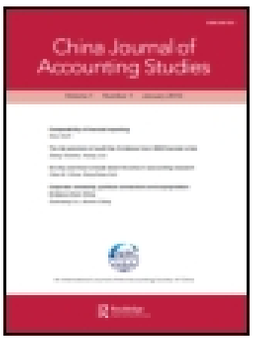

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Mixed-ownership reform and auditor choice: evidence from listed state-owned enterprises

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ABSTRACT

Based on data of state-owned enterprises listed on the Shanghai and Shenzhen Stock Exchanges from 2003 to 2017, this study examines how mixed-ownership reform affects a company's auditor choice from the perspectives of ownership structure and governance. We find that the higher the degree of mixed-ownership reform of state-owned enterprises, the more inclined they are to choose international 'big four' accounting firms as auditors. Further, this effect is more pronounced for firms in high competition industries, in low marketisation regions and with low information transparency. Notably, mixed-ownership reform increases financial constraints of state-owned enterprises. The results of a mediation test suggest that mixed-ownership reform improves the accounting information quality of state-owned enterprises through the choice of auditors. Our study enriches the literature of mixed-ownership reform and auditor choice and provides empirical evidence of the economic consequences of mixed-ownership reform, which is relevant for guiding future state-owned enterprises reform.

KEYWORDS

Mixed-ownership reform; ownership structure; governance; accounting information quality

1. Introduction

Since China's reform and opening up, the reform of state-owned enterprises (SOEs hereafter) has been a topic that attracts much attention in both economic practice and academic research. The reform of SOEs in China has successively experienced the stages of decentralisation and transfer of profits, the substitution of tax payments for profit delivery, and the establishment of a modern corporate system. After the reform and opening up, the economic and social performances of SOEs have increased significantly (Bai et al., 2006). As China's economic development enters a new phase, the importance of mixed-ownership reform among SOEs has been elevated to a new height. For many years, the topic of government intervention – derived from the multiple goals of SOEs and the agency conflict of owner absence – has received extensive scholarly attention (Laffont & Tirole, 1993; Shleifer & Vishny, 1994). As an important solution to the problems of SOEs in the new era, SOE mixed-ownership reform has also become a focus of academic research. Previous literature finds that the mixed-ownership reform of SOEs can help boost economic growth (Z.Y. Xu & Zhang, 2015), improve company performance (Y. Hao & Gong,

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2017), and increase internal control quality (Y.G. Liu et al., 2016). However, some researchers have noted that a simple mix of ownership cannot improve the performance of SOEs (Ma et al., 2015). Thus, it is vital to ensure the legitimate rights of private capital in SOEs, especially the right to nominate and appoint executives (Cai, Liu et al., 2018a).

In mixed-ownership reform, the change to ownership structure and the appointment of executives from non-state-owned shareholders affect the economic behaviour of SOEs. On the one hand, the entry of non-state-owned shareholders can form a more reasonable balance of multiple ownership structures (Y.H Hao & Wang, 2015). Moreover, by participating in corporate governance, non-state-owned shareholders can influence the operating and governance decisions of SOEs to give full play to the monitoring and governance roles of private capital (Cai, Liu et al., 2018a). This forms a monitoring and restraint mechanism with balances and compatible incentives, which helps alleviate the problems of insider control caused by the absence of owners and the regulation failure to realise the governance effect of '1 + 1 > 2' (Ma et al., 2015). On the other hand, with the introduction of non-state-owned capital and the reduction of state ownership, mixed-ownership reform may reduce the resource advantage inherent in state-owned capital to a certain extent, thereby strengthening the financial constraints faced by enterprises (Megginson et al., 2014). When the 'soft budget constraints' of SOEs are weakened to a certain degree, their financing needs will motivate them to adopt corresponding corporate governance mechanisms to reduce information asymmetry with creditors.

Auditing is considered as an important mechanism used to reduce firms' agency costs. Existing research has noted that the higher the agency cost of a firm, the higher the demand for independent auditing (Watts & Zimmerman, 1983). Meanwhile, a company's auditor choice will send signals to investors about the firm value. By selecting high-quality auditors, outside investors can obtain accurate and reliable accounting information, thereby reducing the information asymmetry between the company and investors, which alleviates firms' financial constraints and reduces financing costs (Titman & Trueman, 1986).

This paper examines how mixed-ownership reform affects auditor choice based on data of listed SOEs from 2003 to 2017. To quantify the mixed-ownership reform of listed SOEs from the dimensions of ownership structure and governance, we manually collect data on companies' top ten shareholders, shareholding percentage, and the appointment of directors, supervisors, and executives by shareholders, which are disclosed in annual reports. Our research indicates that, from the perspectives of both ownership structure and governance, the degree of mixed-ownership reform among SOEs is significantly and positively correlated with the probability of choosing international 'big four' accounting firms. Furthermore, this effect is more pronounced for SOEs in high competition industries, in low marketisation regions and with low information transparency. Meanwhile, we observe that the higher the degree of mixed-ownership reform is, the more financial constraints SOEs face. Moreover, our analysis shows that the mixed-ownership reform of SOEs affects companies' accounting information quality via auditor choice.

Compared with the previous literature, the contributions of this article are as follows. First, existing research on the economic consequences of mixed-ownership reform in SOEs has mostly focused on the macroeconomy, operating efficiency, corporate governance, and financial decisions. Moreover, the previous literature has not studied how the

mixed-ownership reform of SOEs affects auditor choice. Therefore, this study enriches the existing literature on the mixed-ownership reform of SOEs. Second, unlike mature markets in developed economies, the institutional background of China – an emerging market in a transitional period – has certain factors that affect the auditor choice of companies. The existing literature has highlighted that SOEs lack demand for high-quality auditors due to the political connection with the government and potential policy burdens (Q. Wang et al., 2008). However, in the context of reduced state ownership among SOEs, strengthened monitoring from non-state-owned shareholders, and weakened resource advantages, how corporate behaviour will be affected is a question to be examined. This article provides answers to this question from the perspective of information intermediary. During the mixed-ownership reform process, SOEs reduce information asymmetry through auditor choice, thereby alleviating agency problems and financial constraints to further realising the transformation of SOEs from government control to marketisation. Therefore, this study enriches the existing literature on auditor choice. Finally, this research also has certain policy implications. Notably, our research finds that the mixed-ownership reform of SOEs has positive consequences in terms of auditor choice, supporting the economic policy of mixed-ownership reform implemented by the Chinese government, and providing relevant information for the further reform of SOEs.

The follow-up structure of the present article is as follows. The second part introduces the institutional background of SOE reform and develops hypothesis based on literature review. The third part outlines the sample, data, research design and model. The fourth part reports the results of the empirical tests. The fifth part is further analysis, examining how the mixed-ownership reform of SOEs affects corporate financial constraints. The sixth part further analyzes how the mixed-ownership reform of SOEs affects accounting information quality through auditor choice. To verify the conclusions, the seventh part introduces several robustness tests. The final part of this article presents the conclusions.

2. Institutional background, literature review, and hypothesis development

2.1. State-owned enterprise reform

SOE reform has always been at the core of China's economic system reform and has constantly been explored and practiced. The rapid development of private enterprises and the relatively low efficiency of SOEs forced SOEs to transform in order to survive (Yang & Yin, 2018). Overall, China's SOE reform has roughly experienced the following four stages.

The first stage (1978 ~ 1992) is the ice-breaking period that involves the preliminary exploration of 'delegating power and transferring profits'. The Third Plenary Session of the Eleventh Central Committee noted that one defect of China's economic system is concentrated power. Thus, it was proposed that local and central SOEs should be given more autonomy in operations and management. SOEs 'delegating power and transferring profits' mainly focused on two aspects: 1) insisting the planned economy while paying full attention to the auxiliary role of the market to adjust the relationship between the state and enterprises; and 2) increasing

enterprises' autonomy and linking corporate performance to employee interests to motivate SOEs and their employees.[1]

The second stage (1993 ~ 2003) is the 'institution innovation' development period. In October 1992, the 14th National Congress of the Communist Party of China highlighted that the goal of China's economic reform is to establish a socialist market economic system, which requires that the speed of economic reform be accelerated through the establishment of this system. In November 1993, the Third Plenary Session of the Fourteenth Central Committee of the Communist Party of China passed the 'Decision of the Central Committee of the Communist Party of China on Several Issues Concerning the Establishment of a Socialist Market Economic System', which proposed that the direction of China's SOE reform should aim to establish a modern corporate system that meets the requirements of a market economy and socialised mass production, with clear property rights, specific rights and responsibilities, separation of government and enterprises, and scientific management. This decision requires that the establishment of a modern corporate system can enable SOEs to become legal persons and market competition entities that make their own operation decisions, take full responsibility for profits and loss, develop themselves, and discipline themselves.

The third stage (2004 ~ 2013) is a period of 'in-depth advancement' dedicated to promoting SOE reform through asset management system reform to realise the preservation and appreciation of state-owned assets, and solve the problem of inefficient management and regulation of the state-owned economy. In November 2002, the Central Committee of the Communist Party of China put forward the major task of deepening the reform of the state-owned system in the report of the 16th National Congress of the Communist Party of China. It clearly required the central and provincial, municipal, and autonomous region governments to establish specialised state-owned asset management institutions. Since then, the Third Plenary Session of the 16th Central Committee also proposed establishing and improving the state-owned asset management and supervision system.

The fourth stage (2014 to present) represents the 'struggling deepening' stage of SOE reform. This stage has involved initiating a pilot programme for the formation of state-owned capital investment and operating companies. Simultaneously, it also involves clarifying a series of implementation measures for mixed-ownership reform, advocating the diversification of equity through the active introduction of various private capital to solve the agency problem of SOEs, enhancing the vitality of the state-owned economy, enlarging the function of state-owned capital, and achieving the goals of maintaining and increasing the value of state-owned assets. Since 2017, the State-owned Assets Supervision and Administration Commission of the State Council has determined four batches of mixed-ownership reform pilot enterprises.

