos Vasarhelyi for providing intellectual stimuli during that time and to Prof. Ferdinand Gul for sharing his extraordinary insights into empirical research in accounting and auditing with me during the last decade. I acknowledge Dr. Chandra Subramaniam at UTA for his constructive comments on the essay. For the preparation of this paper, I thank the help of my graduate assistants, Yvonne and Wei.

Appendix A.

Auditor–manager. game

Auditors can provide a high quality audit (with cost) or a low quality audit (no cost).

Managers can be completely honest or engage in income manipulation (dishonest).

When the audit quality is low, manager's compensation might be lower because there is less credibility in the manager.

Auditor's payoff = Audit fees – Audit cost.

Manager's payoff = Expected compensation + Expropriation. Now, consider the following payoff matrix. The payoffs in cells are (manager's payoff, auditor's payoff).

		Auditor	
		High Quality Audit (HQA)	Low Quality Audit(LQA)
Manager	Honest (H)	(100,10)	(80,15)
	Dishonest (D)	(100,0)	(90,10)

Cell (H, HQA): This payoff matrix is based on the following assumption when the manager is honest and the auditor provides a high quality audit, manager's compensation is \$100, and the auditor incurs the normal audit cost \$5 and gets a fee \$15. His payoff is $\$15 - \$5 = \$10$.

Cell (D, HQA): When the manager is dishonest but the auditor provides a high quality audit, the manager's report is corrected and he receives the same compensation of \$100. (It could be more because of residual expropriation but I choose to ignore it) The auditor has to put in additional effort to identify the managed amounts and revise the report. His cost increases to \$15 and the payoff = $\$15 - \$15 = \$0$.

Cell (H, LQA): The manager is honest but the auditor provides a low quality audit and the decreased credibility in the report reduces the manager's compensation to \$80. The auditor incurs no cost and gets a fee of \$15. His payoff is \$15.

Cell (D, LQA): The manager is dishonest and expropriates an amount of \$10 in addition to the compensation of \$80. The manager's payoff = \$90. The auditor gets his fee of \$15, but suffers an expected litigation cost of \$5. His payoff = \$10.

Analysis: This is a prisoner's dilemma case.

If the manager is honest, the auditor gets a higher payoff of \$15 by providing LQA ($\$15 > \10). If the manager is dishonest, the auditor gets a higher payoff of \$10 by providing LQA ($\$10 > \0). Irrespective of the manager's action, the auditor is better off with LQA.

If the auditor provides HQA, the manager is indifferent between being honest and dishonest (gets \$100 in both cases).

If the auditor provides LQA, the manager is better off being dishonest (gets \$90 instead of \$80). Irrespective of the auditor's action, the manager is better off being dishonest. Therefore, the equilibrium in this period game is (Dishonest, LQA). The preferred outcome is (Honest, HQA).

If the expected litigation cost for the auditor providing LQA = \$18 (say) [Any number ≥ 15]. The payoff matrix will be changed to the following:

		Auditor	
		High Quality Audit (HQA)	Low Quality Audit(LQA)
Manager	Honest (H)	(100,10)	(80,15)
	Dishonest (D)	(100,0)	(90,-3)

We have assumed that the litigation cost = 0 if the manager is honest or if the auditor supplied a high quality audit. Only in the case of (Dishonest, LQA), auditor payoff = $\$15(\text{auditor fee}) - \$18(\text{litigation cost}) = -\3 .

In this case, the manager's equilibrium action is not changed. If the manager is dishonest, however, the auditor anticipates this and given that the manager's action is dishonest, the auditor's optimal response is HQA. The equilibrium in this game would change to (Dishonest, HQA).

The conceptualization is different from the earlier loss function conceptualization in that the auditor's loss depends on the manager's action which is not random.

Appendix B.

Investor. – manager game – earnings management

In this example, I model the interaction between investors and managers as a one-period principal-agent game. The description of the game follows.

Description. of the game

We model a risk-neutral manager who engages in a productive effort that can take two values: High and Low. The effort itself is not observable. The output of the agency is valuable to the investor who is also risk neutral. The output is uncertain and can take two values: x_h and x_L where $x_h > x_L$. The probability of getting the high output x_h is higher with high effort. I denote the probability of high output conditional on high effort as p_h and the probability of getting high output conditional on low effort as p_L , i.e., $\text{Prob}(x_h|\text{High effort}) = p_h$ and $\text{Prob}(x_h|\text{Low effort}) = p_L$. Correspondingly, $\text{Prob}(x_L|\text{High effort}) = 1 - p_h$ and $\text{Prob}(x_L|\text{Low effort}) = 1 - p_L$.

The output is privately observable to the manager but is not observable to the investor. The investor engages a third-party auditor to verify the reported outcome. The manager reports the outcome to the auditor who verifies it and presents the final report (after revision if the audit reveals a wrong report) to the investor. The auditor can be asked by the investor to apply an intensive audit which is very costly (the audit is denoted as HIGH and its cost is denoted as A_H) that will ensure that the manager's report is always corrected (100% success rate for the audit) to the actual output. With this audit, the investor always gets an accurate report of the output. Alternatively, the investor can ask the auditor to apply a moderate audit denoted as LOW with a much lower cost denoted by A_L and a success rate of p , i.e., it detects wrong reports with a probability p and corrects them before sending them to the investor. There is a probability of $(1 - p)$ where the manager can get away reporting the high output when the output is low.

The investor compensates the manager either by a share of the output s , i.e., the compensation = $s * \text{Final report by the auditor}$ (called INCENTIVE COMPENSATION) or by a fixed amount K (called FIXED COMPENSATION). In either case, the expected compensation should cover the reservation wages of the agent (which is the same as K).

The manager incurs a cost (disutility of effort) of V if he supplies the HIGH effort but no cost if he supplies the LOW effort.

The payoff table and the equilibrium

The payoff table given here shows the payoff s to the investor and manager under different choices. We make the following assumptions on the values of the variables:

$A_H \gg A_L$. Moreover, A_H is too costly to implement for the investor. Therefore, the AUDIT = HIGH rows in the table are dominated by the AUDIT = LOW rows.

For ease of presentation, I denote the expected outputs as follows:

The expected output with high effort = $O_H = P_h X_h + (1 - P_h) X_L$

The expected output with low effort = $O_L = P_L X_h + (1 - P_L) X_L$

If fixed compensation is given, it is clear that the manager prefers K over $K - V$ and therefore chooses low effort. This will produce an output $O_L < O_H$ and the investor will have a payoff of $O_L - K - A_L$. On the other hand, if incentive compensation is given, the manager will work for this agency and choose HIGH effort over LOW effort if the following conditions are satisfied:

$1 \geq s \geq \frac{V}{p(x_h - x_L)(p_h - p_L)}$ The first part of this condition will make the sharing possible. The second part is the incentive compatibility condition that will make the manager prefer HIGH effort over LOW effort.

$s \geq \frac{k+V}{p(x_h - x_L)(1 - p_L)}$ This individual rationality constraint will make the manager's expected payoff equal to his reservation utility K .

When these conditions are satisfied, the equilibrium is where the manager puts in high effort and manages the earnings report and the audit technology allows some earnings management to go undetected and uncorrected. Because of condition (ii), the manager is at least weakly better off with the incentive compensation and because of condition (i), the manager prefers to put in high effort instead of low effort in spite of the higher cost of doing so. The investor benefits by higher outcome that he can retain.

I note that the investor benefits from higher effort because of two reasons: (i) $x_h > x_L$; (ii) $p_h > p_L$. The higher the differential between high and low outputs and the higher the differential between high and low efforts in determining the probability of higher output, the greater is the incentive for the investor to induce higher effort. From condition (i), these two reasons can reduce the minimum value of s . Because the audit is not always successful, the manager exploits the system to manage earnings. However, from condition (ii), note that if p is low, the reservation utility of the agent can be satisfied by a low s because the manager rationally expects to manage earnings, “mislead” the investor and earn higher compensation. The investor, on the other hand, rationally expects the manager to engage in such behavior and correspondingly can reduce s and still expect the manager to work for the firm.

I also caution here that this is a highly stylized and simplified model and should not be mistaken to be a comprehensive model for explaining earnings management. I have assumed a risk-neutral manager which, technically, should result in an optimal solution where the investor rents out the facility to the manager and the manager implements the first best solution. I have also reduced the problem to simple binary values of effort, output, and audit technology. Yet, it captures the intuition that information asymmetry about the outcome forces the investor to tolerate earnings management in order to reduce moral hazard and motivate a higher effort on the part of the manager.

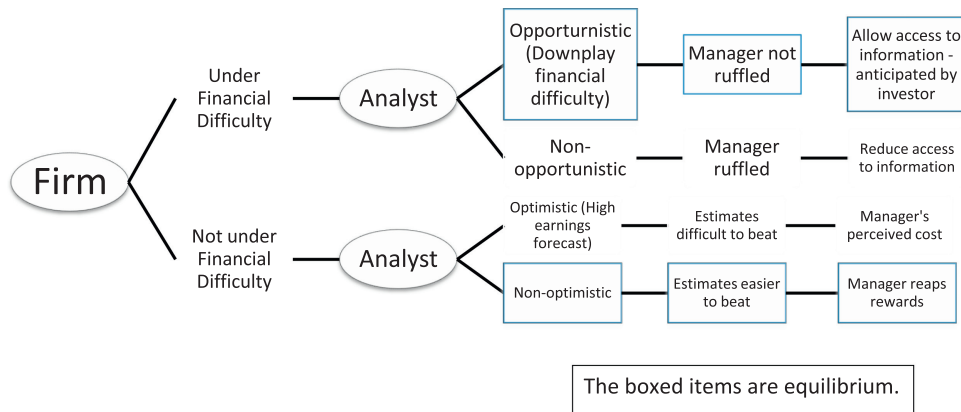
Equilibrium is the boxed square in the table. Investor provides incentive compensation. Manager chooses high effort but manages earnings.

PAYOFF Table.

Each cell contains [Expected Payoff of Investor, Expected Payoff of Manager]					
Investor \ Manager		Effort = High		Effort = Low	
		Reports to Auditor Truthfully	Reports to Auditor Managed Earnings X_h	Reports to Auditor Truthfully	Reports to Auditor Managed Earnings X_h
Audit : HIGH Audit Cost = A_H Audit Success Rate = 100%	Incentive Compensation	$[(1-s) O_H - A_H, sO_H - V]$	$[(1-s) O_H - A_H, sO_H - V]$	$[(1-s) O_L - A_H, sO_L]$	$[(1-s) O_L - A_H, sO_L]$
	Fixed Compensation	$[O_H - A_H - K, K - V]$	$[O_H - A_H - K, K - V]$	$[O_L - A_H - K, K]$	$[O_L - A_H - K, K]$
Audit : Low Audit Cost = A_L Audit Success Rate = p	Incentive Compensation	$[(1-s) O_H - A_L, sO_H - V]$	$[(1-s) O_H - s(1-P_h)(1-p)(X_h - X_L) - A_L, sO_H + s(1-P_h)(1-p)(X_h - X_L) - V]$	$[(1-s) O_L - A_L, sO_L]$	$[(1-s) O_L - s(1-P_L)(1-p)(X_h - X_L) - A_L, sO_L + s(1-P_L)(1-p)(X_h - X_L)]$
	Fixed Compensation	$[O_H - A_H - K, K - V]$	$[O_H - A_L - K, K - V]$	$[O_L - A_L - K, K]$	$[O_L - A_L - K, K]$

Note: $O_H = P_h X_h + (1 - P_h) X_L$; $O_L = P_L X_h + (1 - P_L) X_L$

Appendix C.



References

- Ball, R., Brown, P., 1968. An empirical evaluation of accounting income numbers. *Journal of Accounting Research* 6 (2), 159–177.
- Basu, S., 1997. The conservatism principle and the asymmetric timeliness of earnings. *Journal of Accounting & Economics* 24 (1), 3.
- Bushman, R.M., Piotroski, J.D., 2006. Financial reporting incentives for conservative accounting: The influence of legal and political institutions. *Journal of Accounting and Economics* 42 (1–2), 107–148.
- Churchman, W., 1961. *Prediction and optimal decision: philosophical issues of a science of values*. Prentice Hall, Englewood-Cliffs, New Jersey.
- Das, S., Levine, C.B., Sivaramakrishnan, K., 1998. Earnings predictability and bias in analysts' earnings forecasts. *The Accounting Review* 73 (2), 277–294.
- Dawkins, R., 2009. *The Greatest Show on Earth*. Bantam Press, U.K.
- Dickhaut, J., Basu, S., McCabe, K., Waymire, G., 2010. Neuroaccounting: consilience between the biologically evolved brain and culturally evolved accounting principles. *Accounting Horizons* 24 (2), 221–255.
- Ghoshal, S., 2005. Bad management theories are destroying good management practices. *Academy of Management Learning and Education* 4 (1), 75–91.
- Johnstone, D.J., 2013. The CAPM debate and the logic and philosophy of finance. *Abacus* 49, 1–6.
- Lim, T., 2001. Rationality and analysts' forecast bias. *The Journal of Finance* 56 (1), 369–385.
- Ramalingegowda, S., Yu, Y., 2012. Institutional ownership and conservatism. *Journal of Accounting and Economics* 53 (1–2), 98–114.
- Ronen, J., 2012. The state of accounting research: objectives and implementation. *Asia-Pacific Journal of Accounting and Economics* 19 (1), 3–11.
- Skinner, D.J., 1994. Why firms voluntarily disclose bad news. *Journal of Accounting Research* 32 (1), 38–60.
- Sloan, R.G., 1996. Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71 (3), 289.
- Watts, R.L., 2003a. Conservatism in accounting part I: explanations and implications. *Accounting Horizons* 17 (3), 207.
- Watts, R.L., 2003b. Conservatism in accounting part II: evidence and research opportunities. *Accounting Horizons* 17 (4), 287.
- Waymire, G.B., Basu, S., 2007. Introduction: Why Accounting History Research is Valuable: Now Publishers, pp. 1–6 (Chapter 1).
- Ye, M., Simunic, D.A., 2012. The Economics of Setting Auditing Standards, Forthcoming. SSRN: <<http://www.ssrn.com/abstract=1815707>>. *Contemporary Accounting Research*.



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Determinants of human resource investment in internal controls

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ABSTRACT

Using the unique reporting environment in Korea, this study investigates the determinants of human resource investment in internal controls for 1352 listed firms disclosing the number of personnel who are in charge of internal control-related tasks (IC personnel) from 2005 to 2008. We find that the number of IC personnel within a firm and several key departments increase with firm size, number of employees, complexity and for Chaebols, and decrease in rapidly growing firms. Additional analysis reveals that the factors influencing internal control systems have an accentuated effect on firms with relatively larger firm size.

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1. Introduction

In this study, we examine the determinants of human resource investment in internal controls. Internal control systems, which are vital to the continual existence of a firm, consist of measures implemented by a firm aimed at achieving purposes that include, but not limited to, safeguarding of assets and resources, deterring and detecting errors and fraud, ensuring accuracy and completeness of accounting data, and producing reliable and relevant financial information. Among the procedures and policies for internal control systems, internal controls over financial reporting are defined as a process designed to “provide reasonable assurance

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regarding the reliability of financial reporting and the preparation of financial statements for external purposes” (Public Company Accounting Oversight Board (PCAOB), 2004).¹ A good control environment has the potential to enhance the quality of financial reports, and thus, is considered an important feature of a firm (Ashbaugh-Skaife et al., 2008).

In an effort to improve the reliability of financial reporting, the US Congress enacted the Sarbanes–Oxley Act (SOX) in 2002 to improve firms’ financial reporting practice. Section 302 of SOX requires management to indicate any significant changes in internal controls, while Section 404 of SOX enforces firms to assess the design and operating effectiveness, and auditors to certify the effectiveness of internal controls over financial reporting (Securities and Exchange Commission, 2002, 2003). In response to the wave of financial reporting reforms, Korea also adopted several new regulations. First, the “Act on External Audit of Stock Companies” (the “External Audit Act”), which includes the regulation on the mandatory audit for the firms over a certain size, was significantly amended to improve the financial reporting environment in Korea. Specifically, the Act requires CEOs and CFOs of a firm to oversee and report on the operation and effectiveness of the internal control system to the board of directors. It also requires external auditors to evaluate the assessment by management on the internal control system and express their review opinion on the system. Importantly, the Financial Supervisory Service (the equivalent of the Securities and Exchange Commission in the US) issued a guideline in 2002 which requires every listed firm to disclose its total number of personnel who are in charge of internal control-related tasks (hereafter IC personnel) and the number of IC personnel by department. The requirement is the first in the world with no other countries having adopted a similar disclosure requirement. We use a hand-collected sample of Korean companies that disclosed the number of IC personnel from 2005 to 2008 to investigate factors which affect the human resource investment in internal controls. We define the number of IC personnel as a proxy for the investment in the internal control system.

Our results indicate that firms with a relatively high number of IC personnel are positively associated with (1) firm size, measured by the natural logarithm of total assets; (2) the number of employees, measured by the natural logarithm of the number of employees; (3) financial reporting complexity, as measured by assets denominated in foreign currencies deflated by total assets; and (4) whether a firm is a Chaebol firm or not.² However, the number of IC personnel is negatively associated with firm growth, measured by sales growth from year $t - 1$ to t . Furthermore, such relations are found to be pronounced among larger firms. These firm characteristics incentivize management to build and maintain a strong internal control system by securing sufficient IC personnel, which reduce problems related to the segregation of duties, inadequate staffing and supervision problems.

Since the implementation of Sections 302 and 404, there are a large number of studies investigating the area of internal controls. One line of studies on internal controls documents the positive reporting effects of high quality internal control systems. Doyle et al. (2007b) and Ashbaugh-Skaife et al. (2008) suggest that effective internal controls, measured by the non-existence of internal control weaknesses, increase financial reporting quality, proxied by accruals quality and the size of abnormal accruals, respectively. Furthermore, Ashbaugh-Skaife et al. (2009) find that adequate internal controls reduce information risk, thus lowering the cost of equity. Similar results are reported using the data on IC personnel in Korea. Choi et al. (2013) find that the proportion of IC personnel within the firm is negatively associated with the likelihood that the firm has internal control weaknesses. Lee et al. (2010) investigate the relation between IC personnel and audit fees and suggest that the high quality audit demanded by companies with larger investments in internal controls leads to higher audit fees.

Related to this study, prior research has identified the determinants of internal control weaknesses, arguing that firms with material weaknesses tend to be less profitable, smaller, younger, more complex, growing rapidly or undergoing restructuring (e.g., Ge and McVay, 2005; Krishnan, 2005; Ashbaugh-Skaife et al., 2007;

¹ Specifically, the objective of the policies and procedures related to internal controls of a company are threefold: it aims “(1) to maintain records that accurately and fairly reflect the transactions and dispositions of the assets of the company, (2) to provide reasonable assurance that transactions are recorded in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) to provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the company’s assets that could have a material effect on the financial statements” (PCAOB, 2004).

² Business conglomerates (group of firms) owned by founding families are called Chaebols in Korea. Chaebol firms dominate the Korean economy (Kim and Yi, 2006; Kwon et al., 2012; Lee et al., 2012).

Doyle et al., 2007a). Our general findings about firms which heavily invest in increasing IC personnel, discussed above, complement and corroborate the findings of prior studies. We differ from prior literature in that we investigate the drivers for relatively high investment in human resource in internal controls, rather than the determinants of firms with material weaknesses. In so doing, we provide insight on the type of corporate environment that induces firms to make investments in information systems and internal controls. The investment in IC personnel eventually influences the strength of internal controls (Choi et al., 2013). In this respect, we believe that the results based on a unique reporting requirement in Korea offer valuable implications to stand-setters, practitioners and academics around the world.

The remainder of this paper is structured as follows. In Section 2, we discuss the institutional background in Korea and review prior literature. We develop research hypotheses in Section 3. In Section 4, we discuss our research design and specify our empirical models. Section 5 describes our sample and presents descriptive statistics. In Section 6, we present our empirical results and perform an additional test. Finally, Section 7 sets forth our conclusions.

2. The regulatory environment in Korea and relevant literature

2.1. Regulatory background in Korea

Before the adoption of International Financial Reporting Standards (IFRS) in 2011, Korea used a set of accounting standards known as K-GAAP (Korean Generally Accepted Accounting Principles), which is similar to U.S. GAAP (Generally Accepted Accounting Principles). The convergence efforts led Korea to adopt IFRS beginning in 2011 and allow early adoption of IFRS from 2009. While the regulations and standards in Korea closely resemble those in developed countries, the enforcement system is not as strong (Choi et al., 2013). A distinctive feature of the Korean economy is that the influence of Chaebols, which are Korean business conglomerates, is substantial (Kim and Yi, 2006; Kwon et al., 2012; Lee et al., 2012). Total assets of the 200 largest companies, most of which are Chaebols, in Korea increased from 84.1% to 101.2% of Gross Domestic Product, and sales increased from 70.5% to 86.5% over the decade from 1991 to 2001 (Solidarity for Economic Reform, 2010). Given the important role of Chaebols in Korea, their survival is vital for the continued growth of the Korean economy.

Before the passage of SOX, the regulations on internal controls of firms were virtually non-existent in Korea (Kim et al., 2007; Kim, 2009; Choi et al., 2013). In response to the series of worldwide corporate scandals in 2002, the Financial Supervisory Service announced action plans to improve transparency of the accounting standards and systems in Korea. A series of plans was mandated into law and is referred to as K-SOX (Choi et al., 2013). Similar to SOX, the reform requires certification by CEOs and CFOs of the reliability of the financial reports, a mandatory rotation of auditors every 6 years and prohibits provision of certain non-audit services by incumbent auditors. It also enacted a Securities Class Action Suit Law, which increases the legal liability of firms, management and auditors with respect to financial reporting. Additionally, the plan enhanced the transparency of internal control systems by strengthening the unclear set of regulations that existed on internal control systems (Shin, 2007).

The first wave of changes in regulations was implemented through amendments in the “External Audit Act”. It governs the rules on external auditing and was amended in December 2003 to include regulations on internal control systems. Specifically, Article 2-2 of the External Audit Act requires that any company with total assets over 7 billion Korean Won (approximately US\$6 million) maintain rules and procedures on internal controls and implement adequate internal control systems. It sets forth the responsibilities of CEOs and CFOs to create and oversee their firm’s internal control system and designates one of the directors to be in charge of the operation of the internal control system. This designated director is required to report on the operation of the internal control system to the board of directors and the statutory auditor or an audit committee on a semi-annual basis.³ The statutory auditor or an audit committee should evaluate the effectiveness

³ The role of a statutory auditor in Korea is to supervise the board of directors. It is required for large public companies of which total assets are over 2 trillion Korean Won (\$1.7 billion) to create an audit committee. The rule states that a public company can have either at least one full-time statutory auditor or an audit committee comprised of at least three board members.

of the internal control system and report his evaluation to the board of directors annually (Kim et al., 2007; Shin, 2007; Kim, 2009; Choi et al., 2013).

Article 2-3 of the External Audit Act defines the responsibilities of external auditors related to internal controls. External auditors are required to evaluate management's report on the assessment of internal controls and express their review opinions. The difference between SOX Section 404 and related K-SOX regulation in article 2-3 of the External Audit Act is that Section 404(b) requires auditors' attestation while the Korean counterpart requires auditors' review opinion, which provides a lower level of assurance than an audit (Kim et al., 2007; Shin, 2007; Kim, 2009; Choi et al., 2013).

Secondly, the Operating Committee of Internal Control over Financial Reporting in Korea, which is a committee of the Korea Listed Companies Association, issued the Best Practice Guideline for Internal Control over Financial Reporting (the "Guideline") in June 2005 to reform the accounting system in Korea. The guideline, which is similar to the U.S. Committee of Sponsoring Organization's (COSO, 1992) framework, 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., 2013). Accordingly, in 2005, the Korean Institute of Certified Public Accountants issued the "Standard of Review of Internal Control Systems", which is similar to PCAOB's (2004) Auditing Standard No. 2 in the US, although the level of assurance is slightly lower in Korea (Choi et al., 2013).

The Financial Supervisory Service issued guidelines in 2002 on disclosures related to internal control systems which require every listed firm to report its total number of IC personnel and the number of IC personnel by department (accounting department, audit committee, board of directors, finance department, information technology and system (ITS) and "other"⁴ departments). Additionally, the guidelines mandate the disclosure of the number of certified public accountants (CPAs) in each department and the average length of experience of the IC personnel. These data are disclosed in the "Report on the operation of internal control systems" as a part of a firm's annual report and an example of the disclosure on IC personnel is presented in the Appendix for reference. Overall, regulations on internal controls in Korea are similar to those in the US although the level of enforcement may be slightly weaker.

2.2. Prior literature

After the data on internal controls became available upon the enactment of Sections 302 and 404 of SOX, voluminous studies on internal controls have emerged. One strand of research investigates the effect of internal control weaknesses on the capital market. Beneish et al. (2008) and Ogneva et al. (2007) document the adverse stock price reaction to the disclosure of internal control weaknesses. Additionally, Hammersley et al. (2008) report that the adverse consequences of disclosure of material weaknesses depend on the severity of internal control weaknesses.

Another strand of research investigates whether the quality of internal controls affects financial reporting quality. Doyle et al. (2007b) document a negative relationship between accruals quality and ICWs filed under Section 302. Ashbaugh-Skaife et al. (2008) suggest that earnings quality improves following the remediation of internal control weaknesses reported under both Sections 302 and 404. Korean studies by Shin (2007) and Lee et al. (2007) report similar findings. Furthermore, Feng et al. (2009) examine the relation between internal controls and the accuracy of management guidance and conclude that internal control quality leads to fewer errors in internal management reports. Other studies argue that internal control systems can be influenced by the monitoring mechanisms in place, such as an independent board of directors or audit effort (Krishnan, 2005; Hogan and Wilkins, 2008), with weak monitoring mechanisms resulting in internal control weaknesses.

There are two studies which use the data on IC personnel in Korea. Choi et al. (2013) investigate the effect of the quality of internal control systems on internal control weaknesses and show that the proportion of IC personnel is inversely related to the existence of internal control weaknesses, both at the firm and department levels. This finding is in line with Ge and McVay (2005), who conclude that poor internal controls can be attributed to the lack of qualified accounting personnel. The second study that uses the IC personnel data

⁴ "Other" pertains to the different departments that are related to internal control tasks, not all other departments existing in the firm.

is Lee et al. (2010) who focus on the effect of internal control quality on audit fees. They document a positive relationship between IC personnel and audit fees. The findings suggest that firms with a higher number of IC personnel require a more thorough audit. As a result, auditors increase their effort level (i.e., increase audit hours), which is reflected in higher audit fees.

The strand of literature for which our work is relevant is the literature that identifies the determinants of internal control weaknesses. Using data from the pre-SOX period, Krishnan (2005) examines internal control deficiencies, which consist of both significant deficiencies and those not classified as material weaknesses, for the period 1994–2000. She investigates the characteristics of material weakness firms, focusing on the effect of the quality of monitoring systems (e.g., board of directors, audit committees) on internal control weaknesses. Ge and McVay (2005) document that firms with material weaknesses are relatively more complex, smaller and less profitable, compared to firms without material weaknesses. Doyle et al. (2007a) find results similar to those in Ge and McVay (2005) but include additional variables such as firm age, extreme sales growth and restructuring charge. Doyle et al. (2007a) add to the literature by suggesting that firms disclosing material weaknesses tend to be younger, growth firms and undergoing restructuring. Ashbaugh-Skaife et al. (2007) partially confirm the findings in Doyle et al. (2007a) by documenting that firms with internal control weaknesses are more complex and add that such firms have recent changes in organizational structure, more accounting risk exposure, and fewer resources to invest in internal controls.

This paper corroborates prior findings in this line of literature by analyzing the types of firms that hire sufficient personnel in internal control-related departments. Firms with a relatively high number of IC personnel are likely to have fewer deficiencies in the financial reporting process, segregation of duties problems and inappropriate account reconciliation caused by the lack of qualified accounting personnel (Choi et al., 2013). Compared with most prior studies, we present a much more balanced analysis on the characteristics of firms with varying levels of internal control strength because the data used in this study allows us to make comparisons across all companies regardless of whether or not they report an internal control weakness. In contrast, most prior studies focus on the difference between firms with internal control weaknesses and other firms without weaknesses, thereby treating all firms not reporting internal control weaknesses (more than 95% in most analyses) as being equal.⁵ Thus, the results of our study offer a more general picture of the types of firms that strive for high quality internal control systems.

3. Hypotheses development

In this section, we investigate the specific characteristics that are associated with firms that have a relatively high number of IC personnel. Based on the guidance and results from prior research, we explore eight aspects: size, business complexity, age, financial distress, growth, business group, corporate governance and the type of exchange market. We present predictions on the directional relationships between IC personnel and factors that determine IC personnel in Table 1.

Firstly, literature shows conflicting evidence on the effect of size on internal control quality. Krishnan (2005) finds a negative relationship between firm size and quality of controls. In contrast, studies investigating the factors that are important in determining the likelihood that a firm will disclose an internal control deficiency generally find a positive association between firm size and the quality of internal controls (Ge and McVay, 2005; Ashbaugh-Skaife et al., 2007; Doyle et al., 2007a). Though the evidence is mixed, intuition suggests that large firms have the resources to invest in hiring more qualified internal control personnel which will ensure adequate policies and procedures to be in place. Beasley, (1996), who focus on the cases of financial statement fraud, document a negative relationship between firm size and incidence of fraud. Thus, we expect to find higher quality internal controls for larger firms. We measure size by the natural logarithm of total assets (*LNASSET*) and the natural logarithm of the number of employees within a firm (*LNEMP*).

Another factor that likely determines IC personnel is complexity of the firm. Firms with complex operations and transactions are more likely to experience internal control problems (Ashbaugh-Skaife et al.,

⁵ By focusing on the number of IC personnel, we can look into the firms without internal control weaknesses and infer how strong the internal control system of these firms is. In this respect, we believe that our analyses provide valuable insights over the findings in prior studies.

Table 1
Variable definitions and expected relationships with IC personnel.

