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Accounting information quality, governance efficiency and capital investment choice

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ARTICLE INFO

ABSTRACT

This paper examines the relationship between accounting information quality and capital investment choice from the perspective of accounting information's governance function. Measuring capital investment choice as the correlation of growth of operating income between company and industry, this paper investigates whether and to what extent companies focus on their core business. The results show that the higher the quality of publicly listed firms' accounting information, the stronger that correlation, particularly when the corporate governance of the listed company is poor. The findings imply that accounting information quality can thus optimize the capital investment choice, which complements and strengthens the functioning of corporate governance. Hence, regulators should pay more attention to the market's power to supervise the behavior of listed firms, improve the governance functions of accounting information and increase the efficiency of capital allocation.

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1. Introduction

China's stock market has developed rapidly since 1990, when the capital market was set up. The number of listed companies increased from 10 in 1990 to 2063 in 2010. In the 1990–2010 period, about 5253.7 billion yuan in outside capital flowed into listed companies by initial public offerings, seasoned equity offerings or corporate bonds (China Statistical Yearbook, 2011). Whether companies allocated the capital into their own core businesses has become a very important issue, which more and more market participants are focusing on.

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However, this paper finds that in the 2000–2011 period, about 63.7% of capital was allocated to non-core operating activities, against their original investment plans. There are an average of 53 million yuan for each change, the average 6.7 months of change frequency, and the average 3.6 times change for every firm. Moreover, almost 69.6% of all the changes are inefficient. The frequent changes of the capital investment directions have become a notable problem in China, which severely harms capital allocation efficiency. Many scholars pay attention to this issue and research on it from the views of implementing laws and regulations or improving corporate governance, but the effect of these suggestions is not good to date. Based on this important issue, this paper examines the governance function of accounting information and whether high accounting information quality can form an enforcement mechanism to push management to make capital investment more efficiently.

Since China's Accounting Law was implemented in 1985, the Chinese government has devoted effort to complete the accounting principles system and related rules to improve accounting information quality. In 2006, the Chinese Ministry of Finance issued new accounting principles comprising one basic accounting standard, 38 specific standards and application guides that have been applied to publicly listed companies since 2007. The goal of these standards is to ensure the firms to provide useful accounting information and to help investors make good investment decisions. These accounting standards are created to reduce the information asymmetry between investors and listed companies, helping investors better understand those companies' risks and thus make more rational investment decisions. However, in China's current special institutional background, can accounting information also serve a governance function to influence managements' capital investment choice?

There are several objective external forces that enhance the governance function of accounting information in China's capital market. By the end of 2010, the country's number of securities investment funds had reached 704, with 2.4228 trillion yuan in total assets (China Statistical Yearbook, 2011). Institutional investors also play an important role in China to dig up and transfer the information disclosed by listed firms, compared with other investors. More importantly, institutional investors can also respond more quickly to abnormal accounting information, "vote by foot", and finally improve the market efficiency. We believe that in the long term, high-quality accounting information can help these investors to identify inefficient investments, and in turn incur the pressure on stock price by investors' voting by foot. In an efficient market, the potential decrease in stock prices will further push management to make good investments. Meanwhile, other market forces, such as individual investors and the media, have also begun to pay more attention to interpreting accounting information, and thus finally constrain and supervise the managements' investment behavior. Hence, accounting information has become increasingly important in China to optimize corporate capital investments.

This paper examines whether and how accounting information quality has an effect on corporate investment choices, based on the governance function of accounting information. This issue is very important to government, market participants, current and latent investors, and listed firms. Addressing this issue will help them (such as market participants) better understand the governance function of accounting formations, so as to help them make good decisions.

2. Literature review

Many researchers, both Chinese and foreign, have explored the role played by accounting information quality and information transparency in market efficiency. For example, Zhou and Chen (2008) investigate the influence of the transparency of industry accounting information on industry-level capital allocation based on data from all A-share listed companies on the Shanghai and Shenzhen exchanges from 1999 to 2004. They measured capital allocation efficiency as the allotment of shares and amount of newly raised funds, focusing on whether external capital flows to the best industries. Zhou and Chen (2008) find industry accounting information transparency to exert a significant effect on resource allocation, such that the more transparent that information is, the higher the efficiency of resource allocation.

Based on 3600 firm-year observations of A-share listed companies on the Shanghai and Shenzhen exchanges from 2004 to 2006, Li (2009) examines the influence of accounting information quality on the under- and over-investment of listed companies. His results show that high-quality accounting information

reduces the risks of moral hazard and adverse selection and inhibits both under-investment and over-investment by ameliorating contracts and supervision, thereby improving capital allocation efficiency at the company level.

Bhattacharya et al. (2003) investigate the influence of accounting opacity on the cost of equity capital in 34 countries, finding that the lower a country's degree of accounting information transparency, the higher its overall cost of equity capital and the smaller the trading scale of stocks. Hence, it appears that accounting information transparency also has an influence on capital allocation efficiency at the country level. Using the same 34 countries, Biddle and Hilary (2006) survey the effects of accounting information quality on capital investment efficiency (measured by the sensitivity of the amount of capital investment to net cash flows in operating activities, with the greater the sensitivity, the lower the degree of investment efficiency) at both the country and company levels. Their results indicate that high-quality accounting information reduces information asymmetry between managers and external capital providers, and therefore increase capital investment efficiency at both levels. Drawing on these studies, Biddle et al. (2009) research company-level capital investment efficiency in depth from both the over- and under-investment perspectives, which focus on the relationship between such efficiency and high-quality accounting information.

Using a sample of listed companies that had been examined by the U.S. Securities and Exchange Commission (SEC) or sued by shareholders because of accounting information distortions or restated financial statements, McNichols and Stubben (2008) investigate the role of accounting information in internal decision-making efficiency. Their results suggest that companies engage in over-investment during the periods of illegal accounting activity, but exhibit higher investment efficiency after that activity has been investigated. Hence, it appears that accounting information quality affects companies' internal decisions.

Based on 37 countries and 37 manufacturing industries for each country, Francis et al. (2009) examine the effect of country-level information transparency, rather than just accounting information quality, on resource allocation efficiency. They use the growth rate correlations between manufacturing industries and countries to measure resource allocations. The results show that the higher a matched country's degree of information transparency, the stronger the correlation of growth rate between industries and countries. Therefore, in countries with better information transparency environments, resources flow more smoothly to better-developed industries, resulting in more efficient industry-level resource allocation.

Chen et al. (2011) investigate the association between accounting information quality and the investment efficiency of private enterprises in emerging markets. They find that even when accounting information is of poor quality, it still exerts a positive influence on investment efficiency. Because private enterprises are dependent primarily on bank financing, the association is more obvious than in other scenarios.

The prior literature above examines not only the effects of accounting information quality or transparency on capital allocation efficiency at the country and industry levels, but also on company-level decision-making and investment efficiency from the over- and under-investment perspectives. Based on the analysis of this paper, listed companies frequently change the direction of their capital flows on a large scale. Hence, whether firms invest capital in their main businesses is a major factor in evaluating capital allocation efficiency. However, few studies focus on this issue. This paper thus makes two important contributions to the prior literature. First, it explores the relationship between accounting information quality and a company's choice of capital investment in depth, with a focus on whether it invested capital in its core business. Second, it also examines that relationship from the perspective of the market forces from which the governance function and efficiency of accounting information arise.

3. Theoretical analysis and hypothesis development

Beaver (1989) argues that the major objective of accounting information was to help its users make informed decisions. The quality of accounting information can be assessed in two ways. The first is valuation usefulness, which means that the information is useful to investors looking to make valuation decisions. It reflects the pricing function of accounting information. The second is contract validity, which means that the accounting information benefits contracts, particularly those between investors and administrators. It reflects the governance function of such information. Accordingly, accounting information has two basic functions: pricing and governance. First, accounting information implements its pricing function by influencing

capital costs and stock prices. High-quality information can alleviate information asymmetry, thereby reducing the capital cost of external financing (Myers and Majluf, 1984; Easley and O'Hara, 2004; Zeng and Lu, 2006). The pricing function can also be realized by influencing stock prices. To some extent, a listed company's stock price reflects special information about it. Higher quality, more transparent accounting information allows growth opportunities to be incorporated into the stock price, thereby attracting new investors. Second, by alleviating the ex-post information asymmetry among the interested parties to a contract, accounting information can reduce the imperfections of the contract and restrain and monitor the opportunistic behavior of management. In this way, accounting information serves a governance function. In the case of obtaining external capital, that governance function of accounting information helps listed firms to make rational decisions to focus on their main business and allocate the capital more efficiently.

Bushman and Smith (2003) finds that high-quality information disclosures are beneficial to investors by monitoring management, encouraging them to make investment decisions efficiently and effectively, and finally improving capital allocation efficiency and gaining more returns to investors. Ball and Shivakumar (2005) believe that high-quality accounting information strengthens investors' supervision of management, by placing restrictions on managerial pay for their own or others' interests and by optimizing investment decision-making. In addition, high-quality accounting information can also inform investors in a timely manner about the orientation of the firm's capital investments and help them to supervise managerial activities. Similarly, Biddle et al. (2009) argue that high-quality accounting information inhibits management from building "an empire," discourages unwise investments and improves the ability of investors to monitor the efficiency of managers' investment decisions. Fig. 1 shows how the two major functions of accounting information affect a company's capital investment choice.

On the other hand, the aim of accounting disclosures was to provide external stakeholders with useful information. The quantity and quality of accounting information will affect an investor's judgment on the intrinsic value of the company. If the company's share price or earnings declines, investors will seek to avoid losses through such actions as "exercising their decision-making right to vote" and/or "voting with their feet." Hence, accounting data constitute an essential information resource in determining whether a company's stock price is over- or underestimated. Ohlson (2005) builds a model that reflects the relationship between accounting information and firm value. Many scholars have demonstrated the usefulness of such information by showing how investors use it to make decisions (Beaver, 1968; Ball and Brown, 1968). Investors are concerned with the quality of accounting information because it helps them to better understand the company's operating situation and other fundamentals. High-quality accounting information affords external stakeholders a comprehensive understanding of firm fundamentals and allows them to take action to supervise management behavior. Once managements' activities are not aimed at maximizing the interests of stockholders, major shareholders can seek to alter it by voting for changes on the board of directors and taking part in shareholder meetings. Although minority shareholders are unable to influence management directly, they can influence the stock price by voting with their feet. Institutional investors (and other strategic investors) can also effect managerial changes both through their right to vote for board directors and by voting with their feet. High-quality accounting information thus helps external stakeholders, who can interfere with management either directly or indirectly, to gain a better understanding of a company's capital use and business performance, thereby affecting its choice of capital investment. Hence, the first hypothesis of this paper is developed as following.
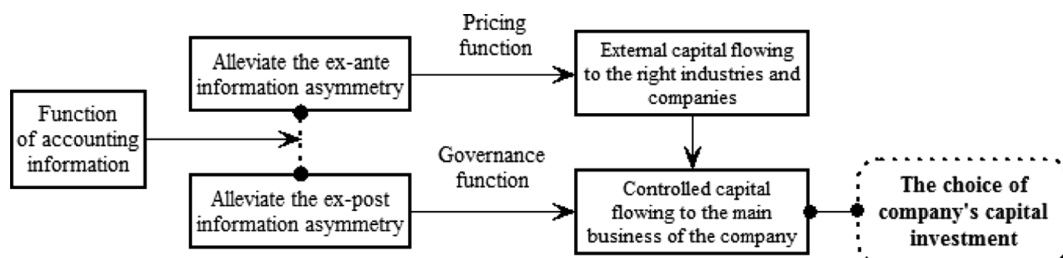
Figure 1. Theoretical analysis framework.

H₁. Companies with higher quality accounting information are more likely to invest more capital in their core business.

Most of the listed companies were established during the country's planned economy era. Hence, they have close relationships with the government that were complicated by the fiscal decentralization reforms that began at the end of the 1970s. Local governments' pursuit of economic and political objectives is heavily dependent on the listed companies under their control, state-owned enterprises (SOEs) in particular. Meanwhile, the legal environment governing Chinese listed companies is in urgent need of improvement. The incomplete nature of the regulatory system results in the companies not abiding by the law and the law not being strictly enforced. It also remains difficult for shareholders to file successful legal appeals, and thus effectively constrain or exert pressure on management.

Although listed firms in China have formally established boards of directors, in reality there are still a number of challenges to those boards' independence. First, the majority of board members are also managers, particularly in SOEs, which result in serious internal control problems. The State-owned Assets Management Department commonly appoints managers, which exacerbates these problems. Second, the role of independent directors is questionable in China because their appointment is intended to meet the requirements of regulators rather than to strengthen corporate governance. Finally, independent directors are normally nominated or appointed by the board chair, and thus constitute an extension of the chair's relationship with and control by the majority shareholders.

The scarcity of board independence and the complex external governance environment make it difficult for corporate governance mechanisms to exert any real effect. Investors, in contrast, can exercise real external supervision by voting with their feet in the case of unreasonable investments, thus placing management under the threat of potential stock price revaluations and promoting the efficient resource allocation. High-quality accounting information can help investors to identify inefficient investments, thereby leading to a potential share price revaluation and putting pressure on the board of directors, which in turn push management to focus on the company's core business and improve the efficiency of capital allocation. Therefore, when a company's internal and external governance environment is weak, the effect of high-quality accounting information on capital investment choice is more pronounced. Hence, we posit the second hypothesis.

H₂. The influence of high-quality accounting information on management capital investment choices is more pronounced when the external governance environment is poor.

4. Research design

4.1. Measurement of accounting information quality

The prior literature measures accounting information quality by two approaches. The first is measured as earnings characteristics, such as accruals quality and earnings persistence, predictability, smoothing, aggressiveness and loss avoidance, mainly based on the financial statements. The second method is to use a company's stock price to measure the quality of accounting information, such as earnings value relevance, earnings timeliness and earnings conservatism. This approach reflects investors' recognition of accounting information quality, which is affected by factors such as the degree of capital market development and the knowledge of individual professionals. Due to weak or not efficient capital market in China, this paper measures accounting information quality as earnings-related characteristics based on financial statement data. We develop four measures to proxy for accounting information quality, such as *Accruals Quality*, *Earnings Persistence*, *Earnings Predictability* and *Earnings Smoothing*. Meanwhile, for robustness, this paper also constructs a comprehensive measurement by ranking the four variables above.

4.1.1. Accruals quality
The Jones model and modified Jones model are frequently used to assess companies' earnings management. However, it is difficult to measure the normal and abnormal components of accruals objectively and precisely. Therefore, Dechow and Dichev (2002) devise another method to measure accruals quality that is based on

whether a company's accruals correspond to its cash holdings in the past, present or future. The more (less) closely the company's past, present and future cash correspond to its accruals, the higher (lower) its accruals quality is. This paper calculates accrual quality based on the DD model. It takes into account how well the company's accruals in the current period (year t) match its cash in the previous period (year $t-1$), current period (year t) and next period (year $t+1$):

$$\Delta TotalCurrentAccrual = b_0 + b_1 CFO_{t-1} + b_2 CFO_t + b_1 CFO_{t+1} + \varepsilon_t,$$

where $\Delta TotalCurrentAccrual$ stands for the company's accruals in year t, which equals the current assets change in year t minus current liability changes, minus the changes of cash and cash equivalent changes in year t, plus change of short-term liability with interests in year t. CFO refers to the operating cash flow.

The regression residual means unrealized cash flow, which is relative to the company's expected accruals. The standard deviation (σ(residuals)) of all observation residuals is used to measure a company's accrual quality. A greater standard deviation means both lower accrual and accounting information quality. We calculate accrual quality by using these variables during the past 10 years for each firm.

4.1.2. Earnings persistence

Using time-series data, the persistence of a company's earnings is measured by regressing its current ROA_t on its previous ROA_{t-1} (Lev, 1983; Ali and Zarowin, 1992). The model is as follows.

$$ROA_t = \alpha_0 + \alpha_1 ROA_{t-1} + \varepsilon,$$

where ROA_t represents the return on assets in period t. Regression coefficient α_1 indicates the level of earnings persistence, with a larger α_1 indicating a higher earnings persistence. For ease of explanation, we take negative value of earnings persistence, which implies a larger $-\alpha_1$ is poorer quality accounting information. We calculate this measure by using data during the past 10 years for each firm.

4.1.3. Earnings predictability

Earnings predictability describes the ability of a company's current earnings to predict its future earnings. It is measured by the same model as that for earnings persistence, i.e.,

$$ROA_t = \alpha_0 + \alpha_1 ROA_{t-1} + \varepsilon.$$

The standard deviation of the residuals (σ(residuals)) obtained from the regression can be used to measure the prediction error in company earnings, with larger σ(residuals) indicating poorer earnings predictability or accounting information quality. We calculate this measure by using data during the past 10 years for each firm.

4.1.4. Earnings smoothing

Our measure of earnings smoothing is based primarily on the shift between accruals and cash in net income, which can be measured by the ratio of the standard deviation of net income to operating cash flow or by the correlation between changed accruals and operating cash flow in the current period. As the principles of the two methods are both based on the shift between accruals and cash in net income, they should produce the same results.

Here, we use the ratio of the standard deviation of net income to operating cash flow, that is, σ(net income)/σ(operating cash flow), where a larger ratio suggests a greater degree of artificial earnings smoothing and lower degree of accounting information quality. We calculate this measure by using data during the past 10 years for each firm.

4.1.5. Comprehensive index of accounting information quality

As we are unable to ascertain which measurement of accounting information quality above is the most important, we construct a comprehensive variable of accounting information quality according to the approach used in the prior literature (Bhattacharya et al., 2003; Biddle and Hilary, 2006). We calculate each unique measurement of accounting information quality for all firm-year observations, and then sort them by

decile ranks by year (with each variable falling between 0 and 9). Finally, we sum up the rank values of every measurement to obtain the comprehensive index of accounting information quality. The smaller the rank value, the better the comprehensive quality of the accounting information.

4.2. Capital investment choice

A company's capital investment choice refers simply to whether the capital it controls flows to its core business. Properly describing and measuring capital investment choice, however, is very complicated. Francis et al. (2009) measure resource allocation efficiency as the correlation between the growth rate of the manufacturing industry to which a focal company belongs and that of a matched sample of companies in the same industry to determine whether capital flows to the most efficient industries at the national level. If a company's capital flows to its main business or main industry, there should be a high degree of correlation and consistency between the firms' operating profits growth and that of the industry as a whole. Therefore, referring to Francis et al. (2009), this paper measures capital investment choice as the correlation between the growth rate of its own operating income and that of the industry as a whole based on the data during the past 10 years. The higher this correlation, the more capital that flows into the company's core business. In calculations, we take the average of the operating income growth of all companies apart from the focal company as the industry-level value. The variable $growth\_corr_t$ represents the correlation between a company's operating income growth and that of the industry in year t. Industries are divided into 13 types in accordance with the industry classifications released by the China Securities Regulatory Commission (CSRC). In robustness tests, we also use both the correlation of the growth of a company's sales with that of the industry and synchronicity to measure capital investment choice.

Table 1
Variable definitions.

Variable	Variable definitions
Explained variable	
growth_corr	Correlation between operating profit growth at the company and industry levels, calculated over a 10-year cycle
Explanatory variables	
Accrual quality	Company accrual quality calculated on a 10-year cycle and analyzed by rank value
Smoothness	Company earnings smoothness calculated on a 10-year cycle and analyzed by rank value
Persistence	Company earnings persistence calculated on a 10-year cycle and analyzed by rank value
Predictability	Company earnings predictability calculated on a 10-year cycle and analyzed by rank value
TAQ	Company overall accounting information quality calculated by the sum of the four independent accounting information variables
Control variables	
Shr1	Ownership concentration measured by the mean of the largest shareholder's stake in a listed company during the 10-year period considered
Hfd_5	Degree of ownership restriction measured by the means of a listed company's second to fifth largest shareholders' Herfindahl index during the 10-year period
Mktscore	Degree of marketization in the region in which the listed company is located measured by the China marketization index compiled by Fan and Wang (2009)
Size	Company size measured by the logarithmic average assets of the listed company over 10 years
MTB	Corporate growth potential measured by the *MTB* mean of all listed companies in the 10-year period
ROA	Corporate profitability measured by the average *ROA* of the listed company in the 10-year period
σ(*sales*)	Volatility of sales measured by the company's standard deviation of revenues (standardized by assets at the previous year end) during the 10-year period
Leverage	Company debt level measured by the mean of the asset-liability ratio of all listed companies during the 10-year period
OperatingCycle	Company operating ability measured by the logarithmic average operating cycle of the listed company during the 10-year period
Industry	Dummy variable conforming to CSRC industry classification

Table 2
Descriptive statistics.

	Mean	Std.Dev.	Min.	Median	Max.	Obs.	Time horizon
Accrual quality	0.0404	0.0437	0.0017	0.0291	0.5258	711	2008
Persistence	−0.4411	0.8369	−2.9954	−0.4738	50.936	4503	2000–2009
Predictability	5.7386	43.6854	0.1018	3.0127	2036.1048	4503	2000–2009
Smoothness	0.9514	1.9316	0.0239	0.6101	51.0512	2519	2007–2009
TAQ	18.4505	8.9761	1.0000	18.0000	36.0000	711	2008
growth_corr	0.1881	0.3499	−0.9097	0.1987	0.9955	5407	2000–2009

Accrual quality, *persistence*, *predictability* and *smoothness* are calculated using the relevant model and a 10-year cycle and analyzed by their raw values. *TAQ* is calculated by summing up the four independent accounting information variables' decile rank values, and *growth_corr* is the correlation between operating income growth between the firm and its industry on the basis of the past 10-year cycle.

4.3. Control variables

The control variables in this paper are firm size, firm growth, profitability, operational volatility, debt ratio, operating cycle and industry fixed effects. The definitions of these control variables are listed in Table 1.

4.4. Model specification

Regression models (1) and (2) are used to test H_1 and H_2, respectively:

$$growth\_corr_{it} = a_0 + a_1 Rank\ of\ AQ_{it} + a_2 SHr1_{it} + a_3 Hfd\_5_{it} + a_4 Mktscore_{it} + a_5 Size_{it} + a_6 MTB_{it}$$
$$+ a_7 ROA_{it} + a_8 \sigma(Sales)_{it} + a_9 Leverage_{it} + a_{10} OperatingCycle_{it} + \varepsilon. \tag{1}$$

$$growth\_corr_{it} = a_0 + a_1 Rank\ of\ AQ_{it} + a_2 GOVER + a_3 Rank\ of\ AQ_{it} \times GOVER + a_4 Size_{it} + a_5 MTB_{it}$$
$$+ a_6 ROA_{it} + a_7 \sigma(Sales)_{it} + a_8 Leverage_{it} + a_9 OperatingCycle_{it} + \varepsilon. \tag{2}$$

In model (1), *growth_corr$_t$* represents the correlation between the company and industry operating income growth rates from years $t − 9$ to t. *Rank of AQ$_{it}$* (accounting quality) represents the accounting information quality, including accruals quality, earnings persistence, predictability and smoothness, and total accounting quality (*TAQ$_t$*). Due to big standard deviation of actual value of these variables, this paper takes the ranking value in decile level. The smaller the rank value of these measures, the higher is the accounting information quality. Total accounting quality (TAQ$_t$) is the sum of all four single variables' rank values in year *t*.

In model (2), *growth_corr$_t$* is the same as in model (1), but total accounting quality (*TAQ$_t$*) is used as a substitute for *Rank of AQ$_{it}$*.[1] *GOVOR* represents the corporate governance mechanism, such as *Shr1*, *Hfd_5* and *Mktscore*. Due to the highly correlations among the corporate governance variables, we test each variable separately to address potential multicollinearity in the model. The coefficient of $AQ_t \times GOVER$ allows us to infer whether the effects of accounting information quality on the capital investment choice are more pronounced with better corporate governance.

5. Data and empirical findings

5.1. Sample and data

All data and all variables come from the Wind Database. With 10 years adopted as the calculation cycle and data of operating cash flow disclosed from 1998 onward, this paper calculates the measurements of accounting information quality and capital investment choices based on different time horizons. The descrip-

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[1] This article also analyzes the rank values of the four single variables: accruals and earnings persistence, predictability and smoothness. The overall result is consistent with that based on total accounting quality (*TAQ$_t$*). Owing to space limitations, these results are omitted.

tive statistics for the key variables at the different time horizons based final samples with excluding missing values are listed in Table 2.