As previously noted, research on the mixed-ownership reform of SOEs has important practical significance. Mixed-ownership reform of SOEs is not only a major subject of China's current economic reforms, but also provides urgent practical research needs

[1]In July 1979, the State Council successively promulgated five documents, including the 'Regulations on Expanding the Operational Autonomy of State-owned Industrial Enterprises'. Through the reform of expanding enterprise autonomy, state-owned enterprises have gained certain production autonomy and have become independent entities. The enthusiasm of enterprises and employees has increased, and the traditional planned economic system has been weakened.

related to micro-enterprises operating in this new phase. In particular, how SOEs transform from government control to marketisation is a common concern for researchers and practitioners.

2.2. Literature review

2.2.1. Mixed-ownership reform

Existing research on the economic consequences of SOE mixed-ownership reform has mainly focused on the following four aspects.

(1) Macroeconomy. Z.Y. Xu and Zhang (2015) finds that the mixed-ownership reform of SOEs can boost economic growth by increasing the marginal output of capital, improving the efficiency of dynamic capital allocation, promoting total factor productivity growth, and exerting external spillover effects on other companies.

(2) Operating Efficiency. H.M. Liu et al. (2018) notes that reducing the proportion of state-owned shareholding among the top five shareholders and increasing the proportion of non-state-owned directors are conducive to improving corporate performance. Y. Hao and Gong (2017) demonstrates that the 'mixed-ownership' structure improves company performance, while the diversification of equity among state-owned capital has no positive impact on company performance. Moreover, an analysis by Ma et al. (2015) shows that a simple mix of equity cannot improve the performance of SOEs. Additionally, H. Zhang et al. (2016) observes that mixed-ownership reform can significantly improve corporate performance by reducing the policy burden of SOEs.

(3) Corporate Governance. Y.G. Liu et al. (2016) highlights that the participation of non-state-owned shareholders in the corporate governance helps to improve the internal control quality of SOEs. Notably, this effect only exists in competitive and local SOEs. Furthermore, Cai, Zheng et al. (2018) notes that the appointment of executives by non-state-owned shareholders is beneficial to improving the executive pay-for-performance sensitivity – a positive effect that is more pronounced in SOEs in competitive industries and low marketisation regions.

(4) Financial Decisions. P. Wang et al. (2015) shows that introducing non-state-owned shareholders who demand a higher return on equity leads to an increase in the cost of capital of SOEs. Moreover, Yang and Yin (2018) finds that the degree of equity integration among SOEs is significantly and positively correlated with the level of cash holdings. Additionally, Lu and Jiang (2018) points out that the degree of SOE mixed-ownership reform is significantly and positively associated with cash dividends, that is, the diversification of shareholder types and ownership structures increases the intensity and willingness of cash dividend distribution by companies.

Additionally, previous studies have also explored factors influencing the mixed-ownership reform of SOEs. For example, Cai, Zheng et al. (2018) finds that the higher the government's willingness to delegate power, the greater the proportion of non-state-owned shareholding and appointed directors, supervisors, and executives by non-state-owned shareholders. S.H. Chen and Lu (2017) shows that SOEs are more likely to transfer equity to private companies when SOE executives have cross-institution connection.

2.2.2. Auditor choice

Watts and Zimmerman (1983) suggests that auditing is an important mechanism to reduce the agency cost of a company. Thus, the higher the agency cost of a firm, the higher the demand for independent auditing. Meanwhile, a company's selection of auditors signals the value to investors. If a company aims to reduce the information asymmetry between investors, it will choose high-quality auditors because such auditors can allow external investors to obtain more accurate and reliable accounting information (Titman & Trueman, 1986). Existing empirical research has primarily examined the influencing factors of corporate auditor choice from the following perspectives.

(1) Ownership Structure. Existing literature suggests an inverted U-shaped relationship between the proportion of major shareholding of listed companies and the selection of high-quality auditors (Zeng & Ye, 2005). Sun and Cao (2004) highlights that the proportion of overseas legal person shareholding and individual shareholding is significantly and positively correlated with the probability of choosing a high-quality auditor. A study by Tang (2011) finds that companies with a greater separation of control rights and cash flow rights are more likely to hire international 'big four' accounting firms to reduce agency costs. Additionally, with an increase in the proportion of qualified foreign institutional investor (QFII) shareholdings, companies are more likely to choose international 'big four' accounting firms (Yi et al., 2016).

(2) Board Characteristics. Existing research has found that when the proportions of female and independent directors are higher, a company is more likely to hire high-quality auditors (Che, 2007; Kuang & Chen, 2011).

(3) Government Intervention. Q. Wang et al. (2008) points out that local SOEs are more inclined to hire local 'small auditors'. An analysis by Lei et al. (2009) shows that listed companies with no political connections are more likely to choose high-quality auditors to convey a signal of good corporate governance to outsiders. Notably, the research of Du and Zhou (2010) also observes the same findings.

Based on the literature review, most existing research on the economic consequences of SOE mixed-ownership reform has focused on the perspectives of macroeconomics, operating efficiency, corporate governance, and financial decisions. To date, no studies have investigated how the mixed-ownership reform of SOEs affects the auditor choice of companies. Previous studies on the auditor choices of Chinese firms have not analysed from the perspective of mixed-ownership reform among SOEs, which is an important economic policy in China and will significantly affect their operation. Therefore, it is of theoretical and practical significance to explore how mixed-ownership reform affects auditor choice.

2.3. Hypothesis development

Berle and Means (1932) notes that the agency problem between shareholders and management under the diverse ownership is an important feature of modern enterprises. For the contract between shareholders and management, Jensen and Meckling (1976) argues that when management's on-the-job consumption, empire-building, and other agency costs result in higher financing costs, the company has a strong incentive to hire high-quality auditors to signal low agency problems. Moreover, in the case of information

asymmetry between shareholders and management, shareholders also have incentives to better monitor a company's management by hiring reputable auditors (Chow, 1982).

However, the aforementioned theories are difficult to apply to SOEs. Vickers and Yarrow (1991) note that private shareholders have incomparable monitoring advantages over public shareholders. Kane (1999) also holds a similar view and points out that both equity dispersion and lack of information will lead to the inefficiency of shareholder monitoring in an SOE. As the major shareholder of SOEs, the government must bear various costs of ownership concentration, such as the inability to avoid the risk of ownership concentration and the pursuit of social benefits. Unlike the shareholders of private enterprises, the government (as a shareholder) also has agency issues that cause multiple agency problems between the government and SOEs. It is difficult to achieve monitoring and there is an obvious owner absence problem in SOEs. Therefore, due to the 'insider control' problem caused by the dominant shareholding and the absence of owners, SOEs have low demand for high-quality auditors.

In the mixed-ownership reform of SOEs, on the one hand, the entry of non-state-owned shareholders can form a more reasonable balance of multiple ownership structures (Y.H Hao & Wang, 2015). On the other hand, non-state-owned shareholders can participate in corporate governance and influence corporate decision-making. Based on the agency theory, non-state-owned shareholders pursue the maximisation of their own interests, have a strong motivation to monitor the behaviour of company management, and to solve the absence of owners issue in SOEs to a certain extent while improving the corporate governance of SOEs. Accounting information plays a critical role in the contract between non-state-owned shareholders and management. To achieve monitoring, non-state-owned shareholders need to use accounting information to evaluate management performance; however, management has an incentive to manipulate accounting information. Therefore, non-state-owned shareholders are motivated to hire reputable auditors to better monitor management.

Additionally, within the context of Chinese special institutions, SOEs have typical 'half-enterprise and half-government' characteristics, which makes them subject to multiple social and economic goals; thus, they simultaneously bear policy burdens and catch-up strategic tasks (Lin & Tan, 1999). State-owned banks will give SOEs more preferential treatment when making credit decisions, and SOEs also receive financial support from the government. Furthermore, since the problem of unemployment caused by the bankruptcy of SOEs harms social stability, the government has an incentive to bail out when SOEs are in financial difficulties to prevent these enterprises from going bankrupt. Therefore, these inherent political connections and multiple goals provide SOEs with advantages in financing, government subsidies, and tax relief (Yang & Yin, 2018). Thus, SOEs do not have strong incentives to hire high-quality auditors to resolve agency conflicts between shareholders and creditors.

With the introduction of non-state-owned capital and the reduction of state-owned shareholding in mixed-ownership reform, the policy burden of SOEs will decrease, which will reduce the resource advantages associated with state-owned capital to a certain extent and strengthen the financial constraints faced by enterprises (Megginson et al., 2014). Therefore, external financing needs may increase after the mixed-ownership reform of SOEs. At this point, the agency conflict between shareholders and creditors

will intensify. To solve the aforementioned agency problems, SOEs are more likely to hire high-quality auditors.

Based on the analysis of non-state-owned shareholder monitoring and the external financing needs of SOEs after mixed-ownership reform, we propose research Hypothesis 1.

Hypothesis 1: The higher the degree of SOE mixed-ownership reform is, the more likely SOEs are to hire high-quality auditors.