Variable	Predicted sign	Definition
<i>LNASSET</i>	+	The natural logarithm of total assets
<i>LNEMP</i>	+	The natural logarithm of one plus the number of employees within the firm
<i>RD</i>	+	R&D expenses deflated by sales in year <i>t</i>
<i>EXPORT</i>	+	Exports/sales in year <i>t</i>
<i>FOR_CURR</i>	+	Assets denominated in foreign currencies/total assets in year <i>t</i>
<i>LNPROD</i>	+	The natural logarithm of one plus the number of products the firm produces
<i>INV_AR</i>	+	Inventory plus accounts receivable divided by total assets in year <i>t</i>
<i>LNAGE</i>	+	The natural logarithm of one plus the age of the firm in years from the date of establishment
<i>LEVERAGE</i>	–	Total liabilities in year <i>t</i> divided by total assets in year <i>t</i>
<i>ZSCORE</i>	–	Decile rank of Altman's (1968) z-score
<i>LOSS</i>	–	Indicator variable that takes the value of one if the firm reports a loss for the year, and zero otherwise
<i>GROWTH</i>	–	Change in sales deflated by total assets in year <i>t</i> – 1
<i>CHAEBOL</i>	+	Indicator variable that takes the value of one if the firm is affiliated with a business group, Chaebol
<i>LARGEST</i>	±	The natural logarithm of one plus the ownership of the largest shareholder
<i>FOROWN</i>	±	The natural logarithm of one plus the ownership of foreign investors
<i>KOSDAQ</i>	±	Indicator variable that takes the value of one if the firm is listed on KOSDAQ, and zero otherwise

This table provides a summary of the variable measurements and each of our directional predictions.

2007). We posit that firms with greater complexity and diverse operations have a higher demand for effective internal control systems to prevent deficiencies in internal controls. For example, a multinational firm which has branches in various locations is affected by the different legal and institutional environments in each country, making it more difficult to structure adequate internal control systems. Also, firms with many distinct product lines, relative to firms with a single product line, need to implement policies and procedures separately for each product line, thus affecting effective internal controls. In summary, we conjecture that firms with high levels of complexity will heavily invest in their internal control systems. We measure complexity using five proxies including *RD*, defined as research and development expenses deflated by sales in year *t*; *EXPORT*, defined as the ratio of exports to total sales in year *t*; *FOR_CURR*, defined as assets denominated in foreign currencies divided by total assets in year *t*; *LNPROD*, defined as the natural logarithm of one plus the number of products the firm produces; and *INV_AR*, defined as the sum of inventory and accounts receivables divided by total assets in year *t*.⁶

Thirdly, the experience of a firm may be associated with the effectiveness of its internal control system. Older firms are likely to have more established processes and procedures in place due to longer experience. Prior studies suggest that firms reporting material weaknesses tend to be younger (Ge and McVay, 2005; Doyle et al., 2007a). In connection to the number of IC personnel, it is likely that older firms have established adequate controls in place and are staffed with experienced accounting personnel who are capable of achieving effective internal control systems, thus reducing the need for a higher number of IC personnel. Age is measured by the natural logarithm of one plus the age of the firm in years from the date of establishment (*LNAGE*). We predict a positive sign for *LNAGE*.

The fourth determinant of IC personnel is a firms' financial health. The ability to establish proper internal control systems may be affected by the performance of firms. Krishnan (2005) argues that poorly performing firms may not be able to invest in adequate internal control systems and reports results consistent with this argument. Relatedly, Ge and McVay (2005) find firm profitability to be inversely related to firm disclosure of material weaknesses. Doyle et al. (2007a) confirm the findings in Ge and McVay (2005) and report that two financial resources measures, the existence of a loss and bankruptcy risk, are positively related to reporting an internal control problem. Based on prior findings, we argue that financial distress prevents firms from investing in effective internal control systems. Consequently, the lack of sufficient time and money in building

⁶ These variables are frequently used in prior studies to represent firm complexity (e.g., Ashbaugh-Skaife et al., 2007; Choi et al., 2008, 2013).

proper controls decreases the number of IC personnel. We measure financial distress using three measures, *LEVERAGE* (total liabilities in year t divided by total assets in year t), *ZSCORE* (Decile rank of Altman's (1968) z-score) and *LOSS* (whether or not a firm reports a loss for the year). We expect these proxies for financial distress to be negatively related to the number of IC personnel.

Fifth, Krishnan (2005) and Doyle et al. (2007a) suggest that firms growing too rapidly may outgrow their existing internal control systems, and thus require additional time and investment to reorganize and revamp the internal control systems in place. Improvement in internal control systems requires implementation of new processes, new technology, and most importantly, new personnel. It is likely that rapidly developing firms lack such resources, and thus have a small internal control department. In this study, growth of a firm is measured by changes in sales deflated by total assets in year $t - 1$ (*GROWTH*).

Sixth, in Korea, a large number of public and private firms are affiliated with business conglomerates, known as Chaebols, in which founding families have full control over affiliated companies (Kim and Yi, 2006; Kwon et al., 2012; Lee et al., 2012). Chaebols are a major determinant of the Korean economy and their influence on Korean society is significant (Chang and Hong, 2000; Joh, 2003). One stream of literature focuses on corporate governance and intra-group transactions within Chaebol-affiliated firms. For example, Kim and Yi (2006) raise the possibility that business group affiliation engenders severe agency problems. The complex structure of business groups makes it difficult for outsiders to monitor self-dealing transactions, and thus Chaebol-affiliation firms have greater opportunities and incentives to divert firm resources through tunneling at the expense of minority shareholders. Another strand of literature analyzes the characteristics of Chaebol firms. Kim and Berger (2009) report that Chaebol firms are larger in size, have higher sales growth rates, lower profitability and lower business risk. Challenging the research methodology adopted by Kim and Berger (2009) and Kim (2012) presents different results for analyses of Chaebol-affiliated firms, using a more refined research design by employing the matching estimator technique. Kim (2012) examines the value implication of business groups in Korea and finds Chaebol-affiliated firms, over time, tend to be larger, more profitable, grow faster with more investments, and enjoy benefits from tax shields and monitoring effects. In summary, prior studies on the characteristics of Chaebols provide general evidence that Chaebol-affiliated firms tend to be larger in size, more profitable and have the capacity to make larger investments, enabling them to prosper for a long period of time. While we acknowledge that the negative effects (e.g., tunneling activities, agency problems) of Chaebols may lead to deteriorating internal control systems, we argue that the greater resources and capacity of Chaebols will have a positive effect on investments in human resources in internal controls. We include an indicator variable, *CHAEBOL*, to identify Chaebol-affiliated firms.

Finally, corporate governance mechanisms may play an important role in the internal control systems of firms. There is mixed evidence on the association between the quality of corporate governance and internal control systems. Krishnan (2005) examines the relation between audit committee quality and the quality of internal controls. She finds that firms with more independent audit committees and audit committees with financial expertise are inversely associated with the existence of internal control problems. Doyle et al. (2007a) posit that firms with good corporate governance mechanisms exhibit fewer material weaknesses. However, they do not find the quality of governance to be significantly related to disclosing a material weakness. The inconsistent results may be explained by the substitutive role of internal control systems. For example, high quality audits by external auditors may alleviate the adverse consequences of material weaknesses (Hogan and Wilkins, 2008). We measure the level of corporate governance by two measures, *LARGEST* (the natural logarithm of one plus the ownership of the largest shareholder) and *FOROWN* (the natural logarithm of one plus the ownership of foreign investors). Concentrated ownership gives owners better incentives to monitor firms and make necessary changes in management (La Porta et al., 1999). By contrast, in firms with diffuse ownership, no single owner has an incentive to "mind the store," so management is not disciplined for bad performance or rewarded for good performance, leading to poor oversight of management. Therefore, firms with high ownership of the largest shareholder will be better governed. Similarly, firms with high levels of foreign investor ownership will be under enhanced monitoring (Guedhami et al., 2009). Thus, high levels of *LARGEST* and *FOROWN* are consistent with high quality corporate governance structures. As the substitutive role of internal control systems suggests, the low level of corporate governance may be alleviated by high quality internal control systems (e.g., Choi and Wong, 2007), resulting in an inverse relationship between corporate governance and IC personnel. We do not predict a sign for *LARGEST* and *FOROWN*. Finally, we

include an indicator variable, *KOSDAQ*, which is comparable to NASDAQ in the US, to control for differences in firms listed on different stock exchanges.⁷

4. Model specification and test procedures

4.1. Determinants of human resource investment in internal controls

To investigate the determinants of human resources in internal controls, we model IC personnel as a function of the above-mentioned firm characteristics. Specifically, we estimate the following multivariate regression:

$$\begin{aligned} IC_PER_t = & \beta_0 + \beta_1 LNASSET_t + \beta_2 LNEMP_t + \beta_3 RD_t + \beta_4 EXPORT_t + \beta_5 FOR_CURR_t + \beta_6 LNPROD_t \\ & + \beta_7 INV_AR_t + \beta_8 LNAGE_t + \beta_9 LEVERAGE_t + \beta_{10} ZSCORE_t + \beta_{11} LOSS_t + \beta_{12} GROWTH_t \\ & + \beta_{13} CHAEBOL_t + \beta_{14} LARGEST_t + \beta_{15} FOROWN_t + \beta_{16} KOSDAQ_t + \text{Industry Fixed effects} \\ & + \text{Year Fixed effects} + \varepsilon_t \end{aligned} \quad (1)$$

where t indexes the year and *IC_PER* is either *IC_TOTAL1*, *IC_TOTAL2*, *IC_ACC*, *IC_FIN*, *IC_ACCFIN* or *IC_IT*. *IC_TOTAL1* is the natural logarithm of the sum of the number of personnel in the internal control department (namely, IC personnel) for accounting, finance, ITS and other departments in the firm.⁸ *IC_TOTAL2* is the natural logarithm of the sum of the number of personnel in the internal control department for accounting, finance and ITS departments in the firm. *IC_ACC*, *IC_FIN*, *IC_ACCFIN* and *IC_IT* are the natural logarithm of the IC personnel for accounting, finance, accounting and finance combined, and ITS departments in the firm, respectively.⁹ All other variables are as defined in Table 1. We include industry and year indicator variables to control for industry fixed effects and year fixed effects. We adjust standard errors for heteroscedasticity and firm-level clustering. All variables are winsorized at 1% and 99% values.

4.2. The Effect of Firm Size on the Determinants of Human Resource Investment in Internal Controls

As a further test to understand firms' characteristics that influence the quality of internal controls, we examine under which situations the importance of determinants has an accentuated effect on IC personnel. Prior studies on the area of internal control systems generally suggest that smaller firms have weaker internal controls due to the lack of resources and infrastructure. Size, as one of the most critical factors which influence the internal control system of a firm, represents firms' ability and capacity to invest in information systems and internal controls. We divide the sample into two sub-samples by the median value of *LNASSET*, the natural logarithm of total assets.¹⁰ We investigate whether the determinants have a larger effect on IC personnel for firms with relatively larger size. To examine the effect of relatively large firm size on the relation observed in Eq. (1), we use the following multivariate regression model:

$$\begin{aligned} IC_PER_t = & \beta_0 + \beta_1 DETERMINANTS_t + \beta_2 LARGE_t + \beta_{18} LARGE_t * DETERMINANTS_t \\ & + \text{Industry Fixed effects} + \text{Year Fixed effects} + \varepsilon_t \end{aligned} \quad (2)$$

where t indexes the year and *IC_PER* is either *IC_TOTAL1*, *IC_TOTAL2*, *IC_ACC*, *IC_FIN*, *IC_ACCFIN* or *IC_IT*. In the regression model, we include a variable named *DETERMINANTS* to convey the sixteen variables

⁷ The variable has a value of 1 if a firm is listed on the KOSDAQ market, and 0 otherwise. Firms listed on the KOSDAQ are less subject to government regulations than firms listed on the Korean Stock Exchange (KSE), which is the major exchange in Korea.

⁸ We use the logged value instead of the raw value to remove the undue influence of a few outliers.

⁹ As reported in the Appendix, Korean firms are required to disclose IC personnel on the audit committee, board of directors, accounting, finance, ITS and other departments separately. Following Choi et al. (2013), we do not include the number of IC personnel working on the audit committee and the board in our analyses because there is almost no variation in the number of IC personnel in these two departments. Most of the sample firms employ 1 or 2 IC personnel in these two departments. In addition, we decide to combine accounting and finance departments to generate *IC_ACCFIN* because some firms do not separate these two departments.

¹⁰ The results using *LNEMP*, another proxy for the firm size, is qualitatively identical and thus not separately reported.

used in our study, *LNASSET*, *LNEMP*, *RD*, *EXPORT*, *FOR_CURR*, *LNPROD*, *INV_AR*, *LNAGE*, *LEVERAGE*, *ZSCORE*, *LOSS*, *GROWTH*, *CHAEBOL*, *LARGEST*, *FOROWN*, *KOSDAQ*. To capture differences in firm size, we include the variable *LARGE*, an indicator variable which equals one if the size of the firm is greater than the median firm size and zero otherwise. Interactions with *LARGE* and the sixteen factors that are known to influence the number of IC personnel (*DETERMINANTS*) are included. Specific definitions of the variables are provided in Tables 1 and 2. For all regressions, we report *t*-statistics that are adjusted using standard errors corrected for heteroskedasticity and firm-level clustering. All variables are winsorized at 1%

Table 2
Descriptive statistics.

Variable	Mean	Q1	Median	Q3	Std. Dev.
<i>Panel A: Number of IC personnel in each department</i>					
<i>IC_N_TOTAL1</i>	10.676	4	7	11	22.637
<i>IC_N_TOTAL2</i>	9.059	4	6	9	16.920
<i>IC_N_ACC</i>	4.820	2	3	5	12.030
<i>IC_N_FIN</i>	2.146	1	1	3	2.813
<i>IC_N_ACCFIN</i>	6.966	3	5	7	13.856
<i>IC_N_IT</i>	2.093	1	1	2	7.484
<i>Panel B: The natural logarithm of the number of IC personnel in each department</i>					
<i>IC_TOTAL1</i>	2.150	1.609	2.079	2.485	0.635
<i>IC_TOTAL2</i>	2.026	1.609	1.946	2.303	0.620
<i>IC_ACC</i>	1.472	1.099	1.386	1.792	0.611
<i>IC_FIN</i>	0.937	0.693	0.693	1.386	0.603
<i>IC_ACCFIN</i>	1.806	1.386	1.792	2.079	0.607
<i>IC_IT</i>	0.868	0.693	0.693	1.099	0.577
<i>Panel C: Determinants of IC personnel</i>					
<i>LNASSET</i>	25.328	24.432	25.050	25.926	1.327
<i>LNEMP</i>	5.403	4.595	5.283	6.014	1.159
<i>RD</i>	0.014	0	0.002	0.014	0.028
<i>EXPORT</i>	0.277	0.006	0.129	0.510	0.311
<i>FOR_CURR</i>	0.065	0.002	0.024	0.087	0.099
<i>LNPROD</i>	1.554	1.386	1.609	1.792	0.289
<i>INV_AR</i>	0.297	0.178	0.284	0.402	0.156
<i>LNAGE</i>	3.084	2.565	3.135	3.584	0.615
<i>LEVERAGE</i>	0.415	0.256	0.416	0.561	0.199
<i>ZSCORE</i>	3.670	1.784	2.751	4.267	3.677
<i>LOSS</i>	0.281	0	0	1	0.449
<i>GROWTH</i>	0.090	-0.041	0.061	0.199	0.308
<i>CHAEBOL</i>	0.112	0	0	0	0.316
<i>LARGEST</i>	0.336	0.202	0.324	0.456	0.178
<i>FOROWN</i>	0.069	0.001	0.010	0.084	0.118
<i>KOSDAQ</i>	0.604	0	1	1	0.489
<i>N</i>	4477	4477	4477	4477	4477

This table provides descriptive statistics by the number of IC personnel in each department, by the natural logarithm of the number of IC personnel in each department and by the determinants of IC personnel. All variables are winsorized at the 1st and 99th percentile values.

IC_N_TOTAL1 = Number of the IC personnel in the accounting, finance, ITS and other departments in the firm;

IC_N_TOTAL2 = Number of the IC personnel in the accounting, finance and ITS departments in the firm;

IC_N_ACC = Number of the IC personnel in the accounting department in the firm;

IC_N_FIN = Number of the IC personnel in the finance department in the firm;

IC_N_ACCFIN = Number of the IC personnel in the accounting and finance departments in the firm;

IC_N_IT = Number of the IC personnel in the ITS department in the firm;

IC_TOTAL1 = The natural logarithm of the number of IC personnel in the accounting, finance, ITS and other departments in the firm;

IC_TOTAL2 = The natural logarithm of the number of IC personnel in the accounting, finance and ITS departments in the firm;

IC_ACC = The natural logarithm of the number of IC personnel in the accounting department in the firm;

IC_FIN = The natural logarithm of the number of IC personnel in the finance department in the firm;

IC_ACCFIN = The natural logarithm of the number of IC personnel in the accounting and finance departments in the firm;

IC_IT = The natural logarithm of the number of IC personnel in the ITS department in the firm;

All other variables are as defined in Table 1.

and 99% values to remove the potential influence of outliers. In all regression specifications, we include industry and year indicator variables to control for industry fixed effects and year fixed effects.

5. Sample and data

5.1. Data collection

The data on the number of employees in the internal control function for accounting, finance, ITS and other departments are hand-collected for the period 2005–2008. An example of the excerpt from the financial statement of Samsung SDI Co. is presented in the Appendix. We take the information presented in the financial statement of each firm and construct our variables of interest from this information.

While the information on IC personnel first became available in 2002, the enforcement of the release of such information became effective beginning in 2005. Due to reliability issues, we use the sample period from 2005 to 2008. We collect data on the financial variables from the KIS-VALUE database.¹¹ Corporate governance variables are hand-collected from annual reports for the period 2005–2008. We include all firms listed on the KSE and KOSDAQ market for which firm-specific financial, corporate governance and internal control-related data are available. Firms in financial, real-estate and utilities industries are excluded. We exclude holding companies from our sample to control for differences in the corporate structure. This yields a sample of 1352 listed firms and 4477 firm-year observations.

5.2. Descriptive statistics

Table 2 provides the descriptive statistics of the variables employed in our analyses for testing H1. Panel A of Table 2 reports the mean, Q1, median, Q3 and standard deviation of the number of IC personnel for the entire firm and for individual departments. The mean number of employees working for accounting departments (*IC_N_ACC*), finance departments (*IC_N_FIN*) and ITS departments (*IC_N_IT*) are 4.82, 2.14 and 2.09, respectively. The mean number of employees engaged in all internal control-related departments (*IC_N_TOTALI*) is 10.68, which indicates that the average IC personnel in each firm is approximately 11. Panel B of Table 2 lists the natural logarithm of the number of IC personnel in each department. In our tests, we use the log-transformed figure of IC personnel to measure proportionate effects of the determinants on IC personnel. The mean of the natural logarithm of the number of employees working for accounting departments (*IC_ACC*), finance departments (*IC_FIN*) and ITS departments (*IC_IT*) are 1.47, 0.94 and 0.87, respectively. The mean of the log-transformed total number of employees in all internal control-related departments is 2.15.

Panel C of Table 2 reports the descriptive statistics of the sixteen determinants of IC personnel, which are included in our regressions. The interpretation on the statistics of the factors that influence IC personnel is as follows. First, the average size of the sample firms (*LNASSET*) is 25.33, which is translated to approximately US\$84 million. The natural logarithm of the number of employees of our sample firm is 5.40, which is equivalent to 662 employees. The proxies which capture complexity are research and development expenses (*RD*), amount of exports (*EXPORT*), assets denominated in foreign currencies (*FOR_CURR*) which represents the significance of foreign operations, the natural logarithm of the number of products of a firm (*LNPROD*) and the sum of inventory and accounts receivable (*INV_AR*). The mean of the variables which capture complexity of business activities and operations are 0.01, 0.28, 0.07, 1.55 and 0.30 for *RD*, *EXPORT*, *FOR_CURR*, *LNPROD* and *INV_AR*, respectively. The average number of products that a firm produces is around 3.91. The natural logarithm of age of a firm is 3.08, which is equivalent to 25.04 years since its founding. The variables that are intended to capture financial distress are *LEVERAGE*, *ZSCORE* and *LOSS*, which have mean values of 0.42, 3.67 and 0.28, respectively. The average growth rate of our sample firms is 0.09. The mean of the indicator variable *CHAEBOL* suggests that 11.2% of our sample is composed of Chaebol-affiliated firms. Two variables which represent the level of corporate governance are *LARGEST* and

¹¹ KIS-VALUE is equivalent to the COMPUSTAT database used for US data and contains financial statement information. KIS-VALUE receives its data from the Korean Information Service (KIS), which is the largest credit rating agency in Korea.

FOROWN. The mean of the natural logarithm of the two variables are 0.11 and 0.34, respectively. Lastly, the mean of the indicator variable *KOSDAQ* indicates that 60.4% of our sample is composed of firms listed on *KOSDAQ*.

6. Empirical results

6.1. Univariate analyses

Table 3 presents the pairwise Pearson correlations between the total number of employees in the internal control-related departments and the determinants of IC personnel.¹² The results indicate that size, measured by total assets and the number of employees of a firm, are positively associated with IC personnel, consistent with our expectation. There are mixed results for the variables which capture the complexity of a firm. As the need for an effective internal control system increases for complex firms, we find *EXPORT* and *LNPROD* to have a positive correlation with IC personnel. However, other proxies of complexity such as *RD*, *FOR_CURR* and *INV_AR*, appear to have an inverse relationship with IC personnel. We further examine this issue in the multivariate analyses below. Furthermore, experience of a firm (*LNAGE*) has a positive effect on IC personnel. As for proxies that capture financial distress, two of the three variables, *ZSCORE* and *LOSS*, are negatively associated with IC personnel, consistent with our prediction that financial distress prevents a firm from investing in its internal control system. The variable *GROWTH* is not significantly related to the internal control systems of firms. There is also preliminary evidence that Chaebol-affiliated firms are more likely to have a larger number of IC personnel. Also, high levels of ownership of the largest shareholder and foreign investors are generally associated with high levels of IC personnel. Finally, *KOSDAQ* firms are likely to have fewer number of IC personnel.

In general, our univariate results are consistent with our hypotheses and predictions outlined in Section 3. However, it is likely that there are multicollinearity issues as evidenced by the significant correlation between variables *LNASSET* and *LNEMP* of 0.831.¹³ Also, the proxies for complexity are significantly correlated with each other. For example, the correlations between *RD* and *EXPORT* and between *RD* and *FOR_CURR* are 0.064 and 0.068, respectively, which are significant at the 5% level. The effect of each of the factors can be validated after controlling for other factors that may affect IC personnel individually or jointly. As a next stage, we re-examine the important determinants of internal control systems using multivariate regression models.

6.2. Multivariate analyses

Table 4 presents the regression results of Eq. (1), which examines the determinants of IC personnel with *IC_TOTAL1* and *IC_TOTAL2*. In the first column of Table 4, we employ *IC_TOTAL1* as the dependent variable, while, in the second column, we use *IC_TOTAL2* as the dependent variable. The two variables are similar in that they capture the natural logarithm of the number of employees from all departments engaged in internal control functions, except that *IC_TOTAL2* omits “other” departments.¹⁴ The adjusted R^2 in Table 4 is 42.7% and 45.3% for the regression models using *IC_TOTAL1* and *IC_TOTAL2*, respectively. The explanatory power is significantly high in both models.

Table 5 reports the results of Eq. (1), using the number of IC personnel for each department (accounting, finance, sum of accounting and finance, ITS department) as the dependent variable. The adjusted R^2 in Table 5 ranges from 15.1% to 43.7% for the four regression models. The explanatory power is high for regressions which employ *IC_ACC* and *IC_ACCFIN* as the dependent variable, but relatively low for regressions which employ *IC_FIN* and *IC_IT* as the dependent variable. The weak results are likely to be caused by low cross-sectional differences in the number of employees for the finance and ITS departments in internal control (see Panel A of Table 2). The overall results based on Tables 4 and 5 suggest that the coefficients on at least five

¹² We do not report the correlations with *IC_TOTAL2*, *IC_ACC*, *IC_FIN*, *IC_ACCFIN* and *IC_IT* in Table 3 for simplicity purposes. They are generally similar to the correlations for *IC_TOTAL1*.

¹³ To remove the potential effect of the high correlation between *LNASSET* and *LNEMP*, we perform analyses with Eq. (1) but without *LNEMP* (*LNASSET*). The empirical results are qualitatively the same and, thus, not separately displayed.

¹⁴ See footnote 4 for the definition of other departments.

Table 3
Pairwise Pearson correlations.

	<i>IC_TOTAL1</i>	<i>LNASSET</i>	<i>LNEMP</i>	<i>RD</i>	<i>EXPORT</i>	<i>FOR_CURR</i>	<i>LNPROD</i>	<i>INV_AR</i>	<i>LNAGE</i>
<i>IC_TOTAL1</i>	1.0000								
<i>LNASSET</i>	0.6215*	1.0000							
<i>LNEMP</i>	0.5994*	0.8310*	1.0000						
<i>RD</i>	-0.0757*	-0.1364*	-0.0910*	1.0000					
<i>EXPORT</i>	0.0674*	0.1241*	0.1359*	0.0638*	1.0000				
<i>FOR_CURR</i>	-0.0064	-0.0395*	-0.0295*	0.0684*	0.5647*	1.0000			
<i>LNPROD</i>	0.0593*	0.0728*	0.1202*	0.0160	-0.0417*	-0.0500*	1.0000		
<i>INV_AR</i>	-0.0431*	-0.1327*	-0.0032	-0.1149*	-0.0172	0.2043*	0.0867*	1.0000	
<i>LNAGE</i>	0.2776*	0.4358*	0.3668*	-0.2566*	-0.0381*	-0.1358*	0.0588*	0.0459*	1.0000
<i>LEVERAGE</i>	0.1235*	0.1950*	0.1925*	-0.1832*	0.0439*	0.0568*	0.0077	0.1785*	0.1567*
<i>ZSCORE</i>	-0.0945*	-0.1667*	-0.1284*	0.1631*	-0.0175	-0.0154	-0.0011	-0.0650*	-0.2405*
<i>LOSS</i>	-0.1698*	-0.2254*	-0.2480*	0.1446*	0.0335*	0.0368*	-0.0671*	-0.1427*	-0.1176*
<i>GROWTH</i>	0.0039	0.0653*	0.0658*	-0.1269*	-0.0033	0.0155	0.0051	0.1853*	-0.0406*
<i>CHAEBOL</i>	0.4211*	0.5687*	0.4772*	-0.0907*	0.0375*	-0.0896*	0.0305*	-0.1323*	0.2005*
<i>LARGEST</i>	0.0519*	0.1203*	0.1187*	-0.1397*	-0.0710*	-0.0851*	0.0197	0.0870*	0.1814*
<i>FOROWN</i>	0.3153*	0.4704*	0.4359*	-0.0340*	0.0556*	-0.0050	0.0135	-0.1165*	0.1151*
<i>KOSDAQ</i>	-0.3863*	-0.5776*	-0.4877*	0.1811*	-0.0148	0.0753*	-0.0738*	0.0144	-0.5851*

	<i>LEVERAGE</i>	<i>ZSCORE</i>	<i>LOSS</i>	<i>GROWTH</i>	<i>CHAEBOL</i>	<i>LARGEST</i>	<i>FOROWN</i>	<i>KOSDAQ</i>
<i>LEVERAGE</i>	1.0000							
<i>ZSCORE</i>	-0.5850*	1.0000						
<i>LOSS</i>	0.1851*	-0.1820*	1.0000					
<i>GROWTH</i>	0.1094*	0.0361*	-0.2312*	1.0000				
<i>CHAEBOL</i>	0.1204*	-0.0642*	-0.1195*	0.0274	1.0000			
<i>LARGEST</i>	-0.0582*	0.0208	-0.1926*	0.0494*	0.1218*	1.0000		
<i>FOROWN</i>	-0.0832*	0.1184*	-0.1612*	0.0141	0.2292*	0.0152	1.0000	
<i>KOSDAQ</i>	-0.1222*	0.1786*	0.1603*	0.0335*	-0.2867*	-0.1427*	-0.2637*	1.0000

This table provides pairwise Pearson correlations between the variables used in the multivariate analysis. The definitions of the variables are presented in Tables 1 and 2.

All variables are winsorized at the 1st and 99th percentile values.

* Denotes significance at the 5% level.

of the sixteen variables, *LNASSET*, *LNEMP*, *FOR_CURR*, *GROWTH* and *CHAEBOL*, are in the predicated direction and are statistically significant. We provide interpretations of the results for each aspect of factors that influence IC personnel below.

6.2.1. Firm size and IC personnel

Results from both Tables 4 and 5 confirm the significant role played by firm size. The two variables which represent the size of a firm, *LNASSET* and *LNEMP*, are positively associated with IC personnel, for both the whole firm as well as the individual departments (*IC_TOTAL1*, *IC_TOTAL2*, *IC_ACC*, *IC_ACCFIN*) at less than 1% levels. For example, when *IC_TOTAL1* is used as a dependent variable, the coefficients on *LNASSET* and *LNEMP* are 0.155 (t -value = 6.61) and 0.149 (t -value = 7.00), respectively, in Table 4. This finding is consistent with prior studies that report the overall positive association between firm size and internal control quality (Ge and McVay, 2005; Ashbaugh-Skaife et al., 2007; Doyle et al., 2007a). This evidence confirms the argument that the resources and infrastructure within large firms allow them to invest in hiring more qualified internal control personnel which will ensure adequate policies and procedures to be in place. The statistical significance of size on IC personnel is weaker or disappears when *IC_FIN* or *IC_IT* are used as the dependent variable in Table 5. It is likely that the low variability across the numbers of IC personnel within finance (mean value of 2 employees) and ITS departments (mean value of 2 employees) is a cause for the weak results.

6.2.2. Complexity and IC personnel

Examining the five variables for complexity, only one variable, *FOR_CURR*, is statistically significant in explaining IC personnel. The coefficient on *FOR_CURR* is significant at the 10% level when *IC_TOTAL1*,

Table 4
Results of determinants of IC personnel using the natural logarithm of total number of IC personnel.