We know that the smaller the value of the five accounting information quality variables, the better the quality of the accounting information. In Table 2, earnings predictability has a mean value of 5.74 with a standard deviation of 43.69%, which indicates that it is easier to distinguish accounting information quality than the other four variables. Earnings persistence has a mean value of −0.44 and a standard deviation of 0.84. The comprehensive index of accounting quality, TAQ has a mean value of 18.45, and its minimum value and maximum values are 1 and 36, respectively. The maximum value of *growth_corr* is 1 and its minimum value is −0.91, which demonstrates that there are considerable inter-company differences in capital investment choice.

Table 3 reports the correlation matrix for the key variables.

Table 3 results (for both the Pearson and Spearman coefficients) show that the four independent measures of accounting information quality are strongly correlated with one another at the 1% significance level, which indicates that all four are important measures. At the same time, the comprehensive accounting information quality variable is significantly correlated with all of the independent variables (at the 1% significance level). More importantly, the results of both the Pearson and Spearman coefficients show that *TAQ* has a significantly negative correlation with *growth_corr* at the 1% significance level, which suggests that the higher the level of comprehensive accounting information quality, the higher the governance efficiency, and the higher likelihood the firms focus on its core business.

The measurements of accounting information quality, such as *accrual quality*, *persistence*, *predictability* and *smoothness* have a negative correlation with *growth_corr*, significantly in Spearman index (at the 1% significance level), but not in Pearson index. This univariate tests show that the higher the quality of the accounting information the higher likelihood the company will focus on its core business.

5.2. Univariate analysis

For each independent variable, all of the sample firms are sorted by decile ranks in ascending order, and divided into groups 1–10, with the smaller the group number, the higher the quality of accounting information. Then, taking the median and mean of *growth_corr* in each group, we map the relationship between accounting information quality and capital investment choice, as shown in Fig. 2.

The direction of the curves in Fig. 2 depends on whether the independent variables or comprehensive variable are used in the calculation. The lower the level of accounting information quality, the smaller the median

Table 3
Correlation matrix for key variables.

	Accrual quality	Persistence	Predictability	Smoothness	TAQ	growth_corr
Accrual quality	**1.00000**	0.18186	0.88455	0.57421	0.65123	−0.03226
		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.3918)
Persistence	**0.20200**	**1.00000**	0.21560	0.10588	0.45280	−0.04553
	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(0.2266)
Predictability	**0.86502**	**0.34943**	**1.00000**	0.75685	0.58587	−0.03297
	(<.0001)	**(<.0001)**		(<.0001)	(<.0001)	(0.3814)
Smoothness	**0.64843**	**0.09898**	**0.70526**	**1.00000**	0.40354	−0.07013
	(<.0001)	**(0.0085)**	**(<.0001)**		(<.0001)	(0.0624)
TAQ	**0.86905**	**0.51453**	**0.93651**	**0.77887**	**1.00000**	−0.16026
	(<.0001)	**(<.0001)**	**(<.0001)**	**(<.0001)**		(<.0001)
growth_corr	**−0.13373**	**−0.09704**	**−0.16568**	**−0.12250**	**−0.17040**	**1.00000**
	(0.0004)	**(0.0098)**	**(<.0001)**	**(<.0001)**	**(<.0001)**	

This table presents the Pearson and Spearman correlation matrices. The upper-right diagonal reports the Pearson correlation coefficients, and the lower-left diagonal the Spearman correlation coefficients in bold. The *accrual quality*, *persistence*, *predictability* and *smoothing* variables are calculated on the basis of the relevant model and a 10-year cycle, and are analyzed by their decile rank values, *TAQ* is calculated by summing up the four independent accounting information variables and *growth_corr* is the correlation of company- and industry-level operating income growth over the 10-year cycle. The numbers reported in parentheses are *p* values.
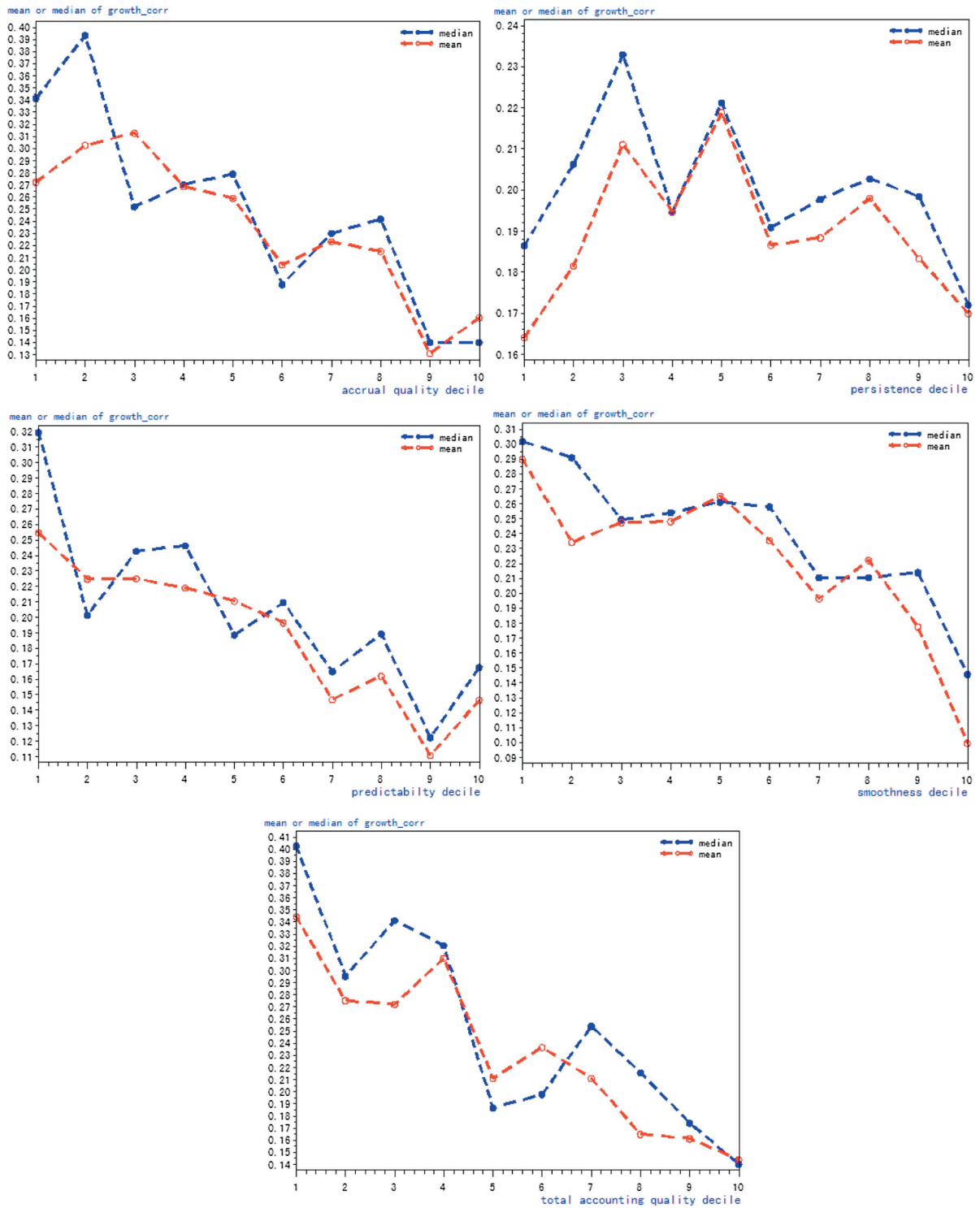
Figure 2. Relationship between *growth_corr* and accounting information quality.

or mean of *growth_corr*, which indicates that there is a significant relationship between whether a company invests its capital primarily in its main business and the quality of its accounting information, thus offering further evidence for this article's main assumption.

For examining the correlation between accounting information quality and capital investment choices, we classify the full sample into two groups based on two different methods. The first is to sort all sample firms by decile rank from smallest to largest into 10 groups, with the top and bottom 10% of firms constituting the high- and low-quality information groups, respectively. The second is to divide the sample into two groups by the median of accounting information quality, with the top 50% of the sample defined as the high-quality group, and the bottom 50% defined as the low-quality group. Table 4 reports the difference of investment choice between high and low quality of accounting information.

Table 4 shows that there are significant differences in the mean of *growth_corr* between the higher and lower quality groups based on two different classification methods, except for *persistence*. For example, the mean of *growth_corr* in the higher quality group is 0.1902, significantly higher (at the 1% significance level) than 0.0707 in the lower quality group for *smoothness*. These univariate results support our prediction, that is, accounting information quality has a significant influence on the choice of capital investment.

5.3. Multivariate analysis

Based on the regression model (1), Table 5 reports the multivariate results.

Table 5 shows all the results based on different measurements of accounting information quality. Except for persistence in model (2), all other measurements have a significant effect on capital investment choice, which support H_1. The results imply that higher quality accounting information makes a firm more inclined to invest its capital in its core business.

For testing H_2, Table 6 reports the results of the joint influence of corporate governance and accounting information quality on capital investment choice. Taking the comprehensive measure of accounting information quality (*Rank of AQ*) as main variable, columns (1)–(3) of Table 6 show different cross-sectional results based on the different measures of corporate governance, such as biggest shareholders ownership(*Shrl*), the Herfindahl index of second to fifth largest shareholders' ownership (*Hfd_5*) and market index (*Mktscore*) from Fan and Wang (2009). Column (4) shows the results when the three measures of corporate governance are included in one regression model. Table 6 shows that the coefficients on *Rank of AQ* are all significantly

Table 4
Differences in capital investment choices between the high- and low-quality accounting information groups.

	Bottom 10% versus top 10% groups		Bottom 50% versus top 50% groups	
	Mean difference of *growth_corr*	*t-value*	Mean difference of *growth_corr*	*t-value*
Independent accounting information quality				
Accrual quality	0.1118	1.91[*]	0.0963	3.66[***]
Persistence	−0.0058	−0.24	0.0088	0.85
Predictability	0.018	4.73[***]	0.0743	7.16[***]
Smoothness	0.1902	5.72[***]	0.0707	5.01[***]
Comprehensive accounting information quality				
TAQ	0.2005	3.62[***]	0.0987	3.75[***]

The results are reported for the two sample-division methods (i.e., bottom 10% *versus* top 10% and bottom 50% *versus* top 50%), and the variables are defined as follows. *Accrual quality*, *persistence*, *predictability* and *smoothness* are calculated on the basis of the relevant model and a 10-year cycle, and analyzed by decile rank value, *TAQ* is calculated by summing the four independent accounting information variables and *growth_corr* is the correlation of operating profit growth between the company and industry calculated based on the 10-year cycle. The mean difference in *growth_corr* is the difference in means between the two subsamples, and the *t*-value column reports the *t*-values of the tests for the equality of means.
[**] Significance at the 5% levels (two-tailed *t*-tests).
[***] Significance at the 1% levels (two-tailed *t*-tests).
[*] Significance at the 10% levels (two-tailed *t*-tests).

Table 5
Effect of accounting information quality on the choice of capital investment.

Variables	Column (1) Accruals quality	Column (2) Persistence	Column (3) Predictability	Column (4) Smoothness	Column (5) TAQ
Intercept	−0.8461**	−0.7955***	−0.6763***	−0.6615***	−0.7455*
	(−2.24)	(−5.24)	(−4.44)	(−3.26)	(−1.93)
Rank of AQ	−0.0113**	0.0019	−0.0059***	−0.0084***	−0.0035**
	(−2.27)	(0.96)	(−2.92)	(−3.26)	(−2.08)
Shr1	−0.0286**	−0.0213**	−0.0242**	−0.0279**	−0.0236**
	(−2.30)	(−2.02)	(−2.21)	(−2.26)	(−2.19)
Hfd_5	0.2767**	0.2575**	0.2114**	0.2073**	0.2174**
	(2.15)	(2.12)	(2.09)	(2.04)	(2.11)
Mktscore	0.0037**	0.0093***	0.0094***	0.0071***	0.0069***
	(2.19)	(3.21)	(3.26)	(2.89)	(2.66)
Size	0.0531***	0.0465***	0.0421***	0.0430***	0.0495***
	(3.08)	(6.56)	(5.91)	(4.60)	(2.83)
MTB	−0.0035	−0.0054***	−0.0044**	−0.0024	−0.0034
	(−0.86)	(−2.69)	(−2.16)	(−0.93)	(−0.83)
ROA	0.3464	0.7589***	0.6924***	0.4749	0.2569
	(0.62)	(3.44)	(3.16)	(1.60)	(0.46)
σ(Sales)	0.0032	−0.0002	−0.0002	0.0003	0.0021
	(0.16)	(−0.37)	(−0.24)	(0.39)	(0.11)
Leverage	0.0185	−0.0326	−0.0248	−0.0316	0.0171
	(0.21)	(−0.88)	(−0.67)	(−0.65)	(0.19)
OperatingCycle	−0.0080	−0.0110*	−0.0088	−0.0042	−0.0105
	(−0.53)	(−1.85)	(−1.47)	(−0.53)	(−0.70)
Industry/year	Control	Control	Control	Control	Control
Obs.	678	4195	4195	2416	678
Adj. R^2	8.89%	8.44%	8.85%	8.34%	8.87%

This table presents the regression results on the effect of each accounting information quality characteristic and TAQ on the choice of capital investment. The variables are defined as follows: *Rank of AQ is* calculated by the decile rank value based on the raw values of *accrual quality*, *persistence*, *predictability* and *smoothness*; *TAQ* is calculated by summing the four independent accounting information variables; *Shr1* is measured by the mean of the largest shareholder's stake in the focal listed company in the 10-year period under study; *Hfd_5* is measured by the mean of the company's second to fifth largest shareholders' Herfindahl index during the 10-year period; *Mktscore* is measured by the China marketization index compiled by Fan and Wang (2009); *Size* is measured by the logarithmic average assets of the listed company during the 10-year period; *MTB* is measured by the *MTB* mean of all listed companies during the 10-year period; ROA is measured by the company's average *ROA* during the 10-years period; *σ(sales)* is measured by a company's standard deviation of revenues (standardized by assets at the previous year end) during the 10-year period; *Leverage* is measured by the mean of the asset-liability ratio of all listed companies during the 10-year period; *OperatingCycle* is measured by the company's logarithmic average operating cycle during the 10-year period; and *Industry* is a dummy variable that equals 1 if the firm is in an industry conforming to the CSRC industry classification standard, and 0 otherwise.

*** Significance at the 1% levels (two-tailed *t*-tests).
** Significance at the 5% levels (two-tailed *t*-tests).
* Significance at the 10% levels (two-tailed *t*-tests).

negative, inconsistent with Table 5. The interactive coefficients of corporate governance and accounting information quality in column (1)–(3) are positive for ***Rank of AQ × Shr1***, negative for ***Rank of AQ × Hfd_5*** and negative for ***Rank of AQ × Mktscore***, all significant at the 5% level, suggesting that accounting information quality plays a more important role in guiding a company to choose the right investment when the corporate governance environment is inefficient. In other words, the results imply that there is a complementary relationship between such quality and the corporate governance mechanisms.

6. Robustness tests

For robustness, we also perform the following tests.

Table 6
Cross-sectional analysis of the effect of accounting information quality on the choice of capital investment.

The model with different governance mechanism variables	Column (1)	Column (2)	Column (3)	Column (4)
Intercept	−.5964	−0.07082[*]	−0.9122[**]	−0.6631
	(−1.53)	(−1.83)	(−2.27)	(−1.62)
Rank of AQ	−0.0119[***]	−0.0047[**]	−0.0048[***]	−0.0079[**]
	(−2.83)	(−2.40)	(−2.79)	(−2.19)
Shr1	−0.4016[*]			−0.5293[**]
	(−1.82)			(−2.28)
Hfd_5		0.0745[***]		0.0715[***]
		(2.16)		(2.15)
Mktscore			0.0260[***]	0.0259[**]
			(2.58)	(2.50)
Rank of AQ × Shr1	0.0230[**]			0.0288[**]
	(2.16)			(2.60)
Rank of AQ × Hfd_5		−0.0058[**]		−0.0040[**]
		(−2.12)		(−2.11)
Rank of AQ × Mktscore			−0.0012[**]	−0.0011[**]
			(−2.43)	(−2.37)
Size	0.0520[***]	0.0512[***]	0.0510[***]	0.0509[***]
	(3.01)	(2.98)	(2.94)	(2.92)
MTB	−0.0025	−0.0035	−0.0035	−0.0029
	(−0.62)	(−0.84)	(−0.86)	(−0.70)
ROA	0.2019	0.2713	0.2047	0.1481
	(0.36)	(0.49)	(0.37)	(0.26)
σ(Sales)	0.0025	0.0022	0.0012	0.0015
	(0.13)	(0.11)	(0.06)	(0.08)
Leverage	0.0057	0.0159	0.0109	−0.0017
	(0.06)	(0.18)	(0.12)	(−0.02)
Operating Cycle	−0.0110	−0.00112	−0.0128	−0.0127
	(−0.75)	(−0.75)	(−0.86)	(−0.85)
Industry/year	Control	Control	Control	Control
Obs.	675	675	675	675
Adj. R^2	5.46%	4.98%	5.14%	6.26%

This table presents the regression results of the interactive effect of corporate governance and accounting information quality on the choice of capital investment. The variables are defined as follows: *Rank of AQ is* calculated by the decile rank value based on the raw values of *accrual quality*, *persistence*, *predictability* and *smoothness*; *TAQ* is calculated by summing the four independent accounting information variables; *Shr1* is measured by the mean of the largest shareholder's stake in the focal listed company in the 10-year period under study; *Hfd_5* is measured by the mean of the company's second to fifth largest shareholders' Herfindahl index during the 10-year period; *Mktscore* is measured by the China marketization index compiled by Fan and Wang (2009); *Size* is measured by the logarithmic average assets of the listed company during the 10-year period; *MTB* is measured by the *MTB* mean of all listed companies during the 10-year period; ROA is measured by the company's average *ROA* during the 10-year period; *σ(sales)* is measured by a company's standard deviation of revenues (standardized by assets at the previous year end) during the 10-year period; *Leverage* is measured by the mean of the asset-liability ratio of all listed companies during the 10-year period; *OperatingCycle* is measured by the company's logarithmic average operating cycle during the 10-year period; and *Industry* is a dummy variable that equals 1 if the firm is in an industry conforming to the CSRC industry classification standard, and 0 otherwise.

[***] Significance at the 1% levels (two-tailed *t*-tests).
[**] Significance at the 5% levels (two-tailed *t*-tests).
[*] Significance at the 10% levels (two-tailed *t*-tests).

6.1. The effect of other unobservable information and endogeneity

The main analysis and variables above in this paper are based on a relatively long time period (i.e., 10 years), which unavoidably result in the problem: are the results above driven by other unobservable information? Meanwhile, the endogeneity problem also arises, as a company's choice of capital investment is likely to affect accounting information quality. To address these issues and problems, we control for **growth_corr** in $t − 1$ *period* (**growth_corr$_{t−1}$**) in regression model (1), and the results are presented in Table 7.

Table 7
Endogeneity analysis of the effect of accounting information quality on the choice of capital investment.

Variables	Column (1) Accruals quality	Column (2) Persistence	Column (3) Predictability	Column (4) Smoothness	Column (5) TAQ
Intercept	−0.6249***	−0.3661***	−0.2877***	−0.2519***	−0.6055***
	(−2.83)	(−3.79)	(−2.97)	(−2.09)	(−2.71)
Rank of AQ	−0.0054*	0.0031	−0.0021*	−0.0030**	−0.0018*
	(−1.80)	(1.55)	(−1.66)	(−1.99)	(−1.85)
growth_corr$_{t-1}$	0.8168**	0.7887**	0.7878**	0.7963**	0.8162***
	(38.46)	(81.43)	(81.25)	(68.32)	(36.42)
Shr1	−0.0213**	−0.0168**	−0.0152**	−0.0224**	−0.0204**
	(−2.17)	(−2.11)	(−2.03)	(−2.43)	(−2.02)
Hfd_5	0.2850**	0.2138**	0.2153**	0.2147**	0.2605**
	(2.23)	(2.13)	(2.18)	(2.11)	(2.17)
Mktscore	0.0023**	0.0051***	0.0054***	0.0032**	0.0027**
	(2.56)	(2.81)	(3.03)	(2.54)	(2.26)
Size	0.0315***	0.0163***	0.0236***	0.0150***	0.0310***
	(3.12)	(3.62)	(3.00)	(2.69)	(3.06)
MTB	0.0027	−0.0001	0.0004	0.0017	0.0028
	(1.14)	(−0.04)	(0.33)	(1.14)	(1.18)
ROA	0.5591*	0.3154**	0.2543*	0.2891*	0.5171
	(1.73)	(2.26)	(1.84)	(1.66)	(1.59)
σ(Sales)	0.0143	0.0000	0.0001	0.0003	0.0137
	(1.27)	(0.01)	(0.14)	(0.75)	(1.22)
Leverage	0.0120	−0.0214	−0.0146	−0.0183	0.0112
	(0.23)	(−0.89)	(−0.61)	(−0.64)	(0.22)
OperatingCycle	−0.0004	0.0019	0.0026	0.0001	−0.0015
	(−0.05)	(0.50)	(0.69)	(0.10)	(−0.17)
Industry/year	Control	Control	Control	Control	Control
Obs.	675	3972	3972	2380	675
Adj. R^2	68.28%	64.05%	64.01%	67.60%	68.29%

This table reports regression results on the effect of each accounting information quality characteristic and *TAQ* on the choice of capital investment when the endogeneity problem is considered. The variables are defined as follows: *Rank of AQ is* calculated by the decile rank value based on the raw values of *accrual quality*, *persistence*, *predictability* and *smoothness*; *TAQ* is calculated by summing the four independent accounting information variables; *Shr1* is measured by the mean of the largest shareholder's stake in the focal listed company in the 10-year period under study; *Hfd_5* is measured by the mean of the company's second to fifth largest shareholders' Herfindahl index during the 10-year period; *Mktscore* is measured by the China marketization index compiled by Fan and Wang (2009); *Size* is measured by the logarithmic average assets of the listed company during the 10-year period; *MTB* is measured by the *MTB* mean of all listed companies during the 10-year period; ROA is measured by the company's average *ROA* during the 10-years period; *σ(sales)* is measured by a company's standard deviation of revenues (standardized by assets at the previous year end) during the 10-year period; *Leverage* is measured by the mean of the asset-liability ratio of all listed companies during the 10-year period; *OperatingCycle* is measured by the company's logarithmic average operating cycle during the 10-year period; and *Industry* is a dummy variable that equals 1 if the firm is in an industry conforming to the CSRC industry classification standard, and 0 otherwise.

*** Significance at the 1% levels (two-tailed *t*-tests).
** Significance at the 5% levels (two-tailed *t*-tests).
* Significance at the 10% levels (two-tailed *t*-tests).

Table 7 shows that after controlling for **growth_corr$_{t-1}$**, the coefficients of accounting information quality are still significantly negative at least the 10% level (except for *persistence*). Thus, the results are consistent with Table 5.

6.2. Measurement of the capital investment choice

For robustness, this paper finally refers to the ideas of Morck et al. (2000) about stock price synchronicity, and uses the synchronicity of operating income growth between industry and firm level as an alternative measurement of capital investment choice. This new measurement is based on the following model.

$$\text{Growth\_Firm}_t = \alpha_0 + \alpha_1 \text{Growth\_Indus}_t + \varepsilon,$$

where Growth_Firm$_t$ is the operating income growth of a given company in year t, and Growth_Indus$_t$ is that of the industry to which the company belongs (using the median of other companies' operating income growth in the same industry). We obtain the **R-square** (R^2) from the regression model above, which reflects the degree to which the industry's growth rate explains that of the company. A higher R^2 indicates greater synchronicity between the operating income growth rates of the company and industry. Based on this new measurement, the new results are consistent with those reported (untabulated due to space limitations).

7. Conclusion

This paper examines whether and how high-quality accounting information can push management to optimize the capital investment choice of listed firms. This is a very important issue. Addressing this issue can help researchers to realize the governance functions of accounting information. The empirical results show that the higher the accounting information quality is, the higher the correlation and synchronicity of operating income growth between the listed firm and its industry. Moreover, the relationship between accounting information quality and capital investment choice is more pronounced when the corporate governance environment is poor. These results imply that high-quality accounting information serves an important governance role, which can supervise and push management to optimize capital investment choices, and finally maximize stockholders' interests.

This paper has several important contributions. First, this paper provides new empirical evidence in a developing capital market. Second, this conclusion implies that regulators need to build a transparent and reliable information environment to allow accounting information to play an effective role to push listed firms to focus on their core business, optimize firms' capital investment choices, and finally increase resource allocation efficiency. Finally, this paper can also help researchers to better understand and realize the governance role of accounting information, and push them to investigate the other role of accounting information deeply and broadly.