Notably, the impact of mixed-ownership reform on SOEs' auditor choice may be affected by additional factors. First, the incentive of non-state-owned shareholders to participate in the governance of SOEs is affected by industry competition. SOEs in monopolistic industries rely on government regulation to obtain massive monopoly rents. The purpose of non-state-owned shareholders to invest in monopolistic SOEs is more likely to be sharing monopoly benefits. Since the massive 'monopoly profits' have met the expectations of non-state-owned shareholders, their motivation to monitor the SOE executives will weaken (Y.G. Liu et al., 2016). For highly competitive industries, it is less difficult for non-state-owned shareholders to enter such enterprises, and it is also easier for them to participate in corporate governance and influence corporate decision-making (Cai, Liu et al., 2018a). Meanwhile, SOEs in highly competitive industries face higher industry competition pressure. Non-state-owned shareholders are more strongly motivated to hire high-quality auditors to monitor management to cope with higher industry competition pressure. Moreover, from the perspective of external financing needs, even if the mixed-ownership reform of SOEs increases external financial constraints to a certain extent, SOEs in monopolistic industries have a weaker incentive to reduce information asymmetry with creditors by hiring high-quality auditors due to the existence of monopoly profits. However, due to greater competitive pressure, highly competitive industries are more strongly motivated to hire high-quality auditors to reduce information asymmetry with creditors and ease financial constraints. Based on the theoretical analysis, we propose Hypothesis 2.

Hypothesis 2: Compared with low-competition industries, the impact of SOE mixed-ownership reform on auditor choice is more significant in high-competition industries.

Second, the degree of external marketisation will also affect the relationship between SOE mixed-ownership reform and auditor choice. Generally, companies in regions with a higher level of marketisation have better corporate governance; therefore, the interests of non-state-owned shareholders are less likely to be infringed upon. Moreover, the accounting information of enterprises in these areas is more transparent, and it is easier for non-state-owned shareholders to monitor management; thus, there is less demand for hiring high-quality auditors. On the contrary, in regions with low marketisation, investor protection is weaker and the legitimate rights and interests of non-state-owned shareholders are more likely to be invaded by corporate insiders (X.X. Xu & Liu, 2013). Moreover, the managers of companies in these areas may be more likely to manipulate accounting earnings; thus, non-state-owned shareholders are more strongly motivated to hire high-quality auditors to monitor the management to protect their rights and interests.

Therefore, in regions with a low degree of marketisation, non-state-owned shareholders have stronger incentives to encourage SOEs to hire high-quality auditors to strengthen monitoring. Existing studies have also shown that high-quality external audits play a strong role in corporate governance. Especially when the external legal environment is not sound or enforcement is flawed, external audits can partially replace the role of the legal system (Fan & Wong, 2005). Additionally, in terms of external financing needs in regions with low marketisation, legal protection is weaker and the interests of creditors are more difficult to be protected. Therefore, SOEs undergoing mixed-ownership reform in these regions are more inclined to reduce information asymmetry with creditors by hiring high-quality auditors, thereby alleviating financial constraints. Based on the aforementioned analysis, we propose Hypothesis 3.

Hypothesis 3: Compared with regions with high marketisation, the influence of SOE mixed-ownership reform on auditor choice is more pronounced in regions with low marketisation.

When a company's information transparency is high, non-state-owned shareholders can better obtain company information to more easily evaluate and judge the behaviour of management. In this case, non-state-owned shareholders have a lower demand for high-quality external auditors. When the transparency of a company's information is low, non-state-owned shareholders face difficulty in conducting effective monitoring on management; thus, they are more strongly motivated to use high-quality external auditors to monitor the company's management. Moreover, for companies with high information transparency, creditors can use the information disclosed by the company to assess the company's solvency and make credit decisions. At this point, the demand for attestation from high-quality external auditors by creditors is relatively weak. However, if the company's information transparency is low, it is difficult for creditors to evaluate the company's operating conditions and the agency conflict between creditors and management is aggravated. At this point, high-quality external auditors are required to reduce the agency costs between creditors and management. Based on the aforementioned theoretical analysis, we propose Hypothesis 4.

Hypothesis 4: Compared with companies with high information transparency, the impact of SOE mixed-ownership reform on auditor choice is more significant among companies with low information transparency.

3. Research design

3.1. Sample and data

Since 2003, China has entered a critical period for the development of mixed-ownership reform among SOEs (Yang & Yin, 2018). SOEs have gradually begun to implement mixed-ownership reform with the listing opportunities. Notably, mixed-ownership reform in China has already been developed to a large extent. Moreover, since 2003, the disclosure

of information on the ultimate controlling shareholder of listed companies has gradually improved. Therefore, this paper finally selects 2003–2017 as the sample period. Since this study examines dynamic changes in SOE ownership structure, we use SOEs in 2003 as the initial sample. On this basis, we screen the sample according to the following criteria: (1) Excluding samples in the financial industry; (2) Excluding IPO and ST samples; and (3) Excluding samples with missing data. Ultimately, we obtain a total of 10,481 firm-year observations.

Basic data on the ownership structure dimension of SOEs undergoing mixed-ownership reform is derived from the top ten shareholders disclosed in each company's annual report. We collect companies' periodic reports, official websites, the JRJ website,[2] and other data to determine the nature and shareholding ratio of the top ten shareholders of each company. Basic data on corporate governance of SOEs undergoing mixed-ownership reform is derived from annual reports that disclose the information of directors, supervisors, and executives and the resumes of them. We hand collect the data and manually determine the status of non-state-owned shareholders' appointments of directors, supervisors, and executives. Other financial data are obtained from the CSMAR and WIND databases. To mitigate the effect of potential outliers, we winsorise all continuous variables at both the upper and lower 1 percentile.

3.2. Variable definitions and research model

3.2.1. Measures of mixed-ownership reform

Following prior studies (Y. Hao & Gong, 2017; Ma et al., 2015; La Porta et al., 1999; Yang & Yin, 2018), we divide shareholders into the following categories: 1) State-owned shareholders, which include shareholders of government departments such as the State-owned Assets Administration Bureau or government-controlled industrial companies and investment management companies; 2) Natural person or family shareholders, which are shareholders of domestic persons or families; 3) Foreign shareholders, which include shareholders of enterprises established overseas, foreign-invested enterprises, or foreign persons; 4) Private enterprise shareholders, which are shareholders of domestic private enterprises; 5) Institutional investors, which are shareholders of institutions engaged in securities investment in the capital market, such as funds, insurance companies, and security companies; and 6) Other shareholders in addition to the five aforementioned types, which specifically include research institutes, education institutions, and other non-profit institutions.

Following C.M. Chen and Sun (2008) and Lu and Jiang (2018), after dividing SOE shareholders into six categories, we construct the mixed-ownership reform variable *Mix_share*, which is equal to 1 minus the square of the shareholding ratio of different shareholders. The larger the value of *Mix_share*, the higher the degree of SOE mixed-ownership reform.

On the other hand, following Cai, Zheng et al. (2018), this paper also measures the mixed-ownership reform of SOEs from the governance dimension (*Mix_gov*) as the proportion of directors, supervisors, and executives appointed by non-state-owned

[2]http://www.jrj.com.cn/

shareholders. The larger the value of *Mix_gov*, the higher the degree of SOE mixed-ownership reform.[3]

3.2.2. Dependent and control variables

Following previous literature, the international 'big four' accounting firms are often used as a measure of high audit quality (Khurana & Raman, 2004). This is because large audit firms are more strongly motivated to maintain their reputation and have more stringent audit quality assurance systems; therefore, they can provide higher audit quality (DeAngelo, 1981; Qi et al., 2004). As a result, we use international 'big four' accounting firms (*Big4*) as a measure of high-quality auditors.

Following prior literature (Du & Tan, 2016; Du & Zhou, 2010; Q. Wang et al., 2008), the following control variables are selected for the analysis: company characteristic variables such as firm size (*Size*), leverage (*Lev*), current ratio (*CR*), inventory ratio (*Inv*), receivable ratio (*Rec*), sales growth (*Growth*), return on total assets (*ROA*), top shareholding (*First*), the duality of chairman and CEO (*Dual*), independent director ratio (*Ind*), equity issue (*Issue*), and dual-listing (*AB*). Additionally, the regression also controls for industry (*Industry*) and year (*Year*) fixed effects. To eliminate the influence of the company clustering effect, the research clusters standard errors at the firm level and adjusts for robust standard error. See Table 1 for detailed definitions of the variables used in the regression.

3.3. Regression model

The following logistic model is constructed to test Hypothesis 1 and we split the sample into subsamples based on industry competition, marketisation index, and information transparency to test Hypotheses 2, 3, and 4.

$$Big4_{i,t} = \beta_0 + \beta_1 Mix_{i,t} + \gamma Controls_{i,t} + \sum Industry + \sum Year + \varepsilon_i \quad (1)$$

The dependent variable *Big4* denotes whether the company hires international 'big four' accounting firms. The independent variable *Mix* denotes the ownership dimension (*Mix_share*) and the governance dimension (*Mix_gov*) of SOE mixed-ownership reform. The control variables are described in Section 3.2.2.

4. Empirical results

4.1. Summary statistics

Table 2 provides summary statistics for the main variables. The average value of *Big4* is 9%, indicating that the proportion of companies audited by international 'big four' accounting firms is 9% in the sample of listed SOEs, which is consistent with the fact that listed companies in China have insufficient demand for high-quality auditors. One of the explanatory variables, the ownership structure dimension of SOE mixed-ownership

[3]Specifically, we hand collect the resumes of directors, supervisors and executives and their positions in the shareholder companies, which are disclosed in the annual reports. Among them, if the shareholder is a natural person, the natural person serving as a director, supervisor, or executive in the listed company is considered the natural person shareholder appointing a director, supervisor, or executive. If the shareholder is a legal company, the criterion is the director, supervisor, or executive of the listed company holding a position in the shareholder company.

Table 1. Variable definition.