Variable	Predicted	<i>IC_TOTAL1</i>	<i>IC_TOTAL2</i>
Intercept		−2.527*** (−4.60)	−2.620*** (−5.00)
<i>LNASSET</i>	+	0.155*** (6.61)	0.149*** (6.75)
<i>LNEMP</i>	+	0.149*** (7.00)	0.158*** (7.67)
<i>RD</i>	+	0.222 (0.52)	0.003 (0.01)
<i>EXPORT</i>	+	−0.078 (−1.51)	−0.043 (−0.87)
<i>FOR_CURR</i>	+	0.239* (1.72)	0.243* (1.83)
<i>LNPROD</i>	+	−0.001 (−0.02)	0.024 (0.58)
<i>INV_AR</i>	+	0.09 (1.06)	0.083 (1.06)
<i>LNAGE</i>	+	0.006 (0.18)	0.006 (0.23)
<i>LEVERAGE</i>	−	−0.039 (−0.53)	−0.013 (−0.18)
<i>ZSCORE</i>	−	−0.001 (−0.49)	−0.001 (−0.25)
<i>LOSS</i>	−	−0.028 (−1.21)	−0.028 (−1.29)
<i>GROWTH</i>	−	−0.072** (−2.56)	−0.073*** (−2.89)
<i>CHAEBOL</i>	+	0.202*** (3.45)	0.202*** (3.71)
<i>LARGEST</i>	±	−0.109 (−1.52)	−0.116* (−1.69)
<i>FOROWN</i>	±	0.051 (0.35)	0.055 (0.40)
<i>KOSDAQ</i>	±	−0.049 (−1.32)	−0.042 (−1.18)
Year effects		Included	Included
Industry effects		Included	Included
<i>N</i>		4477	4477
Adj. <i>R</i> ²		0.427	0.453

* Denote significance at the 10% level.

** Denote significance at the 5% level.

*** Denote significance at the 1% level.

IC_TOTAL2, *IC_ACC*, *IC_IT* are used as the dependent variables in Tables 4 and 5. For example, when *IC_TOTAL1* is used as the dependent variable, the coefficient on *FOR_CURR* is 0.239 (*t*-value = 1.72). The positive association suggests that as the complexity of firms' activities and operations increases, proxied by the significance of foreign operations (*FOR_CURR*), it increases the need for effective internal controls, thus resulting in a high number of IC personnel. Significant foreign operations indicate the possibility that a firm is affected by different institutional and legal environments in which it operates in. The exposure to different environments makes it more difficult to implement adequate internal controls in place, which in turn, increases the demand for effective internal control systems. The positive coefficient on the variable *FOR_CURR* confirms this relationship. While the statistical significance of the coefficient on *FOR_CURR* disappears when *IC_FIN* and *IC_ACCFIN* are used as the dependent variable, the sign is directionally consistent in all analyses.

Table 5
Results of determinants of IC personnel using the natural logarithm of number of IC personnel by department.

Variable	Predicted	<i>IC_ACC</i>	<i>IC_FIN</i>	<i>IC_ACCFIN</i>	<i>IC_IT</i>
Intercept		-2.926*** (-5.52)	-2.279*** (-3.46)	-2.997*** (-5.68)	-1.173** (-2.00)
<i>LNASSET</i>	+	0.141*** (6.36)	0.119*** (4.31)	0.161*** (7.23)	0.051** (2.13)
<i>LNEMP</i>	+	0.153*** (7.78)	0.028 (1.14)	0.133*** (6.80)	0.131*** (5.08)
<i>RD</i>	+	0.005 (0.01)	-0.206 (-0.51)	-0.093 (-0.25)	0.158 (0.34)
<i>EXPORT</i>	+	-0.056 (-1.12)	-0.057 (-1.04)	-0.068 (-1.42)	0.040 (0.71)
<i>FOR_CURR</i>	+	0.220* (1.68)	0.129 (0.86)	0.201 (1.52)	0.308** (2.06)
<i>LNPROD</i>	+	0.050 (1.23)	-0.029 (-0.64)	0.024 (0.61)	0.002 (0.06)
<i>INV_AR</i>	+	0.010 (0.13)	0.171* (1.77)	0.096 (1.22)	-0.014 (-0.17)
<i>LNAGE</i>	+	-0.010 (-0.35)	0.015 (0.48)	0.000 (-0.01)	0.018 (0.62)
<i>LEVERAGE</i>	-	-0.018 (-0.25)	0.111 (1.27)	0.017 (0.24)	-0.034 (-0.42)
<i>ZSCORE</i>	-	0.001 (0.51)	-0.002 (-0.56)	0.000 (0.11)	-0.002 (-0.67)
<i>LOSS</i>	-	-0.028 (-1.25)	-0.037 (-1.48)	-0.033 (-1.51)	-0.009 (-0.40)
<i>GROWTH</i>	-	-0.059** (-2.40)	-0.070** (-2.41)	-0.076*** (-2.93)	-0.039 (-1.53)
<i>CHAEVOL</i>	+	0.198*** (3.64)	0.159** (2.31)	0.213*** (3.97)	0.063 (1.01)
<i>LARGEST</i>	±	-0.144** (-2.02)	-0.041 (-0.52)	-0.134* (-1.96)	0.023 (0.30)
<i>FOROWN</i>	±	-0.025 (-0.18)	0.080 (0.55)	0.003 (0.02)	0.192 (1.25)
<i>KOSDAQ</i>	±	-0.051 (-1.42)	0.007 (0.17)	-0.032 (-0.90)	-0.051 (-1.35)
Year effects		Included	Included	Included	Included
Industry effects		Included	Included	Included	Included
N		4477	4477	4477	4477
Adj. R ²		0.420	0.151	0.437	0.201

This table reports analysis of the determinants of IC personnel. To adjust for heteroskedasticity, standard errors are clustered at the firm-level.

Robust *t*-statistics are in brackets.

All variables are winsorized at the 1% and 99% values.

The definitions of the variables are presented in Tables 1 and 2.

* Denote significance at the 10% level.

** Denote significance at the 5% level.

*** Denote significance at the 1% level.

6.2.3. Age, financial distress and IC personnel

In Tables 4 and 5, neither the age of a firm nor the financial distress of a firm appears to have a significant effect on the number of IC personnel, although they are significantly correlated with *IC_TOTAL1* in the univariate analyses as reported in Table 3. Other determinants of IC personnel may have subsumed the effect of experience and financial performance on the investment in the internal control systems of a firm.

6.2.4. Growth and IC personnel

Next, growth of a firm has a negative effect on the number of IC personnel at the 5% level. The coefficient on *GROWTH* is statistically significant at the whole firm (*IC_TOTAL1* and *IC_TOTAL2*) as well as individual department levels, except for the ITS department. For example, when *IC_TOTAL1* is used as the dependent variable, the coefficient on *GROWTH* is -0.072 (t -value = 2.56). This is consistent with the argument made by Krishnan (2005) and Doyle et al. (2007a) who suggest that rapidly growing firms outgrow their internal control systems. It is likely that the lack of (human) resources, processes and less advanced techniques hinder firms in maintaining adequate internal controls and making investments in human resources in internal control functions.

6.2.5. Business group affiliation and IC personnel

The coefficient on the variable *CHAEBOL* is statistically significant at the 1% level in Table 4. For example, when *IC_TOTAL1* is used as the dependent variable, the coefficient on *CHAEBOL* is 0.202 (t -value = 3.45), indicating the strong influence of business group affiliation on IC personnel at the whole firm level. We find consistent evidence at the individual department level, except for the ITS department. Prior work investigating the characteristics of Chaebols indicates that Chaebols are generally larger in size, more profitable and more capable of making investments (Kim, 2012). The positive coefficients on *CHAEBOL* across different specifications reinforces this finding by suggesting that the larger capacity borne by Chaebol-affiliated firms enables them to make relatively bigger investments in information systems and internal control functions.

6.2.6. Corporate governance and IC personnel

Examining the corporate governance variables, there is a marginally significant effect of the ownership of the largest shareholder on IC personnel. The coefficient on *LARGEST* is significant at the 10% level when *IC_TOTAL2*, *IC_ACC* and *IC_ACCFIN* are used as the dependent variable. For example, when *IC_TOTAL2* is used as the test variable, the coefficient on *LARGEST* is -0.116 (t -value = -1.69) in Table 4. The other corporate governance variable, *FOROWN* is not statistically significant in any specification. The negative association documented between corporate governance and IC personnel is potentially due to the substitutive effect of internal control systems. Concentrated ownership by the owners facilitates the monitoring process and incentivizes them to closely oversee management and to enforce changes when necessary. Firms with good monitoring mechanisms have a reduced need for effective internal control systems, resulting in a lower number of IC personnel. The substitution effect is an explanation for the inverse relation between *LARGEST* and the number of IC personnel.¹⁵

Finally, whether or not the firm is listed on KOSDAQ does not have a statistically significant effect on the number of IC personnel.

Overall, both our univariate and multivariate analyses support our hypotheses in Section 3. We find that the number of IC personnel is relatively higher for firms with bigger size in terms of total assets and the number of employees, firms with complexity and for Chaebol-affiliated firms, however, the number of IC personnel is relatively lower for growth firms. These findings suggest that firms with greater capacity and established infrastructure tend to invest more in human resources in internal control departments. In contrast, firms are hesitant to invest heavily in their internal control systems in the face of a lack of resources, and/or a rapidly changing business environment. The analyses based on the results from Tables 4 and 5 presents moderately significant implications that corporate governance and internal control systems are substitutes. Specifically, a strong corporate governance structure within a firm weakens the need for a high quality internal control system, thus leading to a lower number of IC personnel.

6.3. Additional test

Table 6 provides the results of regression Eq. (2) in which the indicator variable, *LARGE*, which partitions firms with relatively large size, and the interactive terms with the indicator variable are included. The objective

¹⁵ Alternatively, it may be possible that firms with concentrated ownership avoid the investment in IC personnel to pursue private benefits at the expense of minority shareholders. However, this alternative explanation is less likely to occur in the current strong legal environment after the implementation of K-SOX.

Table 6
The effect of firm size on the determinants of IC personnel.

Variable	<i>IC_TOTAL1</i>		<i>IC_TOTAL2</i>	
	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat
Intercept	-0.783	-1.33	-0.810	-1.37
<i>LNASSET</i>	0.089***	3.56	0.086***	3.44
<i>LNEMP</i>	0.091***	3.75	0.090***	3.87
<i>RD</i>	-0.023	-0.05	-0.491	-1.23
<i>EXPORT</i>	-0.034	-0.66	0.000	0.00
<i>FOR_CURR</i>	0.071	0.47	0.104	0.75
<i>LNPROD</i>	-0.010	-0.22	0.016	0.37
<i>INV_AR</i>	0.175*	1.92	0.152*	1.84
<i>LNAGE</i>	0.036	1.38	0.004	0.18
<i>LEVERAGE</i>	-0.103	-1.31	-0.054	-0.73
<i>ZSCORE</i>	-0.004	-1.28	-0.002	-0.91
<i>LOSS</i>	0.020	0.80	0.016	0.70
<i>GROWTH</i>	0.015	0.53	-0.004	-0.15
<i>CHAEBOL</i>	-0.151	-1.08	-0.149	-1.03
<i>LARGEST</i>	0.146**	2.10	0.165**	2.53
<i>FOROWN</i>	0.293*	1.82	0.309*	1.81
<i>KOSDAQ</i>	-0.051	-1.09	-0.055	-1.24
<i>LARGE</i>	-2.803**	-2.56	-2.947***	-2.84
<i>LARGE * LNASSET</i>	0.106**	2.30	0.101**	2.36
<i>LARGE * LNEMP</i>	0.084**	2.23	0.100***	2.74
<i>LARGE * RD</i>	0.215	0.21	0.877	0.89
<i>LARGE * EXPORT</i>	-0.095	-1.03	-0.090	-1.02
<i>LARGE * FOR_CURR</i>	0.456*	1.80	0.415*	1.76
<i>LARGE * LNPROD</i>	0.030	0.38	0.018	0.24
<i>LARGE * INV_AR</i>	-0.077	-0.47	-0.029	-0.19
<i>LARGE * LNAGE</i>	-0.070	-1.21	-0.008	-0.16
<i>LARGE * LEVERAGE</i>	0.118	0.79	0.070	0.51
<i>LARGE * ZSCORE</i>	0.002	0.22	-0.002	-0.24
<i>LARGE * LOSS</i>	-0.120***	-2.76	-0.115***	-2.74
<i>LARGE * GROWTH</i>	-0.194***	-3.20	-0.146***	-2.70
<i>LARGE * CHAEBOL</i>	0.325**	2.13	0.320**	2.07
<i>LARGE * LARGEST</i>	-0.348***	-2.67	-0.380***	-3.06
<i>LARGE * FOROWN</i>	-0.398*	-1.66	-0.407*	-1.71
<i>LARGE * KOSDAQ</i>	-0.028	-0.40	-0.004	-0.06
Year effects	Included	Included	Included	Included
Industry effects	Included	Included	Included	Included
<i>N</i>	4477		4477	
Adj. <i>R</i> ²	0.442		0.471	

This table reports analysis of the determinants of IC personnel.

To adjust for heteroskedasticity, standard errors are clustered at the firm-level. Robust *t*-statistics are presented under the *t*-stat column. All variables are winsorized at the 1% and 99% values.

The definitions of the variables are presented in Tables 1 and 2.

* Denote significance at the 10% level.

** Denote significance at the 5% level.

*** Denote significance at the 1% level.

of this test is to gain an understanding of the situation in which the relations observed in the section above are prevalent. The results of Table 6 suggest that the effect of the determinants of IC personnel is pronounced among firms with relatively larger size (*LNASSET*). The significant coefficients on the interaction terms between the *LARGE* indicator variable and the determinants indicate that the effect of the factors known to influence internal control systems increase with firm size. Specifically, in Table 6, we find that the interaction terms with *LNASSET*, *LNEMP*, *FOR_CURR*, *LOSS*, *GROWTH*, *CHAEBOL*, *LARGEST* and *FOROWN*

are statistically significant.¹⁶ For example, when *IC_TOTAL1* is used as the dependent variable, the coefficient on *LNASSET* is 0.089 (t -value = 3.56) and that on *LARGE*LNASSET* is 0.106 (t -value = 2.30) in Table 6. The results imply that small firm size influences the number of IC personnel (logged value) by 0.089 (the coefficient on *LNASSET*), while large firm size influences the number of IC personnel (logged value) by 0.195 (the sum of 0.089 and 0.106). Specifically, characteristics including firm size, complexity and business group affiliation have a larger positive effect on IC personnel for firms with relatively bigger size (in terms of the natural logarithm of total assets). Large firms experiencing a loss make relatively lower levels of investments in human resources in internal controls. Additionally, the positive effect of business group affiliation on internal control systems is prevalent for large firms. Finally, the substitutive effect of internal control functions and corporate governance is accentuated in large firms. In summary, factors such as firm size, complexity of business environment and operations, financial distress, growth, business group affiliation and corporate governance structure have a larger effect on IC personnel for firms with relatively large total assets.¹⁷

7. Conclusion

This paper investigates the characteristics of firms that induce firms to make investments in human resources in internal controls. Using unique firm-level data on the number of employees engaged in the internal control functions both at the whole firm and individual department levels, we are able to identify the types of firms which implement adequate internal control systems. Prior studies investigating the factors that expose firms to internal control risks generally find that such firms are smaller, younger, financially troubled, more complex, growing rapidly or undergoing restructuring (Ge and McVay, 2005; Ashbaugh-Skaife et al., 2007; Doyle et al., 2007a). Extending this line of research, this study aims to understand the major factors which determine human resource investment in internal controls within a firm. Importantly, the literature attributes material weaknesses in internal controls to the following: lack of training, deficiencies in adequate processes and procedures, lack of segregation of duties and inappropriate account reconciliation (Ge and McVay, 2005). The root problem can be significantly alleviated by having “qualified accounting staff” which is directly related to our main variable of interest, IC personnel.

Following guidance from prior literature, we examine the determinants of the internal control system of a firm in eight aspects: size, business complexity, age, financial distress, growth, business group, corporate governance and type of exchange market. Our results suggest that high quality internal control systems are more likely for firms that are larger both in terms of total assets and number of employees, more complex, less rapidly growing and for Chaebol-affiliated firms. However, other factors including age, financial distress or the type of exchange market do not seem to have a significant effect on the quality of internal control systems. The findings suggest that firms with sufficient resources and established infrastructure (e.g., large firms, Chaebols) have the capability to invest in their internal control systems while growth firms struggle with their financial reporting controls in the face of a lack of resources and a changing business environment. Additional analysis reveals the accentuated effect of firm characteristics on IC personnel among larger firms.

While our findings provide valuable insights, the findings may be subject to certain caveats. First, it is largely a descriptive study which focuses on association, rather than causation. We cannot rule out the possibility that unobserved factors that are correlated with both firm characteristics and IC personnel may drive the results. Second, although the regulations in Korea on internal controls are similar to those in the US or other developed countries, the results may not be generalizable to other countries due to differences in regulatory environments. However, this paper offers valuable insights to policymakers, practitioners and academics as the results demonstrate the important characteristics of firms which adopt high quality internal control systems.

¹⁶ Note that the coefficients on *LOSS*, *LARGEST* and *FOROWN* are mostly insignificant in Tables 4 and 5. The significant interaction terms on these variables in Table 6 suggest that these variables influence the number of IC personnel only in large firms.

¹⁷ Note that we do not tabulate the results for individual departments in Table 6 for simplicity purposes. The untabulated results are generally similar to the tabulated results.

Appendix A. An example of the disclosure of IC personnel

The following table shows the disclosure of SDI Co., Ltd. on IC personnel for the fiscal year ending December 31, 2008. This information is contained in the “Report on the operation of internal control systems,” 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 controls 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 a CPA. The fourth column shows the ratio of CPA to the number of IC personnel. The last column presents the average work experience 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 Experience of IC personnel (in months)
Audit (Committee)	3	3	–	–	101
Board of Directors	7	2	–	–	76
Accounting	39	35	1	2.9%	117
Finance	5	5	–	–	52
ITS	36	1	–	–	156
Others	45	2	–	–	38

References

- Altman, E., 1968. Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy. *Journal of Finance* 23, 589–609.
- Ashbaugh-Skaife, H., Collins, D., Kinney, W., 2007. The discovery and reporting of internal control deficiencies prior to SOX-mandated audits. *Journal of Accounting and Economics* 44 (1/2), 166–192.
- Ashbaugh-Skaife, H., Collins, D., Kinney, W., LaFond, R., 2008. The effect of SOX internal control deficiencies and their remediation on accrual quality. *The Accounting Review* 83 (1), 217–250.
- Ashbaugh-Skaife, H., Collins, D., Kinney, W., LaFond, R., 2009. The effect of SOX internal control deficiencies on firm risk and cost of equity. *Journal of Accounting Research* 47 (1), 1–43.
- Beasley, M.S., 1996. An empirical analysis of the relation between the board of director composition and financial statement fraud. *The Accounting Review* 71 (4), 443–466.
- Beneish, M.D., Billings, M., Hodder, L., 2008. Internal control weaknesses and information uncertainty. *The Accounting Review* 83 (3), 665–703.
- Chang, S.J., Hong, J., 2000. Economic performance of group-affiliated companies in Korea: intergroup-resource sharing and internal business transactions. *Academy of Management Journal* 43 (3), 429–448.
- Choi, J.-H., Choi, S., Hogan, C., Lee, J., 2013. The effect of human resource investment in internal control on the existence of internal control weaknesses. *Auditing: A Journal of Practice and Theory* 31 (4), forthcoming.
- Choi, J.-H., Kim, J.-B., Liu, X., Simunic, D.A., 2008. Audit pricing, legal liability regimes, and Big 4 premiums: theory and cross-country evidence. *Contemporary Accounting Research* 25 (1), 1–49.
- Choi, J.-H., Wong, T.J., 2007. Auditors’ governance functions and legal environments: an international investigation. *Contemporary Accounting Research* 24 (1), 13–46.
- Committee of Sponsoring Organizations of the Treadway Commission (COSO), 1992. *Internal Control2. Internal Control ContU.S.*
- Doyle, J., Ge, W., McVay, S., 2007a. Determinants of weaknesses in internal control over financial reporting. *Journal of Accounting and Economics* 44 (1/2), 193–223.
- Doyle, J., Ge, W., McVay, S., 2007b. Accruals quality and internal control over financial reporting. *The Accounting Review* 82 (5), 1141–1170.
- Feng, M., Li, C., McVay, S., 2009. Internal control and management guidance. *Journal of Accounting and Economics* 48 (2/3), 190–209.
- Ge, W., McVay, S., 2005. The disclosure of material weaknesses in internal control after the Sarbanes-Oxley Act. *Accounting Horizons* 19, 137–158.
- Guedhami, O., Pittman, J., Saffar, W., 2009. Auditor choice in privatized firms: empirical evidence on the role of state and foreign owners. *Journal of Accounting and Economics* 48 (2/3), 151–171.
- Hammersley, J.S., Myers, L., Shakespeare, C., 2008. Market reactions to the disclosure of internal control weaknesses and to the characteristics of those weaknesses under Section 302 of the Sarbanes Oxley Act of 2002. *Review of Accounting Studies* 13 (1), 141–165.

- Hogan, C.E., Wilkins, M.S., 2008. Evidence on the audit risk model: do auditors increase audit fees in the presence of internal control deficiencies? *Contemporary Accounting Research* 25 (1), 219–242.
- Joh, S.W., 2003. Corporate governance and firm profitability: evidence from Korea before the economic crisis. *Journal of Financial Economics* 68 (2), 287–322.
- Kim, C.S., 2012. Is business group inefficient? A long-term perspective. *Asia-Pacific Journal of Financial Studies* 41, 258–285.
- Kim, J.-K., 2009. Internal control weakness over financial reporting and accruals quality. *Korean Accounting Journal* 18 (4), 33–64, Printed in Korean.
- Kim, H.J., Berger, P., 2009. The management characteristics of Korean chaebols vs. non-chaebols: Differences in leverage and its ramifications: myth or reality? *Advances in Management* 2, 26–35.
- Kim, Y.-S., Hwang, K.-J., Kim, Y.-C., 2007. The effect of firm characteristics and corporate governance on the quality of internal control over financial reporting. *Korean Accounting and Auditing Research* 46, 249–275, Printed in Korean.
- Kim, J.-B., Yi, C.H., 2006. Ownership structure, business group affiliation, listing status, and earnings management: Evidence from Korea. *Contemporary Accounting Research* 23 (2), 427–464.
- Krishnan, J., 2005. Audit committee quality and internal control: an empirical analysis. *The Accounting Review* 80, 649–675.
- Kwon, D.-H., Choi, J.-H., Shin, J., Hyun, J.-H., 2012. The effect of agency problem between controlling shareholders and minority shareholders on board and audit committee characteristics. *Korean Accounting Review* 37 (1), 121–155, Printed in Korean.
- La Porta, R., Lopez-De-Silanes, F., Shleifer, A., 1999. Corporate ownership around the world. *Journal of Finance* 54 (2), 471–518.
- Lee, J.-I., Choi, S., Choi, J.-H., 2010. The association between human resource investment in internal control and audit fees. *Korean Accounting and Auditing Research* 51, 191–225, Printed in Korean.
- Lee, M.-G., Choi, S.-T., Chang, S.-J., 2007. Weaknesses in internal accounting control system: its relation with earnings management and information risk. *Korean Accounting and Auditing Research* 46, 61–91, Printed in Korean.
- Lee, M., Shim, H.-S., Choi, J.-H., 2012. Board characteristics and the frequency of disclosure of the firms belonging to large business groups. *Korean Accounting Review* 37 (2), 279–320, Printed in Korean.
- Ogneva, M., Subramanyan, K.R., Raghunandan, K., 2007. Internal control weakness and cost of equity: evidence from SOX Section 404 disclosures. *The Accounting Review* 82 (5), 1255–1297.
- Public Company Accounting Oversight Board (PCAOB), 2004. An Audit of Internal Control over Financial Reporting Performed in Conjunction with an Audit of Financial Statements. Auditing Standard No. 2. Washington, D.C.: PCAOB.
- Securities and Exchange Commission (SEC), 2002. Final Rule: Certification of Disclosure in Companies' Quarterly and Annual Reports. Release Nos. 33–8124; 34–46427. Washington, D.C.: SEC.
- Securities and Exchange Commission (SEC), 2003. Final Rule: Management's Reports on Internal Control over Financial Reporting and Certification of Disclosure in Exchange Act Periodic Reports. Release Nos. 33–8238; 34–47986. Washington D.C.: SEC August 14.
- Shin, H.G., 2007. Analysis of review reports on internal control systems. *Korean Accounting Journal* 16 (1), 107–128, Printed in Korean.
- Solidarity for Economic Reform, 2010. The analysis on the Dynamic Changes of 200 Largest Companies Over 1986–2006 Period. Seoul, Korea, Printed in Korean.



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Information asymmetry, mutual funds and earnings management: Evidence from China

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ABSTRACT

This paper investigates how information asymmetry and mutual fund ownership affect listed companies' earnings management. We show that (1) reducing information asymmetry improves firms' earnings management behavior; (2) relative to short-term mutual funds, long-term mutual funds promote earnings quality by adopting a monitoring role; and (3) by dividing firms into high/low information asymmetry groups, we find that the information environment significantly increases the effect of long-term mutual funds on firms' earnings management. In this paper, we provide new evidence for the role that institutional investors play in a typical emerging capital market. Our results have clear policy implications: to increase earnings quality, it is essential to improve information transparency and develop long-term institutional investors.

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1. Introduction

Earnings information is an important basis for investors' decision making. In recent years, due to a series of significant accounting fraud and violation cases both at home and abroad, the issue of earnings management has attracted considerable attention from academics and practitioners. However, the focus of most studies is

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limited to how to measure earnings management behavior, the factors that influence earnings management and the economic consequences of earnings quality.

The majority of related studies overlook the effects of information asymmetry and institutional ownership and their influence on company earnings management issues. Information asymmetry usually refers to the inequality in the amount of information held by different market participants. It is well known that accounting information provides relatively accurate financial information to market participants. This information helps investors to understand the company's operating activities and thus reduces the information asymmetry between investors and management (Armstrong et al., 2010; Bhattacharya et al., forthcoming). The information environment is likely to impose certain externalities on accounting information: a company's degree of information asymmetry can be decreased by an effective information disclosure system, which provides a transparent information environment for the company's financial reports and accounting earnings quality. Managers under stronger supervision are more likely to provide high-quality accounting reports that further promote improvements in corporate earnings quality (Hunton et al., 2006; Xia and Lu, 2005).

Institutional investors also play an increasingly important role in capital markets. Stock markets in the United States, for example, are largely dominated by institutional investors. Similarly, institutional investors have developed rapidly in China since the first securities investment funds were established in 1998.¹ Today, Chinese institutional investors are among the top 10 shareholders in more than half of the listed companies. Can the increasing number of institutional investors improve the governance structure of companies? Institutional investors are professionals who have advantages in terms of financial support and information discovery – they are good at detecting companies' actual operating conditions and supervising management. However, there is considerable academic controversy over how institutional investors affect earnings management. On the one hand, they may use their professional advantage to oversee the management of listed companies and participate in the corporate governance process, thereby effectively inhibiting accruals-based earnings management behavior (Prowse, 1990; Brous and Kini, 1994; Warfield et al., 1995; Cheng, 2006). On the other hand, there are concerns about their negative influence, as their herd-like and short-sighted behavior can exacerbate the extent of earnings management and thus reduce earnings quality (Graves, 1988; Porter, 1992; Deng and Tang, 2010).

Compared with capital markets in Western countries, Chinese listed companies have suffered from the 'dominance' of non-tradable shares, as a result of which institutional investors fail to play a full role. Zhao and Zheng (2002) argue that the relatively small proportion of Chinese institutional investors, together with the insufficiency of market information disclosure mechanisms and regulatory instruments, increases the information search and interpretation costs for Chinese institutional investors. Therefore, the extent of the information asymmetry between investors and listed companies is likely to further influence the relationship between institutional investors and earnings management.

In summary, can the level of transparency in the information environment influence company earnings management behavior in the Chinese capital market? As the enthusiasm for Chinese mutual funds continues to heat up, do the diverse types and characteristics of mutual funds have different effects on corporate governance? What is the combined effect of these two important factors on earnings management? Our aim in this paper is to explore these as yet unresolved issues.

This paper is innovative in the following two respects. First, although some scholars examine the relationships between the degree of information asymmetry, institutional ownership and earnings management, most studies are based on the mature markets of developed countries. As there is still a lack of comprehensive research into these three factors in China, in this paper we investigate their interaction in the emerging Chinese stock market. Second, previous studies generally analyze overall mutual fund behavior, but they either do not classify funds according to their different investment characteristics or use biased classifications (Brown and Goetzmann, 1997; Sun et al., 2012). To distinguish between the corporate governance behavior of different

¹ There are various types of institutional investors. We choose securities investment funds (mutual funds) as a proxy variable for institutional investors in this study because mutual funds are the largest institutional investors in China and are the main securities investment funds affecting corporate governance, and because the data is relatively easy to access. Hence, unless otherwise stated, when referring to institutional investors, we mean mutual fund investors.

types of funds, we reclassify mutual funds as long-term and short-term funds using the method proposed by Yan and Zhang (2009).

The paper is organized as follows. Section 2 presents the literature review and research hypotheses. Section 3 describes the data sources, variable definitions and empirical models. Section 4 presents the econometric models and results of the empirical analysis. Section 5 presents the results of additional tests. Section 6 summarizes and concludes the paper.