One limitation of this paper is that we assume that a company's investment choice is effective only when it invests capital in its core business. It is of course possible that a better choice for some companies would be to change their current business (rather than increasing the level of investment in their core business), particularly in the case of an industry recession or excess capacity. Therefore, the relationship between accounting information quality and capital investment choice may differ with the different development stage of the industry. Maybe this issue is an important topic for future research.

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Does top executives' US experience matter? Evidence from US-listed Chinese firms

CrossMark

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A B S T R A C T

Foreign firms face enormous obstacles in attracting investors and analysts when issuing securities in the United States. We use US-listed Chinese firms as our research sample and find that firms that hire top executives (i.e., Chief Executive Officer [CEO] or Chief Financial Officer [CFO]) with work experience in the US or educational qualifications from the US attract more US institutional investors and analysts. Further, we find that CFOs' US experience dominates the results. Corroborating our results, we further find that firms with US-experienced CFOs are more likely to hold conference calls and voluntarily issue management forecasts, which suggests that CFOs with a US background are better at communicating with US investors and analysts and acting in alignment with US norms compared with Chinese CFOs. Collectively, our results suggest that hiring a CFO with a US background could facilitate cross-listed foreign firms to lower US investors' and analysts' information disadvantage.

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1. Introduction

Foreign firms that trade their equity on US stock exchanges face serious obstacles in attracting US investors and analysts due to the linguistic, procedural, and institutional differences between their home country and the United States (Lundholm et al., 2014). This paper examines the favorable effects of top executives' US background in attracting US institutional investors and analysts using data from US-listed Chinese firms. We predict that US-listed Chinese firms whose top executives have experience in working in the US attract more US institutional investors and analysts. First, we conjecture that executives with a US background perform better in communicating with US institutional investors and analysts. Due to their US experience,

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they generally have an advantage in understanding US business culture and interacting with US business people. More importantly, they may have a better understanding of what US investors and analysts expect, and tend to act in alignment with US norms. Second, Beatty et al. (2013) find that the likelihood of financial fraud in US-listed Chinese firms is significantly lower if the Chief Executive Officer (CEO) was educated in North America. Based on this evidence, we argue that hiring top executives with a US background can potentially serve as a kind of reputational insurance mechanism. Executives who have worked in the US should better understand the stringent regulations and pay more attention to their reputations in the US market than Chinese executives. Therefore, firms that hire top executives with a US background may build an image of a well-bonded corporation, and thus US institutional investors and analysts prefer to follow them. Third, hiring executives with a US background could reduce the ''psychological distance'' between US investors and foreign firms. Grinblatt and Keloharju (2001) find that investors in Finland prefer to hold and trade with firms with CEOs of a similar cultural origin. We argue that top executives with a US background can reduce US investors' psychological distance, and thus are expected to attract more US institutional investors. Based on at least these three factors, we predict that US institutional investors and analysts exhibit a preference for US-listed Chinese firms with top executives with US work experience.

Using US-listed Chinese firms as our research sample, we find that firms with top executives (i.e., CEO or Chief Financial Officer [CFO]) who have work experience in the US attract more US institutional investors and analysts than firms with Chinese top executives. Further, we find that CFOs with US experience dominate the results. To eliminate the endogenous innate ability argument, we control for CFO innate ability following Giannetti et al. (2014) and the results remain consistent. We also use the two-stage Heckman method to eliminate selection bias and the results remain consistent. We acknowledge, nevertheless, that we cannot totally resolve the endogenous firm-executive matching problem. As supporting evidence, we find that the disclosure practices of CFOs with US experience differ from those of Chinese CFOs, with the former more likely to hold conference calls and voluntarily issue management forecasts. The findings suggest that CFOs with a US background are better at communicating with US investors and analysts, and act in ways that are more consistent with US norms.

Our study contributes to the literature in several ways. To the best of our knowledge, this is the first study to examine the effect of executives' US experience on disclosure practices, and consequently analyst following and institutional holdings, using the setting of US-listed Chinese firms. Our results suggest that hiring top executives with a US background can facilitate US-listed Chinese firms to mitigate home bias and obtain US investment. The results lead to a deeper understanding of the mechanisms that can help Chinese firms to obtain international resources and may well be generalizable to all cross-listed foreign firms on US exchanges.

This paper also extends the literature that examines managerial characteristics or traits (Bertrand and Schoar, 2003; Bamber et al., 2010; Dyreng et al., 2010; Malmendier et al., 2011; Cronqvist et al., 2012, among others). The upper echelons theory from the management literature argues that top managers often face complex situations that do not have calculable solutions. As such, managers are more likely to make strategic choices based on their personal experiences and backgrounds (Hambrick and Finkelstein, 1987; Hambrick, 2007). We observe a meaningful managerial characteristic in the context of US-listed Chinese firms, namely CFOs with a US background, and find that it has a favorable influence in attracting US institutional investors and analysts beyond the previously documented firm-level determinants.

The remainder of the paper proceeds as follows. Section 2 provides the literature review and hypothesis development. Section 3 explains our sample selection and descriptive statistics. Section 4 contains our research design and main results, while Section 5 shows robustness and additional tests. Section 6 concludes the paper.

2. Literature review and hypothesis development

Foreign firms that trade their equity on US stock exchanges face serious obstacles in attracting US investors and analysts. Lundholm et al. (2014) find that foreign firms that provide clearer disclosure have more US institutional ownership, whereas Lundholm et al. (2014) consider reporting quality, we document that foreign

firms can attract more US institutional investors by hiring top executives with a US background. There are three potential reasons, as follows.

First, top executives of foreign firms, especially CFOs, who have work experience in the US may perform better in communicating with US investors and analysts. Due to their US experience, they generally have an advantage in understanding US business culture and how to interact with US business people. More importantly, they are more familiar with what US investors expect and more likely to act in alignment with US norms. Therefore, we argue that CFOs with US experience are better at communicating with US investors and analysts.

Second, we argue that hiring top executives with a US background can potentially serve as a kind of reputational insurance mechanism. Top executives who have worked or are currently working in the US should better understand the stringent regulations and pay more attention to their reputations in the US market than those who work in the Chinese market. Therefore, firms that hire top executives with a US background may build an image of well-bonded corporations, and thus US institutional investors will prefer to invest in those firms. Consistent with our reputational bonding argument, Beatty et al. (2013) find that the likelihood of financial fraud in US-listed Chinese firms is significantly lower if the CEO was educated in North America.

Third, top executives' US background may reduce the "psychological distance" between Americans and foreign firms. Grinblatt and Keloharju (2001) use the unique setting of Finland where there are two cultural origins and find that investors prefer to hold and trade with firms whose CEO is of a similar cultural origin. Consequently, top executives with a US background may increase US investors' familiarity with foreign firms and reduce their psychological distance, and hence these firms are expected to attract more institutional investors. Based on the above analyses, we predict that US institutional investors and analysts exhibit a preference for US-listed Chinese firms with top executives with US work experience.

We use US-listed Chinese firms[1] as our research sample. China is geographically and culturally distant from the US. China's legal system originated from Roman Civil Law and differs from US Common Law. Allen et al. (2005) compare overall investor protection in mainland China with the countries included in La Porta et al. (1998). They find that mainland China is rated one of the worst and the US one of the best financial markets in terms of investor protection. Therefore, there is a significant gap between China and the US, and Chinese firms may face considerable difficulty in attracting US investors and analysts. We use US-listed Chinese firms as our research sample to examine whether hiring executives with US experience could help firms to attract US investors and analysts.

Based on the above analysis, we state our hypotheses as follows:

H1: US-listed Chinese firms with top executives who have worked in the US attract more institutional ownership.
H2: US-listed Chinese firms with top executives who have worked in the US attract higher analyst following.

3. Sample selection and descriptive statistics

Our sample period is 2006-2012. We compile a sample of US-listed Chinese firms from various sources: (1) Wind database, (2) Bank of New York, which provides a list of ADRs on its website, (3) Sina Finance website, and (4) Compustat. We exclude firms that are headquartered outside mainland China by reviewing the corporate profiles. We also exclude financial firms. As a result, our final sample comprises 213 US-listed Chinese firms.

Generally, the CFO, Investor Relations Officer or Vice President of Investor Relations takes charge of investor relations development and mostly communicates with analysts and institutional investors. We hand collect the profiles of all of the top executives from firms' annual reports and proxy statements and find that

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[1] Based on the closing price on 19 Sep 2014, the overall market value of Chinese firms' trading equities in the US is more than 1.4 trillion dollars, which is higher than Spain's total GDP for the whole of 2013 (i.e., 1.36 trillion dollars).

few of the firms in our sample specifically disclose information on the Investor Relations Officer or Vice President of Investor Relations. Therefore, we mainly focus on two top executives: (1) the CFO, who is in charge of information disclosure and communicating with analysts and institutional investors; and (2) the CEO, who takes overall charge of corporate management. We manually extract information on the CEOs' and CFOs' work experience and educational background from SEC filings, such as annual reports and proxy statements.

Financial data are extracted from Compustat. Analyst data are obtained from Institutional Broker's Estimate System (IBES). Institutional investor data are taken from TR 13f. We hand collect all of the required information from 10-Ks, 20-Fs, and proxy statements filed by Chinese firms during the sample period, including insider ownership (holdings by the firms' officers and directors), foreigner blockholders (non-Chinese owners with 5% ownership or higher), board characteristics (board size, board independence), and whether the CEO is the founder of the firm. We also hand collect the conference call and management forecast data from current reports (i.e., 8 k, 6 k). The variable definitions are summarized in Appendix A.

Table 1 Panel A describes the distribution of firm-year observations by year. It shows that approximately 40% of CEOs or CFOs have worked in the US. Panel B shows the distribution of firm-year observations by Fama-French industry categories. It shows that US-listed Chinese firms are concentrated in the manufacturing and business equipment industries, with 28 (13%) and 77 (36%) of firms, respectively. Panel C describes the distribution of sample firms by listing method. In our sample, 88 firms are listed on exchanges via reverse mergers and 125 through the IPO process, and among the latter, 101 firms are listed by issuing American Depositary Receipts (ADRs).

Table 1
Distribution of observations.

Year	#Obs	#WorkUS	Percent (%)
Panel A: Distribution of firm-year observations during the sample period			
2006	50	18	36.00
2007	89	33	37.08
2008	129	45	34.88
2009	146	65	44.52
2010	180	84	46.67
2011	165	78	47.27
2012	136	58	42.65
Total	895	381	42.57

Fama-French industry classification	#Firms	#Firm-year obs
Panel B: Distribution of firms by Fama-French industry classification		
Consumer non-durables	16	72
Consumer durables	7	28
Manufacturing	28	120
Oil, gas, and coal extraction and products	7	31
Chemicals and allied products	9	33
Business equipment	77	336
Wholesale, retail, and some services	15	50
Healthcare, medical equipment, and drugs	22	94
Other	32	131
Total	213	895

Listing method	Freq.	Percent
Panel C: Distribution of firms by listing method		
Reverse merger	88	41.31
ADRs	101	47.42
Direct listing	24	11.27
Total	213	100

Table 2 Panel A provides the descriptive statistics of the continuous variables. The means for analyst coverage (#Analysts) and number of institutional investors (#InstOwners) are 5.55 and 40.82, respectively, and the maximum values for Analysts and #InstOwners are 54 and 415, respectively. The mean of institutional ownership (%InstHolding) is 15.46% and the maximum value is 99.43%. We also provide the statistics for firm size (Size), board size (BoardSize), insider ownership (InsiderOwn), the proportion of independent directors on the board (Independence), and financial indicators such as return on assets (ROA), leverage (Lev) and the book-to-market ratio (BMR).

Table 2 Panel B provides the descriptive statistics for the discrete variables. We construct a dummy variable, WorkUS, to capture top executives' work experience in the US, which equals 1 if the CEO or CFO has worked in the US, and otherwise 0. We construct another dummy variable, WorkOverseas, to capture executives' work experience outside mainland China, excluding the US. WorkOverseas equals 1 if the CEO or CFO has worked overseas excluding the US, and otherwise 0.

Panel B shows that 43% of observations have CEOs or CFOs who have worked in the US, and 38% of observations have CEOs or CFOs who have worked in other countries or regions outside mainland China, excluding the US. Overall, this means that 80% of firm-year observations have top executives who have worked overseas, and 20% of firm-year observations have top executives who have worked only in China mainland.

We construct two variables, CEOworkUS and CFOworkUS, to explicitly capture CEOs' and CFOs' work experience in the US, respectively. Correspondingly, we construct another two variables, CEOWorkOverseas

Table 2
Descriptive statistics.

	Obs.	Mean	S.D.	Min.	Max.
Panel A: Descriptive statistics for continuous variables					
#Analysts(unlogged)	895	5.55	8.20	0	54
#Analysts(logged)	895	1.25	1.11	0	4.01
InsiderOwn	895	36.95	22.80	0	95.10
Size	895	5.60	1.48	2.23	12.76
BMR	895	3.16	14.06	0.10	25.36
BoardSize	895	6.41	1.91	1	14
Independence	895	0.56	0.15	0	1
ROA	895	0.05	0.18	(1.73)	0.66
Lev	895	0.34	0.22	0.02	1.27
#InstOwners(unlogged)	716	40.82	47.92	1	415
#InstOwners(logged)	716	3.18	1.10	0.69	6.03
%InstHolding	716	15.46	18.17	0.00028	99.43
Call	895	2.54	1.68	0	6
MF	895	2.14	2.37	0	17
Panel B: Descriptive statistics for dummy variables					
WorkUS	895	0.43	0.49	0	1
WorkOverseas	895	0.38	0.49	0	1
CEOworkUS	895	0.16	0.37	0	1
CFOworkUS	895	0.36	0.48	0	1
CEOWorkOverseas	895	0.10	0.30	0	1
CFOWorkOverseas	895	0.35	0.48	0	1
CEOeduUS	895	0.18	0.38	0	1
CFOeduUS	895	0.47	0.50	0	1
CEOeduOverseas	895	0.09	0.29	0	1
CFOeduOverseas	895	0.24	0.43	0	1
CEOpreIPO	895	0.82	0.39	0	1
CFOpreIPO	895	0.54	0.50	0	1
Founder	895	0.69	0.46	0	1
Blockholder	895	0.57	0.50	0	1
Independence	895	0.56	0.15	0	1
RM	895	0.40	0.49	0	1

and CFOWorkOverseas, to explicitly capture CEOs' and CFOs' work experience overseas excluding the US, respectively. Panel B shows that 16% of the CEOs and 36% of the CFOs in our sample have worked in the US, and 10% of CEOs and 35% of CFOs have worked overseas but not in the US. This means that the percentages of CEOs and CFOs in our sample who have worked only in mainland China are 73% and 29%, respectively. We also extract the investment banking experience of CEOs and CFOs in their early careers and find that 12.96% of CFOs have worked in an investment bank, while the percentage for CEOs is only 1.45%.

We use the abovementioned variables as primary indicators in our main tests. As a robustness check, we construct another series of variables to capture CEOs' and CFOs' US or overseas experience based on their educational background rather than their career path. First, we construct the variables CEOeduUS and CFOeduUS to capture whether the CEO and the CFO were educated in the US. Then, we construct another two variables, CEOeduOverseas and CFOeduOverseas, to capture whether the CEOs and CFOs were educated abroad but excluding the US. The percentages of CEOs who were educated in the US and other foreign countries or regions are 18% and 9%, respectively. Correspondingly, the percentages for CFOs are 47% and 24%, respectively. This means that 73% of CEOs and less than one-third of CFOs had their education in mainland China. The CFOs are clearly more internationalized than the CEOs in our sample.

We also manually collect data on CFOs' undergraduate universities or institutions. In summary, 15.53% of CFOs graduated from universities or colleges that are not included in the "211 program" in China; 30.28% of CFOs graduated from universities that are members of the "211 program" but not the "985 program"; 18.66% of CFOs graduated from the top tier universities that are members of the "985 program"; and 35.53% of CFOs graduated from universities or institutions overseas.

We also summarize the highest educational qualifications of CEOs and CFOs. A significantly higher percentage of CFOs (40%) than CEOs (15.76%) received an MBA degree, whereas 13% of CEOs received a Ph.D. compared with 2.09% of CFOs.

We also construct two variables to measure whether the CEO or CFO joined the firm before the IPO, CEOpreIPO and CFOpreIPO, respectively. We find that 82% of the CEOs in our sample joined their firms before the IPO; 69% of CEOs were the founder or co-founder of their firms; and 54% of CFOs joined before the IPO.

In Table 3, we describe the main dependent variables in our research. We collect institutional ownership positions from Thomson Financial's 13-F filings database. We measure institutional holdings using the most recent data prior to the end month of fiscal year.[2]

The mean of #InstOwners is 40.82. Approximately 26% of observations have less than 10 institutional investors, including 78 firms listed through reverse mergers; 48.5% of observations have between 11 and 50 institutional investors; 15% of observations have between 50 and 100 institutional investors; 9.4% of observations have between 100 and 200 institutional investors; and 1.2% of observations have more than 200 institutional investors.

The mean institutional ownership is 15.46%; approximately 36% of observations have less than 5% institutional ownership, of which 15% of observations were listed through reverse mergers; approximately half of the observations have between 5% and 30% institutional ownership; and the remaining 15% of observations have more than 30% institutional ownership.

We also provide a detailed distribution of the analyst coverage variable. We collect analysts' data from the IBES database. We measure analyst following using the most recent data prior to the last month of the fiscal year and set missing analyst data to zero. The data for analyst coverage are left-censored at 0. Approximately 18% of observations have up to two analysts following the firm; 32% of observations have between 3 and 10 analysts; and approximately 17% of observations have more than 10 analysts. The maximum number of analysts following a firm in our sample is 54. This is generally consistent with our previous argument that it is difficult to attract analysts for foreign firms issuing securities on US exchanges.

Table 4 summarizes the results of the univariate analysis. The mean analyst coverage is 7.83 for the group in which WorkUS equals 1 and 3.85 for the group in which WorkUS equals 0. The *t*-test results show that the

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[2] If we set the missing institutional holdings data to zero, the results for institutional ownership remain consistent but the result for the number of institutional investors disappears.

Table 3
Detailed summary of dependent variables.

	Freq.	Percent
(a) Detailed summary of the number of institutional investors		
#InstOwners(unlogged)		
1–10	186	25.98
11–20	129	18.02
21–30	93	12.99
31–40	74	10.34
41–50	51	7.12
51–100	107	14.94
101–200	67	9.36
201–max	9	1.25
Total	716	100
(b) Detailed summary of the percentage of institutional holdings		
%InstHolding (unlogged)		
Min–5%	259	36.17
5–10%	123	17.18
10–20%	140	19.55
20–30%	81	11.31
30–40%	36	5.03
40–60%	45	6.28
60–80%	26	3.63
80–100%	6	0.84
Total	716	100
(c) Detailed summary of the number of analysts		
#Analysts(unlogged)		
0	294	32.85
1–2	160	17.88
3–5	168	18.77
6–10	120	13.41
11–20	90	10.06
21–max	63	7.04
Total	895	100

Table 4
Univariate analysis.

	(1) WorkUS=1		(2) WorkUS=0		(3)=(2)−(1)
	Obs.	Mean	Obs.	Mean	*t*-Statistics
#Analysts(unlogged)	381	7.83	514	3.85	−7.3943***
#InstOwners(unlogged)	311	48.93	405	34.59	−4.0107***
%InstHolding (unlogged)	311	21.75	405	10.62	−8.5165***
	(1) CEOworkUS=1		(2) CEOworkUS=0		(3)=(2)−(1)
	Obs.	Mean	Obs.	Mean	*t*-Statistics
#Analysts(unlogged)	146	9.72	749	4.73	−6.8950***
#InstOwners(unlogged)	118	63.24	598	36.40	−5.6805****
%InstHolding (unlogged)	118	29.27	598	12.73	−9.5909***
	(1) CFOworkUS=1		(2) CFOworkUS=0		(3)=(2)−(1)
	Obs.	Mean	Obs.	Mean	*t*-Statistics
#Analysts(unlogged)	326	7.53	569	4.41	−5.5823***
#InstOwners(unlogged)	263	48.19	453	36.54	−3.1548***
%InstHolding (unlogged)	263	20.37	453	12.61	−5.6245***

differences between the means of the two groups are significant for analyst coverage and institutional owner-ship. The results are similar if we replace WorkUS with CEOworkUS or CFOworkUS.

4. Research design and main results

We examine the effect of top executives' US experience on analyst following and institutional investors using the following models:

$$\#Analysts = \beta_0 + \beta_1 \, WorkUS + \beta_2 \, WorkOverseas + \beta \, Controls + Year + Industry + Exchange + \varepsilon.$$

$$\#InstOwners = \beta_0 + \beta_1 \, WorkUS + \beta_2 \, WorkOverseas + \beta \, Controls + Year + Industry + Exchange + \varepsilon.$$

$$\%InstHolding = \beta_0 + \beta_1 \, WorkUS + \beta_2 \, WorkOverseas + \beta \, Controls + Year + Industry + Exchange + \varepsilon.$$

We control for top executives' other overseas experience to ensure the results are cleanly measuring the effect of US experience. As the literature documents that corporate governance can affect analyst coverage and institutional investor following, we use three proxies for corporate governance and control for them in the regressions. We first control for listing method (RM) to capture the quality of corporate governance. Chen et al. (2013) suggest that for Chinese firms that have low bonding incentives and poor governance, the reverse merger process provides an opportunity to access the US capital markets. We also control for common corporate governance features: board characteristics and ownership structure. Our second proxy for corporate governance is board independence. Corporate boards of directors mon-itor top executives and make decisions about top managers' compensation and retention. Board indepen-dence has been widely used as a proxy of the board's aggressive ability to curb opportunistic managerial behavior in the presence of agency problems (e.g., Klein, 2002; Ahmed and Duellman, 2007). Our third proxy for corporate governance is the existence of foreign institutional blockholders. We use an indicator of whether the firm has one or more foreign block institutional investors (non-Chinese institutional own-ers with 5% ownership or higher) to capture the quality of corporate governance, following previous studies that suggest that institutional investors play an important monitoring role in reducing agency costs.

We also include the following control variables: (1) InsiderOwn, which captures the holdings by the officers and directors; (2) BoardSize, which measures the size of the board; (3) Founder, which captures whether the CEO is the founder of the firm; (4) and Size, which equals the log of total assets, and several financial indi-cators including the book-to-market ratio, return on assets, and leverage.

The main results are shown in Table 5. We report robust *t*-statistics based on standard errors adjusted for clustering at the firm level. Column 1 shows that the coefficient of WorkUS is positive and significant at the 0.05 significance level, which means that top executives' work experience in the US has a significant positive effect on analyst following. The coefficient of WorkOverseas is insignificant, which suggests that executives' work experience in other countries or regions does not benefit the firms by attracting analysts in the US market. Consistent with our expectation, the coefficients of Blockholder, Independence, Foun-der, Size, and ROA are positive and significant. Columns 2 and 3 show that the coefficients of WorkUS are positive and significant at the 0.01 significance level, which means that top executives' work experi-ence in the US has a positive effect on both the number of institutional investors and their level of ownership.

Next, to examine whether executives' US work experience dominates the results, we construct two new vari-ables to separately capture CEOs' and CFOs' work experience in the US. Correspondingly, we construct two variables to explicitly capture CEOs' and CFOs' work experience in other countries or regions outside the Chi-nese mainland, but excluding the US. We predict that CFOs' US experience is relatively influential in our research, because CFOs normally take charge of information disclosure and communication with analysts and institutional owners. Table 6 shows that, consistent with our prediction, CFOs' US experience dominates the results.

Table 5
Effect of executives' US experience on analysts and institutional investors.

	(1) #Analysts	(2) #InstOwners	(3) %InstHolding
WorkUS	0.260**	0.300***	0.670***
	(2.314)	(3.423)	(3.734)
WorkOverseas	0.008	−0.041	−0.049
	(0.064)	(−0.492)	(−0.256)
RM	−0.020	0.123	0.273
	(−0.122)	(1.087)	(0.995)
Blockholder	0.369***	0.207***	1.039***
	(3.289)	(3.124)	(5.867)
InsiderOwn	−0.000	−0.004**	−0.004
	(−0.009)	(−2.361)	(−1.084)
Founder	0.367***	0.216**	0.144
	(2.643)	(2.527)	(0.731)
BoardSize	−0.087**	−0.011	−0.166***
	(−2.256)	(−0.391)	(−2.703)
Independence	1.764***	0.813***	1.358**
	(4.202)	(2.800)	(2.260)
Size	0.603***	0.611***	0.434***
	(8.510)	(14.003)	(4.094)
BMR	−0.058***	−0.038***	−0.033*
	(−3.542)	(−4.489)	(−1.919)
ROA	0.879***	0.767**	1.277*
	(2.646)	(2.432)	(1.916)
Lev	−0.219	−0.222	−0.302
	(−0.684)	(−1.012)	(−0.496)
Constant	−3.571***	−1.840***	−9.671***
	(−7.048)	(−3.263)	(−7.408)
Year	Controlled	Controlled	Controlled
Industry	Controlled	Controlled	Controlled
Exchange	Controlled	Controlled	Controlled
Observations	895	716	716
F	15.742	23.242	10.368
r^2_p	0.236	–	–
r^2_a	–	0.689	0.348

Note: This table reports the OLS regression results for the effect of top executives' US experience on institutional investors (columns 2 and 3) and the Tobit regression results for the effect of top executives' US experience on analyst following (column 1). All of the variables are defined in Appendix A. Coefficient estimates are provided in the top row and p-values in the bottom row. *, ** and *** indicate significance at the 10%, 5% and 1% levels (two-tailed test), respectively.