Variable	Definition
Dependent variables	
Big4	High quality auditor dummy, takes the value of one if the company hires international 'big four' accounting firms and zero otherwise.
Independent variables	
Mix_share	Ownership structure dimensional measure of mixed ownership reform, defined as 1 minus the square of shareholding ratio of different types of shareholders.
Mix_gov	Governance dimensional measure of mixed ownership reform, defined as the proportion of directors, supervisors and executives appointed by non-state-owned shareholders.
Other variables	
HHI	Herfindahl Index, calculated as summing the squares of the market shares of all firms in an industry.
MKI	Marketisation index, derived from "China Marketisation Index" compiled by X.L. Wang et al. (2016).
Tran	Information transparency, based on the opposite number of the absolute value of the company's discretionary accruals in the past three years and the annual stock turnover rate, the samples are respectively divided into 10 groups, each assigned a value of 1–10. The higher the transparency, the higher the value assigned, the two assigned values are then added and divided by two.
Size	Firm size, defined as the natural logarithm of the firm's total assets.
Lev	Leverage, defined as the firm's total liabilities divided by total assets.
CR	Current ratio, defined as current assets divided by current liability.
Inv	Inventory ratio, defined as inventory divided by total assets.
Rec	Receivable ratio, defined as accounts receivable divided by total assets.
Growth	Sales growth, defined as the annual growth of the firm's sales.
ROA	Return on assets, defined as the firm's net income divided by total assets.
First	Top shareholding, defined as the proportion of shares held by the firm's largest shareholder.
Dual	Duality of chairman and CEO dummy, defined as a dummy variable equal to one if the chairman and the CEO of a firm are the same person, and zero otherwise.
Ind	Independent director ratio, defined as the number of a firm's independent directors divided by total board directors.
Issue	Equity issue dummy, takes the value of one if the company issues equity in the following year and zero otherwise.
AB	Dual listing dummy, takes the value of one if the company has issued A shares and B shares simultaneously and zero otherwise.
Industry	Industry dummy, industries are based on the CSRC's one-digit industry code for non-manufacturing firms and two-digit industry code for manufacturing firms.
Year	Year dummy, set dummy variable for the year corresponding to the observation.

Table 2. Summary statistics.

Variables	Obs	Mean	Median	S.D.	Min	Max
Big4	10,481	0.09	0.00	0.28	0.00	1.00
Mix_share	10,481	0.26	0.23	0.17	0.02	0.65
Mix_gov	10,481	0.01	0.00	0.05	0.00	0.29
HHI	10,481	0.07	0.05	0.10	0.02	0.82
MKI	10,481	7.38	7.34	1.85	2.94	11.39
Tran	10,481	5.38	5.50	2.03	1.00	10.00
Size	10,481	22.06	21.92	1.30	19.18	25.71
Lev	10,481	0.53	0.54	0.20	0.08	1.14
CR	10,481	1.48	1.21	1.13	0.19	7.47
Inv	10,481	0.17	0.14	0.16	0.00	0.75
Rec	10,481	0.09	0.06	0.10	0.00	0.45
Growth	10,481	0.20	0.11	0.54	−0.68	3.81
ROA	10,481	0.03	0.03	0.06	−0.26	0.19
First	10,481	0.39	0.38	0.16	0.11	0.76
Dual	10,481	0.10	0.00	0.30	0.00	1.00
Ind	10,481	0.36	0.33	0.05	0.22	0.56
Issue	10,481	0.09	0.00	0.30	0.00	1.00
AB	10,481	0.08	0.00	0.27	0.00	1.00

reform (*Mix_share*) has a mean value of 0.26. For the governance dimension of SOE mixed-ownership reform, the average value of *Mix_gov* is 1%, indicating that the proportion of directors, supervisors and executives appointed by non-state-owned shareholders is relatively low; however, there are large differences between sample firms. The average Herfindahl index of sample firm industry sales is 0.07, the average value of the regional marketisation index is 7.38, and the average value of information transparency variable *Tran* is 5.38. The average value of *Size* is 22.06 and the average return on assets is 3%. On average, the companies' leverage ratio reaches 53%, while the average current ratio is 1.48, and the average inventory accounts for 17% of the total assets. Furthermore, the average ratio of accounts receivable to total assets is 0.09, while the average annual sales growth rate of the sample firms is 20%. Additionally, the average value of top shareholding variable *First* is 39%, indicating that the 'large controlling shareholding' phenomenon remains pervasive among SOEs. Companies with the duality of chairman and CEO account for 10% of sample firms, while the average ratio of independent directors is 36%. Overall, 9% of companies issue equity securities in the following year and the proportion of dual-listing companies is 8%.

Table 3 reports the differences in SOE mixed-ownership reform for regions with different marketisation indexes and industries with different competition levels. The results of T test show that the ownership structure dimension of the mixed-ownership reform variable *Mix_share* is significantly higher in low marketisation regions, indicating that the degree of SOE mixed-ownership reform is higher in low marketisation regions from the perspective of ownership structure. The results of comparing industries with different competition levels show that the two-dimensional variables of mixed-ownership reform are both significantly larger in high competition industries. This suggests that when industry competition is higher, SOE ownership structure tends to be more diversified and the participation in governance by non-state-owned shareholders is higher.

4.2. Correlation matrix

Table 4 presents the correlation of variables. It is shown that the ownership structure variable (*Mix_share*) of mixed-ownership reform is significantly and positively correlated with auditor choice (*Big4*), which provides a preliminary confirmation of hypothesis 1.

Table 3. Differences of mixed-ownership reform in regions with different marketisation index and in industries with different competition levels.

Panel A Differences of mixed ownership reform in regions with different marketisation index						
Variables	Low marketisation region		High marketisation region		Difference in mean values	t-value
	N	Mean	N	Mean		
Mix_share	5,196	0.27	5,285	0.26	0.01**	2.57
Mix_gov	5,196	0.01	5,285	0.01	0.00	1.29
Panel B Differences of mixed ownership reform in industries with different competition levels						
Variables	Low competition industry		High competition industry		Difference in mean values	t-value
	N	Mean	N	Mean		
Mix_share	4,593	0.25	5,888	0.27	−0.02***	−5.48
Mix_gov	4,593	0.01	5,888	0.02	−0.01***	−3.06

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 4. Correlation matrix.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)Big4	1.000[a]														
(2)Mix_share	0.053[a]	1.000[a]													
(3)Mix_gov	−0.016	0.135[a]	1.000[a]												
(4)Size	0.327[a]	0.024[b]	−0.069[a]	1.000[a]											
(5)Lev	−0.035	0.034[a]	0.004	0.214[a]	1.000[a]										
(6)CR	−0.028[a]	−0.006	0.030[a]	−0.155[a]	−0.613[a]	1.000[a]									
(7)Inv	−0.043[a]	0.026[a]	0.050[a]	0.048[a]	0.207[a]	0.129[a]	1.000[a]								
(8)Rec	−0.077[a]	−0.026[a]	−0.002	−0.229[a]	0.084[a]	−0.001	−0.050[a]	1.000[a]							
(9)Growth	0.002	0.004	0.045[a]	0.052[a]	0.039[a]	−0.006	0.052[a]	0.012	1.000[a]						
(10)ROA	0.124[a]	0.046[a]	−0.007	0.166[a]	−0.398[a]	0.220[a]	−0.012	−0.130[a]	0.195[a]	1.000[a]					
(11)First	0.121[a]	−0.510[a]	−0.083[a]	0.190[a]	−0.071[a]	−0.002	−0.007	−0.021[b]	0.070[a]	0.127[a]	1.000[a]				
(12)Dual	−0.040[a]	0.096[a]	0.101[a]	−0.048[a]	0.022[b]	0.006	0.052[a]	0.012	−0.003	−0.004	−0.088[a]	1.000[a]			
(13)Ind	0.017	0.067[a]	0.013	0.147[a]	0.038[a]	0.001	0.047[a]	−0.071[a]	−0.003	0.006	−0.038[a]	0.051[a]	1.000[a]		
(14)Issue	−0.002	0.014	0.019	0.040[a]	0.096[a]	−0.062[a]	0.012	0.011	0.031[a]	0.003	−0.014	0.014	0.042[a]	1.000[a]	
(15)AB	0.215[a]	−0.023[b]	−0.030[a]	0.032[a]	0.011	−0.011	0.000	−0.024[b]	−0.019	0.015	−0.002	−0.016	0.000	−0.009	1.000[a]

Superscripts a, b denote significance at the 1%, 5% levels, respectively.

Table 5. Mixed ownership reform and auditor choice.

	Big4	
Variables	(1)	(2)
Mix_share	2.468***	
	(3.18)	
Mix_gov		4.034**
		(2.00)
Size	1.234***	1.320***
	(10.39)	(11.27)
Lev	−3.003***	−2.993***
	(−3.68)	(−3.62)
CR	−0.192	−0.206*
	(−1.62)	(−1.75)
Inv	−1.568*	−1.456
	(−1.69)	(−1.54)
Rec	2.855***	2.998***
	(2.70)	(2.79)
Growth	−0.239***	−0.266***
	(−2.61)	(−3.02)
ROA	3.819*	5.073**
	(1.86)	(2.38)
First	1.882**	0.176
	(2.21)	(0.24)
Dual	−0.440	−0.399
	(−1.44)	(−1.31)
Ind	−2.203	−1.784
	(−1.22)	(−0.98)
Issue	0.047	0.031
	(0.32)	(0.21)
AB	2.036***	1.980***
	(6.51)	(6.35)
Constant	−42.571***	−43.551***
	(−16.21)	(−17.72)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	10,481	10,481
R^2	0.329	0.329

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

Second, firm size (*Size*), return on total assets (*ROA*), top shareholding (*First*), and dual listing (*AB*) are significantly and positively correlated with auditor choice (*Big4*). Simultaneously, current ratio (*CR*), inventory ratio (*Inv*), receivable ratio (*Rec*), and the duality of chairman and CEO (*Dual*) are significantly and negatively correlated with auditor choice (*Big4*). The relationship between the control variables and auditor choice is basically consistent with existing literature. Additionally, the correlation coefficients between the control variables are small, indicating that the regression model does not have a serious multicollinearity problem.