2. Literature review and research hypotheses

Earnings quality is a measure of the profitability of listed companies. It indicates the degree of match between a company's profitability and its cash flow. If they are not well matched, there are potential operating problems. Earnings management occurs when management tries to control or adjust reported accounting earnings information to maximize their own interests. It is clear that earnings management will cause the company's earnings quality to deviate from its true level. Information asymmetry usually refers to inequalities between the information held by market participants, which can affect investors' decision-making. Studies conducted both in China and abroad show that a company's earnings management is closely related to its information environment. Both Dye (1988) and Trueman and Titman (1988) find that information asymmetry between shareholders and management is a necessary condition for the existence of earnings management. Schipper (1989) defines earnings management as management's manipulation of the disclosure of financial reporting by purposefully using their information advantage to seek private interests, which often go against the interests of the business owners. When information asymmetry is high, stakeholders do not have sufficient resources, incentives or access to relevant information to monitor managers' actions, which gives rise to the practice of earnings management. Richardson (2000) provides empirical evidence that information asymmetry, as measured by the bid-ask spread and analysts' forecast dispersion, is positively related to the level of earnings management. Hunton et al. (2006) uses experimental methods to investigate whether greater transparency reduces earnings management attempts. In the experiment, 62 financial executives and chief executive officers decide which available-for-sale security to sell from a portfolio under different levels of transparency of income reporting and projected earnings. The results suggest that more transparent reporting requirements can reduce earnings management attempts or change the focus of earnings management attempts to less visible methods. Jo and Kim (2007) examine the relationship between disclosure frequency and earnings management and the effect of this relationship on post-issue performance, using a sample of seasoned equity offerings (SEOs). They find that firms with extensive disclosure are less likely to face information problems, leading to less earnings management and better post-issue performance. The above discussion suggests that foreign scholars generally agree that earnings management increases as the degree of information asymmetry increases.

The Chinese literature concerning earnings management and the information environment is still relatively sparse. Yang (2005) investigates the relationship between information disclosure and earnings management using a client–agency model, which suggests that information forecasts can decrease the information asymmetry between managers and owners. Managers should face an additional cost for their deliberate forecasting of inaccurate information, so that managers' information forecasts can reduce the possibility of earnings management. Xia and Lu (2005) use listed companies' condemned announcements as a proxy for information disclosure and their results show that the degree of earnings management and the quality of information disclosure are negatively related, implying that listed companies may lower information disclosure quality to conceal their earnings management. Fang and Hong (2007) conclude that the quality of corporate disclosure has an effect on analysts' behavior. Specifically, it improves the accuracy of predictions and reduces the dispersion between analysts, thus ensuring that earnings data are closer to reflecting a company's actual profit.

From the results of studies conducted both in China and abroad, we conclude that the information asymmetry between investors and listed companies leads to management speculation. The accounting earnings information advantage of listed companies' management drives them to adjust their accounting records and information disclosure content to achieve their own personal interests or to benefit the minority. Therefore, improving the transparency of information disclosure to reduce the degree of information asymmetry can effectively regulate major shareholders' violation of interests and improve corporate governance.

Furthermore, it can inhibit earnings management and promote companies' accounting reporting quality to reduce investment risk. Accordingly, we propose the following hypothesis:

Hypothesis 1. The information asymmetry of listed companies is positively related to the degree of earnings management

Institutional investors are often characterized as “sophisticated investors” who have advantages in acquiring and processing information compared to individual investors (Bushee, 1998; Bartov et al., 2000; Jiambalvo et al., 2002). However, domestic and foreign scholars continue to disagree over their specific role in improving reporting quality. As developing capital markets are not perfect, with serious information asymmetry and a lack of funds and technical expertise, institutional investors have little motivation or ability to participate in company governance and thus act as “traders” rather than “owners”. Foreign studies consider institutional investors to be more concerned about current profits than corporate governance, as most institutional investors are still short-term speculators who pay little attention to long-term investment. When a listed company performs poorly, institutional investors tend to “vote with their feet” by selling stock. To prevent the loss of these important institutional investors, the company's management may manipulate earnings to increase reported earnings. As a result, a growing number of significant shareholders who are short-sighted and speculative induce companies to provide low-quality accounting information in an attempt to maintain their attractiveness to institutional shareholders. For instance, Graves (1988) believes that fund managers look mainly for short-term gains from their equity investments. In response to a desire for advancement and job security, institutional investors encourage managers to forego an increase in risky and long-term investments in favor of increasing their short-term financial profitability. Due to the information asymmetry between managers and investors, Froot et al. (1992) show that it is more cost-effective for institutions to invest based on short-term performance, rather than valuing the long-term prospects of the firms in their diversified portfolios. In conclusion, institutional investors may lead to lower-quality accounting information because their frequent trading and short-term focus may encourage managers to exercise short-sighted discretion in reporting a firm's financial performance.

As the development of foreign capital markets involves not only further improvements in laws and regulations, but also the growing scale of institutional investors, the cost of institutional investors “voting with their feet” is increasing. Compared with exiting the market negatively through stock-selling, institutional investors increasingly take an active part in corporate governance by proposing shareholder bills or soliciting proxy voting rights, because they are more capable of achieving higher returns by monitoring managerial behavior than individual investors. Correspondingly, some foreign scholars support the monitoring effect argument, which assumes that institutional ownership will bring high-quality accounting information. Prowse (1990) finds that institutional investors that take part in corporate governance play a supervisory role in earnings management. Brous and Kini (1994) suggest that higher levels of institutional ownership are associated with more effective monitoring of the use of cash a firm obtains from equity issues, due to their higher ownership stake in the firm. Warfield et al. (1995) find that managerial ownership is positively associated with the explanatory power of earnings for predicting returns and inversely related to the magnitude of accounting accrual adjustments. Bushee (1998) holds that more sophisticated institutional investors remove incentives for managers' opportunistic behavior through closer monitoring of managerial behavior, either through explicit governance activities² or through the implicit collection and dissemination of information in the stock market.³ According to this view, institutional investors play an active role in improving financial reporting quality because they are willing to monitor and discipline managers, thus ensuring that managers maximize the long-term value of the firm rather than their own interests. For example, there is evidence to suggest that firms with higher AIMR disclosure rankings have greater institutional ownership (Bushee and Noe, 2000) and managers are less likely to cut R&D to reverse an earnings decline when institutional ownership is high. Chung et al.

² For example, in the early 1990s, some institutional investors (i.e., the California Public Employees Pension Fund and J.P. Morgan) lobbied for the removal of CEOs at several large, poor performing firms, including Kodak, IBM, Westinghouse, Borden, American Express and GM (Kahn and Winton, 1998).

³ Previous studies find that relatively more future earnings information is impounded in stock prices (Jiambalvo et al., 2002) and inefficient pricing of earnings is reduced (Bartov et al., 2000) when institutional ownership is high.

(2002) also find evidence that is consistent with institutional investors monitoring and constraining the self-serving behavior of corporate managers.

The recent foreign literature suggests a new method for studying this issue, by reclassifying institutional investors based on their historical investing characteristics. Following Bushee (1998), Liu and Peng (2006) group mutual funds into three categories⁴ and find that the accuracy of accruals is negatively related to the shareholdings of short-term institutional investors, but positively related to the shareholdings of long-term institutional investors. This suggests that short-term investors decrease earnings quality, whereas long-term investors play a role in monitoring management. Koh (2007) indicates that long-term institutional investors can mitigate aggressive earnings management, whereas transient institutional ownership is only associated with aggressive earnings management among firms that need to meet their earnings benchmarks.

With the rapid development of institutional investors in China, several domestic researchers examine the role of institutional investors with mixed results. Cheng (2006) finds that timeliness is positively associated with the shareholdings of institutional investors, whereas the extent of earnings management is negatively associated with the shareholdings of institutional investors. However, he does not consider the endogeneity problem between earnings quality and institutional shareholdings. Gao and Zhang (2008) use data from Chinese listed companies to show that institutional investors are involved, to an extent, in corporate governance and thus restrain earnings management. Huang (2009) finds an inverse-U relationship between the shareholdings of institutional investors and earnings management. Additionally, Deng and Tang (2010) query whether institutional investors can restrain earnings management. They find that the shareholdings of institutional investors are positively related to earnings management and furthermore, this relationship is more prominent in state-owned enterprises. Their results suggest that the majority of institutional investors in China are still myopic, and increase rather than reduce earnings management.

According to the above discussion, we find that the question of whether institutional investors are short-sighted is a contentious issue, especially in the emerging capital market of China. Supposing the aim of institutional investors is to seek profit maximization, then we have reason to conjecture that institutional investors are motivated to support management to manipulate earnings. Nevertheless, several studies consider how the characteristics of institutional investors affect the extent of firms' earnings management by classifying institutional investors into different types. To address these issues, we propose Hypothesis 2:

Hypothesis 2. Relative to short-term mutual funds, the monitoring effect of long-term mutual funds on listed companies' earnings management is stronger

To date, most studies consider how the information environment or institutional investors affect earnings management. However, they rarely study the issue by incorporating the relationship between information asymmetry and institutional investors. As Ramalingegowda and Yu (2012) suggest, the higher the shareholdings of institutional investors, the higher the earnings conservatism (an important component of earnings quality). When the extent of information asymmetry is higher, the relationship between the shareholdings of institutional investors and earnings conservatism is more prominent. Although the mutual fund industry has recently experienced fast development in China's capital market, gaps still exist compared with the same industry in developed capital markets. The role of mutual funds in China is still limited to stabilizing market efficiency and monitoring the behavior of managers. With respect to the cost when mutual funds play a role in monitoring, the higher the information asymmetry, the higher the cost of supervision. Once the cost exceeds the potential profit, mutual funds will no longer supervise the firm and will vote with their feet (Coffee, 1991). However, when the extent of information asymmetry is low, the cost of monitoring is also low and mutual funds can still gain high potential profits.⁵ Therefore, compared with developed capital markets, do mutual funds in China behave differently when they face firms with different levels of information asymmetry? For instance, do long-term mutual funds tend to have a greater monitoring role in comparison with short-term mutual funds when the extent of information asymmetry is low? Considering that the extent of information

⁴ Bushee (1998) classifies institutional investors into three types. Due to data limitations, we choose the classification method used by Yan and Zhang (2009).

⁵ We thank the referees for this suggestion.

asymmetry will affect the investment behavior of mutual funds, we group firms according to the extent of information asymmetry and then study the effect of mutual fund ownership on earnings management. We propose Hypothesis 3:

Hypothesis 3. When there is low information asymmetry, the monitoring effect of long-term mutual funds on listed companies' earnings management is stronger

3. Data and research design

3.1. Sample selection and data sources

As the number and size of institutional investors has increased since 2004, we choose all companies listed on the Chinese A-share market during the 2004–2010 period. Financial data and institutional investor shareholdings data are obtained from the WIND Database, and stock return and corporate governance data are drawn from the CCER Database. We initially group all listed companies into 13 industries following the CSRC industry classification standard. However, since most companies belong to manufacturing industries, we use subcategories for the manufacturing industry, which results in a total of 22 industry categories.

During the sample selection process, we exclude financial companies, companies listed on the GEM and “Special Treatment” or “Particular Transfer” companies. We also exclude companies with missing data. To minimize the influence of outliers, the top and bottom 1% of the variables are winsorized. In total, we have 7286 firm-year observations in our sample.

3.2. Variable definitions

We use empirical models to study the relationship between earnings management and information asymmetry and long-term or short-term mutual funds. The variables we use are defined as follows.

3.2.1. Earnings management (EM)

There is controversy in the existing literature regarding the definition and measurement of earnings management. Previous studies measure the extent of earnings management in different ways, such as timeliness, smoothness and persistence (Hunt et al., 1996; Lev and Thiagarajan, 1993). However, these methods generally measure the earnings management of a particular group of companies, but not individual companies. The existing literature usually uses the relationships between earnings, operating cash flows and accruals to measure firm-level earnings management. We also follow this method by adopting the model of Dechow and Dichev (2002; hereafter referred to as the DD model) model and extending Ball and Shivakumar's (2005) piecewise nonlinear regression model (hereafter referred to as the BS model).⁶

The DD model considers the relationship between accruals and cash flows, and adopts the mapping relationships between current accruals at t and cash flows in periods $t - 1$, t and $t + 1$, to measure earnings management, as follows:

$$\Delta WC_t = \alpha_0 + \alpha_1 CFO_{t-1} + \alpha_2 CFO_t + \alpha_3 CFO_{t+1} + \varepsilon_t \quad (1)$$

The principle of the DD model is to measure the degree of match between accruals and cash flows. When the part of accruals (ε_t) that cannot be explained by operating cash flows is relatively stable, the accruals quality is high and investors' uncertainty over predictions of future operating cash flows is low. This helps to ensure the high quality of information concerning future cash flows. Therefore, the extent of earnings management is low, and vice versa.

The DD model requires 7 continuous years of information from annual reports. In Eq. (1), ΔWC_t is total accruals at t , measured as operating profit minus operating cash flow; and CFO_{t-1} , CFO_t and CFO_{t+1} represent

⁶ We do not report the results of the BS model as they are consistent with those of the DD model. We provide a detailed description of the measurement method for the BS model in Appendix A. Furthermore, the Pearson correlation between $|BS_eq|$ obtained from the BS model and $|DD_eq|$ obtained from the DD model is 0.94, so using them as the same proxy measure is reliable.

the operating cash flows in periods $t - 1$, t and $t + 1$, respectively. All of the above variables are scaled by average total assets to eliminate the size effect. Using Eq. (1), we regress by each industry and each year separately to obtain the residual ε_t , which represents abnormal accruals. In the DD model, there are generally two ways to calculate earnings management. The first uses the absolute value of the residual as the proxy for earnings management. The second uses the standard deviation of the residual from $t - 4$ to t for each company to obtain the measure of earnings management. If the volatility of abnormal accruals over 5 years is weak, then the risk of earnings is low, and so is the extent of earnings management.

Koh (2007) points out that there is a difference between negative and positive earnings management. Negative earnings management occurs when management is concerned that firm performance will deteriorate in the future, so they use accounting conservatism to hide the firm's current performance and thus artificially inflate future profits. Positive earnings management is due to company management attempting to hide the firm's current poor performance by artificially inflating profits. Although both types of earnings management deceive investors and reduce earnings quality, their motivation and channels of implementation are different. In this paper, we attempt to distinguish the behavior of mutual funds by differentiating between positive and negative earnings management, so we choose the original value of ε_t as the proxy for earnings management, which is defined as DD_eq . If $DD_eq > 0$, then the accruals profit based on working capital exceeds the actual accruals profit calculated by 3 continuous years of operating cash flows, suggesting that accrual profit may be increased artificially, i.e. positive earnings management $DD_eq(+)$. $DD_eq(-)$ reflects negative earnings management. A higher value of $|DD_eq|$ indicates higher earnings management.

3.2.2. Information asymmetry (InfoAsy)—based on the standard deviation of idiosyncratic risk (SD)

Following Dierkens (1991) and Kong and Fu (2005)⁷, for each company in each year, we regress the market model. Then, we calculate the standard deviation of the difference between the actual return and the normal return estimated by the market model and use it as the proxy for information asymmetry. The formula is as follows:

$$\varepsilon'_t = r_{it} - \hat{r}_{it} \quad (2)$$

where r_{it} is the actual daily return of companies in period t , and \hat{r}_{it} is the normal daily return estimated by the following market model:

$$\hat{r}_{it} = \hat{\alpha}_i + \hat{\beta}r_{mt} \quad (3)$$

where $\hat{\alpha}_i$ and $\hat{\beta}$ are estimated using the stock return data for companies in period $t - 1$.

3.2.3. The classification of institutional investors (Insti) as long- and short-term mutual funds (long/short_ratio)

Previous studies rarely group institutional investors according to their characteristics, but some studies show that there is a bias error in the investment style of mutual funds (Brown and Goetzmann, 1997; Sun et al., 2012). Therefore, we do not adopt the classification directly from the database, but follow Yan and Zhang (2009) in classifying mutual funds into long- and short-term investors based on their portfolio turnover over the past year.

First, we calculate aggregate purchases and sales for each mutual fund k :

⁷ We thank the referee for this suggestion. Although previous studies propose different measures of information asymmetry, we choose to follow Dierkens (1991), who suggests that the standard deviation based on idiosyncratic risk actually reflects the uncertainty of firm value, and this uncertainty stems from the information asymmetry between the company management and investors. When the extent of information asymmetry is higher, the disagreement between investors and management regarding firm value is higher, and the management have more chance to hide idiosyncratic information. As the extent of information asymmetry reduces, investors and management have consistent opinions about firm value and uncertainty is reduced. Although the bid-ask spread can also proxy for information asymmetry, it tends to reflect the information asymmetry in trading, which is more likely to be due to the different private information owned by investors. As this paper is interested in the information asymmetry between the company management and investors, we believe it is feasible to measure information asymmetry following Dierkens (1991) and Kong and Fu (2005).

$$CR_buy_{k,t} = \sum_{\substack{i=1 \\ S_{k,i,t} > S_{k,i,t-1}}}^{N_k} |S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t}\Delta P_{i,t}| \quad (4)$$

$$CR_sell_{k,t} = \sum_{\substack{i=1 \\ S_{k,i,t} < S_{k,i,t-1}}}^{N_k} |S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t}\Delta P_{i,t}| \quad (5)$$

where $CR_buy_{k,t}$ and $CR_sell_{k,t}$ are mutual fund k 's aggregate purchases and sales for period t , respectively; $P_{i,t}$ and $P_{i,t-1}$ are the share prices for stock i at the end of period t and $t-1$; $S_{k,i,t}$ and $S_{k,i,t-1}$ are the number of shares of stock i held by investor k at the end of periods t and $t-1$, respectively; and $\Delta P_{i,t}$ is the price change from $t-1$ to t . If the number of shares of stock i held by mutual fund k is less in period t than it is in period $t-1$, then mutual fund k sold stock i , and the capital change in stock i will be accounted for in aggregate sales, otherwise the capital change will be accounted for in aggregate purchases.

Then, we calculate mutual fund k 's churn rate (CR) for period t :

$$CR_{k,t} = \frac{\min(CR_buy_{k,t}, CR_sell_{k,t})}{\sum_{i=1}^{N_k} \frac{S_{k,i,t}P_{i,t} + S_{k,i,t-1}P_{i,t-1}}{2}} \quad (6)$$

and obtain mutual fund k 's average churn rate based on the turnover over the past year:

$$AVG_CR_{k,t} = \frac{1}{2}(CR_{k,t} + CR_{k,t-1}) \quad (7)$$

Given the average churn rate measure, for each period t , we sort all mutual funds into three tertile portfolios based on AVG_CR . Those ranked in the bottom tertile are classified as long-term mutual funds and those ranked in the top tertile are classified as short-term mutual funds. Finally, for each stock, we define the long-term (short-term) institutional ownership (hereafter `long_ratio` and `short_ratio`) as the ratio of the number of shares held by long-term (short-term) mutual fund investors and the total number of shares outstanding.

3.2.4. Other control variables

There is extensive evidence in the literature that effective corporate governance contributes to the improvement of listed companies' accounting information. There are two views on this issue. The first is agency theory, which examines the relationship between management ownership, corporate governance and information content. Klassen (1997) and Warfield et al. (1995) both find that the pressure from capital markets induces companies with low management ownership to choose accounting measures to increase earnings, which consequently reduces the information content of earnings. The second concerns outside blockholders and focuses on the role of corporate governance and its effect on earnings quality. Kaplan and Minton (1994) and Kang and Shivdasani (1995) find that because outside blockholders have strong incentives to obtain information about companies and monitor management, they play a positive role in corporate governance. Therefore, to control for the influence of corporate governance on earnings management, we choose five corporate governance variables as follows:

Duality: A dummy variable that equals 1 if the chairman and the CEO are the same person, and 0 otherwise;

Out_ratio: The proportion of independent directors on the board;

Top1: The proportion of shareholdings of the largest shareholder;

Top2_10: The aggregate proportion of shareholdings by the second to the 10th largest shareholders; and

CR_5: The aggregate proportion of shareholdings of the top five shareholders.

In addition, financing needs, ultimate controllers, auditors and other firm factors may affect earnings management and information asymmetry. Thus, we also use the following control variables:

Offering: Following Ljungqvist et al. (2009), we use a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period t , and 0 otherwise;

Table 1
Descriptive statistics for $|DD_{eq}|$.

Year	Obs	Mean	SD	Min	P25	P50	P75	Max
2004	934	0.034	0.042	0.000	0.008	0.019	0.041	0.259
2005	1012	0.032	0.040	0.000	0.007	0.017	0.039	0.259
2006	1025	0.035	0.044	0.000	0.009	0.021	0.041	0.259
2007	1057	0.041	0.049	0.000	0.011	0.025	0.049	0.259
2008	1095	0.038	0.047	0.000	0.008	0.021	0.045	0.259
2009	1072	0.039	0.049	0.000	0.010	0.023	0.046	0.259
2010	1091	0.037	0.046	0.000	0.011	0.024	0.041	0.259

Notes: This table reports descriptive statistics for $|DD_{eq}|$ from 2004 to 2010. *Obs*: sample size for each year. *Mean*: sample average for each year. *SD*: sample standard deviation for each year. *Min*: sample minimum value for each year. *P25*: sample first quartile for each year. *P50*: sample median for each year. *P75*: sample third quartile for each year. *Max*: sample maximum value for each year.

SOE: A dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise;

Audit: A dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise;

TopAudit: A dummy variable that equals 1 if the company's audit firm is a Big 4 firm, and 0 otherwise.⁸

LnSize: Natural logarithm of total assets at the end of the year;

LnMB: Natural logarithm of the market-to-book ratio; and

To: The turnover of listed companies in each year, because Hakim et al. (2008) find that high earnings quality is positively associated with high liquidity.

4. Empirical analysis

4.1. Descriptive statistics

We calculate abnormal accruals for each firm following the DD model, namely DD_{eq} . Table 1 presents the summary statistics for each year. It shows that since 2004, the earnings quality of listed companies in China first declines and then increases, and peaks in 2007.

Table 2 presents the summary statistics for the key variables. The table shows that the average $|DD_{eq}|$ is 0.037, and the range is between 0 and 0.259. The average $|BS_{eq}|$ is 0.036, and the correlation coefficient of $|DD_{eq}|$ and $|BS_{eq}|$ is 0.94, thus it is reliable to use them as the same proxy measure. The mean of *SD*, which is a proxy for information asymmetry, is 0.024, and the standard deviation is 0.006, suggesting that differences in information asymmetry exist among companies. Furthermore, the average proportion of shareholdings of long-term mutual funds is 0.021 and for short-term mutual funds is 0.036. The summary statistics for the corporate governance variables show that ownership concentration in Chinese listed companies is relatively high. The mean of *Top1* is 37.9% and the maximum value is 75.1%, while the average *TOP2_10* is 18.5%. Considering the corporate governance structure, on average, the proportion of independent directors is relatively high, with a mean of 55.2%, which can play a positive role in monitoring controlling shareholders and management and protecting minority investors. Meanwhile, the average *Duality* is 9.6%, which may reduce earnings quality.

Panel B of Table 2 shows that the extent of earnings management is significantly positively related to information asymmetry and the proportion of shareholdings of long- and short-term mutual funds. This suggests that the extent of earnings management increases as the extent of information asymmetry increases, and both long-term and short-term mutual funds are likely to increase earnings management behavior. Both company size and market-to-book ratios are positively related to abnormal accruals, which shows the dominant role of speculation. The negative correlation coefficient between turnover and abnormal accruals is consistent with the conclusion in Hakim et al. (2008). Considering the corporate governance variables, *Top1* and *CR_5* are both positively related to abnormal accruals, which suggests that large shareholders have an incentive to implement

⁸ We thank the referees for this suggestion.

Table 2
Descriptive statistics and correlation coefficient matrix.

	<i>DD_eq</i>	<i>BS_eq</i>	<i>SD</i>	<i>Long_ratio</i>	<i>Short_ratio</i>	<i>TO</i>	<i>Duality</i>	<i>Out_ratio</i>	<i>Top1</i>	<i>Top2_10</i>	<i>CR_5</i>	<i>LnSize</i>	<i>LnMB</i>	<i>Offering</i>	<i>SOE</i>	<i>Audit</i>	<i>TopAudit</i>
<i>Panel A: Summary statistics</i>																	
<i>N</i>	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286	7286
<i>Mean</i>	0.037	0.036	0.024	0.021	0.036	6.428	0.096	0.552	0.379	0.185	0.530	21.831	1.110	0.131	0.669	0.989	0.073
<i>Std.Dev</i>	0.046	0.044	0.006	0.041	0.066	3.977	0.295	0.107	0.157	0.128	0.150	1.121	0.698	0.338	0.470	0.102	0.260
<i>Min</i>	0.000	0.000	0.012	0.000	0.000	0.787	0.000	0.250	0.090	0.010	0.198	19.838	-0.177	0	0	0	0
<i>P25</i>	0.009	0.009	0.020	0.000	0.000	3.298	0.000	0.500	0.252	0.075	0.424	21.001	0.583	0	0	1	0
<i>P50</i>	0.021	0.021	0.024	0.000	0.001	5.527	0.000	0.500	0.360	0.162	0.537	21.709	1.057	0	1	1	0
<i>P75</i>	0.043	0.043	0.028	0.023	0.043	8.735	0.000	0.600	0.502	0.276	0.638	22.503	1.565	0	1	1	0
<i>Max</i>	0.259	0.253	0.039	0.210	0.314	18.980	1.000	0.900	0.751	0.551	0.910	25.356	3.434	1	1	1	1
<i>Panel B: Correlation matrix</i>																	
<i>BS_eq</i>	0.940																
<i>SD</i>	0.028	0.029															
<i>Long_ratio</i>	0.148	0.145	0.041														
<i>Short_ratio</i>	0.245	0.235	0.061	0.571													
<i>TO</i>	-0.068	-0.068	0.565	-0.101	-0.151												
<i>Duality</i>	-0.022	-0.019	0.028	-0.009	0.002	0.025											
<i>Out_ratio</i>	0.027	0.028	0.081	-0.021	0.002	0.106	0.038										
<i>Top1</i>	0.043	0.047	-0.134	0.055	0.079	-0.144	-0.058	-0.042									
<i>Top2_10</i>	-0.016	-0.021	0.035	0.178	0.166	-0.091	0.042	0.011	-0.464								
<i>CR_5</i>	0.026	0.027	-0.136	0.121	0.134	-0.218	-0.032	-0.042	0.717	0.264							
<i>LnSize</i>	0.370	0.352	0.082	0.395	0.502	0.087	-0.034	0.076	0.178	-0.013	0.147						
<i>LnMB</i>	0.049	0.045	0.477	0.242	0.226	0.390	0.043	0.082	-0.106	0.123	-0.055	0.368					
<i>Offering</i>	0.056	0.056	0.177	0.126	0.089	0.111	-0.009	0.053	-0.007	0.019	-0.015	0.163	0.162				
<i>SOE</i>	0.045	0.037	-0.100	0.032	0.050	-0.105	-0.121	-0.094	0.256	-0.203	0.129	0.136	-0.125	-0.072			
<i>Audit</i>	-0.046	-0.041	0.004	0.049	0.054	0.032	-0.003	0.018	0.021	-0.011	0.006	0.083	-0.004	0.028	0.050	1.000	
<i>TopAudit</i>	0.215	0.196	-0.104	0.117	0.167	-0.119	-0.041	-0.003	0.113	0.091	0.203	0.322	-0.055	0.006	0.093	0.024	1.000

Notes: Panel A presents the descriptive statistics for all variables (dependent, independent and control). *DD_eq* and *BS_eq* are the absolute value of abnormal accruals for each firm, following the DD model and BS model respectively, both of which have a positive relationship with the extent of earnings management. *Long_ratio* (*Short_ratio*) is the ratio between the number of shares held by long-term (short-term) mutual fund investors and the total number of shares outstanding. The rest are control variables, as follows: *Duality*: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. *Out_ratio*: the proportion of independent directors on the board. *Top1*: the proportion of shareholdings of the largest shareholder. *Top2_10*: the aggregate proportion of shareholdings of the second to the 10th largest shareholders. *CR_5*: the aggregate proportion of shareholdings of the top 5 shareholders. *LnSize*: natural logarithm of total assets at the end of the year. *LnMB*: natural logarithm of the market-to-book ratio. *TO*: turnover of listed companies each year. *Offering*: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period *t*, and 0 otherwise. *SOE*: a dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise. *Audit*: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. *TopAudit*: a dummy variable that equals 1 if the company's audit firm is a Big 4 firm, and 0 otherwise. Panel B presents the Pearson correlation coefficients for each variable.

tunneling and propping behavior that benefits themselves but damages other shareholders' interests (Liu and He, 2004). The direct consequence of tunneling and propping is the reduction of earnings quality, so tunneling behavior will reduce transparency and distort earnings. This finding is consistent with Bertrand et al. (2002).

In general, the relationships between the variables are consistent with our predictions. Next, we introduce the control variables and use the regression models to investigate the specific effects of information asymmetry and long- and short-term mutual fund ownership on earnings management.

4.2. Empirical results and analysis

We investigate how the extent of information asymmetry and long/short-term mutual fund ownership, and a combination of the two, affect listed companies' earnings management. To test Hypothesis 1, we examine the relationship between information asymmetry and earnings management, and propose the following regression model:

$$DD_{eq_{i,t}} = \alpha_i + \beta_1 SD_{i,t} + \beta_2 Con_Var_{i,t} + \varepsilon_{i,t} \quad (8)$$

There is an endogeneity problem between information asymmetry and earnings management, because a reduction in transparency may exacerbate earnings management behavior. High quality earnings information may, in turn, reduce the extent of information asymmetry between shareholders and company management. To mitigate this problem, we adopt a difference-in-difference regression method to control for endogeneity, and propose the following regression model:

$$\Delta DD_{eq_{i,t}} = \alpha_i + \beta_1 \Delta SD_{i,t} + \beta_2 Con_Var_{i,t} + \varepsilon_{i,t} \quad (9)$$

In Eqs. (8) and (9), $DD_{eq_{i,t}}$ is the abnormal accruals of firm i in period t , $\Delta DD_{eq_{i,t}}$ is the change in abnormal accruals from $t - 1$ to t . To distinguish between positive and negative earnings management, we not only use $|DD_{eq_{i,t}}|$, but also divide $DD_{eq_{i,t}}$ into two groups based on whether the value of $DD_{eq_{i,t}}$ is larger than 0, then obtain $DD_{eq_{i,t}(+)}$ and $DD_{eq_{i,t}(-)}$. $SD_{i,t}$ is a proxy for the extent of information asymmetry for firm i in period t , and $\Delta SD_{i,t}$ is the change in information asymmetry from $t - 1$ to t . $Con_Var_{i,t}$ indicates the other control variables for firm i in period t , including $LnSize$, $LnMB$, TO , the corporate governance variables ($Top1$, $Duality$, Out_ratio , CR_5 , $Top2_10$) and the dummy variables ($Offering$, SOE , $Audit$, $TopAudit$) that may affect the firm's earnings management. The regression results are presented in Tables 3 and 4.