5. Robustness checks and additional tests

5.1. Controlling for discretionary accruals

We further control for discretionary accruals to capture earnings quality in the robustness analysis and the results remain unchanged.[3] We use the modified Jones model to calculate discretionary accruals. We do not control for discretionary accrual based earnings quality in the main test to avoid further sample reduction.

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[3] The result is untabulated. Please request it from the authors if needed.

Table 6
Effect of CFOs' US experience on analysts and institutional investors.

	(1) #Analysts	(2) #InstOwners	(3) %InstHolding
CFOworkUS	0.199*	0.268***	0.589***
	(1.867)	(3.521)	(3.902)
CFOWorkOverseas	0.026	−0.093	−0.214
	(0.213)	(−1.135)	(−1.146)
CEOworkUS	0.144	0.143	0.240
	(0.915)	(1.104)	(1.025)
CEOWorkOverseas	0.053	0.126	0.390
	(0.271)	(0.883)	(1.134)
RM	−0.005	0.136	0.300
	(−0.028)	(1.160)	(1.065)
Blockholder	0.360***	0.202***	1.032***
	(3.176)	(2.948)	(5.801)
InsiderOwn	0.000	−0.004**	−0.004
	(0.098)	(−2.231)	(−0.922)
Founder	0.369***	0.218**	0.146
	(2.646)	(2.569)	(0.757)
BoardSize	−0.084**	−0.010	−0.164***
	(−2.153)	(−0.359)	(−2.725)
Independence	1.743***	0.839***	1.462**
	(4.167)	(2.920)	(2.535)
Size	0.601***	0.610***	0.433***
	(8.519)	(14.541)	(4.214)
BMR	−0.058***	−0.038***	−0.034*
	(−3.538)	(−4.473)	(−1.928)
ROA	0.911***	0.791**	1.325**
	(2.750)	(2.444)	(1.977)
Lev	−0.226	−0.279	−0.479
	(−0.713)	(−1.289)	(−0.794)
Constant	−3.571***	−1.858***	−9.737***
	(−7.077)	(−3.396)	(−7.685)
Year	Controlled	Controlled	Controlled
Industry	Controlled	Controlled	Controlled
Exchange	Controlled	Controlled	Controlled
Observations	895	716	716
F	14.985	25.449	10.513
r^2_p	0.236	–	–
r^2_a	–	0.690	0.350

Note: This table reports the OLS regression results for the effect of CFOs' US experience on institutional investors (columns 2 and 3) and the Tobit regression results for the effect of CFOs' US experience on analyst following (column 1). All of the variables are defined in Appendix A. Coefficient estimates are provided in the top row and p-values in the bottom row. *, ** and *** indicate significance at the 10%, 5% and 1% levels (two-tailed test), respectively.

5.2. Innate ability explanation

So far, we have shown that CFOs with US experience have a positive effect on analyst following and institutional holdings. It could be argued that these benefits may be due to CFOs' exceptional ability, rather than their US experience. To rule out this alternative explanation, we provide some evidence suggesting that US experience may matter, beyond the executives' ability. Most of the CFOs in our sample obtained their undergraduate degrees in China. Following Giannetti et al. (2014), we measure CFO ability using the rankings of their Chinese universities. We sort the universities into top tier, second tier, and third tier. As the results in Table 7 show, the coefficient of CFOworkUS is significantly positive after controlling for university ranking, which suggests that CFOs' US experience matters beyond their innate ability.

Table 7
Alternative explanation: CFOs' innate ability.

	(1) #Analysts	(2) #InstOwners	(3) %InstHolding
CFOworkUS	0.215[*]	0.358[***]	0.794[***]
	(1.696)	(3.690)	(3.630)
CFOWorkOverseas	0.103	−0.005	−0.326
	(0.593)	(−0.049)	(−1.350)
CEOworkUS	0.236	0.006	−0.229
	(1.065)	(0.039)	(−0.960)
CEOWorkOverseas	0.278	0.453[***]	1.243[***]
	(0.990)	(3.544)	(4.690)
CFOunivRank	0.201[**]	0.031	−0.097
	(2.118)	(0.628)	(−0.777)
RM	0.297	0.320[**]	0.594[*]
	(1.471)	(2.366)	(1.876)
Blockholder	0.487[***]	0.227[**]	1.231[***]
	(3.264)	(2.609)	(5.237)
InsiderOwn	0.001	−0.004[*]	−0.005
	(0.383)	(−1.680)	(−0.980)
Founder	0.347[**]	0.235[**]	0.130
	(2.098)	(2.069)	(0.518)
BoardSize	−0.090[**]	−0.042	−0.287[***]
	(−2.071)	(−1.365)	(−3.630)
Independence	1.324[***]	0.561	0.409
	(3.200)	(1.465)	(0.520)
Size	0.621[***]	0.630[***]	0.536[***]
	(7.927)	(16.188)	(5.002)
ROA	0.609	0.495	1.336
	(1.471)	(1.438)	(1.479)
Lev	−0.640	−0.698[***]	−1.169
	(−1.635)	(−2.881)	(−1.532)
Constant	−3.975[***]	−1.716[***]	−9.160[***]
	(−6.724)	(−2.939)	(−7.283)
Year	Controlled	Controlled	Controlled
Industry	Controlled	Controlled	Controlled
Exchange	Controlled	Controlled	Controlled
Observations	577	451	451
F	11.887	29.799	12.876
r^2_p	0.226	–	–
r^2_a	–	0.718	0.438

Note: This table reports the results after controlling for CFO's innate ability. All of the variables are defined in Appendix A. Coefficient estimates are provided in the top row and *p*-values in the bottom row. [*], [**] and [***] indicate significance at the 10%, 5% and 1% levels (two-tailed test), respectively.

5.3. Self-selection problem

The choice of hiring a CFO with US experience may be determined by corporate governance, the existence of foreign large blockholders, and the CEO's characteristics. We use the Heckman two-stage method to control for this potential self-selection issue. In the first stage, we design a model to examine the possibility of a firm hiring a CFO with US experience. We use CFOpreIPO as an instrumental variable. Column 4 of Table 8 shows the results of the first stage. The results are consistent with the previous main results after controlling for lambda in the second-stage regressions (Columns 1–3 of Table 8).

Table 8
Results of the Heckman two-stage regression.

	Stage two			Stage one
	#Analysts	#InstOwners	%InstHolding	CFOworkUS
CFOworkUS	1.235**	0.886**	1.216*	
	(2.316)	(2.070)	(1.841)	
CFOWorkOverseas	0.042	−0.084	−0.180	
	(0.349)	(−1.011)	(−0.945)	
Lambda	−0.633*	−0.384	−0.394	
	(−1.960)	(−1.497)	(−0.960)	
RM	−0.150	0.136	0.279	−0.102
	(−0.992)	(1.210)	(1.031)	(−0.414)
Blockholder	0.436***	0.251***	1.119***	−0.147
	(3.784)	(3.836)	(6.191)	(−0.987)
InsiderOwn	0.001	−0.004**	−0.005	0.001
	(0.302)	(−2.305)	(−1.096)	(0.160)
Founder	0.408***	0.222***	0.147	0.010
	(2.923)	(2.622)	(0.753)	(0.057)
BoardSize	−0.070*	−0.011	−0.163***	
	(−1.758)	(−0.407)	(−2.656)	
Independence	1.583***	0.827***	1.485**	−0.158
	(4.011)	(2.746)	(2.450)	(−0.357)
BMR	−0.050***	−0.033***	−0.029	−0.037*
	(−2.844)	(−3.931)	(−1.603)	(−1.931)
Size	0.632***	0.621***	0.454***	−0.041
	(9.261)	(14.421)	(4.330)	(−0.544)
ROA	0.929***	0.775**	1.298*	0.138
	(2.795)	(2.427)	(1.961)	(0.403)
Lev	−0.136	−0.258	−0.450	
	(−0.425)	(−1.178)	(−0.749)	
CEOworkUS				0.549**
				(2.379)
CEOWorkOverseas				−0.199
				(−0.712)
CFOpreIPO				−0.302*
				(−1.889)
Constant	−3.944***	−2.007***	−9.977***	0.091
	(−6.901)	(−3.550)	(−7.592)	(0.145)
Year	Controlled	Controlled	Controlled	Controlled
Industry	Controlled	Controlled	Controlled	Controlled
Exchange	Controlled	Controlled	Controlled	Controlled
Observations	895	716	716	895
F	16.868	25.715	10.478	74.99
r^2_p	0.231	–	–	0.133
r^2_a	–	0.690	0.345	–

Note: This table reports the Heckman two-stage results. All of the variables are defined in Appendix A. Coefficient estimates are provided in the top row and p-values in the bottom row. *, ** and *** indicate significance at the 10%, 5% and 1% levels (two-tailed test), respectively.

5.4. Global investment banking experience

We test whether executives' global investment banking experience has an additional effect on the number of analysts and institutional investors following the firm. We find that CFOs' global investment bank experience has an additional positive effect on analyst coverage.[4]

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[4] The results are untabulated. Please request them from the authors if needed.

Table 9
Effect of CFOs' US experience on conference call and management forecast frequency.

	(1) Prob(Call)	(2) Prob(MF)	(3) Call	(4) MF
CFOworkUS	1.213***	0.814***	0.620***	1.248***
	(3.769)	(3.439)	(3.694)	(3.608)
CFOWorkOverseas	−0.015	−0.287	0.175	−0.321
	(−0.043)	(−1.037)	(0.899)	(−0.859)
CEOworkUS	0.358	−0.509	−0.123	−0.719
	(0.656)	(−1.336)	(−0.668)	(−1.608)
CEOWorkOverseas	0.475	1.090**	0.416*	1.710***
	(0.688)	(2.232)	(1.857)	(3.173)
RM	−0.108	−0.043	−0.345	−0.364
	(−0.245)	(−0.136)	(−1.192)	(−0.828)
Founder	1.303***	0.575**	0.836***	1.225***
	(4.381)	(2.219)	(3.844)	(3.369)
Blockholder	1.130***	0.098	0.411**	0.162
	(3.413)	(0.388)	(2.409)	(0.485)
InsiderOwn	0.003	−0.016***	−0.004	−0.026***
	(0.351)	(−2.938)	(−0.883)	(−3.078)
Independence	1.459	1.161	1.428**	1.543
	(1.610)	(1.563)	(2.290)	(1.440)
Size	0.253	0.104	0.218*	0.279
	(1.627)	(0.845)	(1.819)	(1.460)
ROA	0.340	1.653**	0.659	2.304**
	(0.522)	(2.209)	(1.506)	(2.143)
Lev	−0.477	−0.379	0.013	0.233
	(−0.699)	(−0.637)	(0.027)	(0.249)
BMR	−0.012	−0.067*	−0.026	−0.083*
	(−1.014)	(−1.952)	(−1.583)	(−1.887)
Constant	−1.365	0.656	0.294	0.499
	(−1.118)	(0.681)	(0.369)	(0.343)
Industry	Controlled	Controlled	Controlled	Controlled
Year	Controlled	Controlled	Controlled	Controlled
Observations	895	895	895	895
F			9.798	8.100
chi^2	151.6	124.2		
r^2_p	0.299	0.203	0.115	0.0991

Note: This table reports the logit and OLS regression results for the effect of CFOs' US experience on conference calls (columns 1 and 3) and management earnings forecasts (columns 2 and 4). All of the variables are defined in Appendix A. Coefficient estimates are provided in the top row and p-values in the bottom row. *, ** and *** indicate significance at the 10%, 5% and 1% levels (two-tailed test), respectively.

5.5. Alternative measure of US background

We also use another measure to capture executives' US background. We extract the executives' educational background from their biographies and construct the CEOeduUS and CFOeduUS variables to indicate whether they were educated in the US. The results are similar to the main results.[5]

5.6. Other top executives' US background

Generally, the board secretary is in charge of investor relations in Chinese listed firms. It is possible that US-listed Chinese firms follow this custom and the board secretary functions as an IR specialist to communicate with investors and analysts. Therefore, we also test whether the board secretary's US experience has

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[5] The results are untabulated. Please request them from the authors if needed.

an effect on the number of analysts and institutional investors following the firm. However, the results show no support for this effect, which implies that CFOs play a critical role in communicating with analysts and investors in US-listed Chinese firms.

5.7. Are CFOs with US experience more likely to hold conference calls?

There is evidence to suggest that CFOs have a significant influence on companies' financial reporting (e.g., Geiger and North, 2006; Ge et al., 2010). We argue that CFOs with US experience may act more in alignment with US norms in disclosure practices, such as holding conference calls, and thus may attract more US institutional investors and analysts (e.g., Kimbrough, 2005). Consistent with our expectation, we find that (1) firms with US experienced CFOs are more likely to hold conference calls, and (2) the frequency of conference calls is significantly higher for firms with US-experienced CFOs. Columns 1 and 3 of Table 9 report the results, which provide direct evidence of how CFOs with US experience are able to help US-listed Chinese firms to attract more US investors and analysts.

5.8. Do CFOs with US experience voluntarily disclose more management forecasts?

Given that releasing management earnings forecasts is normal practice in the US, CFOs with US experience may act more similarly to domestic US managers in terms of their disclosure activities, such as voluntarily disclosing earnings forecasts, and thus attract more US institutional investors and analysts. Consistent with our argument, we find that (1) firms with US-experienced CFOs are more likely to voluntarily issue management forecasts, and (2) the frequency of management forecasts is significantly higher for firms with US-experienced CFOs. Columns 2 and 4 of Table 9 report the results, which provide direct evidence of how CFOs with US experience are able to help US-listed Chinese firms to attract more US investors and analysts.

6. Conclusion

We use US-listed Chinese firms as our research sample and find that firms that hire top executives (i.e., CEOs or CFOs) with work experience in the US or educational qualifications from the US attract more analysts and institutional investors. Further, we find that CFOs' US experience dominates the results. To eliminate the innate ability argument, we control for CFO innate ability by following Giannetti et al. (2014) and the results remain consistent. We use the two-stage Heckman method to eliminate selection bias and the results again remain consistent. Nevertheless, we acknowledge that we cannot totally resolve the firm–executive matching endogeneity problem.

As supporting evidence, we find that firms with US-experienced executives tend to hold more conference calls and voluntarily issue more management forecasts. This complements previous studies documenting the effect of information disclosure on analysts' and institutional investors' activities by looking beyond the outcomes and identifying the core management drivers. Our results suggest that foreign firms attempt to lower investors' and analysts' information disadvantage or psychological distance by hiring top executives with US experience.

Our findings provide a deeper understanding of the mechanisms that facilitate US-listed Chinese firms to obtain international capital or resources and the results may be generalizable to other foreign firms cross-listed on US exchanges.

Acknowledgments

Appendix A. Variable definitions

Variable	Definition	Data source
WorkUS	Equals 1 if the CEO or CFO has work experience in the US, zero otherwise	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
WorkOverseas	Equals 1 if the CEO or CFO has work experience overseas (including Hong Kong, Taiwan and other foreign countries)	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
CEOworkUS	Equals 1 if the CEO has work experience in the US, 0 otherwise	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
CFOworkUS	Equals 1 if the CFO has work experience in the US, 0 otherwise	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
RM	Equals 1 if the company listed on the US exchange by reverse merger	List of Chinese RM firms obtained from the WIND database and the website of SINA Finance. Double checked by checking the history and headquarters of the company
Founder	Equals 1 if the CEO is also the (co-) founder of the firm	Hand collected from annual reports or proxy statements. Double checked using information from the Internet
Blockholder	Equals 1 if the firm has a foreign blockholder with a shareholding larger than 5%	Hand collected from annual reports and proxy statements
InsiderOwn	The shareholding percentage of insiders (i.e., executives and board members)	Hand collected from annual reports or proxy statements
CEOWorkOverseas	Equals 1 if the CEO has work experience overseas (including Hong Kong, Taiwan and other foreign countries)	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
CFOWorkOverseas	Equals 1 if the CFO has work experience overseas (including Hong Kong, Taiwan and other foreign countries)	Hand collected from annual reports or proxy statements. Double checked using the information from the firm's website
CEOeduUS	Equals 1 if the CEO was educated in the US, 0 otherwise	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
CFOeduUS	Equals 1 if the CFO was educated in the US, 0 otherwise	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
CEOeduOverseas	Equals 1 if the CEO was educated overseas (including Hong Kong, Taiwan and other foreign countries)	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
CFOeduOverseas	Equals 1 if the CFO was educated overseas (including Hong Kong, Taiwan and other foreign countries)	Hand collected from annual reports or proxy statements. Double checked using information from the firm's website
#Analysts	Ln(1 + #analysts)	Collected from IBES. The number of analysts is zero if the data are missing in IBES

Appendix A (*continued*)

Variable	Definition	Data source
#InstOwners	Ln(#InstOwners)	Collected from the TR 13f dataset
%InstHolding	Ln(100 [*] Percentage of institutional ownership)	Collected from the TR 13f dataset
Size	Ln(total assets)	Collected from Compustat
ROA	Net income/total assets	Collected from Compustat
Lev	Total liabilities/total assets	Collected from Compustat
BMR	Total assets/market cap	Collected from Compustat
BoardSize	# of board members	Hand collected from annual reports and proxy statements
Independence	# of independent board member/# of board members	Hand collected from annual reports and proxy statements
CEOpreIPO	Equals 1 if the CEO joined the firm before public listing, 0 otherwise	Hand collected from annual reports and proxy statements
CFOpreIPO	Equals 1 if the CFO joined the firm before public listing, 0 otherwise	Hand collected from annual reports and proxy statements

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Are all investment decisions to subscribe to new stocks mindless?

Investor heterogeneity and behavior in the process of subscribing to new stocks

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ABSTRACT

The IPO process is a way for companies to improve their corporate governance and for investors to assess company quality. This paper posits that investor choices vary with differences in investment ability and experience. Three groups of investors with large holdings, namely individual investors, blue-chip institutional investors and underperforming institutional investors, are compared by their use of three types of corporate governance information: board characteristics, equity structure and affiliated relationships. Overall, institutional investors make greater use of corporate governance information than individual investors, with blue-chip institutional investors making the greatest use. Further, bull-bear markets exert a significant influence on the behavior of both individual and underperforming institutional investors. These results enrich the IPO literature and contribute to optimal social fund allocation in the stock market.

1. Introduction

Although the mispricing of new shares is diminishing with the evolution of China's initial public offering (IPO) supervisory policy, the investment behavior induced by the new share concept remains the subject of considerable research interest. The IPO process not only improves corporate governance, but also provides investors with information on company quality. IPO firms have to provide the public with a large amount

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of information, including information on corporate governance, which has to be of high quality. The corporate governance information required is objective, and thus difficult to manipulate. It also serves to guarantee the reliability of other information. Here, we focus on two main questions. Are there any differences in the degree of information absorption among different types of investors during new share selection? Does the market sentiment caused by the bull-bear market cycle affect investors' information absorption? This paper reports the results of an empirical investigation of these questions using data on the corporation governance information of IPO firms and investor behavior in China.

Historical experience in developed capital markets suggests that institutional investors, who are the main driving force behind the marketization of the global financial system, play a positive role in ex ante stock selection and ex post supervision by virtue of their economies of scale and professional advantages. The prior literature focuses primarily on the economic consequences of the participation of certain types of investors, institutional investors in particular, largely ignoring the subject of stock selection, IPO stock selection in particular. Although institutional investors can take part in corporate governance by voting with their feet, engaging in public opposition or private lobbying and/or exposing management entrenchment (Gillan and Starks, 2003), these efforts are costly and may ultimately be in vain. In fact, governance-sensitive institutional investors display a preference for firms with sound internal governance (Bushee et al., 2014). Therefore, we believe that competent, experienced investors are likelier to select rather than forgo quality stocks.

This paper contributes to the literature in four ways. First, it enriches the literature on new share selection. It reports the first systematic study investigating whether different types of investors make different uses of the governance information disclosed in preliminary prospectuses and listing announcements when bulk-buying a target corporation. Few studies in China have focused on how the corporation governance mechanism affects the new share selection decisions of institutional investors or even examined institutional investor behavior in such selection. The likely reasons for this research gap are the difficulties in the information acquisition and application processes and the inability to draw conclusions concerning IPO issues from Western studies on stock selection strategies that use such financial indicators as the growth rate of operating revenue and the P/B ratio. When investors lack relevant historical performance information, it is wise to focus on corporate governance information. The empirical evidence also shows that distinguishing worthy from worthless stocks with reference to such information improves the efficiency of new share selection, thus implying that the government should place greater emphasis on standardizing and supervising the disclosure of governance information by IPO firms and carry out audits of their prospectuses and listing announcements.

Second, the paper refines the quantification of corporate governance information in the IPO context. One challenge in comprehensively examining the use of such information by investors making new share selection decisions is the selection of indicators. In consideration of the availability of governance information and the quantifiability of indicators, we choose board characteristics, ownership characteristics, affiliated relationships and auditing position to represent internal and external governance, and hence to describe firms' governance situation at the time of their IPOs. In addition, we also adopt the methods of principal component analysis (PCA) and categorical principal component analysis (CATPCA), which take information quantity as a weight, to extract dummy-variable principal components and continuous-variable principal components from our nine corporate governance variables. This method of extracting classified principal components is suitable for studies on corporate governance, and can be extended to sequential studies.

Third, the paper reclassifies investors based on historical investment performance and overweighting experience. Most studies classify investors as individual investors or institutional investors and then further classify the latter by economic laws and regulations. To avoid bias from mindless investors, we focus on the information processing of investors with large holdings, who can be assumed to be professional and capable. In addition, as noted, we classify investors by historical investment performance and overweighting experience rather than by economic laws and regulations. This approach allows us to identify differences in the information absorption of different types of investors, thus rendering the study more pertinent than others. We demonstrate that institutional investors with excellent historical investment performance and rich overweighting experience pay greater attention to the governance situation in IPO firms than other investors.

Finally, the paper investigates the moderating effect of market sentiment on new share selection. More specifically, it examines whether investors' new share selection strategies are influenced by the bull-bear market cycle. We divide our sample into two groups based on the market circumstances at the time of firms' IPOs, and

find that the cycle does exert a significant moderating effect on the new share selection strategies of investors with large holdings. Relative to their individual counterparts, institutional investors are unperturbed by market sentiment and capable of using governance information effectively in a bull market.

The remainder of the paper is structured as follows. Section 2 reviews the domestic and overseas literatures and proposes the study's hypotheses. Section 3 introduces the research design, including data selection and research methods. Section 4 outlines and discusses the empirical results, and Section 5 reports the results of additional analysis using other classification approaches for investors with large holdings. Section 6 concludes the paper with a discussion of the research implications.

2. Literature review and research hypotheses

2.1. Corporate governance information and differences in new stock subscription decisions among heterogeneous investors with large holdings

Corporate governance information allows investors to determine company quality (Shleifer and Vishny, 1986). A high-quality external corporate governance environment can reduce listed firms' operating risks and improve their ability to deal with crises. This corporate governance premium ensures that companies operate smoothly over the long term, and ultimately results in high returns for investors. Accordingly, institutional investors tend to favor companies with good corporate governance (Falkenstein, 1996; Eakins et al., 1998; Grinstein and Michaely, 2005; Xin and Xu, 2007; Song and Li, 2009; Li and Li, 2008; Ye et al., 2009). It can thus be concluded that corporate governance affects both the value of IPO firms and the interests of investors. Investors with large holdings are constrained by limited financial resources and strong profit pressure. Therefore, their investment decisions tend to be relatively cautious. Under pressure to gain a profit, they dig out as much information as possible to determine whether a new stock is really a black horse and to protect their own interests, paying particularly close attention to the firm's corporate governance information. The better the governance structure of an IPO firm, the larger institutional investors' holdings in it are likely to be because these investors are good at making use of information. However, investors are heterogeneous, and their degree of sensitivity to corporate governance information also differs. Hence, we investigate the differences in the strategies of different groups of investors with large holdings, namely institutional investors and individual investors, when they make new stock subscription decisions.