4.3. Regression results

4.3.1. Mixed-ownership reform and auditor choice

Table 5 reports the test results of Hypothesis 1. The explanatory variables in columns (1) and (2) are the ownership structure dimension (*Mix_share*) and governance dimension (*Mix_gov*) of mixed-ownership reform, respectively. Column (1) shows that the regression

coefficient of *Mix_share* is 2.468, which is significant at the 1% level. This result indicates that, in the dimension of ownership structure, the higher the degree of SOE mixed-ownership reform, the more likely SOEs are to hire international 'big four' accounting firms. Column (2) shows that the regression coefficient of the *Mix_gov* variable is 4.034, which is significant at the 5% level, further confirming the positive impact of SOE mixed-ownership reform on auditor choice in the governance dimension. These regression results support Hypothesis 1, that is, the higher the degree of SOE mixed-ownership reform, the more likely SOEs are to hire high-quality auditor.

Among the control variables, the regression coefficients of *Size* and *ROA*, are both significantly positive, indicating that the larger the size of the enterprise and the higher the return on total assets, more inclined they are to hire international 'big four' accounting firms. The regression results for the variables *Lev, CR*, and *Inv* show that companies with higher leverage, higher current ratios, and higher inventory ratios are less likely to choose international 'big four' accounting firms. The coefficient of dual listing dummy *AB* is significantly positive implying that dual listing firms are more likely to hire international 'big four' accounting firms. A company's receivable ratio is positively correlated with the choice to hire international 'big four' accounting firm while company growth is negatively correlated with the choice of international 'big four' accounting firms. Finally, the shareholding of the largest shareholder is positively correlated with the appointment of international 'big four' accounting firms.

4.3.2. Mixed-ownership reform, industry competition, and auditor choice

Table 6 reports the results for Hypothesis 2. For this analysis, we divide our sample into subsamples based on the competition levels in the companies' industries. Columns (1) and (2) employ the ownership structure dimension variable *Mix_share*, while columns (3) and (4) use the governance dimension variable *Mix_gov*. The regression results indicate that in the high-competition industry subsample, the regression coefficients of the variables *Mix_share* and *Mix_gov* are 2.781 and 5.852, respectively, which are significant at the 1% and 5% levels. However, in the low-competition industry subsample, the regression coefficients of the variables *Mix_share* and *Mix_gov* are not significant. Moreover, the F test results for the coefficient difference between two subsamples are significant. The regression results indicate that mixed-ownership reform has a more significant effect on auditor choice for SOEs in high competition industries in terms of the ownership structure and governance dimensions, thus supporting Hypothesis 2.

4.3.3. Mixed-ownership reform, marketisation, and auditor choice

Table 7 reports the results for Hypothesis 3. For this analysis, we divide our sample into subsamples based on the degree of marketisation in the province where the listed company is located. Regression results for the ownership structure dimension of mixed-ownership reform (columns (1) and (2)) indicate that *Mix_share* is significant for companies in low marketisation regions, but not for companies in high marketisation regions. Furthermore, the regressions of the governance dimension variable *Mix_gov* (columns (3) and (4)) also show similar results. These regression results suggest that in regions with low marketisation, the mixed-ownership reform of SOEs has a stronger effect on auditor choice, thus supporting Hypothesis 3.

Table 6. Mixed-ownership reform, industry competition and auditor choice.

	Big4			
Variables	(1) High competition industry	(2) Low competition industry	(3) High competition industry	(4) Low competition industry
Mix_share	2.781***	1.853		
	(2.92)	(1.60)		
Mix_gov			5.852**	−1.277
			(2.37)	(−0.44)
Size	1.367***	1.204***	1.494***	1.263***
	(8.33)	(7.67)	(9.30)	(8.34)
Lev	−2.605**	−3.386***	−2.801**	−3.273***
	(−2.23)	(−3.25)	(−2.30)	(−3.10)
CR	−0.283	−0.157	−0.331	−0.159
	(−1.48)	(−1.14)	(−1.62)	(−1.18)
Inv	−1.499	−2.517*	−1.182	−2.524*
	(−1.39)	(−1.90)	(−1.05)	(−1.92)
Rec	2.309*	4.676***	2.354*	4.995***
	(1.66)	(3.05)	(1.75)	(3.21)
Growth	−0.144	−0.414***	−0.183	−0.427***
	(−1.23)	(−2.64)	(−1.53)	(−2.81)
ROA	6.126*	0.700	7.639**	1.411
	(1.84)	(0.38)	(2.28)	(0.73)
First	1.564	1.492	−0.541	0.316
	(1.43)	(1.32)	(−0.58)	(0.33)
Dual	−0.592	−0.175	−0.541	−0.104
	(−1.50)	(−0.48)	(−1.30)	(−0.31)
Ind	−1.635	−3.311	−0.966	−3.131
	(−0.67)	(−1.43)	(−0.39)	(−1.35)
Issue	0.127	−0.084	0.057	−0.058
	(0.69)	(−0.34)	(0.29)	(−0.24)
AB	2.181***	2.044***	2.142***	1.969***
	(4.82)	(5.03)	(4.83)	(4.74)
Constant	−31.554***	−42.015***	−32.588***	−40.898***
	(−8.23)	(−11.93)	(−8.89)	(−12.47)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Obs	5,888	4,593	5,888	4,593
R^2	0.354	0.354	0.354	0.354
chi2(1)		3.49		16.87
Prob>chi2		0.0618		0.0000

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

4.3.4. Mixed-ownership reform, information transparency, and auditor choice

Table 8 reports the results of Hypothesis 4. For this analysis, we divide our sample into subsamples based on information transparency. The results in columns (1) and (2) of Table 8 show that the coefficient of *Mix_share* is only significant in subsamples with low information transparency. The results in columns (3) and (4) indicate that the variable *Mix_gov* is only significant in the subsample with low information transparency. Moreover, the F test results of the coefficient difference between the aforementioned results are also significant. The regression results suggest that in SOEs with low information transparency, mixed-ownership reform has a more significant impact on auditor choice, thus supporting Hypothesis 4.

5. Further analysis: financial constraints

We further examine the impact of mixed-ownership reform on the financial constraints of SOEs. Specifically, we construct the following regression model:

Table 7. Mixed ownership reform, marketisation and auditor choice.

	Big4			
Variables	(1)low marketisation	(2)high marketisation	(3)low marketisation	(4)high marketisation
Mix_share	2.037***	0.523		
	(3.67)	(1.08)		
Mix_gov			7.122***	0.308
			(2.95)	(0.10)
Size	0.502***	0.750***	1.163***	1.400***
	(6.06)	(9.59)	(6.84)	(9.13)
Lev	−1.731***	−1.133**	−3.862***	−2.097*
	(−2.91)	(−2.07)	(−2.71)	(−1.88)
CR	−0.117	−0.037	−0.338	−0.101
	(−0.98)	(−0.54)	(−1.14)	(−0.78)
Inv	0.105	−1.258**	0.140	−2.182*
	(0.18)	(−2.22)	(0.11)	(−1.89)
Rec	−0.434	1.840***	−0.541	3.571***
	(−0.40)	(2.81)	(−0.22)	(2.82)
Growth	0.024	−0.235***	0.002	−0.412***
	(0.34)	(−3.97)	(0.01)	(−3.58)
ROA	0.233	2.717**	4.840	6.116**
	(0.16)	(2.16)	(1.27)	(2.35)
First	0.111	0.923*	−2.439**	1.046
	(0.19)	(1.74)	(−2.40)	(1.18)
Dual	−0.422*	−0.208	−0.891	−0.424
	(−1.66)	(−1.08)	(−1.49)	(−1.05)
Ind	0.899	−2.013*	2.451	−3.787
	(0.64)	(−1.71)	(0.84)	(−1.60)
Issue	−0.058	0.059	−0.244	0.124
	(−0.39)	(0.65)	(−0.80)	(0.69)
AB	1.141***	1.091***	2.176***	1.905***
	(3.46)	(5.62)	(3.60)	(5.16)
Constant	−16.204***	−20.198***	−39.350***	−41.856***
	(−8.43)	(−11.64)	(−10.37)	(−12.55)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Obs	5,196	5,285	5,196	5,285
R^2	0.355	0.355	0.355	0.355
chi2(1)	17.00		12.2	
Prob>chi2	0.0000		0.0005	

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

$$KZ_{it} = \beta_0 + \beta_1 Mix_{it} + \gamma Controls_{it} + \sum Industry + \sum Year + \varepsilon_{it} \quad (2)$$

Following Li and Li (2017), we use the KZ index to measure corporate financial constraints. The KZ index is calculated following Kaplan and Zingales (1997). The larger the value of the index, the higher the degree of financial constraints faced by a company. The independent variable *Mix* denotes the ownership dimension (*Mix_share*) and governance dimension (*Mix_gov*) of SOE mixed-ownership reform. Following Wu and Huang (2017), the regression controls for firm size (*Size*), leverage (*Lev*), sales growth (*Growth*), return on total assets (*ROA*), operating cash flow ratio (*OCF*), top shareholding (*First*), the duality of chairman and CEO (*Dual*), independent director ratio (*Ind*), company listing period (*Age*), year (*Year*), and industry (*Industry*) variables.

The regression results of model (2) are presented in Table 9. Column (1) of Table 9 shows that the coefficient of *Mix_share* is 0.155, which is significant at the 5% level. This indicates that, in the ownership structure dimension, the higher the degree of

Table 8. Mixed-ownership reform, information transparency and auditor choice.