From the tables, we find that the absolute value of abnormal accruals $|DD_{eq}|$ ($|D_DD_{eq}|$) is significantly positively related to the information asymmetry measure SD (D_SD) in both Eqs. (8) and (9). These results indicate that as the extent of information asymmetry increases, earnings management behavior becomes more serious, thus confirming Hypothesis 1.

We examine positive and negative abnormal accruals separately and find that positive abnormal accruals, $DD_{eq}(+)$, are significantly positively related to the extent of information asymmetry, and this is also confirmed in the difference-in-difference regression. Negative abnormal accruals, $DD_{eq}(-)$, are only significantly negatively related to the extent of information asymmetry in Eq. (8), suggesting that when a company's information transparency is low, both positive and negative earnings management increase, resulting in worse earnings quality. To explain why the coefficient of $D_DD_{eq}(-)$ is not significant, we consider a more common situation in reality: if a firm's management have an information advantage and have more private information, they will usually seek to maximize profits to attract more investors. Therefore, they have an incentive to cover up any potential operational problems and are more likely to manipulate profits, leading to positive earnings management. Consequently, their earnings quality is worse, as in the well-known Enron scandal or "Yin Guang Xia" incident. Such companies can successfully report deceptive earnings information due to the serious information asymmetry between shareholders and management. In particular, because of the high cost of supervision for minority shareholders, investors lack information and cannot determine the company's actual earnings, thus directly providing insiders with the opportunity to manipulate earnings and capture short-term gains. In reality, even if a company has the ability to cover up good performance when they face serious information asymmetry, they do not have the incentive to do so because the negative management will have an adverse effect on the company's short-term performance. Moreover, taking into consideration the

Table 3
Regression results for information asymmetry and earnings management.

	DD_abs	DD_eq(+)	DD_eq(-)
<i>SD</i>	0.570 ^{***} (5.903)	0.558 ^{***} (2.753)	-0.354 ^{***} (-3.229)
<i>TO</i>	-0.000 ^{***} (-2.636)	-0.001 ^{***} (-3.501)	-0.000 (-0.388)
<i>Duality</i>	0.002 (0.839)	0.006 (1.317)	0.002 (0.873)
<i>Out_ratio</i>	-0.008 (-1.608)	-0.001 (-0.121)	0.011 ^{**} (2.076)
<i>Top1</i>	-0.081 ^{***} (-3.247)	-0.037 (-0.730)	0.032 (1.077)
<i>Top2_10</i>	-0.063 ^{***} (-3.000)	-0.044 (-1.028)	0.023 (0.928)
<i>CR_5</i>	0.064 ^{***} (2.682)	0.052 (1.094)	-0.008 (-0.297)
<i>LnSize</i>	0.007 ^{***} (6.803)	0.022 ^{***} (10.601)	0.002 [*] (1.859)
<i>LnMB</i>	-0.000 (-0.321)	-0.012 ^{***} (-4.102)	-0.004 ^{***} (-2.737)
<i>Offering</i>	-0.000 (-0.276)	0.003 (0.990)	0.002 [*] (1.661)
<i>SOE</i>	0.004 (1.436)	-0.010 (-1.467)	-0.009 ^{***} (-2.736)
<i>Audit</i>	-0.025 ^{***} (-5.615)	-0.015 (-0.969)	0.016 ^{***} (3.804)
<i>TopAudit</i>	0.007 ^{**} (1.974)	-0.002 (-0.273)	0.003 (0.729)
<i>Intercept</i>	-0.089 ^{***} (-4.211)	-0.428 ^{***} (-8.891)	-0.098 ^{***} (-3.694)
Obs	7286	2873	4413
<i>R2_adj</i>	0.036	0.098	0.024

Notes: This table reports the regression results for Eq. (8). The data in brackets are the estimated *t*-values of the regression coefficients. |DD_abs| is the absolute value of abnormal accruals for each firm, following the DD model, which has a positive relationship with the extent of earnings management. We divide DD_eq into two groups based on whether the value of DD_eq is larger than 0, then we obtain DD_eq(+) and DD_eq(-). SD: the standard deviation of idiosyncratic risk, used as the measure of information asymmetry. Duality: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. Out_ratio: the proportion of independent directors on the board. Top1: the proportion of shareholdings of the largest shareholder. Top2_10: the aggregate proportion of shareholdings of the second to the 10th shareholder. CR_5: the aggregate proportion of shareholdings of the top 5 shareholders. LnSize: natural logarithm of total assets at the end of the year. LnMB: natural logarithm of the market-to-book ratio. TO: turnover of listed companies for each year. Offering: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period *t*, and 0 otherwise. SOE: dummy variable that equals 1 if company is a state-owned enterprise, and 0 otherwise. Audit: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. TopAudit: a dummy variable that equals 1 if the company's audit firm is a Big 4 firm, and 0 otherwise. Intercept: intercept term. Obs: number of observations. R2_adj: adjusted *R*-square.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

company's corporate reputation, long-term development and investor confidence, the company will use less negative earnings management.

According to the above, the higher the extent of information asymmetry, the more serious the extent of earnings management, whether positive or negative. Therefore, to reduce earnings management, regulators should strengthen the supervision of listed companies, improve the quality of information disclosure and reduce the information asymmetry between investors and listed companies.

Table 4
Difference-in-difference regression results for information asymmetry and earnings management.

	$D_ DD_abs $	$D_DD_eq(+)$	$D_DD_eq(-)$
<i>D_SD</i>	0.328*** (2.906)	0.845*** (2.863)	0.117 (0.759)
<i>D_TO</i>	-0.000 (-1.203)	-0.000 (-0.403)	-0.001*** (-5.087)
<i>Duality</i>	0.001 (0.180)	0.007 (0.806)	0.000 (0.072)
<i>D_Out_ratio</i>	-0.000 (-0.014)	0.021 (1.494)	0.016** (2.045)
<i>D_Top1</i>	-0.066* (-1.870)	-0.046 (-0.511)	-0.016 (-0.322)
<i>D_Top2_10</i>	-0.052* (-1.850)	-0.078 (-1.085)	-0.023 (-0.586)
<i>D_CR_5</i>	0.080** (2.307)	0.126 (1.458)	0.022 (0.433)
<i>D_LnSize</i>	-0.001 (-0.241)	0.053*** (8.928)	0.025*** (7.766)
<i>D_LnMB</i>	0.006*** (2.637)	-0.048*** (-7.965)	-0.021*** (-6.562)
<i>Offering</i>	0.001 (0.467)	0.003 (0.710)	-0.001 (-0.445)
<i>SOE</i>	-0.002 (-0.305)	-0.012 (-0.741)	0.004 (0.497)
<i>Audit</i>	0.003 (0.321)	-0.064** (-1.974)	-0.008 (-0.829)
<i>TopAudit</i>	-0.005 (-0.907)	-0.017 (-1.369)	0.030*** (3.318)
<i>Intercept</i>	-0.000 (-0.022)	0.081** (2.379)	-0.011 (-0.934)
Obs	5915	2270	3645
<i>R2_adj</i>	0.012	0.091	0.037

Notes: This table reports the difference-in-difference regression results for Eq. (9). The data in brackets are the estimated *t*-values of the regression coefficients. $D_|DD_abs|$ is the change in the absolute value of abnormal accruals for each firm, following the DD model, from period $t - 1$ to t . We divide D_DD_eq into two groups based on whether the value of D_DD_eq is larger than 0, then we obtain $D_DD_eq(+)$ and $D_DD_eq(-)$. D_SD : the change in the standard deviation of idiosyncratic risk, used as the information asymmetry measure, from period $t - 1$ to t . *Duality*: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. D_Out_ratio : the change in the proportion of independent directors on the board from period $t - 1$ to t . D_Top1 : the change in the proportion of shareholdings of the largest shareholder from period $t - 1$ to t . D_Top2_10 : the change in the aggregate proportion of shareholdings of the second to the 10th shareholders from period $t - 1$ to t . D_CR_5 : the change in the aggregate proportion of shareholdings of the top 5 shareholders from period $t - 1$ to t . D_LnSize : the change in the natural logarithm of total assets at the end of the year from period $t - 1$ to t . D_LnMB : the change in the natural logarithm of the market-to-book ratio from period $t - 1$ to t . D_TO : the change in the turnover of listed companies for each year from period $t - 1$ to t . *Offering*: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period t , and 0 otherwise. *SOE*: a dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise. *Audit*: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. *TopAudit*: a dummy variable that equals 1 if the company's audit firms is a Big 4 firm, and 0 otherwise. *Intercept*: intercept term. *Obs*: number of observations. *R2_adj*: adjusted *R*-square.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

We also use a fixed-effect model to test Hypothesis 2. Because institutional investors may reduce their investment in companies with low earnings quality, we also use a difference-in-difference regression to control for this endogeneity problem, and propose the following equations:

$$DD_eq_{i,t} = \alpha_i + \beta_1 Insti_{i,t} + \beta_2 Con_Var_{i,t} + \varepsilon_{i,t} \tag{10}$$

$$\Delta DD_eq_{i,t} = \alpha_i + \beta_1 \Delta Insti_{i,t} + \beta_2 Con_Var_{i,t} + \varepsilon_{i,t} \tag{11}$$

Table 5
Regression results for long/short-term mutual funds and earnings management.

	$ DD_abs $	$DD_eq(+)$	$DD_eq(-)$	$ DD_abs $	$DD_eq(+)$	$DD_eq(-)$
<i>Long_ratio</i>	-0.007 (-0.518)	0.002 (0.080)	0.056*** (3.052)			
<i>Short_ratio</i>				0.036*** (3.692)	0.027* (1.762)	0.002 (0.130)
<i>TO</i>	-0.000 (-0.059)	-0.001*** (-2.617)	-0.000** (-1.982)	0.000 (0.255)	-0.001** (-2.394)	-0.000** (-2.184)
<i>Duality</i>	0.002 (0.973)	0.006 (1.294)	0.002 (0.824)	0.002 (0.908)	0.005 (1.179)	0.002 (0.766)
<i>Out_ratio</i>	-0.007 (-1.529)	-0.002 (-0.156)	0.011** (2.119)	-0.007 (-1.499)	-0.002 (-0.155)	0.011** (2.012)
<i>Top1</i>	-0.066** (-2.549)	-0.026 (-0.499)	0.003 (0.100)	-0.095*** (-3.689)	-0.053 (-1.003)	0.025 (0.806)
<i>Top2_10</i>	-0.046** (-2.091)	-0.031 (-0.693)	-0.007 (-0.262)	-0.075*** (-3.407)	-0.058 (-1.273)	0.014 (0.542)
<i>CR_5</i>	0.047* (1.898)	0.036 (0.741)	0.020 (0.684)	0.074*** (2.986)	0.062 (1.236)	0.001 (0.018)
<i>LnSize</i>	0.007*** (6.547)	0.022*** (10.581)	0.003** (2.071)	0.006*** (6.060)	0.022*** (10.415)	0.003** (2.140)
<i>LnMB</i>	0.001 (0.494)	-0.011*** (-3.634)	-0.005*** (-3.518)	0.000 (0.170)	-0.012*** (-3.867)	-0.005*** (-3.129)
<i>Offering</i>	0.000 (0.365)	0.003 (1.230)	0.002 (1.279)	0.000 (0.374)	0.003 (1.304)	0.002 (1.297)
<i>SOE</i>	0.004 (1.270)	-0.011 (-1.573)	-0.009*** (-2.667)	0.004 (1.282)	-0.011 (-1.600)	-0.009*** (-2.701)
<i>Audit</i>	-0.024*** (-5.371)	-0.013 (-0.838)	0.015*** (3.597)	-0.024*** (-5.453)	-0.013 (-0.848)	0.015*** (3.644)
<i>TopAudit</i>	0.007* (1.953)	-0.002 (-0.335)	0.003 (0.592)	0.006* (1.910)	-0.002 (-0.265)	0.003 (0.686)
<i>Intercept</i>	-0.075*** (-3.535)	-0.419*** (-8.705)	-0.108*** (-4.122)	-0.064*** (-2.985)	-0.411*** (-8.503)	-0.111*** (-4.221)
Obs	7286	2873	4413	7286	2873	4413
<i>R2_adj</i>	0.031	0.094	0.023	0.033	0.096	0.020

Notes: This table reports the regression results for Eq. (10). The data in brackets are the estimated *t*-values of the regression coefficients. $|DD_abs|$ is the absolute value of abnormal accruals for each firm, following the DD model, which has a positive relationship with the extent of earnings management. We divide DD_eq into two groups based on whether the value of DD_eq is larger than 0, then we obtain $DD_eq(+)$ and $DD_eq(-)$. *Long_ratio* (*Short_ratio*) is the ratio between the number of shares held by long-term (short-term) mutual fund investors and the total number of shares outstanding. *Duality*: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. *Out_ratio*: the proportion of independent directors on the board. *Top1*: the proportion of shareholdings of the largest shareholder. *Top2_10*: the aggregate proportion of shareholdings of the second to the 10th largest shareholders. *CR_5*: the aggregate proportion of shareholdings of the top 5 shareholders. *LnSize*: natural logarithm of total assets at the end of the year. *LnMB*: natural logarithm of the market-to-book ratio. *TO*: turnover of listed companies for each year. *Offering*: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period *t*, and 0 otherwise. *SOE*: a dummy variable that equals 1 if company is a state-owned enterprise, and 0 otherwise. *Audit*: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. *TopAudit*: a dummy variable that equals 1 if the company's audit firm is a Big 4 audit firm, and 0 otherwise. *Intercept*: intercept term. *Obs*: number of observations. *R2_adj*: adjusted *R*-square.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

where $Insti_{i,t}$ is the proportion of shareholdings held by long- or short-term mutual funds *i* in period *t* (*Long/Short_ratio*). $\Delta Insti_{i,t}$ is the change in the proportion of shareholdings held by long- or short-term mutual funds from period *t* - 1 to *t* (*D_Long/Short_ratio*). Other variables are the same as those used above, and the results are presented in Tables 5 and 6.

Table 6
Difference-in-difference regression results for long/short-term mutual funds and earnings management.

	$D_ DD_abs $	$D_DD_eq(+)$	$D_DD_eq(-)$	$D_ DD_abs $	$D_DD_eq(+)$	$D_DD_eq(-)$
D_Long_ratio	-0.001 (-0.063)	0.004 (0.140)	0.079*** (3.323)			
D_Short_ratio				0.010 (0.920)	0.037* (1.737)	-0.016 (-0.824)
D_TO	-0.000 (-0.318)	0.000 (0.303)	-0.001*** (-4.611)	-0.000 (-0.227)	0.000 (0.500)	-0.001*** (-5.178)
$Duality$	0.001 (0.239)	0.007 (0.865)	0.000 (0.062)	0.001 (0.244)	0.008 (0.880)	0.000 (0.067)
D_Out_ratio	0.000 (0.053)	0.021 (1.430)	0.016** (2.104)	0.000 (0.059)	0.020 (1.402)	0.016** (2.062)
D_Top1	-0.061* (-1.699)	-0.048 (-0.531)	-0.051 (-0.982)	-0.069* (-1.905)	-0.085 (-0.926)	-0.006 (-0.115)
D_Top2_10	-0.046 (-1.602)	-0.079 (-1.062)	-0.056 (-1.376)	-0.054* (-1.859)	-0.116 (-1.539)	-0.013 (-0.317)
D_CR_5	0.072** (2.055)	0.124 (1.394)	0.055 (1.086)	0.079** (2.259)	0.157* (1.760)	0.011 (0.224)
D_LnSize	-0.001 (-0.235)	0.054*** (9.028)	0.024*** (7.483)	-0.001 (-0.309)	0.053*** (8.955)	0.025*** (7.797)
D_LnMB	0.006*** (2.740)	-0.047*** (-7.859)	-0.021*** (-6.723)	0.006*** (2.725)	-0.048*** (-7.892)	-0.021*** (-6.527)
$Offering$	0.001 (0.584)	0.004 (0.835)	-0.001 (-0.431)	0.001 (0.580)	0.004 (0.898)	-0.001 (-0.406)
SOE	-0.001 (-0.151)	-0.010 (-0.614)	0.004 (0.503)	-0.001 (-0.162)	-0.011 (-0.655)	0.004 (0.553)
$Audit$	0.002 (0.288)	-0.063* (-1.930)	-0.009 (-0.872)	0.002 (0.281)	-0.063* (-1.948)	-0.009 (-0.836)
$TopAudit$	-0.005 (-0.871)	-0.015 (-1.250)	0.029*** (3.174)	-0.005 (-0.877)	-0.015 (-1.213)	0.030*** (3.318)
$Intercept$	-0.001 (-0.057)	0.079** (2.291)	-0.010 (-0.876)	-0.000 (-0.043)	0.080** (2.322)	-0.011 (-0.955)
Obs	5915	2270	3645	5915	2270	3645
$R2_adj$	0.011	0.086	0.041	0.011	0.088	0.037

Notes: This table reports the difference-in-difference regression results for Eq. (11). The data in brackets are the estimated t -values of the regression coefficients. $D_|DD_abs|$ is the change in the absolute value of abnormal accruals for each firm, following the DD model, from period $t - 1$ to t . We divide D_DD_eq into two groups based on whether the value of D_DD_eq is larger than 0, then we obtain $D_DD_eq(+)$ and $D_DD_eq(-)$. D_Long_ratio (D_Short_ratio) is the change in the ratio between the number of shares held by long-term (short-term) mutual fund investors and the total number of shares outstanding from period $t - 1$ to t . $Duality$: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. D_Out_ratio : the change in the proportion of independent directors on the board from period $t - 1$ to t . D_Top1 : the change in the proportion of shareholdings of the largest shareholder from period $t - 1$ to t . D_Top2_10 : the change in the aggregate proportion of shareholdings of the second to the 10th largest shareholders from period $t - 1$ to t . D_CR_5 : the change in the aggregate proportion of shareholdings of the top 5 shareholders from period $t - 1$ to t . D_LnSize : the change in the natural logarithm of total assets at the end of the year from period $t - 1$ to t . $LnMB$: the change in the natural logarithm of the market-to-book ratio from period $t - 1$ to t . D_TO : the change in the turnover of listed companies in each year from period $t - 1$ to t . $Offering$: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period t , and 0 otherwise. SOE : a dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise. $Audit$: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. $TopAudit$: a dummy variable that equals 1 if the company's audit firm is a Big 4 audit firm, and 0 otherwise. $Intercept$: intercept term. Obs : number of observations. $R2_adj$: adjusted R-square.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

The results in Tables 5 and 6 indicate a prominent difference between long- and short-term mutual funds. When the dependent variable is negative earnings management, the coefficient of the proportion of shareholdings held by long-term investors is significantly positive. This implies that long-term mutual funds can reduce

Table 7

Regression results for long/short-term mutual funds and earnings management after grouping based on the extent of information asymmetry.

	Low						High					
	<i>DD_abs</i>	<i>DD_eq(+)</i>	<i>DD_eq(-)</i>	<i>DD_abs</i>	<i>DD_eq(+)</i>	<i>DD_eq(-)</i>	<i>DD_abs</i>	<i>DD_eq(+)</i>	<i>DD_eq(-)</i>	<i>DD_abs</i>	<i>DD_eq(+)</i>	<i>DD_eq(-)</i>
<i>Long_ratio</i>	-0.006 (-0.260)	-0.002 (-0.056)	0.071** (2.500)				-0.023 (-1.047)	-0.011 (-0.295)	0.018 (0.572)			
<i>Short_ratio</i>				0.028** (1.992)	-0.001 (-0.050)	0.006 (0.287)				0.046*** (2.747)	0.026 (0.921)	-0.038 (-1.571)
<i>TO</i>	-0.000 (-1.485)	-0.001** (-2.293)	-0.000 (-0.760)	-0.000 (-1.262)	-0.001** (-2.261)	-0.000 (-0.928)	-0.000 (-0.328)	-0.001* (-1.732)	-0.000 (-1.205)	0.000 (0.009)	-0.001 (-1.590)	-0.000 (-1.363)
<i>Duality</i>	0.002 (0.569)	0.003 (0.475)	0.001 (0.146)	0.002 (0.487)	0.003 (0.476)	0.000 (0.106)	0.002 (0.544)	0.008 (1.058)	0.003 (0.870)	0.002 (0.527)	0.008 (1.046)	0.003 (0.905)
<i>Out_ratio</i>	0.009 (1.137)	0.003 (0.211)	-0.009 (-0.976)	0.009 (1.174)	0.003 (0.213)	-0.009 (-0.984)	-0.023*** (-2.976)	-0.011 (-0.629)	0.034*** (3.926)	-0.022*** (-2.930)	-0.011 (-0.591)	0.033*** (3.897)
<i>Top1</i>	-0.110*** (-2.614)	-0.077 (-0.947)	0.090* (1.646)	-0.131*** (-3.121)	-0.077 (-0.933)	0.116** (2.138)	-0.037 (-0.941)	0.052 (0.588)	-0.046 (-0.977)	-0.082** (-2.074)	0.015 (0.161)	-0.017 (-0.365)
<i>Top2_10</i>	-0.064* (-1.804)	-0.069 (-0.994)	0.049 (1.110)	-0.086** (-2.416)	-0.069 (-0.970)	0.075* (1.689)	-0.036 (-1.058)	-0.002 (-0.023)	-0.048 (-1.202)	-0.079** (-2.330)	-0.038 (-0.483)	-0.021 (-0.513)
<i>CR_5</i>	0.089** (2.213)	0.090 (1.172)	-0.068 (-1.310)	0.109*** (2.692)	0.090 (1.145)	-0.091* (-1.765)	0.025 (0.676)	-0.016 (-0.187)	0.070 (1.569)	0.067* (1.781)	0.020 (0.229)	0.043 (0.968)
<i>LnSize</i>	0.011*** (6.126)	0.024*** (6.665)	-0.001 (-0.545)	0.011*** (6.073)	0.024*** (6.749)	-0.002 (-0.707)	0.006*** (3.899)	0.024*** (7.086)	0.007*** (3.547)	0.005*** (3.238)	0.023*** (6.802)	0.007*** (3.891)
<i>LnMB</i>	-0.003 (-1.054)	-0.007 (-1.252)	-0.002 (-0.596)	-0.003 (-1.382)	-0.007 (-1.319)	-0.000 (-0.138)	0.002 (1.055)	-0.014*** (-2.956)	-0.007*** (-3.725)	0.002 (0.912)	-0.014*** (-3.015)	-0.007*** (-3.688)
<i>Offering</i>	0.001 (0.583)	0.003 (0.758)	0.002 (0.787)	0.001 (0.662)	0.003 (0.753)	0.002 (0.831)	0.001 (0.545)	0.005 (1.062)	0.001 (0.512)	0.001 (0.448)	0.004 (1.042)	0.001 (0.563)
<i>SOE</i>	-0.001 (-0.179)	-0.005 (-0.411)	-0.001 (-0.191)	-0.001 (-0.156)	-0.005 (-0.413)	-0.002 (-0.287)	0.007* (1.661)	-0.022** (-1.989)	-0.011** (-2.529)	0.007* (1.687)	-0.022** (-1.991)	-0.011** (-2.576)
<i>Audit</i>	-0.023** (-2.488)	-0.044 (-0.881)	0.015* (1.822)	-0.023** (-2.499)	-0.044 (-0.881)	0.015* (1.844)	-0.020*** (-3.572)	-0.008 (-0.425)	0.008 (1.468)	-0.020*** (-3.619)	-0.008 (-0.429)	0.008 (1.495)
<i>TopAudit</i>	0.013*** (2.833)	0.012 (1.479)	0.001 (0.110)	0.013*** (2.751)	0.012 (1.479)	0.001 (0.133)	-0.002 (-0.312)	-0.011 (-0.991)	0.001 (0.099)	-0.002 (-0.260)	-0.010 (-0.897)	0.002 (0.173)
<i>Intercept</i>	-0.184*** (-4.479)	-0.434*** (-4.836)	-0.016 (-0.297)	-0.179*** (-4.385)	-0.435*** (-4.852)	-0.009 (-0.165)	-0.054* (-1.804)	-0.445*** (-6.010)	-0.193*** (-5.144)	-0.034 (-1.110)	-0.433*** (-5.752)	-0.209*** (-5.504)
Obs	3645	1527	2118	3645	1527	2118	3641	1346	2295	3641	1346	2295
<i>R2_adj</i>	0.043	0.104	0.021	0.044	0.104	0.016	0.032	0.123	0.038	0.034	0.124	0.039

Notes: This table reports the regression results for Eq. (10) after dividing the sample into Low and High groups based on the extent of listed companies' information asymmetry. The data in brackets are the estimated *t*-values of the regression coefficients. *DD_abs* is the absolute value of abnormal accruals of each firm, following the DD model, which has a positive relationship with the extent of earnings management. We divide *DD_eq* into two groups based on whether the value of *DD_eq* is larger than 0, then we obtain *DD_eq(+)* and *DD_eq(-)*. *Long_ratio* (*Short_ratio*) is the ratio between the number of shares held by long-term (short-term) mutual fund investors and the total number of shares outstanding. *Duality*: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. *Out_ratio*: the proportion of independent directors on the board. *Top1*: the proportion of shareholdings of the largest shareholder. *Top2_10*: the aggregate proportion of shareholdings of the second to the 10th largest shareholders. *CR_5*: the aggregate proportion of shareholdings of the top 5 shareholders. *LnSize*: natural logarithm of total assets at the end of the year. *LnMB*: natural logarithm of the market-to-book ratio. *TO*: turnover of listed companies for each year. *Offering*: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period *t*, and 0 otherwise. *SOE*: a dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise. *Audit*: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. *TopAudit*: a dummy variable that equals 1 if the company's audit firm is a Big 4 audit firm, and 0 otherwise. *Intercept*: intercept term. *Obs*: number of observations. *R2_adj*: adjusted *R*-square.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

companies' negative earnings management behavior and play a supervisory role of management, because they have an information advantage and can communicate with listed companies effectively. Furthermore, their large investments and long-sighted view of performance means they are more likely to actively participate in corporate governance and monitor management, thereby reducing the company's profit manipulation behavior. This "supervision effect" increases the company's earnings quality and increases mutual fund investors' returns to compensate them for their monitoring costs and uncertainty risk.

Table 8
Difference-in-difference regression results for long/short-term mutual funds and earnings management after grouping based on the extent of information asymmetry.

	Low				High				
	$D_DD_abs $	$D_DD_eq(+)$	$D_DD_eq(-)$	$D_DD_abs $	$D_DD_eq(+)$	$D_DD_eq(-)$	$D_DD_abs $	$D_DD_eq(+)$	$D_DD_eq(-)$
D_Long_ratio	-0.046* (-1.945)	-0.060 (-1.196)	0.138*** (3.499)	0.002 (0.095)	0.024 (0.723)	-0.022 (-0.694)	0.031 (1.367)	0.056 (1.097)	0.058 (1.560)
D_Short_ratio									
D_TO	-0.000 (-1.092)	-0.001 (-1.962)	-0.001* (-1.962)	-0.000 (-0.755)	-0.001 (-2.558)	-0.001** (-2.558)	0.000 (0.888)	0.000 (0.485)	0.000 (0.411)
$Duality$	-0.002 (-0.469)	0.010 (0.743)	0.002 (0.204)	-0.002 (-0.453)	0.011 (0.795)	0.002 (0.311)	-0.001 (-0.129)	-0.000 (-0.011)	0.001 (0.082)
D_Out_ratio	0.016* (1.800)	-0.006 (-1.595)	-0.006 (-0.442)	0.016* (1.809)	0.033 (1.596)	-0.005 (-0.388)	-0.021** (-2.372)	0.022 (0.787)	0.021 (0.741)
D_Top1	-0.112 (-1.751)	-0.244 (-1.555)	-0.112 (-0.285)	-0.135** (-2.113)	-0.303* (-1.940)	-0.030 (0.320)	0.032 (1.101)	0.165 (1.068)	0.165 (1.068)
D_Top2_I0	-0.060 (-1.197)	-0.216* (-1.723)	-0.085 (-1.118)	-0.083* (-1.652)	-0.275** (-2.193)	-0.200 (-0.620)	-0.044 (-1.053)	0.037 (0.300)	-0.040 (-0.892)
D_CR_5	0.141** (2.240)	0.339** (2.233)	0.013 (0.131)	0.164*** (2.633)	0.396*** (2.642)	-0.049 (-0.499)	0.054 (1.067)	-0.089 (-0.600)	0.048 (0.741)
D_LnSize	0.005 (1.111)	0.056*** (5.061)	0.019** (2.575)	0.005 (1.118)	0.055*** (4.953)	0.018 (2.457)	-0.004 (-1.406)	0.055*** (6.269)	0.027*** (6.673)
D_LnMB	0.002 (0.301)	-0.043*** (-3.833)	-0.019** (-2.497)	0.000 (0.005)	-0.045*** (-4.035)	-0.015** (-1.971)	0.008*** (2.939)	-0.050*** (-5.740)	-0.023*** (-2.943)
$Offering$	0.001 (0.289)	0.006 (0.842)	-0.001 (-0.192)	0.001 (0.211)	0.006 (0.812)	-0.000 (-0.070)	0.002 (0.887)	0.010 (1.304)	-0.002 (-0.481)
SOE	0.005 (0.468)	0.009 (0.352)	-0.026 (-1.402)	0.005 (0.473)	0.009 (0.365)	-0.025 (-1.333)	-0.007 (-0.962)	-0.025 (-0.842)	-0.007 (-1.579)
$Audit$	0.021 (1.073)	-0.191** (-2.320)	-0.019 (-0.900)	0.020 (1.057)	-0.194** (-2.357)	-0.019 (-0.874)	-0.000 (-0.047)	-0.042 (-1.049)	-0.005 (-0.386)
$TopAudit$	0.014* (1.783)	0.006 (0.369)	-0.010 (-0.759)	0.014* (1.713)	0.006 (0.358)	-0.008 (-0.643)	-0.027** (-2.383)	-0.007 (-0.284)	0.061*** (3.424)
$Intercept$	-0.025 (-1.208)	0.188** (2.230)	0.021 (0.830)	-0.025 (-1.182)	0.192** (2.269)	0.019 (0.745)	0.008 (0.689)	0.067 (1.523)	0.008 (1.527)
Obs	2954	1225	1729	2954	1225	1729	2961	1045	1916
$R2_adj$	0.017	0.083	0.034	0.015	0.082	0.022	0.024	0.135	0.073

Notes: This table reports the difference-in-difference regression results for Eq. (11) after dividing the sample into Low and High groups based on the extent of listed companies' information asymmetry. The data in brackets are the estimated *t*-values of the regression coefficients. $D_DD_abs|$ is the change in the absolute value of abnormal accruals for each firm, following the DD model, from period $t - 1$ to t . We divide D_DD_eq into two groups based on whether the value of D_DD_eq is larger than 0, then we obtain $D_DD_eq(+)$ and $D_DD_eq(-)$. D_Long_ratio (D_Short_ratio) is the change in the ratio between the number of shares held by long-term (short-term) mutual fund investors and the total number of shares outstanding from period $t - 1$ to t . $Duality$: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. D_Out_ratio : the change in the proportion of independent directors on the board from period $t - 1$ to t . D_Top1 : the change in the proportion of shareholdings of the largest shareholder from period $t - 1$ to t . D_Top2_I0 : the change in the aggregate proportion of shareholdings of the second to the 10th largest shareholders from period $t - 1$ to t . D_CR5 : the change in the aggregate proportion of shareholdings of the top 5 shareholders from period $t - 1$ to t . D_LnSize : the change in the natural logarithm of total assets at the end of the year from period $t - 1$ to t . $LnMB$: the change in the natural logarithm of the market-to-book ratio from period $t - 1$ to t . D_ITO : the change in turnover of listed companies for each year from period $t - 1$ to t . $Offering$: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period t , and 0 otherwise. SOE : a dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise. $Audit$: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. $TopAudit$: a dummy variable that equals 1 if the company's audit firm is a Big 4 audit firm, and 0 otherwise. $Intercept$: intercept term. Obs : number of observations. $R2_adj$: adjusted *R*-square.