Securities investments account for only a small proportion of individual investors' portfolios. These investors also struggle with complex operations such as short selling. Therefore, in the face of numerous investment possibilities, individual investors are prone to the "search problem." Kumar and Lee (2006) find little variety in the securities in which individual investors invest and a high degree of correlation in their investment behavior. In addition, individual investors display obvious myopia, often making investment decisions on the basis of past price change patterns. Field and Lowry (2009) show that individual investors generally ignore information on the characteristics of IPO companies in their decision-making process and do not even consider those companies' pre-IPO earnings conditions. In addition, they find that a considerable proportion of such investors make large investments in IPO companies with poor financial performance. Individual investors are also more easily affected by hearsay and tend toward impulse investments, showing themselves to be behaviorally motivated (Shefrin and Statman, 1985). Barber and Odean (2004) find that many individual investors are net buyers of "eye-catching" stocks, that is, those with a news media focus, high turnover rate or high daily returns. In summary, individual investors depend on noise in making transaction decisions, and find it difficult to make full use of corporate governance information on IPO firms.

Institutional investors clearly have a number of advantages over individual investors, including teamwork, knowledge accumulation and practical experience. They are better able to judge market conditions and identify high-quality stocks, and hence are likelier to achieve returns higher than the market average (Grinblatt and Titman, 1989, 1992; Nofsinger and Sias, 1999; Wermers, 2000). Institutional investors have been found to identify firms that beat market benchmarks over a one-quarter horizon and to avoid firms that exhibit poor performance over the long run (Field and Lowry, 2009), and thus to have a strong ability to screen companies at the IPO stage. Using a dataset of bid information on every IPO auction in Taiwan from 1995 to 2000, Chiang et al. (2012) find that the bids of institutional investors are relatively consistent with those of informed

bidders in IPO auction theory, whereas those of individual investors are not.[1] The trading strategies of institutional investors are also more diverse than those of individual investors, and they are more adept at using the short-selling strategy profitably (Barber and Odean, 2008). Therefore, institutional investors create more portfolios in the process of subscribing to IPOs. Although public information is the main information source tapped by institutional investors, these investors have a stronger motivation than their individual counterparts to dig for additional information under the dual pressure of supervision and agency costs. They are thus choosier when selecting securities, and keep a vigilant eye on corporate governance information (Giannetti and Simonov, 2006; Russell Reynolds Associates, 1998; Chiu and Monin, 2003; Schnatterly and Johnson, 2014; Li et al., 2015).

To sum up, compared with individual investors, institutional investors have advantages in knowledge and capital reserves, information processing and industry specialization, among other advantages. They are good at exploiting the governance information publicly disclosed by IPO companies, and adjust their investment portfolios using a discretionary approach. These investors can also bear a higher level of investment volatility than their individual counterparts. Therefore, we believe that institutional investors have advantages in the use of public information on IPO firms, and thus put forward Hypothesis 1a.

Hypothesis 1a. Compared with individual investors, institutional investors with large holdings pay more attention to the corporate governance conditions of IPO firms when subscribing to new stocks.

Although there is a clear boundary between individual and institutional investors, a large degree of heterogeneity exists within the latter group. Because there is a lack of historical transaction data for IPO stocks, investors' decisions about whether to buy them can be based only on the publicly disclosed information in their prospectuses. Accordingly, we believe that different types of institutional investors have differing degrees of ability to grasp governance information on IPO firms. Del Guerciu (1996), Bushee and Noe (2000) and Bushee et al. (2014) all posit that due to significant variations in information sources, data analysis, professional knowledge and investment experience among institutional investors, their sensitivity to and utilization of corporate governance information also differ. Therefore, we divide institutional investors into two groups, blue-chip investors and underperforming investors, based on their historical investment ability and experience.

The historical investment performance of investors has some predictive power for future performance (Fung and Hsieh, 2000). Blue-chip institutions achieved higher than market average returns in the past, which suggests that they have the ability to select high-quality stocks. In the process of forming their own investment style, institutional investors also acquire information interpretation and application skills that give them the ability to grasp a comprehensive body of information. They also subject IPO companies to quality screening. Therefore, we believe that among investors with large new stock holdings, those whose historical performance is good (blue-chip institutional investors) have a stronger motivation and ability to make use of corporate governance information on IPO corporations than those whose historical performance is poor (underperforming institutional investors), which leads us to propose Hypothesis 1b.

Hypothesis 1b. Institutional investors with good rather than poor historical performance pay more attention to corporate governance information on IPO companies before making a large investment.

2.2. Moderating effects of bull-bear cycle on new stock subscription strategies of investors with large holdings

Different external market environments lead to significant differences in investors' decision-making behavior. Daniel et al. (1998) construct a theoretical model of cognitive and emotional bias based on the behavioral pricing context. Bagozzi et al. (1999) and Statman et al. (2003) find that rising market sentiment prompts some investors to assess future securities performance in an overly optimistic fashion and to have confidence in their predictive ability concerning securities. Using Chinese data, You (2010) shows that the market is likely to

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[1] In price bids for IPO firms, institutional investors' information superiority allows them to win at a relatively low price, and their bids are generally consistent with IPO auction theory. In contrast, the information inferiority of individual investors means that they generally overbid, and hence their bids differ from those predicted by auction theory. As a matter of fact, returns are higher when more institutional investors take part in the auction.

overreact (underreact) when market sentiment is bullish (bearish). Hong and Stein (1999, 2007) further emphasize the importance of investor heterogeneity. Although all types of investors display behavioral bias, the extent to which they do so differs. In China's securities market, individual investors are more sensitive to market sentiment than institutional investors, and tend to buy securities in a herd when such sentiment is positive (Li et al., 2015). The pattern of new stock subscription decisions is similarly affected by the external market environment.

During the up phase of a composite index, a highly speculative atmosphere is likely to make some investors overly optimistic, thereby dampening demand for information on new shares. In this situation, the motivations of both individual and underperforming institutional investors to use corporate governance information are likely to weaken. Mature investors, in contrast, are more capable of maintaining a stable investment style and identifying potential investment targets calmly and objectively in the up phase of a stock index. Therefore, during bull market periods, the ability of individual and underperforming institutional investors to interpret IPO governance information is reduced, whereas that of their blue-chip counterparts holds steady.

In the down phase of a composite index, in contrast, the resulting stock market recession forces investors to be more cautious in their selection. Individual investors and blue-chip and underperforming institutional investors alike are forced to exploit the investment signals contained in corporate governance information due to the smaller profit space. Therefore, in these circumstances, the motivations of both individual and underperforming institutional investors to make use of corporate governance information are enhanced.

To summarize, the bull-bear market cycle is an important factor in investors' new stock subscription behavior. An external environment characterized by a composite index in an up phase weakens the ability of less sophisticated investors (individual investors and underperforming institutional investors) to make use of corporate governance information on IPO firms. This discussion brings us to our final hypothesis.

Hypothesis 2a. Compared with institutional investors, individual investors' motivation and ability to make use of corporate governance information on IPO companies is weakened during the up phase of a composite index.

Hypothesis 2b. Compared with blue-chip institutional investors, underperforming institutional investors' motivation and ability to make use of corporate governance information on IPO companies is weakened during the up phase of a composite index.

3. Research design

3.1. Sample selection and data sources

To investigate how the corporate governance of IPO companies influences the new stock subscription decisions of different types of investors, we collect corporate governance data on all Chinese IPO companies listed between 20 May 2002 (when the market value allotment system started in full) and 31 December 2014. The sample is then divided into stages based on the IPO bull-bear market cycle. The sample is also cleaned as follows. First, observations with incomplete information disclosure, such as a lack of financial information for the three years before the listing date, market information on new shares and corporate governance information, are excluded. Second, the agent variables are calculated according to the original data; that is, extreme values are winsorized at 1%. Investor information is collected from the first post-listing quarterly reports of the sample IPO firms, and corporate governance information is collected manually from IPO prospectuses and listed company statements. Data on the control variables are collected from the CSMAR, RESSET and CNINFO databases, and information on underwriter reputation from the official Web site of the China Securities Industry Association (CSIA). All data are double-checked for discrepancies. After data-processing, the final sample includes 1516 observations.

Fig. 1 shows the time series of the Shanghai and Shenzhen Composite Indexes, which are further divided into up and down periods in Appendix A in accordance with the Elliott Wave Principle. The Shanghai and Shenzhen stock markets experienced 10 up cycles and nine down cycles between May 2002 and December 2014. The cycles in both directions lasted from one month to approximately two years, although the average
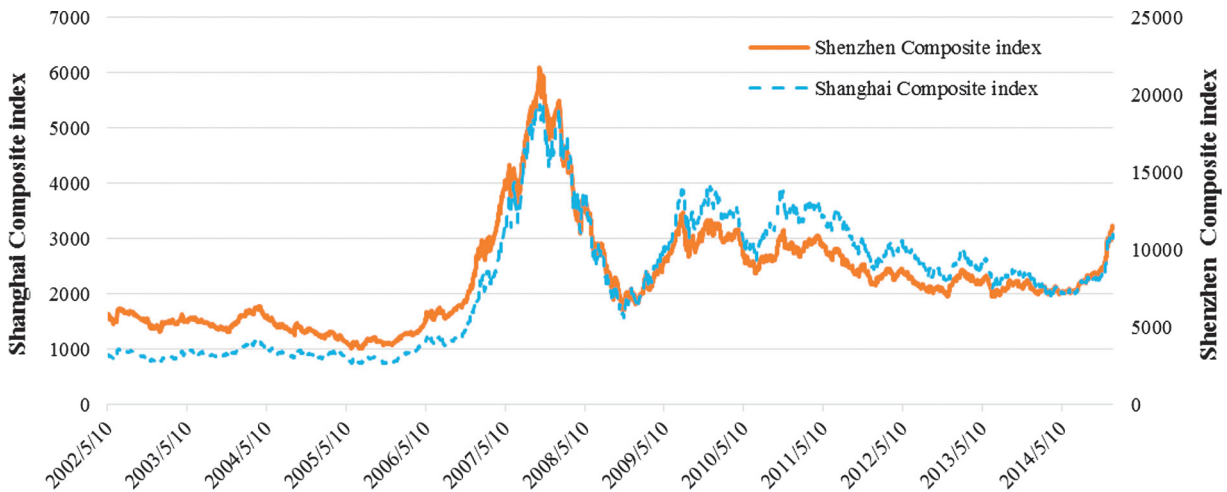
Figure 1. External investment environment at the time of new stock listings (time series of the Shanghai and Shenzhen Composite Indexes).

cycle is about 251 days. More importantly, the distribution of new stocks in the overall bull-bear cycle depicted in Fig. 1 shows, in general, that there is a significant difference in the distributions of the 1516 sample IPO firms in bull and bear periods.

3.2. Independent variable: division of investor heterogeneity

Most scholars distinguish between different types of institutional investors by economic laws and regulations, although institutional investors' affiliated background and investment style are increasingly being taken into consideration. However, the heterogeneity of these investors is rarely considered from the perspective of large-holding experience. Yang et al. (2012) conclude that most researchers are concerned purely with the study of securities investment funds, with only a few studies comparing such funds with securities companies or social insurance funds, a few comparing them with securities companies and the Qualified Foreign Institutional Investor (QFII) scheme, and a few comparing securities investment funds, securities companies, the QFII scheme and trust companies. We argue that these classifications are inadequate. Because IPO stock subscription decisions have a strong degree of specificity, and the experience of institutional investors diverges widely (Bushee et al., 2014), it is necessary to make a more meaningful division of the institutional investor group.

To measure the investment capacity of institutional investors, we reclassify those who buy large holdings in new stocks. Based on their past investment performance, we divide institutional investors into blue-chip and underperforming investors and carry out a comparative study of the two using rational factors to reflect their institutional experience and ability. Distinguishing the investment ability of heterogeneous institutional investors who subscribe to new stocks allows us to characterize, for example, the age of the institution, historical investment return pattern and historical number of investments. However, because the effect of institutional age is difficult to distinguish, it is not considered in this study. Historical investment returns reflect past investment performance, which is used as a classification criterion in our main model. The historical number of investments reflects the investment experience of institutional investors, and it is thus used as the classification criterion in our extended analysis.

Gillan and Starks (2000) posit that the shareholding ratio reflects investors' degree of participation. We first divide investors into institutional and individual investors, whose shareholdings are noted as P_INST and P_INDI, respectively, and then further divide institutional investors by their investment performance in the previous year. The shareholding ratios of blue-chip and underperforming institutional investors are noted as P_WINNER and P_LOSER, respectively.

Because of the limited rationality of investors, there are cognitive differences in the perception of corporate governance information, which results in differing patterns of new stock subscription behavior. Owing to the limited resources available in the process of competing for new stocks, investors necessarily shoot their arrows at the target to gain higher returns.[2] Investors who invest heavily in new stocks put a lot of money into particular IPO corporations, resulting in a huge degree of profit pressure. Then, by making use of their investment experience and analytical capacity, these investors have a strong motivation to dig out hidden content in the information they collect to identify the best new stocks. We believe that under the three drivers of experience, ability and pressure, heavily investing investors can exploit various types of information to capture the details hidden therein[3] to maximize their profits and purchase new stocks preferentially. Therefore, the research object in this paper is investors who invest heavily in new stocks.

3.3. Main observation variables: extraction of principal components of corporate governance

Following Xu et al. (2006), who extract an operating performance index as a reference, we use PCA to calculate the principal components of comprehensive corporate governance, which are then used as the standard in the following analysis. We extract three representative variables featuring board characteristic information and three featuring equity structure information, two dimensions reflecting affiliation information, and one variable featuring audit information on IPO prospectuses. These variables are sourced from the annual reports issued one year before the IPOs, and act as representative indicators. The definitions of the variables and their descriptive statistics are presented in Table 1.

We refine the nine explanatory variables on corporate governance information to construct a principal component factor that shows the overall corporate governance conditions of new shares. For continuous variables such as *BODSIZE*, *DEGREE_SEP*, *OR* and *LEVEL*, we use conventional PCA to extract the principal components. For the five other categorical variables, the PCA precondition that the variables to be extracted are in a multivariate normal distribution is difficult to meet. Therefore, the researchers perform data classification using CATPCA instead. That method can play the same function as ordinary PCA (Zhang et al., 2004). In addition, it can not only eliminate any interaction between evaluation indexes, but also simplifies the index synthesis steps and then briefly shows the relationship between corporate governance and investment strategy. The synthesis process is illustrated in Table 2.

First, Panel A of Table 2 shows that the first eigenvalue's cumulative contribution rate to the continuous and categorical variables, respectively, interprets 81.11% and 77.09% of the represented variables. Hence, it can be used to express the optimal linear combination of the nine variables. Second, the variance contribution rate is taken as a weight to construct the eigenvector, and the first principal component of continuous variable *GOV_CTN1* and first principal component of categorical variable *GOV_DUM1* derived from PCA can be identified as a comprehensive indicator of the corporate governance level.

The loading coefficients (factor loadings) of *GOV_CTN1* to the continuous variables are *BODSIZE* (0.197), *DEGREE_SEP* (−0.215), *OR* (0.234) and *LEVEL* (−0.221), and those of *GOV_DUM1* to the categorical variables are *LAW_INDIR* (0.529), *SAMECITY* (−0.263), *SOE* (−0.365), *PEER* (−0.243) and *BIG_14* (0.460).

Panel B of Table 2 shows the directions of the coefficients corresponding to the positive and standardized nine governance information variables to be consistent with expectations. Therefore, we take the first principal component factor scores of the corporate governance continuous (*GOV_CTN1*) and -categorical (*GOV_DUM1*) variables as agent variables of corporate governance, and enter them in the selection model.

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[2] For example, when setting up new stock products, many funds commit themselves to increasing the probability of obtaining profitable new stocks. Accordingly, rational investors tend to screen IPO companies and select those of high quality to ensure higher returns rather than aimlessly investing or casting a wide net.

[3] The detailed descriptions of investment strategies and regular disclosure of investment lists on the Web sites of the main securities investment funds provide some corporate governance information, such as board characteristics, ownership structure, company affiliation and audit condition.

Table 2
Synthesis of three types of corporate governance indicators using multi-index evaluation information.

Continuous variables				Dummy variables			
Eigenvalue	Value	Covariance contribution rate	Cumulative covariance contribution rate	Eigenvalue	Value	Covariance contribution rate	Cumulative covariance contribution rate
PANEL A: Computed eigenvalues and contribution rates according to the covariance of weight multiplied and standardized data							
λ_1	2.204	0.811	0.811	λ_1	2.724	0.771	0.771
λ_2	0.275	0.086	0.897	λ_2	0.284	0.099	0.870
λ_3	0.232	0.070	0.967	λ_3	0.236	0.070	0.940
λ_4	0.118	0.027	0.994	λ_4	0.140	0.051	0.991
λ_5	0.008	0.003	0.997	λ_5	0.032	0.005	0.996
				λ_6	0.006	0.003	0.999
Principal component	Expected direction and process		GOV_CTN1	GOV_CTN2	GOV_DUM1	GOV_DUM2	GOV_DUM3

PANEL B: Computed eigenvector (PCA coefficients) according to the covariance of weight multiplied and standardized data

		Expected direction and process	GOV_CTN1	GOV_CTN2	GOV_DUM1	GOV_DUM2	GOV_DUM3
Board	LAW_INDIR	+			0.529	0.248	−0.099
	SAMECITY	− Positive			−0.263	−0.161	0.104
	BODSIZE	?	0.197	−0.093			
Ownership	SOE	− Positive			−0.365	−0.128	0.218
	DEGREE_SEP	− Positive	−0.215	−0.115			
	OR	+	0.234	0.227			
AFFILI&AUDIT	PEER	− Positive			−0.243	−0.110	0.061
	LEVEL	− Positive	−0.221	−0.181			
	BIG_J4	+ Positive			0.460	−0.215	−0.172

3.4. Model test and variable connotation

After extracting the three types of principal components of the corporate governance information of IPO corporations (GOV_i), we regress the three indexes to the shareholding ratios of heterogeneous investors, the listing exchange of new stocks and the bull-bear market cycle, as shown in Eq. (1).

$$HLDP = \beta_0 + \beta_1 GOV + \beta_2 GOV \times BULL + \beta_3 BULL + \sum_{i=1}^{11} \beta_{4j} CONTROLVARS + \sum_{j=1}^{2} \beta_{5j} LISTEXG + \varepsilon \quad (1)$$

In Eq. (1), the dependent variable $HLDP$ represents the shareholding ratios of different types of investors. The independent variable GOV represents both the first principal component of the continuous corporate governance variable (GOV_DUM1) and that of the categorical corporate governance variable (GOV_CTN1). Hypothesis 1 predicts the regression coefficients of the GOV variables to be significantly positive for the shareholding ratio of institutional investors (blue-chip investors in particular); that is, β_1 should be significantly positive. Further, to examine the effect of the bull-bear market cycle on the relationship between the corporate governance of IPO firms and institutional investors' holding decisions, we include the principal components of the two variables of corporate governance (GOV_DUM1 and GOV_CTN1) and the bull-bear cycle ($BULL$). If the composite index of the host exchange (Shanghai or Shenzhen) is in an upward cycle when new stocks are issued, then $BULL$ equals 1; if it is in a downward phase, $BULL$ equals 0. Hypothesis 2 predicts the coefficient of the product to be significantly positive for the shareholding ratio of institutional investors (particularly blue-chip investors); that is, β_2 should be significantly positive.

The definitions of the variables used in this research are presented in Table 3.

The control variables ($CONTROL\ VARS$) in Eq. (1) are chosen with reference to previous research and China's institutional background. They include IPO financial information, which is directly related to the investment decision (i.e., company size, capital structure and performance indicators), basic information (i.e., company age before listing, reputation of underwriters and venture capital institution, and participation of venture capital institution) and market information (i.e., excess subscription of new shares, first-day turnover rate and industry boom index in new share listing month). In addition to these three categories of control variables, we also control for fixed effects (i.e., the stock exchange on which new shares are listed).

First, with regard to the aforementioned financial information, the scale of a company's assets suggests the scale of its economy, which has a positive effect on rational investors (Shefrin and Statman, 1994; Lakonishok et al., 1994), who are more willing to hold shares in large companies (Gompers and Metrick, 2001). In addition, the capital structure, namely, the debt level, reveals the extent of a firm's financial risk and financial distress (Ohlson, 1980). Although the indicator of liabilities to assets has many defects, it is often used by rational investors to select stock (Bushee, 2001) because the earnings response coefficient of highly leveraged companies is significantly lower than that of less-leveraged firms (Dhaliwal et al., 1991). The issuing price-to-earnings ratio constitutes internal information used to estimate the IPO stock price, and therefore provides a pricing channel. It plays an important role in guiding investment decisions. Prior studies have found that stocks in public corporations with high profit and growth levels are likely to be held by institutional investors with large shareholdings (Gompers and Metrick, 2001).

Second, with regard to the basic information, the length of time between an IPO company's establishment and its listing date constitutes a special signal. Company age can affect the future excess returns of IPO companies. For those in mature industries, the longer the length of establishment before the listing, the higher the level of market awareness. For IPO firms in industries such as Internet and new media, e-commerce, and new energy or other emerging industries, however, growing rapidly and quickly passing the China Securities Regulatory Commission's (CSRC) listing criteria are suggestive of a strong development tendency. Investors can judge the information disclosed by the company's age after considering its industry. Underwriter reputation is an important factor that influences the success and performance of IPO companies (Carter and Manaster, 1990; Megginson and Weiss, 1991; Cooney et al., 2003). We select underwriter performance to measure underwriter reputation. Data on the amount of underwriting undertaken by a principal underwriter in the year before an IPO are obtained from the CSIA Web site. If that amount puts him or her into the top 15 in the given industry, then he or she is regarded as having a strong reputation, and $UW\_REPU = 1$. The participation

Table 3
Definitions of main research variables.

Variable category		Variable	Variable definition
Dependent variables	Institutional investors' shareholding	P_INST	Institutional investors' shareholding in top 10 tradable shareholders
	Individual investors' shareholding	P_INDI	Individual investors' shareholding in top 10 tradable shareholders
	Blue-chip institutional investors' shareholding	P_WINNER	Of the top 10 tradable shareholders, the institutional investors whose shareholding returns in the previous year are larger than or equal to the market return are defined as blue-chip investors. The shareholding ratio of these investors is designated P_WINNER
	Underperforming institutional investors' shareholding	P_LOSER	Of the top 10 tradable shareholders, the institutional investors whose shareholding returns in the previous year are less than the market return are defined as underperforming institutions. Their shareholding ratio is designated P_LOSER
Independent variables	Corporate governance comprehensive indexes	GOV_CTN1	The first principal component of the continuous variable of corporate governance computed via PCA
		GOV_DUM1	The first principal component of the dummy variable of corporate governance computed via CATPCA
Moderator variable		BULL	If the composite index of the host exchange (Shanghai or Shenzhen) is in an upward phase when new stocks are issued, the BULL equals 1; if it is in a downward phase, then BULL equals 0
Control variables		LN_ASSET	Natural logarithm of total assets disclosed in the annual report one year before listing. It is used to control for possible size effect
		LEV	Leverage disclosed in the pre-listing annual report, which is equal to total debt divided by total assets. It is used to control the capital structure factor
		IPO_PE	Price-earnings ratio, which is used to indicate the extent of the over- or under-valuing of different stock prices
		PRELISTAGE	Length of time in years from IPO company establishment to listing date
		UW_REPU	If the underwriting experience of the principal underwriter in the pre-listing year places it in the top 15 in the industry (data from CSIA Web site and WIND), the variable equals 1, and otherwise 0
		VC	If a venture capital institution is listed as the main shareholder in the IPO prospectus (data from Chinese Venture Capital Research Institute), the variable equals 1, and otherwise 0
		VC_SHARE	Shareholding ratio of venture capital institution in prospectus (%)
		PLOT_ONLN	IPO excess purchase rate (reciprocal online success rate), which indicates a subscription volume higher than the offering volume
		TNOV	Turnover rate on the first day
		CLIMATE	Industry boom index in the month new shares are listed. It is manually constructed from the 21 sectors of the monthly economic index released by the Industry Climate Monitoring Platform of the Development Research Center of the State Council
		LISTEXG	IPO stock exchange. Shanghai stock exchange = 1; Shenzhen stock exchange = 2

and shareholding ratio of venture capital (VC) institutions are also considered. The IPO process is affected by the behavior and reputation of VC investors to varying degrees (Zhang and Liao, 2011; Chen et al., 2011; Cai et al., 2013). We adopt the approach of Coakley et al. (2007) and Chen et al. (2011). If VC institutions are listed among the main shareholders in an IPO prospectus, we believe that VC investors participate in the firm.