	Big4			
Variables	(1)High information transparency	(2)Low information transparency	(3)High information transparency	(4)Low information transparency
Mix_share	0.916	2.966***		
	(1.57)	(8.10)		
Mix_gov			−1.049	5.257***
			(−0.41)	(5.15)
Size	1.301***	1.195***	1.329***	1.291***
	(13.50)	(21.20)	(13.96)	(22.70)
Lev	−0.998	−3.890***	−1.077	−3.824***
	(−1.23)	(−8.47)	(−1.33)	(−8.42)
CR	0.167*	−0.346***	0.160	−0.363***
	(1.65)	(−4.80)	(1.59)	(−5.10)
Inv	−2.016***	−1.468***	−1.962**	−1.370***
	(−2.58)	(−2.99)	(−2.52)	(−2.80)
Rec	3.966***	2.469***	4.009***	2.645***
	(4.30)	(3.81)	(4.34)	(4.13)
Growth	−0.198	−0.245**	−0.201	−0.273***
	(−0.80)	(−2.34)	(−0.80)	(−2.62)
ROA	8.243***	2.526**	8.823***	3.727***
	(3.37)	(2.19)	(3.65)	(3.23)
First	1.347*	1.947***	0.741	−0.153
	(1.92)	(4.54)	(1.28)	(−0.47)
Dual	−0.989**	−0.303	−0.970**	−0.246
	(−2.52)	(−1.57)	(−2.48)	(−1.30)
Ind	0.168	−3.051***	0.250	−2.471**
	(0.10)	(−3.06)	(0.15)	(−2.49)
Issue	0.043	0.078	0.049	0.034
	(0.15)	(0.44)	(0.17)	(0.19)
AB	2.402***	1.941***	2.393***	1.847***
	(11.33)	(14.52)	(11.31)	(14.05)
Constant	−44.603	−40.103	−45.113	−41.883
	(−0.09)	(−0.10)	(−0.08)	(−0.06)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Obs	4,475	6,006	4,475	6,006
R^2	0.321	0.321	0.321	0.321
chi2(1)	7.02		7.14	
Prob>chi2	0.0081		0.0075	

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

SOE mixed-ownership reform, the higher the degree of financial constraints. Column (2) of Table 9 presents that the coefficient of *Mix_gov* is 0.337, which is significant at the 10% level. This result shows the positive correlation between the mixed-ownership reform of SOEs and financial constraints in the governance dimension, which further supports the theoretical analysis of hypothesis.

6. Further analysis: mediation effects

The aforementioned results in section 4.3.1 suggest that mixed-ownership reform increases the probability of SOEs choosing international 'big four' accounting firms. We further analyse how this affects the accounting information quality of SOEs. Specifically, we use a mediation effect test proposed by Wen et al. (2004) to construct the following three models:

Table 9. Mixed-ownership reform and financial constraints.

	KZ	
Variables	(1)	(2)
Mix_share	0.155**	
	(2.47)	
Mix_gov		0.337*
		(1.73)
Size	−0.223***	−0.220***
	(−14.83)	(−14.66)
Lev	3.338***	3.341***
	(45.54)	(45.44)
Growth	−0.108***	−0.109***
	(−4.10)	(−4.16)
ROA	−2.879***	−2.838***
	(−11.35)	(−11.20)
OCF	−0.000	−0.000
	(−1.38)	(−1.32)
First	0.185**	0.096
	(2.31)	(1.35)
Dual	0.012	0.012
	(0.37)	(0.37)
Ind	0.379**	0.397**
	(2.04)	(2.14)
Age	0.008**	0.008**
	(2.04)	(2.00)
Constant	4.423***	4.420***
	(14.45)	(14.33)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	10,481	10,481
R^2	0.647	0.647

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust t-statistics are in parentheses.

$$AQ_{i,t} = \beta_0 + \beta_1 Mix_{i,t} + \gamma Controls_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (3)$$

$$Big4_{i,t} = \beta_0 + \beta_1 Mix_{i,t} + \gamma Controls_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (4)$$

$$AQ_{i,t} = \beta_0 + \beta_1 Mix_{i,t} + \beta_2 Big4_{i,t} + \gamma Controls_{i,t} + \sum Industry + \sum Year + \varepsilon_{i,t} \quad (5)$$

Following the existing literature, we use discretionary accruals (*DA*) and small profits (*SP*) to measure companies' accounting information quality (*AQ*). Following Kothari et al. (2005), this study adopts the performance-matched Jones model to calculate *DA*. Small profit *SP* is a dummy variable that takes the value of 1 if the ratio of the company's net profit to market value is between 0 and 2%; otherwise, its value is 0. *Mix* denotes the ownership dimension (*Mix_share*) and governance dimension (*Mix_gov*) of SOE mixed-ownership reform. *Big4* is the mediator variable between SOE mixed-ownership reform and accounting information quality that takes the value of 1 if the company chooses international 'big four' accounting firms and 0 otherwise. The specification of model (4) is the same as that of model (1). Following prior research (Francis et al., 2005; Luo & Wu, 2018), in model (3) and model (5), we control for firm size (*Size*), leverage (*Lev*), sales growth(*Growth*), return on total assets (*ROA*), audit opinion (*Opinion*), audit fees (*AuditFee*), Tobin'Q (*TobinQ*), independent director ratio (*Ind*), top shareholding (*First*), year *(Year)*, and industry *(Industry)* variables.

Based on the mediation effect test proposed by Wen et al. (2004), the coefficient of *Mix* in model (3) should be examined first. When using *DA* to measure accounting information

Table 10. Mediation effect of mixed-ownership reform and accounting information quality (without mediator variable).

	DA		*SP*	
Variables	(1)	(2)	(3)	(4)
Mix_share	−0.013**		−1.025***	
	(−2.10)		(−4.69)	
Mix_gov		−0.002		−1.046*
		(−0.09)		(−1.78)
Size	−0.003**	−0.003***	−0.467***	−0.489***
	(−2.53)	(−2.76)	(−12.23)	(−12.83)
Lev	0.016**	0.016**	−0.258	−0.296
	(2.43)	(2.34)	(−1.26)	(−1.44)
Growth	0.001	0.001	−0.038	−0.039
	(0.22)	(0.20)	(−0.82)	(−0.84)
ROA	0.471***	0.467***	−3.343***	−3.563***
	(18.27)	(18.19)	(−4.34)	(−4.65)
Opinion	0.005	0.005	−0.967***	−0.977***
	(1.04)	(1.01)	(−5.41)	(−5.36)
AuditFee	−0.001**	−0.001**	−0.003	−0.005
	(−2.07)	(−2.17)	(−0.43)	(−0.70)
TobinQ	−0.003***	−0.003***	0.098***	0.081***
	(−3.07)	(−3.31)	(3.37)	(2.84)
Ind	0.009	0.008	0.329	0.262
	(0.50)	(0.44)	(0.51)	(0.41)
First	−0.030***	−0.022***	−1.035***	−0.445*
	(−3.76)	(−2.88)	(−3.93)	(−1.89)
Constant	0.073***	0.075***	10.374***	10.461***
	(2.99)	(3.01)	(12.50)	(12.58)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Obs	10,481	10,481	10,481	10,481
R^2	0.094	0.094	0.118	0.116

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust t-statistics are in parentheses in column (1) and column (2); robust z-statistics are in parentheses in column (3) and column (4).

quality, the result in column (1) of Table 10 shows that the coefficient of the ownership structure dimension for the mixed-ownership reform variable *Mix_share* is significantly negative. When using *SP* to measure accounting information quality, columns (3) and (4) of Table 10 show that the regression coefficients of the variables *Mix_share* and *Mix_gov* are both significantly negative. These results indicate that the mixed-ownership reform of SOEs improves corporate accounting information quality.

Since the coefficients of *Mix* in model (3) are significant, the next step is to test the coefficient of *Mix* in model (4) and the coefficient of *Big4* in model (5). The regression results of model (4) are shown in Table 5. The coefficients of *Mix_share* and *Mix_gov* are both significant and positive. The regression results of model (5) are shown in Table 11 and the coefficients of *Big4* are all significantly negative. Based on the work of Wen et al. (2004), the next step is to examine the coefficient of *Mix* in model (5). If the coefficient of *Mix* is not significant, a complete mediation effect is assumed; however, if the coefficient of *Mix* is significant, a partial mediation effect is assumed. The results in columns (1) and (3) of Table 11 show that the coefficients of *Mix_share* are significant. This indicates a partial mediation effect, which suggests that SOE mixed-ownership reform improves

Table 11. Mediation effect of mixed-ownership reform and accounting information quality (with mediator variable).

Variables	*DA*		*SP*	
	(1)	(2)	(3)	(4)
Mix_share	−0.012*		−0.973***	
	(−1.83)		(−4.40)	
Mix_gov		0.000		−0.938
		(0.01)		(−1.62)
Big4	−0.011**	−0.012***	−0.637***	−0.666***
	(−2.53)	(−2.65)	(−3.82)	(−3.95)
size	−0.002	−0.002*	−0.428***	−0.446***
	(−1.56)	(−1.71)	(−10.87)	(−11.29)
Lev	0.015**	0.014**	−0.307	−0.347*
	(2.23)	(2.14)	(−1.50)	(−1.69)
Growth	0.000	0.000	−0.046	−0.048
	(0.15)	(0.13)	(−1.01)	(−1.05)
ROA	0.471***	0.468***	−3.304***	−3.515***
	(18.37)	(18.33)	(−4.29)	(−4.59)
Opinion	0.006	0.006	−0.935***	−0.943***
	(1.18)	(1.16)	(−5.22)	(−5.16)
AuditFee	−0.001*	−0.001*	−0.001	−0.003
	(−1.86)	(−1.93)	(−0.13)	(−0.36)
TobinQ	−0.003***	−0.003***	0.105***	0.090***
	(−2.83)	(−3.02)	(3.67)	(3.20)
Ind	0.009	0.008	0.309	0.243
	(0.47)	(0.42)	(0.48)	(0.38)
First	−0.029***	−0.022***	−0.995***	−0.435*
	(−3.63)	(−2.88)	(−3.76)	(−1.85)
Constant	0.051*	0.050*	9.518***	9.533***
	(1.96)	(1.93)	(11.13)	(11.12)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Obs	10,481	10,481	10,481	10,481
R^2	0.095	0.095	0.118	0.116

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust t-statistics are in parentheses in column (1) and column (2); robust z-statistics are in parentheses in column (3) and column (4).

companies' accounting information quality – partly through choosing international 'big four' accounting firms.