* Significant at the 10% level.
 ** Significant at the 5% level.
 *** Significant at the 1% level.

However, we find a difference in short-term mutual funds' investment behavior. Table 5 shows a significant positive relationship between the proportion of shareholdings held by short-term investors and positive abnormal accruals. The sign is consistent with our prediction in the difference-in-difference regression when the dependent variable is $D_|DD_abs|$, although it is only marginally significant. This result suggests that an increase in the proportion of shares held by short-term mutual funds reduces listed companies' earnings quality and, in particular, increases positive earnings management. We also find that the coefficient for the proportion of shareholdings held by short-term investors is not significant when the dependent variable is negative abnormal accruals. As negative management will not increase short-term returns, there is less incentive to implement negative earnings management to reduce financial reporting quality.

From the investment behavior of long- and short-term mutual funds, we conclude that compared with short-term mutual funds, the monitoring effect of long-term mutual funds on listed companies' earnings management is stronger, consistent with Hypothesis 2.

For Hypothesis 3, we divide the sample into Low and High groups based on the extent of listed companies' information asymmetry, and investigate the effect of the proportion of shareholding held by long- and short-term mutual funds on earnings management in different information environments. The results are presented in Tables 7 and 8.

The results indicate that the speculation of short-term mutual funds is observable, regardless of the extent of information asymmetry. In the low information asymmetry group, for each unit increase in the proportion of short-term mutual funds, the company's earnings management increases by 2.8%. In the high information asymmetry group, the increase is 4.6%. This suggests that when short-term mutual funds invest in high information asymmetry companies, they are more likely to focus on short-term returns. For long-term mutual funds, when the extent of information asymmetry is low, the proportion of shareholdings is significantly positively related to negative abnormal accruals. This suggests that in a relatively transparent information environment, long-term investors can mitigate negative earnings management and increase earnings quality. However, when the extent of information asymmetry is high, all of the coefficients for long-term mutual funds are non-significant. Therefore, when the information environment is relatively transparent, the monitoring effect of long-term mutual funds on listed companies' earnings management is stronger, consistent with Hypothesis 3. Based on these results, we suggest that it is important to promote the development of long-term institutional investors by expanding information channels and increasing the information transparency between listed companies and investors.

In summary, we find that although short-term mutual funds may exploit their information advantage to trade frequently, when the information environment is more transparent, long-term investors can mitigate earnings management and the earnings information published by listed companies will be more credible. These results reveal the importance of improving transparency for institutional investors. We propose that regulators could prevent institutional investors from manipulating profits and reducing companies' earnings quality by strengthening information disclosure and transparency.

5. Additional tests

Because Chinese accounting standards changed significantly in 2006, we create a dummy variable to examine the effect of this change. The dummy variable is defined as follows: all years before and including 2006 take the value of 0, and all subsequent years take the value of 1. The interaction terms of this year dummy variable and the other main variables reflect the differences before and after the change in accounting standards. We run the regression using Eqs. (12) and (13), and the results are shown in Tables 9 and 10.

$$DD_eq_{i,t} = \alpha_i + \beta_1 SD_{i,t} + \beta_2 after2006 + \beta_3 SD \times after2006 + \beta_4 Con_Var_{i,t} + \varepsilon_{i,t} \quad (12)$$

$$DD_eq_{i,t} = \alpha_i + \beta_1 Insti_{i,t} + \beta_2 after2006 + \beta_3 Insti_{i,t} \times after2006 + \beta_4 Con_Var_{i,t} + \varepsilon_{i,t} \quad (13)$$

From Table 9, we find that the interaction term coefficients for information asymmetry and the year dummy variable are both significantly positively related to positive and negative earnings quality. This indicates that after 2006, the association between information asymmetry and positive earnings management is

Table 9
Regression results for information asymmetry and earnings management using year dummy variables.

	$ DD_abs $	$DD_eq(+)$	$DD_eq(-)$
<i>SD</i>	0.716*** (4.839)	0.557* (1.872)	-0.601*** (-3.478)
<i>after2006</i>	0.001 (0.342)	-0.030*** (-3.452)	-0.017*** (-3.396)
<i>SD</i> × <i>after2006</i>	-0.148 (-0.879)	0.659* (1.906)	0.523*** (2.708)
<i>TO</i>	-0.000*** (-2.648)	-0.001*** (-3.630)	-0.000 (-0.662)
<i>Duality</i>	0.002 (0.808)	0.005 (1.217)	0.002 (0.866)
<i>Out_ratio</i>	-0.007 (-1.487)	0.004 (0.369)	0.013** (2.421)
<i>Top1</i>	-0.084*** (-3.357)	-0.061 (-1.216)	0.023 (0.782)
<i>Top2_10</i>	-0.067*** (-3.170)	-0.069 (-1.603)	0.016 (0.651)
<i>CR_5</i>	0.065*** (2.732)	0.060 (1.256)	-0.011 (-0.385)
<i>LnSize</i>	0.008*** (6.229)	0.031*** (11.813)	0.005*** (3.230)
<i>LnMB</i>	-0.001 (-0.511)	-0.019*** (-5.741)	-0.005*** (-3.269)
<i>Offering</i>	-0.000 (-0.331)	0.002 (0.929)	0.002 (1.532)
<i>SOE</i>	0.004 (1.345)	-0.013* (-1.770)	-0.009*** (-2.772)
<i>Audit</i>	-0.024*** (-5.566)	-0.015 (-0.940)	0.016*** (3.873)
<i>TopAudit</i>	0.006* (1.925)	-0.003 (-0.571)	0.003 (0.672)
<i>Intercept</i>	-0.110*** (-4.310)	-0.607*** (-10.491)	-0.137*** (-4.509)
Obs	7286	2873	4413
<i>R2_adj</i>	0.037	0.112	0.028

Notes: This table reports the regression results for Eq. (12). The data in brackets are the estimated *t*-values of the regression coefficients. $|DD_abs|$ is the absolute value of abnormal accruals for each firm, following the DD model, which has a positive relationship with the extent of earnings management. We divide DD_eq into two groups based on whether the value of DD_eq is larger than 0, then we obtain $DD_eq(+)$ and $DD_eq(-)$. *SD*: the standard deviation of idiosyncratic risk as the information asymmetry measure. *after2006*: a year dummy variable that equals 1 if the year is later than 2006 (excluding 2006), otherwise 0. *SD* × *after2006*: interaction term of *SD* and *after2006*. *Duality*: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. *Out_ratio*: the proportion of independent directors on the board. *Top1*: the proportion of shareholdings of the largest shareholder. *Top2_10*: the aggregate proportion of shareholdings of the second to the 10th largest shareholders. *CR_5*: the aggregate proportion of shareholdings of top 5 shareholders. *LnSize*: natural logarithm of total assets at the end of the year. *LnMB*: natural logarithm of the market-to-book ratio. *TO*: turnover of listed companies in each year. *Offering*: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period *t*, and 0 otherwise. *SOE*: a dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise. *Audit*: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. *TopAudit*: a dummy variable that equals 1 if the company's audit firm is a Big 4 audit firm, and 0 otherwise. *Intercept*: intercept term. *Obs*: number of observations. *R2_adj*: adjusted *R*-square.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

more significantly positive, while the association with negative earnings management is more significantly negative. Overall, however, companies are more likely to artificially increase their earnings by using information asymmetry after 2006.

Table 10
Regression results for long/short-term mutual funds and earnings management using year dummy variables.

	<i>Long Investor</i>			<i>Short Investor</i>		
	<i> DD_abs </i>	<i>DD_eq(+)</i>	<i>DD_eq(-)</i>	<i> DD_abs </i>	<i>DD_eq(+)</i>	<i>DD_eq(-)</i>
<i>Long_ratio</i>	-0.014 (-0.844)	-0.008 (-0.296)	0.088*** (3.869)			
<i>Long_ratio</i> × <i>after2006</i>	0.018 (0.891)	-0.028 (-0.814)	-0.086*** (-3.106)			
<i>Short_ratio</i>				0.024* (1.789)	0.043** (2.116)	0.073*** (3.162)
<i>Short_ratio</i> × <i>after2006</i>				0.016 (1.180)	-0.017 (-0.764)	-0.083*** (-3.649)
<i>after2006</i>	0.000 (0.133)	-0.010*** (-3.371)	-0.003** (-2.202)	-0.000 (-0.159)	-0.010*** (-3.380)	-0.004** (-2.400)
<i>TO</i>	0.000 (0.064)	-0.001** (-2.271)	-0.000** (-2.119)	0.000 (0.373)	-0.001* (-1.947)	-0.000** (-2.079)
<i>Duality</i>	0.002 (0.967)	0.005 (1.246)	0.002 (0.851)	0.002 (0.920)	0.005 (1.069)	0.002 (0.775)
<i>Out_ratio</i>	-0.008 (-1.542)	0.001 (0.093)	0.013** (2.367)	-0.007 (-1.515)	0.002 (0.166)	0.013** (2.349)
<i>Top1</i>	-0.065** (-2.537)	-0.024 (-0.468)	0.003 (0.092)	-0.093*** (-3.590)	-0.069 (-1.318)	0.012 (0.388)
<i>Top2_10</i>	-0.046** (-2.091)	-0.030 (-0.682)	-0.006 (-0.241)	-0.073*** (-3.312)	-0.076* (-1.659)	0.002 (0.085)
<i>CR_5</i>	0.047* (1.909)	0.025 (0.498)	0.013 (0.458)	0.072*** (2.914)	0.066 (1.328)	0.005 (0.170)
<i>LnSize</i>	0.006*** (5.069)	0.028*** (11.028)	0.005*** (3.668)	0.006*** (4.790)	0.028*** (10.939)	0.005*** (3.807)
<i>LnMB</i>	0.001 (0.536)	-0.013*** (-4.188)	-0.005*** (-3.769)	0.000 (0.308)	-0.015*** (-4.755)	-0.005*** (-3.638)
<i>Offering</i>	0.000 (0.388)	0.003 (1.241)	0.002 (1.264)	0.000 (0.383)	0.003 (1.291)	0.002 (1.325)
<i>SOE</i>	0.004 (1.282)	-0.013* (-1.794)	-0.009*** (-2.789)	0.004 (1.287)	-0.013* (-1.884)	-0.009*** (-2.789)
<i>Audit</i>	-0.024*** (-5.358)	-0.012 (-0.763)	0.015*** (3.653)	-0.024*** (-5.417)	-0.012 (-0.776)	0.015*** (3.688)
<i>TopAudit</i>	0.007* (1.935)	-0.003 (-0.544)	0.003 (0.622)	0.006* (1.880)	-0.003 (-0.452)	0.003 (0.643)
<i>Intercept</i>	-0.066*** (-2.650)	-0.538*** (-9.560)	-0.161*** (-5.446)	-0.057** (-2.286)	-0.531*** (-9.437)	-0.164*** (-5.625)
Obs	7286	2873	4413	7286	2873	4413
<i>R2_adj</i>	0.031	0.102	0.029	0.033	0.103	0.028

Notes: This table reports the regression results for Eq. (13). The data in brackets are the estimated *t*-values of the regression coefficients. *|DD_abs|* is the absolute value of abnormal accruals for each firm, following the DD model, which has a positive relationship with the extent of earnings management. We divide *DD_eq* into two groups based on whether the value of *DD_eq* is larger than 0, then we obtain *DD_eq(+)* and *DD_eq(-)*. *Long_ratio* (*Short_ratio*) is the ratio between the number of shares held by long-term (short-term) mutual fund investors and the total number of shares outstanding. *after2006*: year dummy variable that equals 1 if the year is later than 2006 (excluding 2006), otherwise 0. *Long_ratio* × *after2006* (*Short_ratio* × *after2006*): interaction terms of *Long_ratio*(*Short_ratio* × *after2006*) and *after2006*. *Duality*: a dummy variable that equals 1 if the chairman and CEO are the same person, and 0 otherwise. *Out_ratio*: the proportion of independent directors on the board. *Top1*: the proportion of shareholdings of the largest shareholder. *Top2_10*: the aggregate proportion of shareholdings of the second to the 10th largest shareholders. *CR_5*: the aggregate proportion of shareholdings of the top 5 shareholders. *LnSize*: natural logarithm of total assets at the end of the year. *LnMB*: natural logarithm of the market-to-book ratio. *TO*: turnover of listed companies in each year. *Offering*: a corporate financing needs dummy variable, which equals 1 if the company has an SEO, rights offering or debt issue in period *t*, and 0 otherwise. *SOE*: a dummy variable that equals 1 if the company is a state-owned enterprise, and 0 otherwise. *Audit*: a dummy variable that equals 1 if the audit opinion is unqualified, and 0 otherwise. *TopAudit*: a dummy variable that equals 1 if the company's audit firm is a Big 4 audit firm, and 0 otherwise. *Intercept*: intercept term. *Obs*: number of observations. *R2_adj*: adjusted *R*-square.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

In Table 10, the coefficients for the interactions between long- and short-term investors and negative earnings management are significantly negative, which suggests that both types of investors have a reduced monitoring effect after 2006. Combining these results with those in Table 9, we conjecture, on the one hand, that more companies might exploit information asymmetry to manipulate earnings after 2006, resulting in a reduction in institutional investors' monitoring behavior. On the other hand, the rapid development of institutional investors in China has created increasingly strong industry competition. Consequently, more and more institutional investors may shun long-term investments and monitoring of corporate governance in favor of short-term returns. This would also explain the reduced monitoring effect of institutional investors in recent years.

6. Conclusion

In this paper, our sample includes all listed companies in the Chinese A-share market for the 2004–2010 period. We calculate earnings management based on the DD model proposed by Dechow and Dichev (2002), define the standard deviation of idiosyncratic risk as the information asymmetry measure, divide mutual funds in China into long- and short-term mutual funds following Yan and Zhang (2009), and use the proportion of long- and short-term mutual funds as our proxy for institutional investors' shareholdings. In addition, we control for companies' fundamental characteristics, corporate governance, accounting standards, financing needs, auditors and ultimate controllers and so forth, to investigate how the extent of information asymmetry and the behavior of long- and short-term mutual funds affect listed companies' earnings management. We also divide our sample into two groups based on the extent of information asymmetry and examine the effect of the interaction between information asymmetry and mutual funds on earnings management.

We find that low information asymmetry can increase companies' earnings quality. This promotes effective monitoring and encourages company management to publish reliable earnings information by expanding information channels and increasing information transparency. Furthermore, the Chinese capital market is speculative, and the good and the bad are intermingled in the mutual fund industry. The empirical results indicate that compared with short-term mutual funds, long-term mutual funds play a supervisory role of company management and effectively reduce negative management behavior, resulting in increased earnings quality.

To further examine the findings, we divide the sample into different groups based on the extent of information asymmetry. Considering the difference in the investment style and objectives of long- and short-term mutual funds, when information asymmetry is low, long-term mutual funds can monitor earnings management more effectively and thus increase earnings quality. However, as the extent of information asymmetry increases, the supervision effect of long-term mutual funds is seriously weakened, while short-term mutual funds are associated with higher earnings management and thus reduce earnings quality. Therefore, it is important for corporate governance to improve information disclosure systems in China and to regulate the behavior of Chinese institutional investors.

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Appendix A

A.1. Ball and Shivakumar (2005) piecewise nonlinear regression model

Based on the DD model, Ball and Shivakumar (2005) propose a piecewise nonlinear regression model to improve traditional models. They argue that traditional linear models cannot reflect the nonlinear properties of accruals, so they introduce DCF and the interaction of DCF and CF to adjust the DD model. Wang (2006) and Yang et al. (2007) both use the BS model to measure earnings management. The BS model increases the explanatory power of traditional models, and it only requires financial information for 1 year before and after:

$$ACC_t = \beta_0 + \beta_1 CF_t + \beta_2 CF_{t-1} + \beta_3 CF_{t+1} + \beta_4 DCF_t + \beta_5 DCF_t \times CF_t + \varepsilon_t \quad (13)$$

where ACC_t is total accruals in period t , CF_t , CF_{t-1} and CF_{t+1} are the operational cash flows in periods t , $t-1$ and $t+1$, respectively. All variables are scaled by average total assets to eliminate the size effect. DCF_t equals 1 if $CF_t - CF_{t-1} < 0$, and 0 otherwise. Following the CSRC industry classification standard, we regress by each industry and each year, and the residual ε_t is the proxy for earnings management, BS_eq . Similar to the DD model, we distinguish between positive earnings management $BS_eq(+)$ and negative earnings management $BS_eq(-)$. The higher the absolute value of $|BS_eq|$, the higher the extent of earnings management.

References

- Armstrong, C.S., Guay, W.R., Weber, J.P., 2010. The role of information and financial reporting in corporate governance and debt contracting. *Journal of Accounting and Economics* 50 (2–3), 179–234.
- Ball, R., Shivakumar, L., 2005. Earnings quality in UK private firms: comparative loss recognition timeliness. *Journal of Accounting and Economics* 39, 83–128.
- Bartov, E., Radhakrishnan, S., Krinsky, I., 2000. Investor sophistication and patterns in stock returns after earnings announcements. *The Accounting Review* 75 (1), 43–63.
- Bertrand, M., Mehta, P., Mullainathan, S., 2002. Ferreting out tunneling: an application to Indian business groups. *Quarterly Journal of Economics* 117, 121–148.
- Bhattacharya, N., Desai, H., Venkataraman, K., forthcoming. Does earnings quality affect information asymmetry? Evidence from trading costs. *Contemporary Accounting Research*.
- Brous, P.A., Kini, O., 1994. The valuation effects of equity issues and the level of institutional ownership. *Financial Management* 23, 33–46.
- Brown, S.J., Goetzmann, W.N., 1997. Mutual fund styles. *Journal of Financial Economics* 43, 373–399.
- Bushee, B.J., 1998. The influence of institutional investors on myopic R&D investment behavior. *The Accounting Review* 73 (3), 305–333.
- Bushee, B.J., Noe, C., 2000. Corporate disclosure practices, institutional investors, and stock return volatility. *Journal of Accounting Research* 38, 171–202.
- Cheng, S.Q., 2006. An empirical study on the relationship between institutional ownership and the listed firms' accounting earnings information. *Management World* 9, 129–136 (in Chinese).
- Chung, R., Firth, M., Kim, J.B., 2002. Institutional monitoring and opportunistic earnings management. *Journal of Corporate Finance* 8, 29–48.
- Coffee, J.C., 1991. Liquidity versus control: the international investor as corporate monitor. *Columbia Law Review* 91 (6), 1277–1368.
- Dechow, P.M., Dichev, I.D., 2002. The quality of accruals and earnings: the role of accrual estimation errors. *Accounting Review* 77, 35–59.
- Deng, K.B., Tang, X.Y., 2010. Can institutional investors really decrease earnings management? Evidence from China's listed firms. *Industrial Economics Research* 5, 71–86 (in Chinese).
- Dierkens, N., 1991. Information asymmetry and equity issues. *Journal of Finance and Quantitative Analysis* 26, 181–199.
- Dye, R.A., 1988. Earnings management in an overlapping generations model. *Journal of Accounting Research* 26, 195–235.
- Fang, J.X., Hong, J.Q., 2007. Listed firms' information disclosure quality and securities analysts' earnings forecasts. *Securities Market Herald* 3, 25–30 (in Chinese).
- Froot, K.A., Scharfstein, D.S., Stein, J.C., 1992. Herd on the street: information inefficiencies in a market with short-term speculation. *Journal of Finance* 47, 1461–1484.
- Gao, L., Zhang, J., 2008. Corporate governance, institutional investors and earnings management. *Accounting Research* 9, 64–72 (in Chinese).
- Graves, S.B., 1988. Institutional ownership and corporate R&D in the computer industry. *Academy of Management Journal* 31 (2), 417–428.
- Hakim, F., Triki, F., Omri, A., 2008. Earnings quality and equity liquidity: evidence from Tunisia. *International Journal of Managerial and Financial Accounting* 2, 147–165.
- Huang, Q., 2009. An empirical study on the relationship between institutional investors and earnings management of China listed companies. *Modern Economic Science* 4, 108–115 (in Chinese).
- Hunt, A., Moyer, S., Shevlin, T., 1996. Managing interacting accounting measures to meet multiple objectives: a study of LIFO firms. *Journal of Accounting and Economics* 21 (3), 339–374.
- Hunton, J.E., Libby, R., Mazza, C.L., 2006. Financial reporting transparency and earnings management. *The Accounting Review* 81 (1), 135–157.
- Jiambalvo, J., Rajgopal, S., Venkatachalam, M., 2002. Institutional ownership and the extent to which stock prices reflect future earnings. *Contemporary Accounting Research* 19 (1), 117–145.
- Jo, H., Kim, Y., 2007. Disclosure frequency and earnings management. *Journal of Financial Economics* 84 (5), 561–590.
- Kahn, C., Winton, A., 1998. Ownership structure, speculation, and shareholder intervention. *Journal of Finance* 53 (1), 99–129.
- Kang, J.K., Shivdasani, A., 1995. Firm performance, corporate governance and top executive turnover in Japan. *Journal of Financial Economics* 38, 29–58.

- Kaplan, S.N., Minton, B.A., 1994. Appointments of outsiders to Japanese boards: determinants and implications for managers. *Journal of Financial Economics* 36, 225–257.
- Klassen, K.J., 1997. The impact of inside ownership concentration on the trade-off between financial and tax reporting. *The Accounting Review* 72 (3), 455–474.
- Koh, P.S., 2007. Institutional investor type, earnings management and benchmark beaters. *Journal of Accounting and Public Policy* 26, 267–299.
- Kong, D.M., Fu, K.H., 2005. A study on market reaction and impact factors of the Chinese stock market's seasoned equity offerings. *World Economy* 10, 51–59 (in Chinese).
- Lev, B., Thiagarajan, S.R., 1993. Fundamental information analysis. *Journal of Accounting Research* 31 (2), 190–215.
- Liu, F., He, J.G., 2004. Ownership structure and substantial shareholders' choice in interest realizing methods: tentative study on tunneling in Chinese capital market. *China Accounting Review* 2, 141–158 (in Chinese).
- Liu, L.Y., Peng, E.Y., 2006. Institutional Ownership Composition and Accruals Quality. Working Paper.
- Ljungqvist, A., Mally, C.J., Marston, F.C., 2009. Rewriting history. *Journal of Finance* 64, 1935–1960.
- Porter, G., 1992. Accounting earnings announcements, institutional investor concentration and common stock returns. *Journal of Accounting Research* 30 (1), 46–155.
- Prowe, S.D., 1990. Institutional investment patterns and corporate financial behavior in the United States and Japan. *Journal of Financial Economics* 27, 43–66.
- Ramalingegowda, S., Yu, Y., 2012. Institutional ownership and conservatism. *Journal of Accounting and Economics* 53, 98–114.
- Richardson, V.J., 2000. Information asymmetry and earnings management: some evidence. *Review of Quantitative Finance and Accounting* 15 (4), 325–347.
- Schipper, K., 1989. Commentary on earnings management. *Accounting Horizons* 3 (4), 91–102.
- Sun, Z., Wang, A., Zheng, L., 2012. The road less traveled: strategy distinctiveness and hedge fund performance. *Review of Financial Studies* 25 (1), 96–120.
- Trueman, B., Titman, S., 1988. An explanation for accounting income smoothing. *Journal of Accounting Research* 26, 127–139.
- Wang, D.C., 2006. Founding family ownership and earnings quality. *Journal of Accounting Research* 44, 619–656.
- Warfield, T.D., Wild, J.J., Wild, K.L., 1995. Managerial ownership, accounting choices, and informativeness of earnings. *Journal of Accounting and Economics* 20, 61–91.
- Xia, L.J., Lu, X.N., 2005. On the relationship between earnings management and information disclosure quality of listed firms. *Contemporary Economy & Management* 10, 145–150 (in Chinese).
- Yang, D.M., 2005. The disclosure of information forecasts and earnings management. *Chinese Journal of Management Science* 7, 108–112 (in Chinese).
- Yang, D.M., Lin, B., Xin, Q.Q., 2007. Earnings quality, investors' reasonless behavior and earnings momentum. *Journal of Financial Research* 2, 122–132 (in Chinese).
- Yan, X.M., Zhang, Z., 2009. Institutional investors and equity returns: are short-term institutions better informed? *Review of Financial Studies* 22, 893–924.
- Zhao, T., Zheng, Z.X., 2002. Asymmetric information and manipulate stock in institutions behavior. *Economic Research Journal* 7, 41–48 (in Chinese).



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A survey of executive compensation contracts in China's listed companies

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ABSTRACT

We analyze 228 executive compensation contracts voluntarily disclosed by Chinese listed firms and find that central-government-controlled companies disclose more information in executive compensation contracts than local-government-controlled and non-government-controlled companies. Cash-based payments are the main form of executive compensation, whereas equity-based payments are seldom used by Chinese listed companies. On average, there are no significant differences in the value of basic salaries and performance-based compensation in executive compensation contracts. But, compared with their counterparts in non-government-controlled companies, executives in government-controlled companies are given more incentive compensation. Accounting earnings are typically used in executive compensation contracts, with few firms using stock returns to evaluate their executives. However, the use of non-financial measures has increased significantly since 2007.

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1. Introduction

Numerous studies analyze the relationship between executive compensation and firm performance in China's listed companies, and their findings enrich our understanding of the mechanisms and effectiveness of executive compensation contracts. However, due to the difficulties in acquiring details about executive compensation contracts, previous studies assume that the level of executive compensation is related to certain measures of accounting (such as return on assets (ROA) or return on equity (ROE)) or market (stock return) performance. To better understand the structure of executive compensation contracts, we hand collected the details of 228 such contracts voluntarily disclosed by Chinese listed firms between 2004 and 2010. We provide descriptive empirical evidence on various characteristics of executive compensation contracts, such as the degree of disclosure, the structure of compensation, the assessment measures used and the method of calculating performance compensation. We aim to shed light on executive compensation by presenting a more comprehensive understanding of executive compensation contracts in Chinese listed firms.

To the best of our knowledge, the survey conducted by Pan et al. (2006) is the only other study of executive compensation contracts in China. Based on 54 executive compensation contracts from 2002 to 2004, they show that executive performance evaluation is mainly based on financial rather than non-financial measures. They also find that executive performance evaluations are chiefly based on performance budgets set by the board of directors. We re-examine this issue for several reasons.

First, the 54 executive compensation contracts collected by Pan et al. (2006) were disclosed between 2002 and 2004. Since 2004, there has been a series of changes in the compensation regulations, especially in central-government-controlled firms. These regulation changes may have affected the design of compensation contracts and it is necessary to examine whether actual executive compensation contracts have changed along with the regulations.

Second, it is well documented that the structure and effectiveness of executive compensation depend on the governance system (Liu et al., 2007; Fang, 2009; Xin and Tan, 2009). Pan et al. (2006) do not find evidence of compensation contracts varying with governance systems due to the limited number of contracts studied. This study provides both a general descriptive analysis of compensation contracts and evidence of how governance systems affect the structure of such contracts.

Third, Banker and Datar (1989) find that performance measure quality affects the structure of executive compensation contracts. Accounting profit is one of the chief performance measures in executive compensation contracts. In 2007, Chinese listed companies implemented a new accounting standards system that differs significantly from the old accounting standards. For example, the new standards introduce fair value measurement and management is afforded much more discretionary choice. These changes have certainly had a significant influence on accounting information quality. Ke et al. (2011) find that the implementation of the new accounting standards has reduced the sensitivity of executive compensation and accounting profitability. In this study, we examine whether the use of accounting information in compensation contracts differs before and after the implementation of the new accounting standards.

Finally, significant changes in the content disclosed and level of disclosure in compensation contracts have taken place since 2004, which means we can now collect more information from compensation contracts. For example, we are now able to study the weighting of different performance measures and analyze specific performance assessment formulas.

The remainder of this study is structured as follows. Section 2 presents the related compensation regulation background and provides a review of the executive compensation literature. In Section 3, we provide descriptions of the sample compensation contracts. A detailed analysis of compensation contracts is provided in Section 4, including the assessment criteria used, performance evaluation, the use of financial performance measures and structure. Section 5 concludes the study and discusses directions for future executive compensation studies.