Finally, with regard to the market information, the IPO excess purchase rate is indicative of online subscription success, as it refers to the subscription volume being higher than the offering volume. The first-day turnover rate indicates the presence of strong institutions, which has implications for assessing stock price volatility. We also control for differences in industry boom. With reference to the CSRC's 2001 "Listing

Corporation Industry Classification Guidelines," we obtain the industry boom index for each IPO company in its listing month. We also add the stock listing exchange (*LISTEXG*) to our model as a fixed-effect variable to reflect differences between the Shenzhen and Shanghai trading markets.

4. Empirical results

4.1. Descriptive statistics

Table 4 tabulates summary statistics for the variables used in our main analysis. Judging from the list of investors who take a large holding in new stocks, institutional investors tend to have a larger ownership stake than individual investors, averaging around 4.61% in our sample. Moreover, within the institutional investor group, blue-chip investors have a larger ownership stake than their underperforming counterparts, which is consistent with our expectations.

Descriptive statistics for the control variables are also presented in the table. The mean value of underwriter reputation (*UW_REPU*) is 0.326, indicating that 32.62% of the sample firms recruit highly reputable underwriters. The mean values of *VC* and *VC_SHARE* are 0.502 and 0.089, respectively, suggesting that VC institutions subscribe to only a few new stocks. Their holdings are 8.91% on average. The new firms in our sample tend to have low financial leverage ratios, averaging around 0.375. The mean value of *CLIMATE* is 103.210, which is expected as new firms always list in a bull market. The other variables are within normal ranges.

Table 5 reports the correlations between the ownership stakes of the two institutional investor groups and the explanatory variable, i.e., corporate governance. The Pearson correlations are on the bottom left, and the Spearman correlations in the upper right. Consistent with our hypothesis, the ownership stakes of institutional investors and blue-chip investors, *P_INST* and *P_WINNER*, are strongly and positively correlated with the two proxies for corporate governance. In contrast, *P_INDI* is negatively correlated with both independent variables, and the correlation between *P_LOSER* and *GOV_CTN1* (*GOV_DUM1*) is unstable, providing preliminary support for our hypothesis that underperforming institutional investors do not make effective use of corporate governance information.

4.2. Group testing of investor heterogeneity and new stock subscription behavior

Panel A of Table 6 divides the full sample into two groups by both the value of corporate governance and investor heterogeneity. The horizontal axis distinguishes the sample by the median of *GOV_CTN1* and

Table 4
Descriptive statistics of the main variables.

Variable		N	Mean	Std.	Q1	Median	Q3
Dependent Variables	P_INST	1516	0.084	0.131	0.007	0.031	0.111
	P_INDI	1516	0.038	0.033	0.018	0.033	0.052
	P_WINNER	1516	0.070	0.110	0.006	0.029	0.085
	P_LOSER	1516	0.041	0.069	0.010	0.027	0.050
Independent Variables	GOV_DUM1	1516	1.107	0.819	0.539	0.939	1.517
	GOV_CTN1	1516	1.014	0.911	0.621	1.193	1.735
Controls	UW_REPU	1516	0.326	0.081	0.000	0.000	1.000
	VC	1516	0.502	0.495	0.000	0.000	1.000
	VC_SHARE	1516	0.089	0.307	0.015	0.094	0.138
	LN_ASSET	1516	20.412	1.635	17.402	19.455	24.303
	LEV	1516	0.375	0.371	0.331	0.403	0.662
	IPO_P/E	1516	19.530	20.190	13.975	51.220	26.185
	PRELISTAGE	1516	8.766	8.083	3.972	7.811	11.015
	CLIMATE	1516	103.210	5.232	100.241	103.208	110.274
	PLOT_ONLN	1516	1.521	0.098	0.475	1.350	1.718
	TNOV	1516	0.720	0.008	0.623	0.731	0.901

Table 5
Correlation matrices.

	P_INST	P_INDI	P_WINNER	P_LOSER	GOV_CTN1	GOV_DUM1
P_INST	1	0.439***	0.721***	0.167***	0.079***	0.184***
P_INDI	0.056**	1	−0.270***	0.281***	−0.270***	−0.024
P_WINNER	0.492***	−0.080***	1	−0.130***	0.002***	0.063**
P_LOSER	0.746***	−0.015	−0.064**	1	−0.098***	0.093***
GOV_CTN1	0.085***	−0.241***	0.080***	0.04	1	−0.578***
GOV_DUM1	0.179***	−0.077***	0.026**	−0.069**	−0.682***	1

GOV_DUM1, and the vertical by whether the investors are institutions or individuals. The values of P_INST descend a significant 2.11% from high GOV_CTN1 to low GOV_CTN1, indicating a positive relationship between corporate governance and investors' decisions. In contrast, the change in the mean values of the P_INDI measure from high to low governance is not significant, which is consistent with Hypothesis 1a. We repeat the group testing using the first principal component of the dummy variable GOV_DUM1, and the results are basically consistent with the foregoing conclusion.

Furthermore, we also compare the two types of institutional investors, as shown in Panel B of Table 6. It can be seen that blue-chip investors hold more stock in newly listed firms with high GOV_CTN1 and GOV_DUM1 values than their underperforming counterparts and tend to avoid new firms with low such values, which is consistent with Hypothesis 1b.

4.3. Multivariate analyses

Table 7 reports the empirical results for Hypothesis 1. The dependent variable in Columns (1) and (3) is P_INST, whereas that in Columns (2) and (4) is P_INDI. The explanatory variables are GOV_CTN1 and GOV_DUM1, respectively.

Without considering the effect of bull and bear cycles, the estimated coefficients on GOV_CTN1 and GOV_DUM1 are significantly positive in the first model in Table 7, indicating that newly listed firms with better corporate governance tend to attract more institutional investors. In the second model considering the shareholding of individual investors, however, the coefficient of GOV_CTN1 lacks significance and that of GOV_DUM1 is positive only at the 10% significance level. These results are in line with our expectation and support Hypothesis 1a.

We next include the interaction item for market cycle and the two principal components of corporate governance. For institutional investors, the coefficient of GOV_CTN1*BULL in column (3) lacks significance and that of GOV_DUM1*BULL is positive only at the 10% significance level, indicating that institutional investors

Table 6
Shareholdings of heterogeneous investors in new firms with different levels of corporate governance.

	Grouped by	Share	Number	Grouped by	Share	Number
PANEL A: Ownership of individual and institutional investors						
INST	High GOV_CTN1	0.095	4.272	Low GOV_CTN1	0.074	3.845
	High GOV_DUM1	0.087	4.155	Low GOV_DUM1	0.077	3.964
INDI	High GOV_CTN1	0.041	5.785	Low GOV_CTN1	0.035	6.133
	High GOV_DUM1	0.039	5.854	Low GOV_DUM1	0.038	6.062
PANEL B: Ownership of blue-chip and underperforming institutional investors						
WINNER	High GOV_CTN1	0.077	4.434	Low GOV_CTN1	0.063	3.815
	High GOV_DUM1	0.072	4.168	Low GOV_DUM1	0.06	4.088
LOSER	High GOV_CTN1	0.016	4.184	Low GOV_CTN1	0.018	4.075
	High GOV_DUM1	0.017	3.905	Low GOV_DUM1	0.016	4.361

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

prefer well-governed new firms even in an environment of feverish speculation. However, the picture is different when it comes to individual investors. As shown in column (4), the coefficients of *GOV_CTN1*BULL* and *GOV_DUM1*BULL* are −0.007 and −0.002 at significance levels of 10% and 1%, respectively, thus confirming Hypothesis 1b.

The results for the control variables are also consistent with our expectations. For instance, the estimated coefficients on *LN_ASSET* are significantly positive, which indicates that large firms supported by VC are better received by institutional investors because of those firms' reputational capital. The coefficients on *LEV* are not consistent in the different models, indicating that the influence of leverage may be conditional.

We now seek to explain the relationship between corporate governance and the behavior of investors with different historical performance records. Table 8 presents the regression estimates of those investors proxied by

Table 7
The influence of corporate governance on new stock selection.

Dependent variable	(1) P_INST	(2) P_INDI	(3) P_INST	(4) P_INDI
GOV_CTN1	0.003***	0.001	0.003**	0.006
	(2.78)	(1.04)	(2.02)	(1.24)
GOV_DUM1	0.012**	0.002*	0.015**	0.001*
	(2.15)	(1.93)	(2.33)	(1.82)
BULL			0.007**	0.003***
			(2.31)	(3.55)
GOV_CTN1*BULL			−0.003	−0.007*
			(−1.46)	(−1.72)
GOV_DUM1*BULL			0.003*	−0.002***
			(1.80)	(−3.35)
LN_ASSET	0.035***	0.001	0.036***	0.001
	(6.26)	(0.15)	(6.43)	(0.19)
LEV	−0.042*	0.022	−0.049*	0.019
	(−1.78)	(1.26)	(−1.82)	(1.05)
IPO_PE	0.001	0.000	0.000	0.000
	(0.88)	(0.94)	(0.72)	(0.85)
PRELISTAGE	−0.000	−0.000	−0.000	−0.000
	(−0.19)	(−0.14)	(−0.40)	(−0.19)
UW_REPU	−0.041**	−0.018	−0.042**	−0.018
	(−2.18)	(−1.42)	(−2.24)	(−1.40)
VC	0.103***	0.027**	0.108***	0.030**
	(5.64)	(2.22)	(5.84)	(2.40)
VC_SHARE	0.001	−0.002***	0.001	−0.003***
	(0.70)	(−2.80)	(0.64)	(−2.92)
TURNOVER	0.002	0.016***	−0.000	0.016***
	(0.29)	(4.23)	(−0.035)	(4.19)
CONSTANT	−0.808***	−0.342***	−0.797***	−0.364***
	(−4.84)	(−3.05)	(−4.68)	(−3.18)
IND & LISTEXG	Controlled	Controlled	Controlled	Controlled
Observations	1516	1516	1516	1516
Adj. R^2	0.23	0.12	0.24	0.12
Subsample test on the coefficient of		(1) VS (2)		(3) VS (4)
		GOV_CTN1		GOV_CTN1*BULL
		Chi^2(1) = 7.05		Chi^2(1) = 3.05
		Prob > Chi^2 = 0.0121		Prob > Chi^2 = 0.1102
		GOV_DUM1		GOV_DUM1*BULL
		Chi^2(1) = 3.80		Chi^2(1) = 4.46
		Prob > Chi^2 = 0.0781		Prob > Chi^2 = 0.0346

The *t*-statistics reported in parentheses are based on standard errors adjusted for firm-level clustering.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 8
Influence of corporate governance on investors with different levels of investment performance.

Dependent variables	(1) P_WINNER	(2) P_LOSER	(3) P_WINNER	(4) P_LOSER
GOV_CTN1	0.005**	−0.004	0.002*	−0.004
	(2.51)	(−1.15)	(1.93)	(−1.00)
GOV_DUM1	0.017***	0.003	0.025***	0.002
	(2.88)	(1.17)	(2.73)	(1.49)
BULL			0.008***	0.008***
			(2.80)	(2.92)
GOV_CTN1*BULL			−0.002	−0.003*
			(−0.33)	(−1.78)
GOV_DUM1*BULL			−0.007	−0.002**
			(−1.07)	(−2.31)
LN_ASSET	0.036***	0.005	0.037***	0.006
	(6.38)	(1.30)	(6.43)	(1.53)
LEV	−0.067**	0.037**	−0.074***	0.032*
	(−2.47)	(2.14)	(−2.69)	(1.87)
IPO_PE	0.000	0.001*	0.000	0.001
	(0.44)	(1.72)	(0.26)	(1.64)
PRELISTAGE	−0.000	0.000	−0.001	0.000
	(−0.65)	(0.19)	(−0.80)	(0.064)
UW_REPU	−0.040**	−0.011	−0.041**	−0.011
	(−2.10)	(−0.93)	(−2.14)	(−0.93)
VC	0.051***	0.077***	0.055***	0.081***
	(2.72)	(6.50)	(2.91)	(6.72)
VC_SHARE	0.001	−0.002**	0.001	−0.002**
	(0.61)	(−2.40)	(0.57)	(−2.52)
TURNOVER	0.006	0.008**	0.006	0.007*
	(1.10)	(2.20)	(0.95)	(1.90)
CONSTANT	−1.006***	−0.234**	−1.016***	−0.235**
	(−5.85)	(−2.16)	(−5.79)	(−2.13)
IND & LISTEXG	Controlled	Controlled	Controlled	Controlled
Observations	1516	1516	1516	1516
Adj. R^2	0.20	0.18	0.20	0.19
Subsample test on the coefficient of		(1) VS (2)		(3) VS (4)
		GOV_CTN1		GOV_CTN1*BULL
		$Chi^2(1) = 5.05$		$Chi^2(1) = 2.86$
		Prob > $Chi^2 = 0.0400$		Prob > $Chi^2 = 0.1590$
		GOV_DUM1		GOV_DUM1*BULL
		$Chi^2(1) = 8.12$		$Chi^2(1) = 3.92$
		Prob > $Chi^2 = 0.0112$		Prob > $Chi^2 = 0.0721$

The t-statistics reported in parentheses are based on standard errors adjusted for firm-level clustering.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

P_WINNER and P_LOSER. The results in columns (1) and (2) show the coefficients on GOV_CTN1 and GOV_DUM1 to be significantly positive below 5% and 1%, respectively (t-statistics = 2.51 and 2.88, respectively).

After controlling for bull and bear cycles, we observe the influence of the market environment on investor behavior. Both GOV_CTN1*BULL and GOV_CTN1*BULL are more significantly negative in column (4) than in column (3), indicating that the market environment is negatively associated with the rationality of underperforming institutional investors relative to their blue-chip counterparts, which is consistent with Hypothesis 2b.

In sum, the results in Tables 7 and 8 suggest that compared with individual investors, institutional investors with large holdings make more effective use of corporate governance information. Similarly, compared with their underperforming counterparts, blue-chip institutional investors also make better use of such information. Furthermore, bull and bear markets exert a significant influence on the behavior of both individual investors and underperforming institutional investors.

5. Extended research

The differences between individual and institutional investors are obvious, but the classifications of institutional investors differ. In expanded testing, we change the classification criteria for the ability of institutional investors. We first consider large holding experience instead of historical investment performance, and we then

Table 9
Effects of corporate governance on institutional investors with large holding experience when they make large investment decisions about IPO stocks.

Dependent variables	(1) P_VETERAN	(2) P_GREEN	(3) P_VETERAN	(4) P_GREEN
GOV_CTN1	0.006***	0.001**	0.009***	0.002**
	(3.16)	(2.30)	(3.81)	(2.09)
GOV_DUM1	0.013**	−0.002	0.017**	−0.003
	(2.01)	(−1.28)	(2.43)	(−1.49)
BULL			0.015**	0.003*
			(2.12)	(1.82)
GOV_CTN1*BULL			−0.001	−0.013***
			(−0.41)	(−3.05)
GOV_DUM1*BULL			−0.003	−0.007***
			(−1.01)	(−2.51)
LN_ASSET	0.055***	−0.020***	0.056***	−0.020***
	(8.91)	(−11.8)	(9.10)	(−11.7)
LEV	−0.056*	0.036***	−0.066**	0.036***
	(−1.89)	(4.52)	(−2.21)	(4.41)
IPO_PE	0.001	−0.000	0.001	−0.000
	(1.45)	(−0.31)	(1.24)	(−0.30)
PRELISTAGE	−0.001	0.000	−0.001	0.000
	(−0.68)	(1.56)	(−0.90)	(1.56)
UW_REPU	−0.057***	−0.001	−0.059***	−0.001
	(−2.74)	(−0.26)	(−2.82)	(−0.13)
VC	0.121***	0.009*	0.129***	0.009*
	(5.94)	(1.68)	(6.25)	(1.65)
VC_SHARE	−0.001	−0.000	−0.002	−0.000
	(−0.99)	(−0.28)	(−1.12)	(−0.28)
TURNOVER	0.013**	0.005***	0.011*	0.005***
	(2.01)	(2.93)	(1.69)	(2.96)
CONSTANT	−1.511***	0.361***	−1.508***	0.346***
	(−8.11)	(7.12)	(−7.96)	(6.70)
IND & LISTEXG	Controlled	Controlled	Controlled	Controlled
Observations	1516	1516	1516	1516
Adj. R^2	0.34	0.21	0.35	0.22
Subsample test on the coefficient of		(1) VS (2) GOV_CTN1 Chi^2(1) = 2.70 Prob > Chi^2 = 0.1006 GOV_DUM1 Chi^2(1) = 4.92 Prob > Chi^2 = 0.0266		(3) VS (4) GOV_CTN1*BULL Chi^2(1) = 4.71 Prob > Chi^2 = 0.0270 GOV_DUM1*BULL Chi^2(1) = 5.31 Prob > Chi^2 = 0.0306

reclassify institutional investors in accordance with economic laws and regulations to determine whether the main regression conclusions hold.

5.1. Reclassifying institutional investors according to large holding experience

We first compare the top 10 tradable shareholders of IPO companies with those of the companies a year before their IPO. We then sort the listed companies held by institutions with large holdings who invest heavily in new stocks, ranking them from high to low. Next, we choose the top 10% as "institutions with rich large holding experience" (*VETERAN*) and the bottom 10% as "institutions lacking large holding experience" (*GREEN*). Finally, using this new classification method, we reexamine the ability of different types of institutional investors to make use of corporate governance information. The results are presented in Table 9.

As can be seen in columns (1) and (2) of Table 9, the higher the level of corporate governance, the larger the shareholding of institutions with rich experience. Columns (3) and (4) show that when the bull-bear cycle variable and its cross term with the corporate governance variables are added, the regression coefficients of the cross terms between the corporate governance principal components (*GOV_CTN1*, *GOV_DUM1*) and *BULL* are significantly negative in the group with a lack of large holding experience. The implication is that investors with little such experience make little use of corporate governance information on IPO corporations in a bull market environment, thus further highlighting the informational advantage of institutional investors with considerable large holding experience in the IPO context, particularly in the up phase of a stock market index.

To further test the robustness of the regression results, the classification standards are adjusted in two ways. First, we relax the classification criteria. More specifically, we quarter the number of listed companies in which institutions were once heavily invested, and then take the median (*MEDIAN* = once held large shares of three other listed companies) and upper quartile (P_{75} = once held large shares of at least four other listed companies) as the classification standard for "institutional investors with rich large holding experience." Second, we tighten the classification standard. More specifically, we rank the listed companies once heavily held by institutions from high to low, and then take the top 5% (P_{95} = once held large shares of at least seven other listed companies) as the classification standard. The results are basically consistent with those discussed above.

5.2. Reclassifying institutional investors by economic laws and regulations

Most studies classify institutional investors by economic laws and regulations and are concerned purely with the study of securities investment funds, although a few studies compare such funds with securities companies or social insurance funds or with securities companies and the QFII scheme, and there are also a few comparing securities investment funds, securities companies, the QFII scheme and trust companies. In extended testing, we investigate the application of governance information on IPO corporations by different institutional investors classified on the basis of economic laws and regulations.

Table 10 presents the results of testing the relationship between the shareholding ratios of institutional investors classified by economic laws and regulations and accounting information quality. Restricted by the law and investment environment, the number of samples in each column differs. Except for securities investment funds and common legal institutions, the holdings of listed companies by other institutional investors are limited. The test results are as follows. (1) According to the two principal component variables of corporate governance (*GOV_CTN1*, *GOV_DUM1*), the shareholdings of securities investment funds, social insurance funds, trust companies and QFII firms are all significantly positively correlated with the corporate governance variables. In contrast, the positive relationship between those variables and the shareholding of common legal institutions is relatively weak, probably because the trading strategies of such institutions are stable and they keep in close contact with IPO companies. The shareholding of insurance companies is negatively correlated with the corporate governance variables, probably because these companies often have business affiliations with the target companies. (2) From the cross terms of the two principal component variables of corporate governance with the bull-bear cycle (*GOV_CTN1*BULL*, *GOV_DUM1*BULL*), it can be seen that the relationship between institutional investors' shareholding and the corporate governance variables is not negatively affected

Table 10
Effects of corporate governance on institutional investors of different economic natures when they make large investment decisions on IPO stocks.

Dependent variables	LOF		General corporate		Insurance company		Social security fund		Trust company		QFII	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GOV_CTNI	0.014**	0.017**	0.002	0.002	-0.002	-0.002	0.002***	0.003**	0.004*	0.002*	0.003**	0.003*
	(2.14)	(2.22)	(1.53)	(1.62)	(-1.48)	(-1.35)	(2.73)	(2.02)	(1.93)	(1.72)	(2.08)	(1.95)
GOV_DUM1	0.020***	0.019***	0.003*	0.003*	-0.001	-0.000	0.004**	0.004**	0.003**	0.003**	0.004*	0.005**
	(3.24)	(2.61)	(1.79)	(1.76)	(-0.58)	(-0.28)	(2.11)	(2.21)	(2.18)	(2.11)	(1.98)	(2.04)
BULL		0.002***		-0.005		0.000		0.001**		0.001**		-0.004
		(3.33)		(-0.42)		(0.76)		(2.28)		(2.13)		(-0.65)
GOV_CTNI*BULL		-0.003		0.002		0.002		-0.001		0.015*		-0.004
		(-1.03)		(1.33)		(0.73)		(-1.12)		(1.67)		(-0.51)
GOV_DUM1*BULL		0.002*		-0.005		0.000		0.002**		0.005		0.006*
		(1.87)		(-0.45)		(0.12)		(2.40)		(0.58)		(1.75)
LN_ASSET	0.022***	0.002	0.014**	0.015**	0.001	0.000	-0.001	-0.001	-0.011***	-0.010***	-0.002	-0.002
	(4.00)	(0.82)	(2.29)	(2.36)	(0.54)	(0.40)	(-1.17)	(-1.07)	(-2.86)	(-2.64)	(-0.48)	(-0.54)
LEV	0.002	-0.001	-0.046	-0.048	-0.005	-0.005	0.006	0.005	0.015	0.012	0.006	0.005
	(0.13)	(-0.068)	(-1.56)	(-1.62)	(-0.79)	(-0.86)	(1.04)	(0.84)	(0.79)	(0.65)	(0.58)	(0.40)
IPO_PE	-0.000	-0.000	-0.002**	-0.002**	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000	0.000
	(-0.54)	(-0.63)	(-2.55)	(-2.55)	(-0.89)	(-0.99)	(-0.53)	(-0.68)	(-0.96)	(-1.02)	(1.68)	(1.53)
PRELISTAGE	0.000	0.000	0.000	0.000	-0.000	-0.000	0.000	0.000	0.000	0.000	-0.001***	-0.001**
	(0.098)	(0.069)	(0.54)	(0.54)	(-0.33)	(-0.35)	(0.55)	(0.54)	(0.67)	(0.60)	(-2.80)	(-2.52)
UW_REPU	-0.023**	-0.023*	0.021	0.020	0.001	0.001	0.001	0.001	-0.020	-0.022	-0.005	-0.005
	(-2.02)	(-1.97)	(1.00)	(0.96)	(0.13)	(0.14)	(0.32)	(0.28)	(-1.34)	(-1.51)	(-0.57)	(-0.57)
VC	-0.005	-0.004	0.026	0.029	0.009**	0.009**	0.002	0.003	0.063***	0.059***	0.015**	0.015**
	(-0.59)	(-0.37)	(1.31)	(1.45)	(2.30)	(2.22)	(0.45)	(0.66)	(4.43)	(4.14)	(2.08)	(2.08)
VC_SHARE	0.001	0.001	-0.001	-0.001	-0.000	-0.000	-0.001**	-0.001**	0.000	-0.000	-0.001*	-0.001*
	(1.24)	(1.02)	(-0.90)	(-0.85)	(-0.80)	(-0.71)	(-2.36)	(-2.45)	(0.20)	(-0.025)	(-1.72)	(-1.80)
TURNOVER	0.001	0.001	-0.020***	-0.021***	-0.001	-0.001	-0.001	-0.001	-0.002	-0.003	0.000	0.000
	(0.44)	(0.38)	(-3.22)	(-3.23)	(-0.57)	(-0.52)	(-0.65)	(-0.77)	(-0.71)	(-0.85)	(0.13)	(0.074)
CONSTANT	-0.073	-0.075	0.098	0.275	0.020	0.023	0.081***	0.065**	0.278***	0.259***	0.072	0.077
	(-1.08)	(-1.08)	(0.72)	(1.50)	(0.89)	(0.92)	(2.51)	(2.34)	(3.24)	(3.06)	(1.54)	(1.55)
IND & LISTEXG	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Observations	1225	1225	1516	1516	240	240	392	392	267	267	169	169
Adj. R^2	0.16	0.16	0.32	0.32	0.40	0.40	0.28	0.28	0.43	0.43	0.61	0.61

by a bull market cycle. The implication is that institutional investors pay close attention to corporate governance information even in the upward phase of a stock index, which is quite consistent with the results in Table 7.