7. Robustness tests

To increase the reliability of the research results, we conduct the following robustness tests: 1) Use other variables to measure the mixed-ownership reform of SOEs; 2) Use one-year lagged values of independent variables; 3) Exclude central SOE samples; 4) Use auditor upward change as the dependent variable; 5) Use the instrumental variable method to solve possible endogenous problems; 6) Construct the PSM+DID test using changes in governance participation by non-state-owned shareholders; 7) Construct the PSM+DID test using mixed-ownership reform pilot firms; and 8) Control for firm fixed effects. The detailed test results are as follows.

7.1. Using other variables of the mixed-ownership reform

Following Yang and Yin (2018), we first construct *Mix1*, which is defined as the proportion of non-state-owned shareholding among the top ten shareholders. Second, in the main

test we use the Herfindahl index to construct the *Mix_share* and here we use the EI entropy index to construct *Mix2*. The detailed formula is as follows:

$Mix2 = \Sigma Qj \times \ln(1/Qj)$ (6)

where *Qj* is the ratio of shares held by j types of shareholders to the shares held by the top ten shareholders.

Finally, following Cai, Zheng et al. (2018), we define *Mix3* as the ratio of the number of directors appointed by non-state-owned shareholders to the total number of board directors, which measures the governance dimension of SOE mixed-ownership reform.

Table 12 reports the regression results using other variables to measure the mixed-ownership reform of SOEs. The results show that regardless of the measures of SOE mixed-ownership reform, the degree of mix-ownership reform is significantly and positively correlated with the likelihood of choosing international 'big four' accounting firms, which further supports the conclusions of this study.

Table 12. Use other variables to measure mixed-ownership reform of state-owned enterprises.

	Big4		
Variables	(1)	(2)	(3)
Mix1	2.636***		
	(4.19)		
Mix2		1.436***	
		(3.10)	
Mix3			2.291*
			(1.82)
Size	1.276***	1.249***	1.316***
	(10.82)	(10.52)	(11.21)
Lev	−3.100***	−3.002***	−2.971***
	(−3.78)	(−3.66)	(−3.60)
CR	−0.200*	−0.196*	−0.204*
	(−1.69)	(−1.66)	(−1.73)
Inv	−1.531	−1.551*	−1.477
	(−1.60)	(−1.68)	(−1.57)
Rec	3.092***	2.877***	2.981***
	(2.91)	(2.71)	(2.77)
Growth	−0.309***	−0.241***	−0.259***
	(−3.39)	(−2.64)	(−2.95)
ROA	4.436**	3.988*	5.012**
	(2.11)	(1.92)	(2.36)
First	0.674	1.709**	0.171
	(0.94)	(2.07)	(0.24)
Dual	−0.553*	−0.431	−0.402
	(−1.73)	(−1.41)	(−1.32)
Ind	−1.896	−2.164	−1.835
	(−1.05)	(−1.20)	(−1.01)
Issue	0.016	0.041	0.036
	(0.10)	(0.28)	(0.24)
AB	2.073***	2.009***	1.974***
	(6.71)	(6.41)	(6.32)
Constant	−42.296***	−42.837***	−43.455***
	(−16.45)	(−16.52)	(−16.86)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Obs	10,481	10,481	10,481
R^2	0.328	0.328	0.328

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

7.2. Using one-year lagged values of independent variables

To alleviate the potential endogenous problem, we employ one-year lagged values of independent variables in the regressions (*LMix_share*/*LMix_gov*). The regression results are presented in Table 13. The coefficients of the two independent variables remain significantly positive, which further supports our conclusions.

7.3. Excluding central SOE samples

The appointment of auditors to central SOEs in a particular period is subject to the state's administrative regulations; thus, some central SOEs are bound to hire international 'big four' accounting firms. To rule out this effect on the results, we remove the central SOE samples and perform the regression of model (1) again. The regression results are

Table 13. Use one-year lagged values of independent variables.

	Big4	
Variables	(1)	(2)
LMix_share	2.499***	
	(3.14)	
LMix_gov		4.714**
		(2.34)
Size	1.245***	1.338***
	(9.89)	(10.63)
Lev	−2.888***	−2.924***
	(−3.29)	(−3.29)
CR	−0.227*	−0.243*
	(−1.69)	(−1.83)
Inv	−1.689*	−1.579
	(−1.74)	(−1.60)
Rec	3.180***	3.464***
	(2.81)	(3.02)
Growth	−0.282***	−0.267***
	(−2.87)	(−2.87)
ROA	4.914**	6.103***
	(2.20)	(2.62)
First	1.843**	0.141
	(2.17)	(0.18)
Dual	−0.453	−0.411
	(−1.42)	(−1.31)
Ind	−2.627	−2.120
	(−1.32)	(−1.06)
Issue	0.038	0.021
	(0.25)	(0.13)
AB	2.046***	2.004***
	(6.28)	(6.22)
Constant	−44.054***	−45.155***
	(−14.93)	(−15.69)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	9,072	9,072
R^2	0.339	0.339

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

Table 14. Exclude central SOEs samples.

	Big4	
Variables	(1)	(2)
Mix_share	3.404***	
	(3.70)	
Mix_gov		4.519**
		(2.44)
Size	1.269***	1.352***
	(8.50)	(9.10)
Lev	−2.712***	−2.655***
	(−2.70)	(−2.67)
CR	−0.354***	−0.362***
	(−2.75)	(−2.71)
Inv	−2.544**	−2.401**
	(−2.36)	(−2.26)
Rec	2.964**	2.863**
	(2.11)	(2.02)
Growth	−0.164	−0.181*
	(−1.52)	(−1.80)
ROA	4.551	6.483**
	(1.42)	(2.00)
First	2.306**	−0.171
	(2.20)	(−0.19)
Dual	−0.546	−0.502
	(−1.62)	(−1.55)
Ind	−3.326	−2.598
	(−1.50)	(−1.17)
Issue	−0.153	−0.197
	(−0.86)	(−1.13)
AB	2.205***	2.083***
	(5.72)	(5.55)
Constant	−43.123***	−43.420***
	(−13.11)	(−13.10)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	7,927	7,927
R^2	0.356	0.356

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

provided in Table 14. It shows that the results remain valid after removing the central SOE samples, suggesting that the impact of central SOEs' administrative regulations is not a concern.

7.4. Using auditor upward change as the dependent variable

Since a company's auditor choice is endogenous, we further use the upward change of auditors as the dependent variable to examine the impact of mixed-ownership reform on the auditor choice of SOEs. Following M. Zhang et al. (2012) as well as Yao et al. (2017), this study defines auditor upward change (*USwitch*) as a dummy variable. If a company's accounting firm switches from the domestic 'top ten' to the international 'big four' or from a small domestic accounting firm to the domestic 'top ten' or the international 'big four' accounting firm, the value of *USwitch* is 1; otherwise, it is 0. The regression results are provided in Table 15. The regression coefficients of the two mixed-ownership reform variables are both significantly positive, indicating that the higher the degree of mixed-ownership reform, the more likely the company is to switch to a high-quality auditor.

Table 15. Mixed-ownership reform and upward auditor change.

	USwitch	
Variables	(1)	(2)
Mix_share	1.245***	
	(3.10)	
Mix_gov		1.948**
		(1.98)
Size	0.626***	0.664***
	(9.81)	(10.22)
Lev	−1.359***	−1.379***
	(−3.35)	(−3.35)
CR	−0.058	−0.067
	(−0.94)	(−1.08)
Inv	−0.861**	−0.811*
	(−1.97)	(−1.83)
Rec	1.126**	1.183**
	(2.13)	(2.20)
Growth	−0.044	−0.053
	(−0.70)	(−0.84)
ROA	1.889*	2.424**
	(1.93)	(2.39)
First	0.938**	0.154
	(2.18)	(0.40)
Dual	−0.144	−0.129
	(−0.96)	(−0.85)
Ind	−0.554	−0.391
	(−0.59)	(−0.41)
Issue	0.131	0.129
	(1.27)	(1.25)
AB	1.269***	1.247***
	(5.97)	(5.85)
Constant	−14.810***	−15.079***
	(−10.49)	(−10.60)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	10,481	10,481
R^2	0.141	0.141

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

7.5. Two-stage regression

Since SOEs choosing the international 'big four' may have better corporate governance and are more likely to attract non-state-owned shareholders to invest, our analysis may have endogenous problems. To control for endogenous problems, we employ industrial policy (*IP*) as an instrumental variable for mixed-ownership reform. The research by Z.C. Wang et al. (2020) finds that industrial policies will increase the barriers for non-state-owned capital to enter the industries, thereby inhibiting mixed-ownership reform. Therefore, this variable meets the relevance requirements. Since industrial policy is formulated in accordance with the national development strategy and has no direct influence on the selection of SOE auditors, this variable meets the exogenous requirements.

To further illustrate the validity of the instrumental variable, we directly test the relationship between the instrumental variable *IP* and the dependent variable *Big4*. Specifically, we add the instrumental variable *IP* to the main regression model (1), and the regression results are presented in Table 16. The results indicate that after adding the instrumental variable *IP*,

Table 16. Instrument variable validity.