2. Institutional background and literature review

2.1. Background of compensation regulation in China

2.1.1. Regulation of compensation disclosure

Article 61 of the Securities Act 1999 states that companies with publicly listed stocks or bonds should disclose in their annual reports the resumes of all directors, supervisors and top managers together with their shareholdings in the company. The Companies Law, which was promulgated in 1999 and revised in 2005, requires that “a company shall regularly disclose to its shareholders information about remunerations obtained by the directors, supervisors and top managers from the company.” Both the Securities Act and Companies Law have laid the foundation for compensation disclosure in limited liability corporations.

Before 1997, executive compensation disclosure was not well regulated. In 1997, a new accounting standard (Related Party Transactions) was issued by the Ministry of Finance (MOF) that defines key management personnel as related parties and thus mandates that their compensation must be disclosed as the main transaction of a related party. However, as there were no detailed disclosure rules, compensation disclosures differed greatly in both format and content.

The second disclosure requirement – Content and Format of Annual Reports – of the Format and Content of Information Disclosure by Companies with Public Offering Securities regulations issued by the China Securities Regulatory Commission (CSRC) in 1997 had a great effect on compensation disclosure. It requires listed companies to disclose more details of executive compensation and was revised seven times between 1998 and 2012.⁴ The 2001 version requires that companies disclose the compensation decision-making process and the determinants of compensation for directors, supervisors and senior managers, and the total amount of compensation received by the top three directors and senior managers. It also requires the separate disclosure of independent directors’ allowances and other benefits. The 2005 version requires companies to disclose the total compensation of each individual director, supervisor and senior manager. Thus, studies conducted before 2005 use only the top three directors’ or managers’ total compensation, and studies conducted after 2005 typically use individual compensation data for the CEO or board chairperson. In 2007, the requirements changed again to mandate the disclosure of the compensation committee’s duties and the implementation of stock-based incentive plans. These disclosure regulations have contributed significantly to increasing the transparency of executive compensation.

With the establishment of the Growth Enterprise Market (GEM), the CSRC issued the Content and Format of the Annual Report of GEM Listed Companies in 2009. This document stipulates the standards for executive compensation disclosure in GEM companies. It requires a summary report of the compensation committee’s duties under the board of directors, including the audit opinion of the disclosed compensation of directors, supervisors and senior managers; clarification of whether the company has established a sound and effective system to assess its directors, supervisors and senior managers; and the incentive system and its implementation. The report must also include a verification opinion on whether the authorization process in the implementation of the company’s stock-based incentive plan is compliant and whether the exercise condition is fulfilled. This report requirement was revised in 2013 and now GEM companies are required to disclose their decision-making processes and the determinants of compensation for directors, supervisors and senior managers, in addition to the actual payments made to each of them.

2.1.2. Regulation of compensation contract structure

There is little evidence regarding the compensation regulations used by local governments in local-government-controlled companies. Some studies, such as those of Chen et al. (2005, 2009, 2010), find systematic differences in the compensation structure of companies in different regions and thus imply that local governments have different executive compensation regulations. However, due to the complexity of local government structure, we could not obtain any information on local government regulations covering executive compensation.

⁴ It was revised in 1998, 1999, 2001, 2003, 2005, 2007 and 2012.

We thus only survey the central government regulations that are generally applied to large-scale government-controlled companies.

Since the implementation of the annual compensation system in 2002, the State-owned Assets Supervision and Administration Commission (SASAC) has required that executive compensation in government-controlled companies must not be higher than 12 times the average employee salary in the firm. Yueda Investment, for example, uses this multiple as its executive compensation determinant. The contract reads as follows: “annual compensation is formed by basic salary and performance compensation. The basic salary is determined by the annual budget set by the compensation committee and the base should be two or three times the previous year’s average employee salary. Performance compensation is determined by the evaluation of executives’ performance relative to their agreed targets and responsibilities. In principle, the total annual compensation should not be higher than 10 times the average employee salary.” However, the enforcement of this ceiling is very loose and many executives’ salaries are much higher than the ceiling.

In 2003, the SASAC published the Interim Measures on Performance Evaluation of Executives in Central-government-controlled Companies (the Interim Measures), which require companies to design incentive contracts based on performance evaluation. The evaluation system includes annual and three-year evaluations. The annual evaluation measures include annual profit (30%), ROE (40%) and industry-specific measures (30%). The three-year evaluation measures include the state-owned asset increment rate (40%), three-year core operating income average growth rate (20%), three-year annual performance evaluation result (20%) and industry-specific measures (20%).

The SASAC revised the Interim Measures three times: in 2006, 2010 and 2013. The evaluation system between 2004 and 2009 placed more emphasis on accounting profit measures. From 2010 to 2012, the ROE measure was replaced by economic value added (EVA), which carried a weight of 40% in the annual evaluation. The revised version in 2013 further enhanced the use of EVA by increasing the weight to 50% in most enterprises in the annual evaluation and replaced the sales growth rate with total asset turnover to assess performance efficiency in the three-year evaluation.

To reinforce the implementation of the Interim Measures, the SASAC has introduced various other complementary measures on executive compensation. For example, after the Interim Measures on the Compensation Management of Executives in Central-government-controlled Companies were published in June 2004, the SASAC published the Supplementary Regulations on Executives’ Annual Performance Evaluation in Central-government-controlled Companies and other regulations. The compensation incentive system in central-government-controlled companies has been progressively refined. In 2006, the SASAC and the Ministry of Finance (MOF) jointly published the Trial Procedures for the Implementation of Stock-based Incentives in Government-controlled Listed Companies. Later, the equity-based incentive compensation system was introduced and implemented in government-controlled listed companies. In 2007, the SASAC published a supplementary regulation on executives’ term performance evaluations. These supplementary regulations serve important functions in implementing the Interim Measures and standardizing compensation systems in central-government-controlled companies.

The Ministry of Human Resources and Social Security (MHRSS) and other ministries jointly issued the Further Guidance to Standardize Executives’ Compensation Contracts in Central-government-controlled Companies (the Guidance), which formally classifies executive compensation into basic annual salary, performance salary and middle- to long-term incentive benefits. Whereas the basic annual salary is to be paid in monthly installments, the performance salary is to be paid in a lump sum (or by installments) following a performance evaluation. The Guidance clearly states that in central-government-controlled companies, executives’ basic annual salaries must be linked to the previous year’s average employee salary. Performance salaries must also be determined by annual performance evaluation results and there should be a cap on executive compensation. However, the enforcement and implementation of the Guidance is not yet clear.

The MOF and the China Banking Regulatory Commission (CBRC) have set explicit regulations on executive compensation in financial institutions. To standardize compensation contracts in financial institutions following the global financial crisis in 2008, the MOF published the Announcement of Executive Compensation in Government-controlled Financial Institutions (the Announcement) in 2009. The

Announcement clearly required that executive compensation in government-controlled financial institutions in 2008 could not be higher than 90% of the annual compensation in 2007. Further, executive compensation had to be adjusted downward by 10% if an institution's performance was weaker in 2008 than in 2007. In 2010, the CBRC published the Commercial Bank Compensation Regulation Guidance, which requires that basic salaries in commercial banks not exceed 35% of total salaries and that performance salaries be determined by performance evaluation and not be more than three times greater than the basic salary.

2.2. Literature review

Much research has been conducted on executive compensation in China's listed companies. We summarize this research under three main headings.

2.2.1. Is executive compensation based on firm performance?

Early studies fail to find a link between executive compensation and firm performance (Wei, 2000; Li, 2000). With the introduction of pay-for-performance compensation regulations and improvements in corporate governance, more recent studies have discovered a significant positive relationship between compensation and performance (Du and Qu, 2005; Fang, 2009). Fang (2009) finds that although the positive relationship between executive compensation and performance exists, it is asymmetric. The magnitude of the growth in compensation when performance improves is significantly higher than the magnitude of the decline in compensation when performance weakens.

2.2.2. What are the determinants of pay–performance sensitivity?

If executive compensation is based on a company's performance, then the question naturally arises as to the factors that affect the pay–performance relationship. Zhang and Shi (2005) find that executive compensation is more sensitive to firm performance in firms with higher proportions of independent directors, within the compensation committees of boards of directors and where the roles of chief executive officer (CEO) and board chairperson are separated. Xiao and Peng (2004) also find that pay–performance sensitivity is lower when the CEO is also the chairperson of the board. The relationship is again asymmetric: it increases with an improvement in firm performance, but decreases as firm performance deteriorates. Liu et al. (2007) shows that the usefulness of accounting performance in compensation contracts is influenced by the institutional environment, in that accounting information in executive compensation contracts is less useful when there is a greater degree of government intervention and more useful for companies in more competitive industries. Wu and Wu (2010) find that the level of compensation increases with the level of managerial control and that the control effect is more pronounced in non-government-controlled companies than in their government-controlled counterparts.

Another stream of research investigates the effect of accounting information quality on pay–performance sensitivity. Bi and Zhou (2007) show that accounting information quality has a negative effect on the relationship between executive compensation and accounting performance, and that the negative effect varies with the institutional environment. Ke et al. (2011) similarly show that after the adoption of more principle-based accounting standards, the sensitivity of executive compensation and accounting performance declines significantly.

Another factor that affects the relationship between executive compensation and firm performance is the market environment in which a firm operates. Xin and Tan (2009) examine the effect of market reform on compensation contracts in government-controlled companies and find that more developed markets boost the sensitivity of executive compensation to firm performance.

2.2.3. Compensation regulation and managerial perks

Because of the various restrictions on executive compensation, managers are expected to enjoy more managerial perks to compensate for lower salaries. Chen et al. (2005) find consistent results. Chen et al. (2009) further find that the probability of management fraud is positively related to compensation regulations. Chen et al. (2010) extend previous studies by providing evidence of a trade-off

between executive compensation and managerial perks. They find that both compensation and managerial perks are higher in years and regions with higher marketization indices, and that a higher proportion of managerial perks are replaced by executive compensation.

In summary, the majority of previous studies use accounting performance such as ROA or ROE to examine the sensitivity of executive compensation to firm performance. However, these studies fail to discuss the details of executive compensation contracts, which may result in an omitted variable problem in the research design. We attempt to open up the “black box” of companies’ compensation contracts and provide some guidance for future research on executive compensation in China.

3. Research sample

As discussed in the institutional background section, China’s listed companies are only required to disclose certain compensation information in their annual reports based on the disclosure guidance published by the CSRC. Although the regulations require information such as the form and amount of executive compensation, they do not require the disclosure of the details of executive compensation contracts. We hand-collected 228 compensation contracts that were voluntarily disclosed by listed companies between 2004 and 2010. The details of these contracts are available from the CNINFO website (<http://www.cninfo.com.cn/>). As of December 31, 2010, there were 2141 listed companies with A shares in China and about 11% of these companies voluntarily disclosed their executive compensation contracts.

Whether the disclosed contracts were actually executed is debatable. Among the companies that disclosed their compensation contracts, only some explicitly reported the execution of the contracts.⁵ For the companies that did not do so, we verify the execution by examining whether the companies’ actual compensation was the same as the amount calculated based on the agreement in the contract.⁶ Although we could not verify the contracts individually, we conclude that they were executed fairly well according to the validity of the publicly disclosed contracts.

Table 1 presents statistics of the sample compensation contracts. Panel A presents the annual distribution of the sample between 2004 and 2010. The 228 executive compensation contracts were disclosed by 201 companies, of which 25 companies disclosed two contracts and two companies disclosed three contracts. Before 2007, few companies disclosed their executive compensation contracts. The number increases gradually after 2008, with 59 executive compensation contracts being disclosed in 2010. Among the 228 contracts, 89 (39%) are from non-government-controlled companies. Of the 139 (61%) contracts disclosed by government-controlled companies, 41 were disclosed by central government-controlled companies. Local-government-controlled compa-

⁵ For example, in its 2008 annual report, Shenzhen Energy (stock code 000027) states that “the compensation and evaluation committee has evaluated the implementation of the compensation contracts of directors, supervisors and senior management personnel and confirmed that the compensation of directors, supervisors and senior management personnel has been implemented and is the same as the amount in the compensation contracts.” The actual payments to executives are also disclosed: “The annual-salary structure was implemented for the chairman and general managing director, which consists of basic salary, performance compensation and incentive annual salary. The basic salary is RMB240,000 annually and is paid monthly at RMB20,000. The performance and incentive annual compensation are granted after the annual evaluation, 80% of which is paid immediately after completion of the evaluation and the remaining will be paid in the subsequent year. The 2007 chairman performance and incentive compensation was RMB670,000 in total, 80% of which was granted in 2008 and the residual 20% has been withheld. The CEO’s (Mr. Li Bin) performance and incentive compensation was RMB636,000 in 2007, 80% of which was granted in 2008 and the residual 20% has been delayed.”

⁶ For example, Hangzhou Jiebai’s (stock code 600814) 2006 executive compensation contract states that executive annual salaries include a basic salary and performance compensation: the basic salary is RMB120,000 and the performance compensation is paid as 100% of the basic salary if the profit target (RMB28,000,000) set by the board of directors is achieved. If the profit is below RMB40,000,000, then a 1% change in profit corresponds to a 3% change in the performance compensation based on the basic salary. If the profit reaches between RMB40,000,000 and RMB60,000,000, then the performance compensation is based on 0.5% of the incremental profit. If the profit exceeds RMB60,000,000, then the performance compensation is based on 0.3% of the incremental profit. The chairman and CEO’s compensation packages are based on this standard. Other executives’ compensation is about 50–70% of the standard. We compare the actual compensation with the disclosed compensation structure to see whether the contract was executed. The 2006 realized profit was RMB62,302,571 and the total compensation based on the contract should have been RMB501,200. We find that the actual payment of compensation to the CEO was the same amount. We thus conclude that the contract was fully executed.

Table 1
Distribution of executive compensation contracts by year and ownership.

	Total	2004	2005	2006	2007	2008	2009	2010
<i>Panel A. Distribution by year</i>								
All sample contracts	228	23	17	8	19	51	51	59
Non-government controlled	89	1	4	3	8	21	24	28
Government controlled	139	22	13	5	11	30	27	31
<i>Including</i>								
Central government controlled	41	3	3	1	1	9	11	13
Local government controlled	98	19	10	4	10	21	16	18
		Non-government controlled		Local government controlled		Central government controlled		
<i>Panel B. Sample percentage of the total population by ownership</i>								
Number of contracts disclosed	89		98			41		
Total number of listed companies	1081		677			355		
Percentage	8%		14%			12%		

Note: The total number of listed companies is as at December 31, 2010. Ultimate control data was extracted from CSMAR.

Table 2
Distribution of executive compensation contracts by industry.

Industry	Number of compensation contracts	Total number of companies	Percentage
Manufacturing: pulp, paper and publishing	6	38	16
Media and culture	4	26	15
Agriculture, forestry, animal and fishing	6	41	15
Construction	6	41	15
Mining	7	48	15
Transportation and warehousing	9	71	13
Manufacturing: oil, chemistry and plastic	27	214	13
Manufacturing: medicine, biological products	16	131	12
Manufacturing: electronics	14	117	12
Wholesale and retail trade	13	114	11
Utilities: electricity, gas and water	8	71	11
Manufacturing: mechanical, equipment and instruments	39	354	11
Manufacturing: agri-food and beverage	9	82	11
Manufacturing: metal and non-metal	18	164	11
Information technology	15	146	10
Realty business	13	127	10
Social services	6	59	10
Manufacturing: textile, clothing and fur	7	69	10
Manufacturing: others	2	21	10
Conglomerate	3	55	5
Manufacturing: wood and furniture	0	9	0
Financial and insurance	0	38	0
Total	228	2036	11

Note: The number of companies is as at December 31, 2010. Industry classifications are from the WIND financial database.

nies disclosed 98 contracts. Thus, compared with private companies, more government-controlled companies voluntarily disclosed their executive compensation contracts.⁷

⁷ We analyze the characteristics of the companies that voluntarily disclose their compensation contracts. The dependent variable is a measure of whether the company voluntarily discloses its compensation contracts. The independent variables include internal governance measures (the largest shareholder's ownership percentage, whether the company is government controlled and the ratio of independent directors), external governance measures (a cross-listing indicator, a local marketization index and a GEM indicator), company characteristics (age of the company since IPO, debt ratio and company size), and time and industry dummies. The regression results show that companies with a more recent IPO and with government ownership are more likely to voluntarily disclose their compensation contracts. The other variables have no significant effect on the likelihood of voluntary disclosure.

Table 3
Disclosure of executive compensation contracts.

Degree of disclosure	Total		Non-government controlled		Local government controlled		Central government controlled	
Total	228		89		98		41	
No disclosure of evaluation measures or performance compensation calculation formula	43	19%	27	30%	11	11%	5	12%
Disclosure of evaluation measures only	31	14%	15	17%	14	14%	2	5%
Disclosure of calculation formula only	25	11%	13	15%	6	6%	6	15%
Disclosure of both evaluation measures and performance calculation formula	129	57%	34	38%	67	68%	28	68%

Note: The percentages are calculated as the number of disclosures over the total number of contracts in each category.

Table 2 shows the industry distribution of the sample compensation contracts. The petroleum industry has the highest number (27) of disclosed contracts. In terms of the percentage among companies in the same industry, the pulp, paper and publishing industry has the highest percentage of disclosed contracts (16% with six contracts). No companies in the financial and insurance industry voluntarily disclosed any compensation contracts.

4. Analysis of executive compensation contracts

4.1. Degree of executive compensation disclosure

Some of the contracts are disclosed in detail, yet others provide only basic information. We assess the degree of disclosure by examining whether the evaluation measure and the method of computing the performance compensation are provided. The results are shown in Table 3.

Among the 228 compensation contracts, 129 (or 57% of the total) disclose the evaluation measure and the formula for computing performance compensation, 25 (or 11% of the total) disclose only the formula for performance compensation, 31 (or 14% of the total) disclose only the evaluation measures and 43 (or 19% of the total) provide only the method of determining the executive compensation in principle, without any details.

We then classify the contracts by central-, local- and non-government-controlled firms. Among the 43 contracts that do not give evaluation measures and computing formula details, the majority (27 cases) are from non-government-controlled firms and only five cases are from central government-controlled firms. In comparison, among the 129 contracts that disclose the evaluation measures and computing formula details, the majority (67 and 28 cases, respectively) are from local- and central-government-controlled firms. The percentage of firms tells the same story. Whereas about 68% of the contracts from government-controlled firms include evaluation measures and computing formula details, only 38% of the non-government-controlled firms include the same details. In summary, government-controlled firms tend to disclose more information in compensation contracts than non-government-controlled firms.

4.2. Contract parties in executive compensation contracts

In the conventional type of principal-agent relationship, shareholders are the principals and managers are the agents. Hence, boards of directors represent shareholders in setting managers' compensation contracts. The contract parties in compensation contracts are normally the CEO or the senior management team led by the CEO. However, in many Chinese listed companies, directors such as chairpersons and supervisors are also considered to be contract parties. Thus, the contract parties may include the chairperson (and other directors), the CEO (and his or her management team) and supervisors.

Table 4 presents statistics of the contract parties. Among the 228 executive compensation contracts, 97 contracts were designed for the CEO and the management team, about 43% of the total sample. For example,

Table 4
Contract parties in compensation contracts.

	Total	Non-government controlled	Local government controlled	Central government controlled
	228	89	98	41
CEO and other senior executives (excluding directors and supervisors)	97 (43%)	28 (31%)	45 (46%)	24 (59%)
Directors, supervisors and senior executives (including CEO)	60 (26%)	32 (36%)	20 (20%)	8 (20%)
Directors and senior executives (including CEO but excluding supervisors)	47 (21%)	24 (27%)	17 (17%)	6 (15%)
Managers (including middle-level and subsidiary managers)	6 (3%)	1 (1%)	4 (4%)	1 (2%)
Directors and supervisors (excluding managers)	5 (2%)	2 (2%)	3 (3%)	0 (0%)
All employees (including directors)	5 (2%)	0 (0%)	3 (3%)	2 (5%)
No clear specification of parties	8 (4%)	2 (2%)	6 (6%)	0 (0%)

Avic Real Estate's (stock code 000043) contract in 2010 was designed only for its CEO and other senior executives. Sixty of the contracts were designed for the chairperson, CEO and supervisors, representing approximately 26% of the total sample. One example is the contract disclosed by Redsun (stock code 000525) in 2008. Forty-seven contracts (or 21% of the total) include the chairperson and CEO, but exclude supervisors as the contract parties.

The difference in contract parties included in compensation contracts casts doubt on the effectiveness of performance-based executive compensation. According to the basic principle of corporate governance, the board of directors (and mainly the compensation committees of the board) sets executive compensation and evaluates the subjects' performance, and supervisors supervise the directors and executives' actions. If the board of directors sets the compensation for both directors and supervisors, then the monitoring role of the board and supervisors may be thrown into doubt, which may jeopardize the effectiveness of executive compensation contracts. Whether this issue has receded since the introduction of more stringent corporate governance regulations is an interesting issue. The percentage of contracts with a chairperson as the contract party in this sample is 49%, which is less than the 70% reported by Pan et al. (2006). The percentage of contracts with supervisors as the contract parties is 29%, compared to the 36% in Pan et al. (2006). We thus observe an improvement in the past decade. Compared to government-controlled firms, non-government-controlled firms tend to have more compensation contracts for the chairperson of the board of directors, indicating that more chairpersons of non-government-controlled firms are involved in business operations.

4.3. Evaluation measures of performance in executive compensation contracts

Baker et al. (1988) argue that a company's compensation policy consists of three components: the level, functional form and components of compensation. The functional form includes pay–performance sensitivity and the definition of performance evaluation measures. They argue that the level of compensation determines a company's ability to attract employees and that the functional form provides incentives that could determine the future behavior of employees who are hired. The performance evaluation measures that should be included in managerial compensation contracts remain in question. Holmstrom (1979) suggests that measures that better reflect information on managers' effort be included. Accounting information plays a stewardship role that reflects manager effort. Thus, accounting profits are typically used to evaluate managerial performance. The more strongly accounting profit and manager effort are related, the more effective the profit-based compensation contract. Stock price and non-financial measures can also be used to measure managers' output. According to Banker and Datar (1989), the effectiveness of compensation contracts depends on the extent to which the performance evaluation measures therein measure manager effort. The higher the accuracy and the less

Table 5
Evaluation measures used in executive compensation contracts.

	Total	2004	2005	2006	2007	2008	2009	2010
Disclosure of evaluation measures	160	21	15	8	14	34	32	36
Total number of evaluation measures	715	82	64	31	79	145	152	162
Average number of evaluation measures in each contract	4.5	3.9	4.3	3.9	5.6	4.3	4.8	4.5
<i>Including</i>								
Average number of financial measures	3.0	3.0	2.7	2.6	3.6	2.9	3.1	2.8
Average number of non-financial measures	1.5	1.0	1.5	1.3	2.0	1.4	1.6	1.7
Average number of evaluation measures based on profit	2.1	2.2	2.1	2.3	2.4	1.8	2.5	1.9
Average number of evaluation measures based on non-profit measures	0.8	0.7	0.6	0.4	1.2	1.0	0.7	0.9

noise involved in measuring managers' behavior, the more accurately their effort level is reflected and the heavier the weight of this measure in the compensation contract.

Murphy (2001) examines 177 executive compensation contracts in US companies, which include 428 performance measures, both financial and non-financial. Almost every company uses accounting measures in their annual monetary incentive plans. These accounting measures include sales, net profit, profit before tax, operating profit and EVA, among others. After analyzing the performance measures of the compensation contracts of 317 companies, Ittner et al. (1997) conclude that 312 companies use accounting measures. Of these companies, 28.5% use earnings per share, 27.2% use net profit, 25.3% use operating profit or profit before tax, 13.7% use sales and 12.8% use cash flow, with each company using 1.7 financial measures on average. The authors also reveal that 114 (or 36%) of the companies use non-financial measures in their incentive plans. Of these, 36.8% use customer satisfaction measures, 28% use non-financial strategic objective measures and 21% use product and service quality measures, with each company using 2.3 non-financial measures on average.

Table 5 shows the overall evaluation measure statistics used in our sample of executive compensation contracts. Among the 228 sample contracts, 160 disclosed evaluation measures between 2004 and 2010. The total number of evaluation measures used is 715, comprising 475 financial measures, 237 non-financial measures, and 3 fair value measures. All 160 contracts use financial measures, with each company using three on average.

Table 6 shows detailed statistics on the use of evaluation measures. Panel A presents the use of financial measures. Compared with the results of Pan et al. (2006), contracts using a single financial measure decreased from 42% to 33% (52 contracts) whereas contracts using multiple financial measures increased from 58% to 68% (108 contracts). These changes indicate that more companies are now using multiple financial measures to evaluate the performance of top executives. Among the 52 contracts using a single financial measure, the majority (43 contracts, or 27%) use the profit measure, but others use ROE, sales and EVA.

The profit measure is the most important financial measure. Among the 160 contracts that disclose executive evaluation measures, 146 (or 91%) use profit measures. The definition of profit varies: 72 contracts define it as net profit, 33 define it as profit before tax, 19 do not clearly define it, 12 use the net profit after non-recurring item adjustment and the remainder use the net profit growth rate.

Other measures such as sales and ROE are also frequently used, accounting for 39% and 32% of the total, respectively. About 11% of the contracts use accounts receivable turnover, 7% use inventory turnover and 8% use cash flow as financial measures. For example, in addition to the profit measure, Hailu-Boiler's (stock code 002255) 2009 executive compensation contract includes inventory, accounts receivable and total asset turnovers, reflecting the company's operating efficiency. Consistent with the results of Pan et al. (2006), we find that Chinese listed companies continue to use profit, sales, ROE and other measures that reflect their profitability to evaluate executives. However, we also observe an increasing trend of including measures that reflect the operational efficiency of assets and cash flow adequacy, further diversifying the use of financial measures.

Panel B reports the use of non-financial measures. Among the 160 contracts, 79 (or 49%) use non-financial measures, compared with only 34% in the study of Pan et al. (2006). This result shows that more companies are using non-financial measures to evaluate their executives. The safety measure (43 contracts, or 27% of the total sample) is the most popular non-financial measure, and includes production safety, economic safety, political safety and corporate reputation. For example, in 2008, Huaxi Village (stock code 000936) used the

Table 6
Specific evaluation measures.

	Contract number	Percentage
Contracts that disclose evaluation measures	160	
<i>Panel A: Use of financial measures</i>		
Contracts using financial measures	160	100
Contracts using a single financial measure	52	33
Profit	43	27
Return on equity	4	3
Sales	1	1
EVA	1	1
Others	3	2
Contracts using multiple financial measures	108	68
Profit	103	64
Sales	62	39
Return on equity	51	32
Accounts receivable turnover	17	11
Operating cash flows	13	8
Inventory turnover ratio	11	7
Asset value increment rate	11	7
Asset-liability ratio	11	7
Sales volume	8	5
Output of productions	6	4
Others	61	38
<i>Panel B: Use of non-financial measures</i>		
Contracts using non-financial measures	79	49
Security	43	27
Project completion	19	12
Measures related to the Communist Party	15	9
Operations management	18	11
Development and growth	18	11
Product or service quality and innovation	10	6
Scientific research and technological innovation	9	6
Employee satisfaction	7	4
Job attitude, professionalism and learning ability	7	4
Staff salaries	7	4
Others	41	26

safety measure in its executive compensation contract with a weight of 20%. The second most popular non-financial measure is the implementation of projects, which is used in 19 contracts (12%). Other notable non-financial measures are company management and standard operations (11%), strategic development measures (11%) and measures related to the development of the Communist Party of China (9%). Most of the non-financial measures are much more subjective than the more objective financial measures. Thus, the execution of these measures is worthy of further research.

Ittner et al. (1997) surveyed 114 executive compensation contracts with non-financial measures in the United States. Their results show that 42 contracts (36.8%) use customer satisfaction as a non-financial measure. Other non-financial measures include non-financial strategy completion status (28%), product and service quality (21%), employee safety (16.6%) and market share (11.4%). The comparison shows that whereas US companies are more likely to use measures of customer satisfaction, product quality and employees, Chinese listed companies use fewer measures that reflect customer and employee satisfaction.

Table 7 presents statistics on disclosure by year. From 2004 to 2010, companies disclosing evaluation measures always used financial measures in their executive compensation contracts. In comparison, the use of non-financial measures experienced a significant jump in 2007, which is consistent with our observation that more companies have introduced non-financial measures into their compensation contracts in recent years.

Table 7
Evaluation measures by year.

	Total	2004	2005	2006	2007	2008	2009	2010
Contracts that disclose evaluation measures	160	21	15	8	14	34	32	36
Contracts using financial measures	160	21	15	8	14	34	32	36
	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)
Contracts using non-financial measures	79	5	6	3	9	20	16	20
	(49%)	(24%)	(40%)	(38%)	(64%)	(59%)	(50%)	(56%)
Contracts using financial measures with clear definitions	158	21	15	8	14	33	32	35
Contracts using financial measures based on profit measures	158	21	15	8	14	33	32	35
	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)
Contracts using financial measures based on non-profit measures	68	10	7	3	7	14	14	13
	(43%)	(48%)	(47%)	(38%)	(50%)	(42%)	(44%)	(37%)

Table 8
Evaluation measures by ownership.

	Total	Non-government controlled	Local government controlled	Central government controlled
Contracts that disclose evaluation measures	160	49	81	30
Contracts using financial measures	160	49	81	30
	(100%)	(100%)	(100%)	(100%)
Contracts using non-financial measures	78	20	37	21
	(49%)	(41%)	(46%)	(70%)
Contracts using financial measures with clear definitions	158	49	80	29
Contracts using financial measures based on profit measures	158	49	80	29
	(100%)	(100%)	(100%)	(100%)
Contracts using financial measures based on non-profit measures	68	19	35	14
	(43%)	(39%)	(44%)	(48%)

We present the evaluation measure disclosure statistics by company type in Table 8. It is evident that both government- and non-government-controlled companies typically use at least one financial measure in their executive compensation contracts, and that there is at least one financial measure of profitability in all of the contracts. However, there is a marked difference among the companies in the use of financial measures not related to profitability, such as asset turnover and cash adequacy ratios. A total of 48% of the contracts in central-government-controlled companies and 44% of the contracts in local-government-controlled companies use financial measures related to both non-profitability and profitability, compared with only 39% in non-government-controlled companies. Further, 70% of the contracts in central-government-controlled companies, 46% of those in local-government-controlled companies and 41% of those in non-government-controlled companies introduce non-financial measures. The use of non-financial measures is clearly much higher in central government-controlled companies than in the other two types of companies. Ittner et al. (1997) examine the factors that affect the use of non-financial measures in executive compensation contracts in the United States, and find that regulated companies, companies with more innovative strategies and companies with noisier financial measures tend to use non-financial measures to evaluate executives. In Chinese listed companies, the use of non-financial measures differs across years and firm types. More studies are required to better understand the factors that drive these differences.