6. Conclusions and implications

An IPO is not only a process that improves a firm's corporate governance level; it is also a process that provides investors with useful information. It is generally believed that a boom in new stock investment possibilities renders it difficult for the market to ascertain the real value of IPO companies, and thus triggers irrational investor behavior. The consequences are reflected in capital investment behavior, with investors often overestimating the initial returns on new stocks. However, there is a great deal of heterogeneity in investor capacity and performance. Do all investors really choose new stocks irrationally? Does mindless investment exist in the IPO market? The theoretical analyses and empirical tests described in this paper are carried out to find answers to these questions.

Our study sample incudes all IPO companies in China that went public between 20 May 2002 and 31 December 2014. We use the PCA method to extract corporate governance characteristics, and compare the use of corporate governance information by diverse investors with large holding experience when they subscribe to new stocks. The empirical results show the following. First, compared with individual investors, institutional investors make greater use of corporate governance information. Second, there are significant variations in the use of such information by institutional investors. Compared with underperforming institutional investors, blue-chip institutional investors make more effective use of corporate governance information. Third, in the up phase of a stock index, the use of such information by both individual investors and underperforming institutional investors declines significantly. However, the bull-bear cycle exerts little influence on the use of corporate governance information by blue-chip institutional investors.

This paper enriches the literature on China's IPO market. The findings help us to better understand the behavioral characteristics of investors in the process of selecting new stocks, and shed light on how to optimize the allocation of social funds in the capital market, both of which are of theoretical and practical significance. The paper can serve as a reference for China's reform of its IPO issuance and supervision system, and provide suggestions for IPO firms seeking long-term development. It can also provide support for investors looking to take advantage of corporate governance information to improve the efficiency of their new stock subscription activities. IPO companies need to be aware of the importance of such information in the capital markets, and improve their governance structures accordingly. To attract more institutional investors with large holdings, thereby supporting their long-term development, these firms need to establish a reasonable board structure, hire an accounting firm with an international reputation, optimize their ownership structure and develop an internal control system. In terms of theory, this study shows the value of focusing on investors with large holdings and investigating the relationship between external behavior and internal decision-making in the new stock subscription process.

Acknowledgments

Appendix A

See Table A1.

Table A1
Distribution of abnormal main fund movements in bull and bear markets.

Shenzhen composite index

Top (Date/Index)	Bottom (Date/Index)	Up phase (Date/Change rate)	Event (Firm)	Down phase (Date/Change rate)	Event (Firm)
Begin	2002/5/20 3041.4	—	—	—	—
2004/4/7 4146.45	2005/12/9 2678.78	688 36.33%	2	611 −35.40%	50
2007/10/17 19203.11	2007/11/29 15189.4	677 616.86%	127	43 −20.90%	12
2008/1/14 18955.5	2008/11/7 5598.21	46 24.79%	14	298 −70.47%	71
2009/7/27 13465.72	2009/9/1 10387.42	262 140.54%	3	36 −22.86%	10
2009/12/10 13763.63	2010/7/2 8945.2	100 32.50%	57	204 −35.01%	183
2010/11/3 13388.37	2011/12/27 8692.38	124 49.67%	101	419 −35.08%	293
2012/5/3 10400.32	2012/12/5 7782.68	128 19.65%	60	216 −25.17%	75
2013/2/6 9884.13	2013/6/25 7045.6	63 27.00%	0	139 −28.72%	0
2013/11/29 8542.608	2014/7/17 7194.744	157 21.25%	1	230 −15.78%	47
2014/12/31 11014.624	End	167 53.09%	35	—	—
Total		—	400	—	741

Shanghai composite index

Top (Date/Index)	Bottom (Date/Index)	Up phase (Date/Change rate)	Event (Firm)	Down phase (Date/Change rate)	Event (Firm)
Begin	2002/5/20 1541.53	—	—	—	—
2004/4/9 1783.01	2005/6/3 998.23	690 15.66%	138	420 −44.01%	46
2007/6/1 4335.96	2007/7/9 3563.54	728 334.36%	25	38 −17.81%	1
2007/10/19 6124.04	2008/10/30 1664.93	102 71.85%	6	377 −72.81%	12
2009/7/31 3454.02	2009/9/30 2712.3	274 107.46%	3	61 −21.47%	2
2009/11/27 3096.26	2010/6/22 2313.1	58 14.16%	2	207 −25.29%	18
2010/11/3 3030.99	2012/1/5 2148.452	134 31.04%	8	764 −33.05%	44
2012/5/4 2452.014	2012/12/6 2029.24	120 14.13%	11	216 −17.24%	15
2013/2/22 2314.16	2013/6/14 2162.04	78 14.04%	0	112 −6.57%	0
2013/12/10 2237.49	2014/3/6 2059.58	179 3.49%	0	86 −7.95%	7
2014/12/31 3234.677	End	300 57.06%	37	—	—
Total		—	230	—	145

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How does auditors' work stress affect audit quality? Empirical evidence from the Chinese stock market

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ABSTRACT

With reference to the Job Demands–Control Model, we empirically examine the effect of auditors' work stress on audit quality using a sample of Chinese A-share listed companies and their signature auditors from 2009 to 2013. The results show that (1) there is generally no pervasive deterioration in audit quality resulting from auditors' work stress; (2) there is a significant negative association between work stress and audit quality in the initial audits of new clients; and (3) the perception of work stress depends on auditors' individual characteristics. Auditors from international audit firms and those in the role of partner respond more strongly to work stress than industry experts. Auditors tend to react more intensively when dealing with state-owned companies. We suggest that audit firms attach more importance to auditors' work stress and rationalize their allocation of audit resources to ensure high audit quality.
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1. Introduction

Work stress has been referred to as an "occupational flu" in this era of the knowledge-driven economy (Lu, 2006). Under the mechanism of market competition, various professionals such as lawyers, doctors and executives all face some degree of work stress, as do auditors, who enjoy the reputation of the economic police. In the US, the Public Company Accounting Oversight Board has expressed concern that audit quality might be compromised due to auditors' workload or time pressure.[1] Auditors in China suffer from pervasive work

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stress resulting from time limits, human resources, liability risks, etc. Work stress peaks in the busy season, from January to February, when auditors' work schedules average more than 10 h per day. It is therefore logical to question (1) whether and how pervasive work stress affects auditors' decision-making and audit quality; and (2) whether auditors' response to work stress supports conflict theory or incentive theory, or both?

Despite its widespread existence in audit practice, academic studies concerning auditors' work stress are rare. The unavailability of large samples and the consequent absence of empirical evidence mean that a majority of studies are based on questionnaire surveys or experimental studies, and there is still no consensus among researchers (Jones et al., 2010; Liu and Zhang, 2008). Fortunately, we have access to the mandatorily disclosed information on Chinese listed companies' signature auditors required by the China Securities Regulatory Commission (CSRC). Therefore, in this paper we empirically examine the effects of auditors' individual work stress on audit quality using large samples of listed companies and their corresponding signature auditors in the Chinese A-share market from 2009 to 2013, following the framework of the Job Demands–Control model proposed by Karasek (1979). We hope that our work will help to clarify the mechanism by which work stress affects audit behavior and the coping system regarding the stress response.

Specifically, the primary originalities and contributions of this paper are as follows: (1) Despite the fact that auditors' work stress is familiar to us in practice, academic studies concerning the issue are seldom addressed. This study helps to fill this gap by offering a logical argument and empirical evidence in the context of the Chinese stock market. (2) Our conclusion, which is more systematic than those in the literature based solely on the analysis of work demands (stressors), is drawn from a comprehensive study of the combined effects of work demands and work control, while taking into account the particular demands of auditing. (3) The paper enriches related studies on auditors' work stress from a psychological perspective by taking into consideration individual differences in perception, thus leading to the finding that responses to work stress vary significantly from person to person.

2. Literature review

Since the early twentieth century, with the development of industrialization and informatization, work stress has become an important issue in the fields of psychology, behavioral science and sociology. There has been widespread discussion regarding the definition of work stress, its influence mechanism and coping strategies, resulting in a series of outstanding academic achievements represented by Stimulation Theory, Response Theory (Selye, 1976) and Interaction Theory (Karasek, 1979), among others. The above studies indicate that individual responses to work stress can affect physical and mental health, work quality and even organizational performance through the stimulus and response system (Janssen, 2001; Lu et al., 2010). However, the effect of work stress on audit quality is seldom addressed in the field of auditing studies.

First, among the diagnoses and experimental studies, Soobaroyen and Chengabroyan (2006) and Agoglia et al. (2010) argue that stress due to work or time budgeting tends to impair audit efficiency and quality. Liu (2008) claims that the time pressure of audit engagements could impede the proper implementation of audit procedures and damage audit quality, according to a survey of a nationwide audit firm. Stress due to time budgeting or deadlines also tends to aggravate auditors' perceived pressure (Margheim et al., 2011). Second, in terms of empirical studies, López and Peters (2012) argue that workloads can damage audit quality at the level of the audit firm. A few scholars focusing on "busyness" (which differs from work stress) find it harmful to audit quality (e.g., Sundgren and Svanström, 2014), while others do not. For example, Goodwin and Wu (2016) suggest that the relationship between auditor busyness and audit quality depends on whether the former is in equilibrium, yet Choo (1986) finds an inverse U-shaped relation between the two. Choo's work is supported by Huang and Bai (2014), who draw a similar conclusion from the results of a questionnaire survey involving several audit firms in China's Nanjing, Suzhou and other regions. However, the universality of that conclusion is still under question given the limited representativeness of the study sample.

In the past 20 years, scholars have begun to consider auditors' work stress. However, the academic results are not fruitful, nor are the findings consistent. What is more, the literature discussing the effects of work stress on audit performance and quality is limited by a lack of reliability and generalizability, because most studies use experimental or survey designs. We are very fortunate that the accessibility of personal information on the auditors of Chinese listed companies, the market competition environment and the centralized auditing of

annual reports in peak season make it possible to carry out a systematic study. Given this, in this paper we provide an in-depth investigation of the topic from an individual perspective to address the shortage of academic research. This paper is expected to contribute to a solution to the practical issues concerning auditors' work stress, and at the same time providing scientific evidence for perfecting the regulatory policies on auditors' behavior.

3. Theoretical analysis and hypothesis development

Combining various interpretations of work stress, we define it as a series of physiological, psychological and behavioral responses due to the continuing effects of one or more stressors on individuals in an organization (Xu, 1999). In terms of auditing, auditors' work stress mainly results from the conflict between limited auditing resources and overwhelming audit workload within a limited time window (López and Peters, 2012).

According to the Job Demands–Control Model proposed by Karasek (1979), which is widely recognized in the fields of psychology and management science, work stress includes two key aspects: job demands and job control. The effect of work stress depends on the interaction between work demands and work control.[2] Work demands refer to difficulty and workload, including the amount of work, time and role conflicts; work control reflects the individual's response to work demands, including coping strategies and relief mechanisms. Previous studies find that work stress is positively related to the intensity of work demands, and negatively associated with work control (Landsbergis, 1988; Fletcher and Jones, 1993); moreover, work control is helpful for improving job satisfaction and job performance (Greenberger et al., 1989; Dwyer and Ganster, 1991). In terms of auditing work, auditors' work demands (stressors) include multiple aspects ranging from time pressure and workload, cost control and performance evaluation to legal risk and responsibility. In view of work demands, an auditor's work control ability (coping strategies) usually includes time planning, allocation of manpower and material resources, adjustment of the audit plan, etc.[3] Then, the joint effect depends on the effectiveness of the auditor's work control over work demands, and the heterogeneity of an auditor's work control ability will lead to different responses. Hence, given the quality control mechanism of an audit firm, how does an auditor's work stress influence the audit behavior and audit quality? To clarify this mechanism, we analyze it from the perspective of time pressure, work load, cost and assessment, in the context of the competitive environment and institutional background of the Chinese audit market.

Time pressure is the main concern. Many studies show that time pressure, including time limitation pressure and time budget pressure, is the main factor affecting auditor behavior (Rhode, 1978; Margheim et al., 2011). First, the CSRC stipulates that all listed companies should disclose their audited financial reports before 30 April, which means that auditors face a clear time limitation pressure because they must finish all of the audit work within the prescribed time and issue a fair audit report. Usually, the auditing process is more complex when the auditee is larger, and auditors will bear a greater workload and take longer to complete the audit, so the time pressure is more obvious. For example, the auditor of PetroChina listed on the Main Board will experience greater time pressure than the auditor of Donghua Energy Ltd., an SME-listed company in the energy industry. Second, according to preliminary data from the past five years, auditors on average sign the financial statements of more than three listed companies a year in the China stock market. The auditors in charge sign the audit reports of more than four companies on average, which means that they face a certain amount of stress from time budgeting. They have to allocate their work hours reasonably according to the features of each auditee. Usually, if an auditor takes a number of clients in a fiscal year, the working time allocated to each client will be less, and he will bear a heavier time budgeting pressure. Under the dual pressures of a prescribed time limit and time budgeting, auditors must take corresponding control measures, including allocating time to all clients and arranging the audit staff, but whether these control measures can work effectively depends on how well the time pressure is controlled. In general, as the time limitation and time budget pressures increase, the auditor's boundary of control is likely to be exceeded, especially in the busy audit season when a number of engagements need to be carried out in parallel. Time pressure is

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[2] In this paper, job demands and work demands and job control and work control are used synonymously.

[3] In general, the work control strategies of an audit firm mainly include organizational support, incentive mechanism, etc., but every auditor uses each of these strategies.

greater, and it becomes difficult to ensure that each client has enough disposable time to implement full audit procedures appropriately, so auditors have to compress time or even cut short audit procedures (Willett and Page, 1996; Soobaroyen and Chengabroyan, 2006), which directly affects the reliability and adequacy of the audit evidence obtained, and thereby affects the efficiency of the audit judgment (Pierce and Sweeney, 2004).

Second, workload and job burnout are discussed. In China, auditing is recognized as a special service performed under high stress, but with low job satisfaction. Generally, in the busy annual audit season, the more engagements an auditor undertakes, the more difficult or complicated the auditing projects, so the greater the workload intensity. In view of the high intensity of the workload, the auditor and his team often implement control measures such as lengthening their working hours, sometimes for several months, which undoubtedly influences the efficiency and effectiveness of auditing work. The possible negative consequences include the unreasonable compression of audit time, and following audit procedures in a parrot-like fashion (Agoglia et al., 2010). More importantly, auditors who experience intense time pressure and bear a high-intensity workload, beyond their capacity and over a long period, will suffer from job burnout.[4] Moreover, the greater the workload pressure, the stronger the sense of job burnout will be. Further, auditors' job burnout can lead to emotional exhaustion, extreme tiredness or even depersonalization (Sweeney and Summers, 2002). The potential consequences of such manifestations include reduced professional skepticism and audit efficiency, such as accepting questionable evidence; less recalculation or re-execution of programs that are time consuming and labor intensive; and a reduction in the necessary analyses, which make it difficult to identify inconsistent fluctuations between the auditee and its industry information or anomalies between the actual and expected data. Hence, there is less likelihood of detecting accounting differences or misstatements and an increased probability of audit failure, finally resulting in reduced audit quality (Margheim et al., 2011).

Third, audit cost and performance appraisal are considered. Although people regard auditors as the "economic police," auditors are responsible for their own profits and losses, and are economic actors with limited rationality. They must, therefore, comply with the "cost-benefit principle," with limitations on the expenditures for each auditee, including manpower and physical resources. It is necessary to match audit quality with audit fees. In general, under the premise of the given audit resources of an audit firm, the more complex and difficult the audit projects, the more clients there are, and the greater the resource constraints and cost control pressure. In the busy audit season, the cost control pressure on auditors conflicts with the quality control requirements of the audit firm. This is especially true when there is intense audit market competition, and performance appraisal systems tend to be based on the time budget. In short, this kind of conflict increases the potential for unethical behavior, such as spending less time on audits or even violating auditing standards, thus increasing the probability of audit failure (Liu, 2008).

Fourth, auditors are subject to legal risks and responsibilities. Given the changing economic environment, industry globalization, increasingly complicated business transactions and financial accounting, auditors are facing growing difficulties in their work. However, public investors tend to place increasing expectations on auditors due to contract objectives, decision making and risk aversion (Schipper and Vincent, 2003). In addition, with the gradual improvements in audit laws and regulations, the legal risks and responsibilities of audit firms and auditors for failing to carry out proper auditing are become increasingly explicit. In contrast, improvements in audit knowledge and technological innovations are relatively slow, resulting in unbalanced development and an increasing gap between investors' expectations and auditors' ability. This gap further intensifies auditors' stress and escalates the effects of stress on auditing behavior and quality.

In summary, individual work stress is created by the combined effects of time pressure, workload, cost control, performance appraisal, legal risks and responsibilities. This stress, along with the resulting job burnout, influences auditors' psychological activities and behavioral decisions, which in turn affect audit efficiency and quality. Usually, the greater the stress, the greater the observed effects; however, consistent with Incentive Theory, it is possible that the effects of stress on audit quality might be limited or even beneficial when there are effective work controls on work demands (McClenahan et al., 2007). Nevertheless, the relationship between

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[4] Job burnout is a comprehensive set of symptoms including individual emotional exhaustion, the disintegration of personality and low personal accomplishment.

work stress and audit quality remains an empirical question that is yet to be tested. Thus, we propose the following hypothesis:

H1. Auditors' work stress affects audit quality.

Next, we consider whether the relationship between auditors' work stress and audit quality is subject to other factors due to the distinctiveness of auditing work. Audit tenure may be one such factor. Specifically, to evaluate the audit risk during the initial audit of a new client, the auditor must gain a comprehensive understanding of the client's operating characteristics, accounting policies, industry development and other information. In this case, the auditor needs to invest more initial audit costs in the new client, including working hours, human and material resources and so on. The more clients an auditor is responsible for, the greater the total workload and the fewer working hours and audit resources he will able to spend on each client, especially new clients. This is how the direct conflict between work demand and work control is created. Moreover, the more intense the conflict, the greater the work stress and its negative effects are likely to be, and the greater the negative consequences on the audit performance, the provision of sufficient evidence and the efficiency of the audit judgment. Correspondingly, in non-initial audits for continuing clients,[5] given a certain total workload and stress, the effectiveness of work controls on work demands tends to improve with subsequent audits, and the accumulation of experience and knowledge acquired through the familiarity with and mastery of specific client and industry information. The improvement in effectiveness then mitigates the negative effects of work stress on audit quality. This analysis leads to the second hypothesis:

H2. The influence of auditors' work stress on audit quality is mainly observed in the initial audit engagement of a new client.

4. Research design

4.1. Sample and data

Our sample comprises A-share companies listed on the Shanghai and Shenzhen stock markets from 2009 to 2013. Financial data for these companies are derived from the CSMAR database, and each auditor's personal information is manually collated and corrected according to company annual reports and information system of the CICPA. Consistent with former studies, we remove (1) companies in the finance industry; (2) companies with missing financial data for the previous year, with initial public offerings or with less than 15 industry-year observations in the calculation of discretionary accruals; and (3) companies with missing data on the signature auditor. Additionally, we winsorize the continuous variables in the intervals 0–1% and 99–100%. The final sample includes 9639 firm-year observations.

4.2. Variables and model

4.2.1. Variable definitions

(1) Auditors' work stress (*WS*). Work stress is measured by the number of listed companies audited by an auditor, taking into consideration both the number of companies and the business complexity of each company. Therefore, we estimate work stress by the following equation:

$$WS = \frac{\sum_{i=1}^{m}\sum_{j=1}^{n} TAij}{m} \tag{a1}$$

where for listed company *j* audited by auditor *i*, TA_{ij} refers to the natural logarithm of total assets; *n* is the total number of listed companies audited by auditor *i* in the fiscal year; and *m* is the number of signature auditors of specific company *j*. In the majority of cases, there are two auditors in charge of audit-

ing a company's annual report ($m = 2$), although in a few cases there are three ($m = 3$, accounting for about 1.75%). *WS* reflects the average work stress borne by the two or three signature auditors of a specific company.

(2) Audit quality. Audit quality is measured by the absolute value of discretionary accruals (*DA*) using the *Modified Jones Model*. In addition, we use audit failure as a substitute variable in the robustness tests.
(3) Initial audit. The initial audit is defined as the first audit of a company and the signing of the corresponding annual reports: *FST* equals 1 for new clients, and 0 otherwise (see Table 1).

4.3. Model design

(1) Test of Hypothesis 1
We establish model 1 to test the influence of auditors' work stress on audit quality.

$$|DA| = \alpha_0 + \alpha_1 WS + \sum \beta_i Company\_chara_i + \sum \lambda_j Auditfirm\_chara_j + \sum \mu_k Auditor\_chara_k$$
$$+ \sum \phi_l year_l + \sum \varphi_m ind_m + \varepsilon \tag{1}$$

$|DA|$ refers to the absolute value of discretionary accruals, as a proxy of audit quality. *WS* refers to auditors' work stress, which is expected to be positive. We take three determinants of audit quality into consideration: company characteristics (*Company_chara*), audit firm characteristics (*Auditfirm_chara*) and auditor characteristics (*Auditor_chara*), drawing on the experience of Xue et al. (2012), Gul et al. (2013), among others.

Table 1
Variable definitions.

Category	Variable	Symbol	Definition
Explained variable	Audit quality	*|DA|*	The absolute value of discretionary accruals
Explanatory	Work stress	*WS*	Formula (a1)
variables	Initial audit	*FST*	Initial audit equals 1; 0 otherwise
Company_chara	Financial situation	*debt*	Asset-liability ratio
	Size	*size*	The natural logarithm of total assets
	Cash flow	*cf*	Net cash flow of operating activities per share
	Special treatment	*st*	Special treatment equals 1; 0 otherwise
	Litigation risk	*risk*	Pending litigation risk equals 1; 0 otherwise
	Earnings	*loss*	Net profit is negative equals 1; 0 otherwise
	Inventory ratio	*inv*	Total inventory/operation revenue
	Accounts receivable	*rec*	Accounts receivable/operation revenue
	Company value	*tq*	Market value/replacement cost
	Company governance	*spv*	Size of the board of supervisors
	Age of company	*age*	Age of company
Auditfirm_chara	Audit firm size	*big*	Equals 1 for Big-4 audit firm; 0 otherwise
	Audit firm tenure	*ften*	The cumulative audit years of audit firm
	Audit firm change	*chg*	Equals 1 if the audit firm has changed; 0 otherwise
	Audit firm Transformation	*trs*	Equals 1 if the audit firm changes to a limited liability partnership; 0 otherwise
Auditor_chara	Gender	*gen*	Equals 1 if at least one female auditor, 0 otherwise
	Qualification	*deg*	Equals 1 if more than one auditor has a master's degree; 0 otherwise
	Experience	*epr*	The average number of signatures for listed companies of the auditor in previous years
	Client dependence	*imp*	Average of a specific client/all client assets
Fixed Effect	Year, Industry	*year*, *ind*	Dummy variables

Table 2
Descriptive statistics.

	N	Mean	Median	Min	Max	Std
|DA|	9639	0.074	0.049	0.001	0.523	0.085
WS	9639	67.312	60.151	20.411	191.865	35.909
FST	9639	0.145	0	0	1	0.352
debt	9639	0.466	0.469	0.046	1.161	0.233
size	9639	21.823	21.660	19.192	25.765	1.281
cf	9639	0.348	0.257	−2.192	3.485	0.797
st	9639	0.048	0	0	1	0.213
risk	9639	0.133	0	0	1	0.339
loss	9639	0.093	0	0	1	0.291
inv	9639	0.433	0.193	0	5.397	0.813
rec	9639	0.187	0.128	0.0004	1.002	0.196
tq	9639	1.894	1.503	0.594	7.935	1.243
spv	9639	0.426	0.375	0.200	0.833	0.129
age	9639	13.617	13	1	35	5.094
big	9639	0.057	0	0	1	0.232
ften	9639	6.049	4	1	21	4.832
chg	9639	0.067	0	0	1	0.251
trs	9639	0.530	1	0	1	0.499
gen	9639	0.496	0	0	1	0.500
deg	9639	0.216	0	0	1	0.412
epr	9639	16.279	11.5	0	117.5	15.235
imp	9639	0.528	0.548	0.134	1	0.235

(2) Test of Hypothesis 2

We establish model 2 to test the influence of auditors' work stress on audit quality with different audit tenures.

$$|DA| = \alpha_0 + \alpha_1 WS + \alpha_2 FST + \alpha_3 WS * FST + \sum \beta_i Company\_chara_i + \sum \lambda_j Auditfirm\_chara_j$$
$$+ \sum \mu_k Auditor\_chara_k + \sum \phi_l year_l + \sum \varphi_m ind_m + \varepsilon \qquad (2)$$

$WS * FST$ refers to the interaction term between WS and FST, which is expected to be positive. To test hypothesis H2, the analysis is divided into two steps. First, we conduct a regression test on model 1 grouped by initial audit (FST equals 1 or 0), and second, we include the interaction term ($WS * FST$) and conduct another regression test on model 2.