Table 9 presents statistics for the weighting of the financial measures used in the sample compensation contracts. Among the 228 contracts, only 57 clearly state the weight given to financial measures in the evaluation system. The minimum weight is 30% and the maximum is 100%, with an average of 76%. For example, Zhong Bai Holding's (stock code 000759) 2006 executive compensation contract includes financial measures such as net profit less non-recurring items, operating income, net asset growth rate less non-recurring items and operating cash flow per share. The weights of these measures are clearly stated to be 30%, 30%, 20% and 20%, respectively.

Table 9
Weight of financial measures used in executive compensation contracts.

Year	Number of contracts	Average weight (%)	Minimum weight (%)	Median weight (%)	Maximum weight (%)
<i>Panel A. Financial measures by year</i>					
Total	57	76	30	80	100
2004	6	79	45	90	100
2005	4	89	55	100	100
2006	3	83	60	90	100
2007	8	61	30	60	100
2008	14	69	40	65	100
2009	11	79	40	80	100
2010	11	85	50	95	100
<i>Panel B. Financial measures by company type</i>					
Non-government controlled	16	77	40	80	100
Local government controlled	29	75	30	70	100
Central government controlled	12	78	40	88	100
Total	57	76	30	80	100

The statistics by year show that the weight of the financial measures drops slightly after 2007. Before 2007, the average and median weight for the financial measures is 83% and 100%, respectively, whereas after 2007 the corresponding figures are 74% and 70%, respectively. Panel B of Table 9 presents the statistics by company type. It shows that the use of financial measures in executive compensation contracts is slightly higher in central-government-controlled companies than in the other two types.

4.4. Performance standards in executive compensation contracts

Executive compensation contracts normally set certain performance standards. Companies then compare the actual results with the performance standards to evaluate executives' performance and determine their compensation. In a monetary bonus plan, the performance standard of a performance evaluation measure is a pre-determined target value. In addition to the performance evaluation measure and pay-performance sensitivity, the performance standard is an important component of executive compensation contracts. As expected, the level of compensation is different if an executive influences the performance standards of the evaluation measures. Murphy (2001) uses statistical data from 177 US companies' compensation contracts between 1996 and 1997 to study performance standards. The study shows that 125 companies used a total of 219 accounting performance standards. Of these performance standards, 144 are based on a single standard and 88 (61%) use budgeting values as the evaluation measure standard. Another 22 firms (15%) use past performance as the standard, 13 (9%) use standards that were at the discretion of the board of directors and 6 (4%) use a fixed value as the standard. Performance standards such as budget and past performance are affected by internal management and hence are categorized as internal standards. Industry standards, the cost of capital and fixed standards are normally not affected by internal management, and hence are categorized as external standards. Murphy (2001) shows that when past performance has more estimation noise than peer performance, companies are more likely to use external standards such as industry performance and the cost of capital. Companies that use internal standards such as past performance or budgeted performance fluctuate less in the level of executive compensation and carry out more earnings smoothing than companies that use external performance standards. However, Murphy (2001) does not find significant firm performance differences between companies using internal and external standards. Murphy explains that the choice of internal or external standards may reflect a company's selection of managers and board of directors: the board of directors may prefer predictable and smooth performance and executives may prefer a predictable and more stable compensation package.

Table 10 shows statistics on the performance standards disclosed in the executive compensation contracts by the Chinese listed companies in our sample. In the 160 contracts disclosing 715 evaluation measures (refer

Table 10
Performance standards used in executive compensation contracts.

	Total		Non-government controlled		Local government controlled		Central government controlled	
Number of performance standards with clear definitions	453		123		243		87	
Using a single performance standard	440	97%	119	97%	239	98%	82	94%
<i>Including</i>								
Internal standards	366	81%	106	86%	189	78%	71	82%
Budget	292	64%	84	68%	148	61%	60	69%
Past performance	74	16%	22	18%	41	17%	11	13%
External standards	74	16%	13	11%	50	21%	11	13%
Fixed value	59	13%	11	9%	40	16%	8	9%
Industry value	9	2%	0	0%	9	4%	0	0%
Cost of capital	6	1%	2	2%	1	0%	3	3%
Using multiple performance standards	13	3%	4	3%	4	2%	5	6%
<i>Including</i>								
Budget and past performance	10	2%	4	3%	1	0%	5	6%
Budget and industry	1	0%	0	0%	1	0%	0	0%
Budget and cost of capital	1	0%	0	0%	1	0%	0	0%
Budget and fixed value	1	0%	0	0%	1	0%	0	0%

Note: The percentage is calculated as the number of measures in each cell over the total number (453).

to Table 5), we identify 453 financial measures with performance standards. Among these financial measures, 440 (97%) use a single performance standard and the rest use multiple performance standards. For example, Chi Tian Hua's (stock code 600227) 2008 executive compensation contract uses past performance as a standard for the ROE measure. Shenzheng Energy (stock code 000027) uses budget value and industry performance as standards to evaluate ROE performance. It also uses budget value and past performance as standards to evaluate the profit before tax measure in its 2008 compensation contract.

In our sample of contracts, 81% of the measures use a single internal standard as reference, with 64% based on budget value and 17% based on past performance. Another 16% use a single external standard as reference, with 13% based on a fixed standard. Qianjiang Motor (stock code 000913) uses a fixed ROE of 6.5% to evaluate its ROE performance measure. Shenzhen Tonge (stock code 000090) uses an ROE value from a government regulation as its performance standard. Six measures use cost of capital as a performance standard. For example, Jinxi Axle's (stock code 600495) executive compensation contract uses the bank interest rate in the same year as the performance standard to evaluate the ROE performance of its executives.

Among the 453 performance measures used between 2004 and 2010, 83% (81% of single standards and 2% of multiple standards) use internal standards and 16% use external standards. The remainder use both internal and external standards. These results are close to those reported by Murphy (2001), who finds that among 144 measures that use single standards, 85% use internal standards and 14% use external standards. Pan et al. (2006) present statistics on the performance standards of 50 executive compensation contracts between 2002 and 2004. Their results show that 72% of the contracts use internal standards and 36% use external standards. However, their statistics are based on the number of companies rather than the number of performance measures presented. Collectively, these results show consistently that most companies use internal standards as their evaluation reference.

Table 10 presents the statistics by company type. In non-government-controlled companies, 123 financial measures clearly indicate performance standards, with 89% of the companies using internal standards and 11% using external standards. In central-government-controlled companies, 87 financial measures clearly indicate performance standards, with 88% of the companies using internal standards and 12% using external standards. In local-government-controlled companies, 243 measures clearly indicate performance standards, with 78% of the companies using internal standards and 21% using external standards. It seems that local-government-controlled companies use more external standards, especially fixed and industry standards.

4.5. Executive compensation structure

Executive compensation normally includes a basic salary, annual bonuses, stock-based incentive compensation, long-term incentive compensation and allowances and welfare payments. Jensen and Murphy (1990) argue that compared with monetary compensation, stock-based compensation encourages managers to work harder to improve firm value. According to the 1997 statistics on CEO compensation structures in 1095 US companies, basic salary accounts for 34.4% of total compensation, monetary bonuses account for 20.51% and stock-based incentive compensation value accounts for 37.56% on average. In some companies, the proportion of stock-based incentive compensation is even larger. For example, Timothy Cook, the CEO of Apple Inc., received a basic salary of US\$900,017 (2.3%), stock-based incentive compensation of US\$37,618,000 (95.4%)⁸ and non-stock-based incentive compensation of US\$900,000 (2.3%) in 2011.

According to the WIND database, as at March 16, 2012, 347 Chinese domestic companies had implemented stock-based incentive compensation plans, representing 15% of all A-share listed companies. Among the 201 companies that voluntarily disclosed their compensation contracts, only 32 implemented (or passed board of directors proposals on) stock-based incentive plans, which is only 16% of the total. Thus, monetary salaries, including basic salaries and performance compensation, are still the main component of executive compensation in listed companies. As there is no requirement for listed companies to disclose the components of executive compensation in their annual reports, we could not obtain detailed statistics on the components for every company. However, among the 228 voluntarily disclosed compensation contracts, only 68 provide the exact basic salary amounts. We thus collected the total executive compensation from their annual reports to calculate the amount of performance compensation and then analyzed the relative weighting of the basic salary and performance compensation.⁹

Of the 68 compensation contracts that disclosed the exact basic salary amounts, seven contracts from 2004 are excluded because their companies' annual reports do not report the total executive compensation amount. We exclude another two companies that do not disclose the total compensation in their annual reports, nine companies that underwent general manager changes and nine companies that disclose total compensation amounts that are lower than the basic salary amounts.¹⁰ Thus, only 41 contracts are available to examine the relative weighting of basic salary and performance compensation. The data on total executive compensation was extracted from the RESSET financial research database and missing data was manually collected from the companies' annual reports.

Panel A of Table 11 reports the descriptive statistics on performance compensation and basic salaries. The average basic salary and performance compensation are RMB261,716 and RMB265,101, respectively. The ratio of performance compensation to basic salary is 1.38 on average and the median ratio is 1.03, indicating that performance compensation is generally higher than basic salaries. However, Panel B shows that the average ratio varies with company type. In non-government-controlled companies, the ratio of performance compensation to basic salary has an average of 1 and a median of 0.67. In local-government-controlled companies, the average and median of the ratio are 1.63 and 1.36, respectively. In central-government-controlled companies, the average and median of the ratio are 1.62 and 1.56,

⁸ Apple Inc.'s 2011 executive compensation table shows the value to be US\$37,618,000. The company granted 1 million restricted stocks to the CEO, the fair value of which is computed based on the daily market price of the stock. Fifty percent of the restricted stocks have a restricted trade period of five years and the other half has a restricted trade period of ten years. Thus, the annual incentive of the restricted stocks is worth US\$37,618,000 based on the 10-year average.

⁹ Note that the weighting of basic salary and performance compensation is based on ex post total compensation data rather than the design of the compensation contract. Thus, a lower performance compensation amount may only indicate weak executive performance rather than a lower incentive.

¹⁰ Seven companies' executive total compensation is lower than the reported basic salary. For example, Star Hi-Tech (000676) discloses its chairman's basic compensation as RMB600,000 in its 2010 compensation contract, with a basic salary of RMB480,000 and an allowance of RMB120,000. The 2010 annual report discloses the chairman's total compensation before tax as RMB313,000. The actual profit is lower than the standard profit and the compensation contract states that if this is the case, then the corresponding proportion will be deducted from the executive's basic salary.

Table 11
Descriptive statistics on compensation structure.

	Number of disclosures	Average (RMB)	Minimum (RMB)	Median (RMB)	Maximum (RMB)
<i>Panel A: Descriptive statistics on basic salaries and performance compensation</i>					
Basic salary	41	261,716	24,000	180,000	1,080,800
Performance	41	265,101	1,600	200,000	1,079,600
Performance/basic salary	41	1.38	0.01	1.03	5.02
<i>Panel B: Performance to basic salary ratio by ownership</i>					
Non-government controlled	16	1.00	0.04	0.67	4.00
Local government controlled	20	1.63	0.01	1.36	5.02
Central government controlled	5	1.62	0.03	1.56	3.06
<i>Panel C: Relative weight of basic salary and performance compensation</i>					
	Total	Privately owned	Local state-owned enterprise	Central state-owned enterprise	
Performance compensation is lower than basic salary	18 44%	11 69%	5 25%	2 40%	
Performance compensation is the same as or higher than basic salary	23 56%	5 31%	15 75%	3 60%	
Total	41	16	20	5	

Table 12
Methods for determining basic salaries.

	Total	Non-government controlled	Local government controlled	Central government controlled
Total	228	89	98	41
Contracts that disclose the method of determining basic salaries	108	28	60	20
<i>Including</i>				
Basic salary is a fixed value	58 (54%)	18 (64%)	31 (52%)	9 (45%)
Basic salary is a multiple of staff salaries	28 (26%)	3 (11)	18 (30%)	7 (35%)
Basic salary is a percentage of total remuneration	12 (11%)	6 (21%)	5 (8%)	1 (5%)
Basic salary is a function of factors such as assets and profit	8 (7%)	0 (0%)	5 (8%)	3 (15%)
Basic salary is a multiple of profits	2 (2%)	1 (4%)	1 (2%)	0 (0%)

respectively. The ratio of performance compensation to basic salary is apparently lower in non-government-controlled companies than in the other two types.

To further examine the proportion of basic salary and performance compensation in the sample contracts, we classify the sample into two groups: one with a ratio higher than 1 and one with a ratio lower than 1. Panel C in Table 11 shows the statistical results after the grouping. Among the 41 observations, 18 contracts (or 44%) have a ratio lower than 1. Of these 18 contracts, 11 (or 61%) are from non-government-controlled companies, a significantly higher proportion than the other two types of companies. This result is consistent with that presented in Panel B. King Field (stock code 002239), a non-government-controlled company, disclosed a compensation contract in 2008 that includes basic salaries (60%) and performance compensation (40%). The results show that whereas non-government-controlled companies choose compensation structures with lower incentive compensation, government-controlled companies and especially local-government-controlled companies, prefer to use compensation structures with higher incentives.

Table 13
Formula for performance compensation calculation.

	Total		Non-government controlled		Local government controlled		Central government controlled	
Contracts that disclose a formula	154		47		73		34	
<i>Including</i>								
$Bonus = Fpay * b$	59	38%	18	38%	30	41%	11	32%
$Bonus = NI * b$	63	41%	20	43%	31	42%	12	35%
$Bonus_t = (NI - Equity * r) * b$	9	6%	1	2%	3	4%	5	15%
$Bonus_t = Bonus_{t-1} * (1 + r) * b$	10	6%	7	15%	2	3%	1	3%
$Bonus = Apay_{employee} * m * b$	11	7%	1	2%	5	7%	5	15%
$Bonus = f(ROE)$	2	1%	0	0%	2	3%	0	0%

Note: The percentage is calculated as the number of contracts in each cell over the total number of contracts for each category.

$Bonus = Fpay * b$ is based on a fixed salary, multiplied by coefficient b . $Fpay$ is a fixed amount, usually the basic salary. The calculation of coefficient b is presented in Table 14.

$Bonus = NI * b$ is based on profit. NI may be the current year's net income or another measure based on profit.

$Bonus_t = (NI - Equity * r) * b$ is based on the economic value added.

$Bonus_t = Bonus_{t-1} * (1 + r) * b$ is based on past performance compensation, where r is the growth rate.

$Bonus = Apay_{employee} * m * b$ is based on multiples of the average compensation of all employees.

$Bonus = f(ROE)$ is based on ROE.

4.6. Computation of basic salaries

Basic salaries are typically determined by job responsibilities, which are not linked to a company's operating performance. This approach helps to protect executives' interests by controlling the risk of performance volatility. Table 12 presents a summary of the basic salary computation methods used in the sample contracts. Among the 228 sample contracts, 108 disclose the methods of determining basic salaries, representing 47% of the total contracts. Fifty-eight of these contracts (54%) use fixed basic salaries. The percentage is higher in non-government-controlled companies (18 contracts, or 64%) and lower in central-government-controlled firms (nine contracts, or 45%). For example, Ningbo Marine (stock code 600279) states its general manager's basic salary in 2004 to be RMB100,000. Twenty-eight contracts (26%) determine basic salaries based on the average employee salary. For example, Kingray Technology's (stock code 600390) 2009 executive compensation contract states that basic salaries should be based on $W0 * L * R * C$, where $W0$ is five times the previous year's national average employee salary for government-controlled companies, L is an adjustment factor that is determined by firm size and annual salaries adjustment coefficient, R is the basic salary adjustment coefficient and ranges from 0.8 to 1.2, and C is the weight that reflects an executive's ranking (1 for the CEO and 0.6–0.8 for other executives). The table also shows that whereas 30% and 35% of local- and central-government-controlled companies respectively determine their executives' basic salaries based on their employees' basic salaries, only 11% of non-government-controlled companies do so. Another 12 contracts (11%) regulate the proportion of basic salaries in the total compensation package. For example, YingLiTe's (stock code 000635) 2008 executive compensation contract states that the proportions of basic salary and performance compensation are each 50%.

Eight contracts (7%) link basic salaries with performance measures and another two contracts (2%) use a multiple of earnings to determine basic salaries. Lier Chemical (stock code 2258) states that its 2009 executive annual basic salaries are based on total assets, operating income, net profit and return on equity. iFlyTek (stock code 2230) states that the basic salary of the chairperson of the board of directors should be 0.25% of the net profit attributable to the shareholders of the parent companies and that the basic salary of the general manager should be 80% of the chairperson's basic annual salary. It also states that the total basic salary of the chairperson and general manager should not be higher than 1.5% of the budgeted net profit attributable to the parent company as agreed by the board of directors.

Table 14
Methods for calculating coefficient b .

	Total	Non-government controlled	Government controlled	Local government controlled	Central government controlled
Total contracts	228	89	139	98	41
Contracts that do not disclose the method of calculating b	112	59	53	41	12
Contracts that disclose the method of calculating b	49%	66%	38%	42%	29%
Contracts that disclose the method of calculating b	116	30	86	57	29
<i>Including</i>					
b is a fixed value	15	4	11	6	5
	13%	13%	13%	11%	17%
$b = f$ (evaluation scores)	101	26	75	51	24
	87%	87%	87%	89%	83%

4.7. Computation of performance compensation

Table 13 presents statistics on the methods used to compute performance compensation. Among the 228 sample contracts, 154 disclose the determinants of performance compensation, some 68% of the total sample. Fifty-eight (38%) of the 154 contracts use the fixed compensation multiplied by a certain coefficient (denoted as b) to determine the performance compensation. Coefficient b is typically determined by the performance evaluation results, as illustrated in Table 14. For example, Shenzhen Zhenye (stock code 000006) states that its executive annual incentive compensation should equal a personal incentive compensation base multiplied by a company annual incentive compensation coefficient multiplied by a personal evaluation coefficient (b).

Sixty-three contracts (41%) determine executive compensation based on net profit with a multiple of coefficient b . For example, Donger Erjiao's (stock code 000423) executive compensation contract in 2004 states that the annual performance compensation for all executives is 2% of the realized net profit, and that the allocation coefficient b is determined by the individual executive's performance evaluation. As such, the CEO's performance compensation should be (Net Income * 2% * b), where b is the allocation coefficient.

Nine contracts (6%) choose economic value-added (profit less the cost of capital) as a basis to determine performance compensation. For example, Banner Technology's (stock code 002106) 2000 executive compensation contract states that its general manager's annual performance compensation should equal (performance compensation base * 2.5%), and that the annual performance compensation base should equal (net profit of the current year -10% of net assets at the beginning of the year).

Ten contracts (6%) determine the current year's performance compensation based on the previous year's performance compensation. For example, Cangzhou Mingzhu's (stock code 2108) 2009 compensation contract states that the Year N performance compensation should equal the Year $N - 1$ performance compensation multiplied by the company performance evaluation coefficient multiplied by a position evaluation coefficient multiplied by a time coefficient.

Eleven contracts (7%) determine performance compensation based on a multiple of employee salaries. For example, SZTT Electronics' (stock code 002197) compensation contract in 2009 states that a general manager's performance compensation should equal $p * b * c$, where p is total employees' salaries, b is a basic coefficient formed by personal performance and c is the performance salary payout ratio, which is determined by the company's performance.

Finally, two contracts determine executive performance compensation based on ROE. Feicai Holding's (000887) executive compensation contract in 2004 states that when the annual ROE is less than or equal to 0%, the annual performance compensation is 0; when it is above 0%, every additional 0.1% corresponds to an increase of RMB600 in performance compensation; and when it is above 3%, 6%, 10% and 15%, every additional 0.1% corresponds to increases of RMB900, RMB1,200, RMB2,400 and RMB3,600, respectively.

We also present the statistics by company type. While 43% of non-government-controlled companies and 42% of local-government-controlled companies determine performance compensation based on a multiple of profit, only 35% of central-government-controlled companies do so. By comparison, 15% of central-govern-

Table 15
Ceilings and floors for performance compensation.

	Total	Non-government controlled	Local government controlled	Central government controlled
<i>Performance compensation with a ceiling</i>				
Total	40	13	18	9
Multiple of the basic salary	19	4	10	5
Fixed value	10	7	3	0
Ceiling without definition	4	0	1	3
Multiple of last year's salary	2	0	2	0
Multiple of net profit	2	1	0	1
Ceiling for coefficient <i>b</i>	1	1	0	0
Multiple of salary standards	1	0	1	0
Multiple of the average staff salary	1	0	1	0
<i>Performance compensation with a floor</i>				
Total	16	6	8	2
Fixed value (not zero)	7	6	1	0
Value of zero	6	0	5	1
Basic salary	1	0	1	0
Minimum wage of employees	1	0	1	0
Floor without definition	1	0	0	1

ment-controlled companies use EVA, whereas only 2% of non-government-controlled companies and 4% of local-government-controlled companies do so. These results are related to the Interim Measures to Evaluate Central-government-controlled Enterprise Managers' Performance published by the SASAC in 2010, which recognizes EVA as an effective evaluation measure. A total of 15% of private companies determine current performance compensation on the basis of the previous year's performance compensation, whereas only 3% of local- and central-government-controlled companies follow this approach. The last notable result is that whereas 15% of central-government-controlled companies and 7% of local-government-controlled companies determine performance compensation on the basis of a multiple of the average employee salary, only 2% of non-government-controlled companies do so. This result indicates that government-controlled companies, especially central-government-controlled companies, give more consideration to employee salaries when determining executive compensation, reflecting that executive compensation regulations do have an effect on government-controlled companies.

Table 14 presents statistics on the methods of determining coefficient *b* in the performance compensation computation formula discussed in Table 13. From the 116 contracts in which coefficient *b* could be determined, 87% state that coefficient *b* is determined based on the evaluation results of the performance measures and 13% give a fixed value for the coefficient. Central government-controlled companies have a greater tendency to set *b* at a fixed value than non-government and local-government-controlled companies.

To minimize the risk of exposure to executives, compensation contracts normally set a ceiling and floor for performance compensation. Table 15 presents the statistics on performance compensation ceilings and floors. Forty contracts provide a performance compensation ceiling. Among these, 19 calculate the ceiling as a multiple of the annual basic salary and 10 set a specific amount for the ceiling. Only 16 contracts provide a performance compensation floor. Seven of these 16 contracts give a specific amount and another six set the floor at 0.

5. Conclusion and directions for future research

This study analyzes 228 executive compensation contracts voluntarily disclosed by Chinese listed firms between 2004 and 2010, and finds the following main results.

First, central-government-controlled companies disclose the most information on compensation packages, followed by local- and non-government-controlled companies. We mainly focus on the disclosure of performance evaluation measures and compensation calculation methods.

Second, the evaluation measures in compensation contracts are still chiefly based on accounting profit measures, with only three companies using market return measures. We observe that an increasing number of companies have used non-financial measures since 2007. In addition, non-financial measures are more widely used by central-government-controlled companies than by their local- and non-government-controlled counterparts.

Third, the performance standards used in evaluation measures are still mainly based on internal standards, such as past performance and company budgets. Very few companies choose industry performance, cost of capital and other external standards as standards to evaluate executive performance. Murphy (2001) argues that it is easier for executives to manipulate internal standards than external standards. Thus, our results indicate that Chinese listed companies fail to consider executives' influence on performance standards when setting executive compensation.

Fourth, 57 of the sample contracts disclose the weight given to financial measures in the evaluation system. Compared with the years before 2007, both the average and median weight accorded to financial measures drops significantly after 2007. We cannot offer any explanation for this change: it may be due to changing executive compensation regulations introduced by the government or to the application of the new accounting standards in 2007. We also find that the weight given to financial measures in central-government-controlled companies is slightly higher than that in local- and non-government-controlled companies.

Fifth, the structure of executive compensation consists of basic salary and performance compensation, but relatively little stock-based compensation. Most contracts set basic salaries at a certain fixed value. Some contracts set them based on a multiple of the average employee salary. The basic salary amount is typically not significantly different from the performance compensation amount, which is about half of the total compensation. However, government-controlled companies offer greater performance compensation than non-government-controlled companies.

Finally, most companies determine performance compensation based on profit or a fixed value in combination with the results of the executives' performance evaluation. However, some companies determine performance compensation based on past performance or average employee compensation.

Our survey results shed light on future executive compensation research in China. We have identified five future research directions. First, performance evaluation measures vary significantly across companies. It would be interesting to examine why companies choose different performance evaluation measures. Such research would help to determine how companies should choose and balance the use of financial and non-financial measures, and whether performance standards should be based on internal standards such as budgeting and past performance, or on external standards such as industry performance and cost of capital. Answering these questions would help us to better understand how companies construct their compensation packages.

The second direction is to determine which measures are more effective in motivating executives and mitigating agency problems. The answer to this question could help companies to design more effective compensation contracts. The reactions of management to different measures are also unknown. The literature focuses mainly on managers' incentives to manipulate earnings to achieve their personal goals. However, there are large variations in performance evaluation measures and performance standards. How can managers manipulate so many measures and standards? Do they exhibit different kinds of opportunistic behavior? An understanding of managers' reactions to performance measures would be useful in designing better compensation contracts.

The third direction is to examine what motivates companies to voluntarily disclose compensation contracts. There is a need for further analysis on the disclosure of company compensation policies. It would also be interesting to examine how investors react to the voluntary disclosure of executive compensation contracts. These research avenues would increase our comprehension of the function of compensation contracts in company operations and offer policy implications for regulators of disclosure policies.

Fourth, due to a lack of detailed information on the compensation regulations introduced by local governments, additional surveys and field studies are required to understand how local governments regulate compensation and how central government regulations are enforced by local governments. How would different

regulations by local governments affect company choices? Such research would help us to understand the structure of compensation contracts in local-government-controlled companies.

Finally, previous studies often suffer from an omitted variable problem in their pay–performance sensitivity analyses. In addition to the various forms of accounting profit evaluation measures, contracts contain many non-accounting-profit measures, such as operating efficiency measures and cash flow measures, that are normally not controlled for in previous studies. Many companies also use non-financial measures. These omitted variables may also have affected the current research findings.

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References

- Baker, G.P., Jensen, M.C., Murphy, K.J., 1988. Compensation and incentives: practice vs theory. *Journal of Finance* 3, 593–616.
- Banker, R., Datar, S., 1989. Sensitivity, precision and linear aggregation of signals for performance evaluation. *Journal of Accounting Research* 27, 21–39.
- Bi, X., Zhou, X., 2007. The influences of earnings quality on the usefulness of accounting information in pay contracts and ownership characteristics' interacting effect. *China Accounting Review* 3, 55–82 (in Chinese).
- Chen, D., Chen, X., Wan, H., 2005. Regulation and non-pecuniary compensation in Chinese SOEs. *Economics Research Journal* 2, 92–101 (in Chinese).
- Chen, D., Liang, S., Jiang, D., 2010. How marketization affects incentive contracting costs and choices: perks or monetary compensations? *Accounting Research* 11, 56–64 (in Chinese).
- Chen, X., Chen, D., Wan, H., Liang, S., 2009. The disparity in regions, the regulation of emolument, and the corruption of high-ranking managers. *Management World* 11, 130–138 (in Chinese).
- Du, S., Qu, Y., 2005. An empirical analysis of the determinants of annual compensation of general managers. *Management World* 8, 114–200 (in Chinese).
- Fang, J., 2009. Is top management compensation of chinese public companies sticky? *Economic Research Journal* 3, 110–124 (in Chinese).
- Holmstrom, B., 1979. Moral hazard and observability. *Bell Journal of Economics* 10, 74–91.
- Ittner, C.D., Larcker, D.F., Rajan, M.V., 1997. The choice of performance measures in annual bonus contracts. *Accounting Review* 72, 231–255.
- Jensen, M.C., Murphy, K.J., 1990. Performance pay and top-management incentives. *Journal of Political Economy* 98, 225–264.
- Ke, B., Li, Y., Yuan, H., 2011. Mandatory IFRS Adoption and the Stewardship Role of Financial Reporting. Working Paper, Nanyang Technological University.
- Li, Z., 2000. Incentive mechanisms and corporate performance: an empirical study of listed companies. *Accounting Research* 1, 24–30 (in Chinese).
- Liu, F., Sun, Z., Li, Z., 2007. Government intervention, industry competition and executive compensation: an empirical analysis of government-controlled companies. *Management World* 9, 76–84 (in Chinese).
- Murphy, K.J., 2001. Performance standards in incentive contracts. *Journal of Accounting and Economics* 30, 245–278.
- Pan, F., Shi, M., Tong, W., 2006. A survey on senior management incentive contracts. *Chinese Industrial Economy* 3, 68–74 (in Chinese).
- Wei, G., 2000. Senior management incentive and performance of listed companies. *Economic Research Journal* 3, 32–39 (in Chinese).
- Wu, Y., Wu, S., 2010. Executive pay: incentive or self-interest? *Accounting Research Journal* 11, 40–48 (in Chinese).
- Xiao, J., Peng, W., 2004. A study on the compensation performance sensitivity of general managers in listed companies. *Finance Research Journal* 12, 34–43 (in Chinese).
- Xin, Q., Tan, W., 2009. Market-oriented reform, firm performance and executive compensation in Chinese state-owned enterprises. *Economic Research Journal* 11, 68–81 (in Chinese).
- Zhang, B., Shi, J., 2005. Board characteristic, top managers' compensation, and pay–performance sensitivity in Chinese listed companies: an empirical analysis. *Management Science* 8, 32–39 (in Chinese).