5. Empirical results and analysis

5.1. Descriptive statistics and correlation analysis

Tables 2 and 3 report the descriptive statistics and correlation analyses.[6] Table 2 shows that there is substantial variation in WS, making it suitable for analyzing work stress reactions at the individual level. In terms of the composition of audit clients, new clients account for about 14.5%. Table 3 shows that the correlation between WS and $|DA|$ is insignificant in the full sample. After distinguishing by audit tenure, the correlation between WS and $|DA|$ is significantly positive at the 5% level in the initial audit, while it is insignificant in the non-initial audit. Moreover, the correlation between $WS * FST$ and $|DA|$ is significantly

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[6] We also test whether there is a u-shaped relationship between work stress and audit quality. The results show that the Pearson coefficient of $|DA|$ and WS squared is not significant, and the univariate and multivariate analyses show that the regression coefficient of WS squared is not significant. Moreover, the robustness test using alternative measurements of work stress and audit quality does not support a u-shaped relationship.

Table 3
Pearson correlations.

Pearson	WS			WS $*$ FST
	ALL	FST $= 1$	FST $= 0$	
$|DA|$	−0.001	0.061[**]	−0.007	0.075[***]

Notes: Because of the limited space, this table only lists the correlation coefficients of the main variables.
[*] $p < 0.1$.
[**] $p < 0.05$.
[***] $p < 0.01$.

positive. This indicates that the effect of auditors' work stress on audit quality is more obvious in the initial audits of new clients, which is yet to be further tested.

5.2. Multivariate analysis

5.2.1. Preliminary test of the full sample

Table 4 reports the regression results of the full sample. The results of model 1 show that when audit quality is measured by $|DA|$, the coefficient of WS is positive but not significant, suggesting that work stress does not impair audit quality overall in the Chinese audit market. Therefore, the finding that auditors' work stress is controlled fails to support H1. However, this does not mean that auditors' work stress has no effect, as we still need to consider the particular details of audit work.

5.2.2. Considering audit tenure

Considering audit tenure, first, the result of model (1) shows that the coefficient of WS is significantly positive at the 1% level in the initial audits of new customers (FST $= 1$), but decreases and is non-significant in non-initial audits (FST $= 0$). Moreover, the results of the Chow test show a significant difference between these two groups. Second, when the interaction term (WS $*$ FST) is included in model (2), the coefficient of WS $*$ FST is significantly positive at the 5% level. These results show that signature auditors have different work stress reactions with different audit tenures. The effect of work stress on audit quality is mainly indicated in the initial audit, reflecting a negative reaction, which supports H2. In other words, in the initial audits of new clients, the conflict between work demands and work control exerts a negative effect on audit efficiency and audit quality due to unclear business features, accounting methods and industry information. This evidence supports the Conflict Theory. However, in the non-initial audit stage, the effects of learning by doing, which occur with the accumulation of audit experience and the acquisition of relevant knowledge, can enhance the signature auditor's work control capability and ease the negative effect of work stress.

Among the control variables, some coefficients of *size* and *cf* are significantly negative, while other coefficients of *debt*, *st* and *risk* are significantly positive, indicating that earnings quality is better in larger companies that have better cash flow. This result is consistent with previous studies (Xue et al., 2012). In addition, the significantly negative coefficient of *deg* suggests that highly educated auditors help to ensure a high quality audit.

6. Further analysis

6.1. Perception of work stress varies from person to person

Audit work has a distinct people-oriented characteristic, which means that auditors' perceptions of work stress and their reactions are likely to vary from person to person. Individuals differ in their ability to cope with the same level of work stress. Different auditors adopt different coping strategies with varying degrees of effectiveness, which eventually leads to work stress having different effects on audit quality. Previous studies also indicate that individual heterogeneity is an important factor affecting audit quality. There are two main factors that influence auditors' perceptions of stress: individual heterogeneities, such as the auditor's role,

Table 4
Multivariate regression.

	Model (1)	Model (1) group test		Model (2)
		$FST = 1$	$FST = 0$	
WS	0.004(1.32)	0.021***(2.84)	0.001(0.45)	0.001(0.26)
Chow Test			0.020***(0.000)	
FST				0.004(0.06)
WS * FST				0.026**(2.47)
Debt	0.041***(3.85)	0.036*(1.84)	0.043***(4.26)	0.042***(3.92)
Size	−0.006***(−2.84)	−0.005(−0.78)	−0.006***(−3.43)	−0.006***(−2.61)
Cf	−0.013***(−3.13)	−0.021***(−3.58)	−0.012***(−2.81)	−0.013***(−3.15)
st	0.020***(3.94)	0.034*(1.87)	0.016***(2.80)	0.020***(3.93)
risk	0.006**(2.49)	0.007(0.70)	0.005***(2.70)	0.006**(2.52)
loss	0.006(1.63)	0.009(0.58)	0.005(1.57)	0.006(1.52)
inv	0.003(0.58)	0.004(0.35)	0.002(0.56)	0.003(0.58)
rec	−0.0005(−0.06)	0.005(0.38)	−0.002(−0.22)	−0.0004(−0.06)
tq	0.006***(3.77)	0.002(1.09)	0.007***(4.48)	0.007***(4.31)
spv	−0.006(−0.59)	−0.015(−0.54)	−0.003(−0.44)	−0.006(−0.55)
age	0.0002*(1.73)	0.0001(0.06)	0.0003(1.38)	0.0003*(1.95)
big	−0.0002(−0.04)	−0.002(−0.19)	−0.001(−0.11)	−0.001(−0.13)
ften	−0.001**(−2.24)	−0.002(−1.49)	−0.0004(−1.42)	−0.0004*(−1.86)
chg	0.008*(1.88)	−0.003(−0.24)	−0.005(−1.30)	−0.001(−0.09)
trs	−0.002(−0.85)	−0.008**(−2.31)	−0.0005(−0.16)	−0.002(−0.84)
gen	−0.002(−1.20)	−0.007**(−2.03)	−0.002(−0.73)	−0.002(−1.14)
deg	−0.005***(−3.20)	−0.006*(−1.86)	−0.006***(−3.20)	−0.006***(−3.21)
epr	−0.000(−0.45)	−0.0002(−1.18)	0.0001(0.77)	0.000(0.31)
imp	0.002(0.41)	0.008(0.87)	0.005(0.77)	0.003(0.62)
year, ind	Controlled	Controlled	Controlled	Controlled
adj R^2	0.079	0.097	0.076	0.079
F	18.61***	4.14***	15.99***	18.35***
N	9639	1396	8243	9639

Notes:
(1) For ease of understanding, the coefficients of the explanatory variables *WS* and *WS * FST* are multiplied by 100; the rest are unchanged.
(2) The Chow test results outside the brackets refer to the difference between the coefficients of the two groups and the significance level, and the *P* values are inside the brackets.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

industry expertise, gender and age; and audit firm heterogeneities, such as the efficiency of quality control mechanisms, support mechanisms and mechanisms for sharing legal responsibility.

6.1.1. The role of signature auditors

In China, the annual financial reports of listed companies should be audited and signed by at least two auditors to clarify the legal responsibility, which means that the different roles of signature auditors determine different legal responsibilities. Specifically, partner auditors have responsibility for the residual control and income of the audit firm and thus bear more legal responsibilities than non-partners. In particular, after a partnership is transformed into a limited liability partnership, the legal responsibilities of the partners increase significantly. Therefore, it is possible that the different legal responsibilities of partners and non-partners may lead to differences in their reactions to stress.

For this purpose, we partition the full sample into two groups: partners (PART equals 1) and non-partners (PART equals 0).[7] As shown in Panel A of Table 5, when PART equals 0, the regression coefficient of work stress (*WS*) is 0.016 and significant at the 5% level in the initial audit engagement of a new client. When PART

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[7] If all signature auditors are partners, we define it as a partners' group, and otherwise as a non-partners' group. We test the sample of non-initial audits (old clients), but do not draw any evidential conclusions.

Table 5
Further tests.

Panel A: Further test 6.1			
(1) Role	$PART = 0$	$PART = 1$	ALL_1
WS	0.016**(2.02)	0.061***(3.77)	0.015**(2.15)
Chow test		0.045*(0.051)	
PART			−0.019(−1.20)
$WS * PART$			0.033**(2.44)
(2) Industry experts	$EXPT = 0$	$EXPT = 1$	ALL_1
WS	0.025***(2.93)	−0.013(−0.51)	0.025***(2.71)
Chow test		0.038(0.588)	
EXPT			0.004(0.32)
$WS * EXPT$			−0.016**(−2.00)
(3) Gender	$GEN = 0$	$GEN = 1$	ALL_1
WS	0.025*(1.80)	0.018**(2.03)	0.024***(2.80)
Chow test		0.007(0.181)	
GEN			−0.002(−0.33)
$WS * GEN$			−0.008(−0.74)
(4) Age	$OLD = 0$	$OLD = 1$	ALL_1
WS	0.017*(1.72)	0.019*(1.71)	0.022(1.63)
Chow test		0.002(0.271)	
OLD			0.001(0.16)
$WS * OLD$			−0.001(−0.06)
(5) Audit firms	$BIG = 0$	$BIG = 1$	ALL_1
WS	0.019**(2.38)	0.148***(2.82)	0.021***(2.73)
Chow test		0.129(0.901)	
BIG			−0.005(−0.18)
$WS * BIG$			0.008(0.11)
Panel B: Further test 6.2			
(1) SOE	$State = 0$	$State = 1$	ALL_1
WS	0.016*(1.68)	0.047**(2.09)	0.017*(1.93)
Chow test		0.031(0.283)	
State			−0.027***(−6.34)
$WS * State$			0.013(0.99)
(2) Central enterprises	$Cent = 0$	$Cent = 1$	ALL_1
WS	0.015**(2.26)	0.103***(2.98)	0.018**(2.37)
Chow test		0.088**(0.045)	
Cent			−0.025***(−3.20)
$WS * Cent$			0.035*(1.84)
Panel C: Further test 6.3			
Direction of discretionary accruals		$|DA^+|$	$|DA^-|$
WS		0.022**(2.26)	0.001(0.10)
Chow test			0.021***(0.000)

Notes:
(1) ALL_1 refers to the initial audit sample.
  * $p < 0.1$.
 ** $p < 0.05$.
*** $p < 0.01$.

equals 1, the regression coefficient of *WS* increases to 0.061 and significant at the 1% level, and the Chow test shows that there is a significant difference between the two groups. In addition, the coefficient of the $WS * PART$ interaction is significantly positive at the 5% level. These results comprehensively indicate that partner auditors have a stronger response to stress than non-partners. The reasonable explanation for this phenomenon is that partners of audit firms bear relatively more legal responsibilities and are more conscious

of their brand reputation. Although we do not deny that this can urge partners to ensure the quality of audit, it also leads to greater work stress in response to the same workload, which increases work stress indirectly.

6.1.2. Industry expertise

Industry expertise is behind the saying, "Able men are always busy": the most able auditors can be deemed industry experts. Compared with non-experts, does the advantage of experience in the client's industry ease the stress reaction in the initial audit of a new client?

For this purpose, we partition the full sample into two groups: industry experts (EXPT equals 1) and non-experts (EXPT equals 0).[8] Panel A of Table 5 shows that the coefficient of WS is 0.025 and significant at the 1% level in the group of non-experts (EXPT equals 0), while WS is insignificant in the group of industry experts (EXPT equals 1). The Chow test shows that there is no significant difference between these two groups, but the coefficient of $WS * EXPT$ is significantly negative. This shows that the effect of industry experts cannot completely eliminate, but does partially alleviate, the negative effects of auditors' work stress on audit quality.

6.1.3. The gender of signature auditors

In daily life, males and females have different physiological and psychological responses to stress, and thus their perceptions and reactions to work stress are different. Therefore, we examine whether the effects of auditors' work stress differ between males and females. We define a group that includes at least one female auditor as a female group (GEN equals 1), and otherwise as non-female (GEN equals 0).[9] Panel A of Table 5 shows that the coefficients of WS in the non-female group are larger than in the other, but the difference is not significant. This indicates that there is no significant correlation between an auditor's gender and the effect of work stress.

6.1.4. The age of signature auditors

People of different ages may have different perceptions of and reactions to work stress. In terms of audit work, younger auditors are usually able to withstand greater work intensity such as increased working hours. However, older auditors have richer experience that may help to ease the perception of work stress. Therefore, we examine whether work stress is influenced by auditors' age. We partition the full sample into two groups: an old (OLD equals 1) and a non-old group (OLD equals 0).[10] The results in Table 5 show that there is no significant difference between the two groups, which means that the effect of work stress on audit quality is not influenced by the auditor's age.

6.1.5. Audit firm characteristics

The audit service provided by an auditor clearly relies on the audit firm, so the audit firm's mechanisms for restraining auditors' professional behavior are likely to affect perceptions of and reactions to work stress. Specifically, the audit quality control mechanism and the work support mechanism for auditors, such as the allocation of audit resources and peer review mechanism, differ depending on the scale and type of audit firm. These factors together constitute the behavior constraint mechanism, which affects auditors' psychological perception. In short, the heterogeneous characteristics of different audit firms can also affect the perception and reaction of work stress. Fortunately, the Chinese audit market provides a natural condition, namely the co-existence of local and Big 4 audit firms. As the quality control mechanism, staff support and restraint mechanisms of these two kinds of firms are different, is there any difference in work stress response?

We partition the full sample into two groups: local firms (BIG equals 0) and Big 4 firms (BIG equals 1). Table 5 shows that compared with local audit firms, the auditors of Big 4 firms have a more obvious stress

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[8] If at least one of the signature auditors has audited more than five companies belonging to the same industry within in the previous year, we define it as an expert group, and otherwise as a non-expert group. In the sample of initial audits (new clients), the accumulated number of companies audited within the previous year is 1.8 on average, which is lower than the mean value of 4.8 in the full sample. Similar to the study by Xue (2012), we use the definition standard of the top 20% and top 20 in the industrial market, and we finally obtain consistent conclusions.

[9] In addition, if all signature auditors are female we define the group as female, and otherwise as non-female; we find no significant difference between these two groups.

[10] If the average age of the signature auditor is greater than the mean value of 44.19, then the group is classified as old, and otherwise as non-old.

response, but the difference between the two groups is not significant. This lack of difference may be due to the joint effect of two forces: on the one hand, compared to local audit firms, Big 4 firms usually provide better work support and incentive mechanisms for auditors, which can ease work stress; on the other hand, perhaps more importantly, the need for Big 4 firms to protect their strong brand reputation and reduce risk imposes more rigid service requirements and stricter restrictions, which may enhance the auditor's perception of and reaction to work stress.

6.2. Property nature of audit clients

Listed companies in the Chinese security market can be divided into state-owned companies and non-state-owned companies according to their property. In terms of state-owned companies, central holding companies and local government holding companies coexist, which are characteristics of the Chinese security market. In particular, the central holding companies have to be audited by both a public audit firm and the Chinese National Audit Office. Therefore, is there any difference in the perception of and response to work stress for the two types of companies?

Based on this characteristic of the Chinese security market, we conduct further analysis. In Panel B of Table 5, we divide the full sample into state-owned companies (State equals 1) and non-state-owned companies (State equals 0). The results show that the reaction to work stress is more obvious in the sub-sample of state-owned companies, but this difference is not significant. We then divide the full sample into central holding companies (Cent equals 1) and local government holding companies (Cent equals 0), and the results show that the reaction to work stress is more obvious in the sub-sample of central holding companies, and the Chow test shows that the difference is significant. The coefficient of $WS * Cent$ is also significantly positive. These results show that government audits increase auditors' work stress and negative reactions, but unfortunately government audits do not enhance the quality of independent audits.

6.3. Direction of discretionary accruals

We divide the full sample into two sub-samples by distinguishing between positive discretionary accruals ($|DA+|$) and negative discretionary accruals ($|DA-|$). The regression results listed in Panel C of Table 5 show that the coefficient of WS is significantly positive in the positive ($|DA+|$) but not in the negative discretionary accruals ($|DA-|$) sub-group. This difference between the two sub-samples is significant, indicating that the negative reaction to work stress is mainly embodied in tolerating the positive discretionary accruals of initial audit clients.

7. Robustness tests

To strengthen the reliability of the results, we perform the following robustness tests.

7.1. Endogeneity test

In exploring the relationship between auditors' work stress and audit quality, there may be a problem with client-auditor self-selection; that is, auditors with a heavy workload and high stress may exercise less discretion in selecting clients. They may be more likely to accept clients with poor quality accounting information, which leads to lower audit quality. To alleviate this problem, we adopt the propensity score matching method. First, we calculate the median of auditors' work stress by sub industry and sub year, and judge the intensity of work stress accordingly. We classify those with stress levels higher than the median as the treated group, and the rest as the control group. Then, we use the nearest neighbor matching method to perform tests. The results listed in Table 6 show that the T value is 2.00 before and 1.68 after the nearest neighbor matching, suggesting that there is a significant positive correlation between WS and $|DA|$ in the initial audits of new clients.[11]

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[11] Other empirical results, which are not shown in Table 6 due to limited space, indicate that the T values are 1.68 and 1.79 using the radius matching method and kernel matching method, respectively, which are consistent with the above. In addition, we use the above methods to test the full sample, and obtain consistent conclusions.

Table 6
Robustness tests.

Variable	Sample	Treated	Control	Diff.	S.E.	T-stat
Panel A: Robustness test 7.1						
|DA|	Pre-matching	0.095	0.084	0.011	0.006	2.00
	Post-matching	0.095	0.061	0.034	0.020	1.68

	Model (1)	Model (1) group testing		Model (2)
		$FST = 1$	$FST = 0$	
Panel B: Robustness test 7.2				
WS''	0.001(0.31)	$0.013^{***}(3.56)$	$-0.002(-0.59)$	$-0.003(-1.03)$
Chow test			$0.015^{***}(0.000)$	
FST				$0.011^{**}(2.27)$
$WS'' * FST$				$0.028^{***}(2.93)$
	Model (1)	Model (1) group testing		Model (2)
		$FST = 1$	$FST = 0$	
Panel C: Robustness test 7.2				
WS''	0.002(0.68)	$0.012^{***}(3.53)$	$-0.001(-0.40)$	$-0.001(-0.25)$
Chow test			$0.013^{***}(0.000)$	
FST				0.172(1.54)
$WS'' * FST$				$0.012^{***}(3.66)$

Notes: AF is the only explanatory variable; the coefficient of WS'' listed in Table 6 is not enlarged 100 times.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

7.2. Alternative measurement of auditors' work stress

There is an occupational characteristic of audit work: the longer an auditor works, the more his qualifications and abilities increase, as well as the number of clients. In Fig. 1, the horizontal axis represents the accumulated working years of auditors before the observation year, and the vertical axis represents auditors' business workload (the mean value of the sum of the natural logarithm of the audit client's assets). To rule out the possible effect of auditors' qualifications or abilities on the measurement of auditors' work stress, we adopt the following specific methods. First, according to the number of working years (*Years*) accumulated before the observation year, we divide the auditors into eight grades (*N*) with 3-year intervals[12]; second, we calculate the annual average workload of various grades of auditors ($V_{\_N}$); and third, we define WS'' as the measurement of work stress in the regression analysis, where WS'' is equal to *WS* minus $V_{\_N}$.

The results in Table 6 show that the coefficients of WS'' and $WS'' * FST$ are significantly positive, which means that auditors' work stress has a significantly negative effect on audit quality only in the initial audits of new clients. Furthermore, considering auditors' individual characteristics, empirical results that are not shown due to the limited space indicate that the stress reaction of partner auditors is more pronounced, but industry experts can partially alleviate the reaction. However, the stress reaction has no significant association with the gender or age of signature auditors.

7.3. Alternative measurement of audit quality

Following previous studies (Xie and Yan, 2014), audit failure (AF) is adopted as an alternative measurement of audit quality.[13] Table 6 shows that the coefficient of WS'' is significantly positive only in the sample of

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[12] The maximum and minimum numbers of *Years* are 0 and 20; *Years* = 0 is defined as the first year (*N* equals 1); *Years* = (1–3) is defined as the second year (*N* equals 2); *Years* > 18 is defined as the eighth year (*N* equals 8).
[13] If the signature auditors issue a company with a clean opinion, but a financial restatement occurs after the disclosure of the annual financial report, AF equals 1, and 0 otherwise. The sample of firms with financial restatements is sorted manually from financial statement footnotes and restatements.
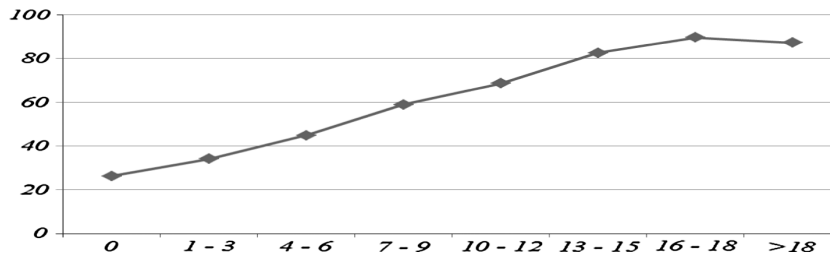
Figure 1. Diagram of auditors' working years and workload.

initial audits of new clients, and the coefficient of $WS'' * FST$ is significantly positive. In addition, according to the signature auditors' individual characteristics including their role, industry expertise, sex and age, the results (which are not shown due to limited space) are in accordance with the above.

8. Conclusions

Work stress can affect work quality and organizational performance. The auditing industry is a people-oriented industry and the work stress of auditors cannot be neglected. However, the literature on auditors' work stress reactions and coping mechanisms is insufficient, as it lacks studies with large samples and empirical evidence. This paper takes advantage of the favorable condition in the Chinese stock market, which requires mandatory disclosure of the signature auditors' personal information. With reference to the Job Demands–Control Model, we empirically examine the effects of auditors' individual work stress on audit quality using a sample of listed companies on the Chinese A-share market and their corresponding signature auditors from 2009 to 2013. The main findings are as follows. (1) In general, there is no pervasive deterioration in audit quality resulting from auditors' work stress that is under control. (2) There is a significant negative association between work stress and audit quality in the initial audits of new clients after setting apart different stages of audit tenure, due to the lack of comprehensive understanding of client and industry information. However, with the learning by doing effect brought about by ongoing auditing, the negative response reaction tends to be reduced. (3) Perceptions of work stress and related responses vary from person to person according to signature auditors' individual characteristics. The results suggest that auditors from international audit firms and those in the role of partner show a more distinct response to work stress while auditors with industry expertise demonstrate a weaker reaction. However, there is no evidence that gender or age affects auditors' stress response. Auditors also tend to be more sensitive and react more intensively when dealing with state owned, especially central government owned, enterprises.

In summary, based on a comprehensive analysis and discussion of the relationship between work pressure and audit quality at the individual level, this paper clarifies the mechanism by which work stress affects audit behavior and the coping system in response to stress. The findings not only make up for the shortage of empirical studies, but also offer a perspective on and evidence from the Chinese stock market. More importantly, our findings provide practical guidance on the standardization of auditors' behavior and the quality management of audit firms. Specifically, to ensure service quality, we recommend that experienced auditors be assigned to new clients because negative responses toward stress are most apparent in initial audits. Second, we favor the exchange of internal experience within audit firms, the ongoing accumulation of client and industry information and the cultivation of industry expertise. Third, we advise auditing regulators and supervising departments to consider the establishment of an upper limit on the number of clients during busy periods, with full consideration of multidimensional factors including the audit firm's features and individual auditors' capabilities. These measures should help to resolve the negative effects of overwhelming work stress on audit quality. We admit that these suggestions may contain certain biases and execution difficulties in audit practice, which concern problems that need prompt resolution, further analysis and practical examination.

Acknowledgments

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