	Big4	
Variables	(1)	(2)
Mix_share	2.447***	
	(3.18)	
Mix_gov		3.971**
		(1.98)
IP	−0.267	−0.278
	(−1.35)	(−1.39)
Size	1.234***	1.318***
	(10.43)	(11.30)
Lev	−3.000***	−2.988***
	(−3.67)	(−3.61)
CR	−0.196*	−0.210*
	(−1.66)	(−1.78)
Inv	−1.602*	−1.498
	(−1.72)	(−1.58)
Rec	2.984***	3.131***
	(2.80)	(2.89)
Growth	−0.249***	−0.274***
	(−2.68)	(−3.06)
ROA	3.880*	5.103**
	(1.89)	(2.39)
First	1.876**	0.187
	(2.22)	(0.26)
Dual	−0.437	−0.397
	(−1.42)	(−1.30)
Ind	−2.280	−1.878
	(−1.26)	(−1.03)
Issue	0.047	0.032
	(0.32)	(0.22)
AB	2.038***	1.985***
	(6.49)	(6.33)
Constant	−42.235***	−43.187***
	(−15.74)	(−16.07)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	10,481	10,481
R^2	0.338	0.330

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

the coefficients of the explanatory variables *Mix_share* and *Mix_gov* remain significantly positive, while the instrumental variable *IP* is not significant. Therefore, *IP* does not directly affect the selection of auditors and meets the requirements of instrument variable.

Table 17 reports the results of the two-stage regression. The results in columns (1) and (3) of Table 17 show that the coefficients of *IP* are both significantly negative, indicating that industrial policies inhibit the mixed-ownership reform of SOEs. This result is consistent with the findings of Z.C. Wang et al. (2020). The regression results of the second stage are shown in columns (2) and (4) of Table 17. The regression coefficients are significantly positive for the ownership structure dimension variable *Mix_share* and the governance dimension variable *Mix_gov*. These results further confirm our conclusion that the higher the degree of SOE mixed-ownership reform, the more likely SOEs are to hire high-quality auditors.

7.6. Changes in appointment of directors, supervisors, and executives by non-state-owned shareholders

To further alleviate possible endogeneity, this study examines how changes in appointment of directors, supervisors, and executives by non-state-owned shareholders under mixed-ownership reform affect the choice of accounting firms for SOEs. Specifically, we employ the change of appointment of directors, supervisors, and executives by non-state-owned shareholders as the event and define the year of the appointment of directors, supervisors, and executives as the event year. Then, we take these enterprises as the treatment group and defines the *Treat* variable as 1. Simultaneously, we select SOEs whose non-state-owned shareholders do not appoint directors, supervisors, and executives as potential control groups. We use the method of propensity score matching (PSM) to match each treatment company with a control company in the year before the event. The value of *Treat* for control companies is set to 0. The value of *Post* is 1 if the year was the event year or after the event year; otherwise, it is 0. The regression results are presented in

Table 17. Two-stage regression.

	Mix_share		*Mix_gov*	
Variables	(1)*First*	(2)*IV*	(3)*First*	(4)*IV*
IP	−0.007**		−0.003**	
	(−1.99)		(−2.25)	
Mix_share		2.613*		
		(1.75)		
Mix_gov				6.836*
				(1.84)
Size	0.013***	0.049**	−0.005***	0.118***
	(9.12)	(2.55)	(−11.20)	(5.91)
Lev	0.013	−0.181***	0.005	−0.180***
	(1.22)	(−4.75)	(1.37)	(−4.99)
CR	−0.004**	0.001	−0.000	−0.008*
	(−2.32)	(0.10)	(−0.29)	(−1.73)
Inv	0.015	−0.145***	0.006	−0.148***
	(1.21)	(−3.45)	(1.45)	(−3.61)
Rec	−0.022	0.127**	−0.014***	0.165**
	(−1.36)	(2.06)	(−2.52)	(2.26)
Growth	0.006**	−0.028**	0.005***	−0.051**
	(1.97)	(−2.41)	(5.98)	(−2.33)
ROA	0.302***	−0.669	0.016*	0.010
	(10.92)	(−1.47)	(1.71)	(0.10)
First	−0.590***	1.554*	−0.009***	0.075*
	(−60.41)	(1.77)	(−2.75)	(1.71)
Dual	0.028***	−0.073*	0.012***	−0.084*
	(5.99)	(−1.66)	(7.74)	(−1.76)
Ind	0.081***	−0.235	−0.016*	0.088
	(2.82)	(−1.56)	(−1.66)	(0.88)
Issue	0.005	−0.011	0.002	−0.014
	(0.92)	(−0.69)	(1.27)	(−0.86)
AB	−0.019***	0.260***	−0.005***	0.244***
	(−3.66)	(7.87)	(−2.81)	(10.11)
Constant	0.192***	−2.082***	0.127***	−2.450***
	(5.88)	(−7.16)	(11.54)	(−5.20)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Obs	10,481	10,481	10,481	10,481
R^2	0.319	–	0.050	–

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 18. Change of directors, supervisors and executives appointed by non-state-owned shareholders and auditor choice.

	Big4 USwitch	
Variables	(1)	(2)
Treat	−0.235	−0.409
	(−0.65)	(−1.22)
Post	−0.885**	−1.004***
	(−2.54)	(−2.89)
Treat×Post	0.711*	1.175**
	(1.68)	(2.43)
Size	0.542***	0.419***
	(4.18)	(3.04)
Lev	−0.938	−0.571
	(−0.94)	(−0.52)
CR	−0.650***	−0.175
	(−2.97)	(−0.70)
Inv	−0.654	−0.605
	(−0.84)	(−0.64)
Rec	1.143	0.598
	(0.90)	(0.50)
Growth	−0.341***	−0.057
	(−3.50)	(−0.36)
ROA	7.885***	4.118
	(3.20)	(1.32)
First	0.334	0.415
	(0.37)	(0.46)
Dual	−1.620***	−0.970**
	(−2.67)	(−2.00)
Ind	1.053	−1.215
	(0.43)	(−0.54)
Issue	−0.224	0.329
	(−0.96)	(1.03)
AB	1.082***	1.129***
	(3.09)	(2.66)
Constant	−17.267***	−9.775***
	(−6.21)	(−3.22)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	1,334	1,334
R^2	0.369	0.129

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

Table 18. The coefficients of *Treat×Post* in columns (1) and (2) are both significantly positive, indicating that after non-state-owned shareholders appoint directors, supervisors, and executives, SOEs are more likely to switch to high-quality auditors and choose international 'big four' accounting firms as auditors, which further supports the conclusion.

7.7. Mixed-ownership reform pilot companies

To further reduce the potential endogenous problem in this study, we conduct a PSM +DID analysis based on mixed-ownership reform pilot enterprises announced by the State-owned Assets Supervision and Administration Commission. Specifically, we define the year in which a company was selected for the mixed-ownership reform pilot as the

Table 19. Mixed ownership reform pilot and auditor choice.

	Big4 USwitch	
Variables	(1)	(2)
Treat	−0.092	−0.100
	(−0.21)	(−0.23)
Post	0.093	−0.305
	(0.26)	(−0.72)
Treat×Post	1.134***	0.878**
	(2.87)	(2.41)
Size	0.951***	1.019***
	(4.54)	(4.94)
Lev	−3.138*	−2.316
	(−1.89)	(−1.49)
CR	−0.294	−0.116
	(−0.73)	(−0.33)
Inv	2.113	2.733**
	(1.63)	(2.31)
Rec	5.057***	5.401***
	(3.31)	(3.48)
Growth	0.778**	0.517*
	(2.22)	(1.66)
ROA	−1.509	−0.308
	(−0.57)	(−0.11)
First	−0.852	−0.861
	(−0.95)	(−1.00)
Ind	0.646	0.540
	(0.35)	(0.30)
Issue	0.121	0.089
	(0.37)	(0.23)
Constant	−25.974***	−27.984***
	(−5.26)	(−5.69)
Year	Yes	Yes
Industry	Yes	Yes
Obs.	402	402
R^2	0.488	0.519

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

event year. We also define these companies as the treatment group and construct the *Treat* variable as 1. Simultaneously, we select non-pilot SOEs as potential control group. We use the PSM method to match three control group companies with each treatment group company. The value of *Treat* for control companies is set to 0. The value of *Post* is 1 if the year was the event year or after the event year; otherwise, it is 0. The coefficient of *Treat×Post* reflects the changes in auditor choice before and after SOEs were selected for the mixed-ownership reform pilot programme. The regression results are shown in Table 19. In columns (1) and (2) of Table 19, the coefficients of *Treat×Post* are both significantly positive, suggesting that when a company is selected for the mixed-ownership reform pilot programme, it is more likely to switch to high-quality auditors and employ international 'big four' accounting firms.

7.8. Controlling for firm fixed effects

To further alleviate the endogenous problem, we control for firm fixed effects in the regression. Since the dependent variable in this study is a dummy variable, adding the firm dummy variable directly to the logit regression model will cause a large number of

Table 20. Control for firm fixed effects.

	Big4	
Variables	(1)	(2)
Mix_share	2.057***	
	(2.68)	
Mix_gov		4.893**
		(2.57)
Size	1.079***	1.151***
	(9.13)	(9.70)
Lev	−1.790**	−1.739**
	(−2.11)	(−2.02)
CR	−0.083	−0.094
	(−0.69)	(−0.77)
Inv	−1.733**	−1.639**
	(−2.13)	(−2.05)
Rec	3.084***	3.209***
	(2.87)	(2.93)
Growth	−0.250**	−0.285***
	(−2.44)	(−2.82)
ROA	5.574***	6.614***
	(2.59)	(3.05)
First	1.148	−0.311
	(1.39)	(−0.42)
Dual	−0.622*	−0.610*
	(−1.90)	(−1.94)
Ind	−1.144	−0.720
	(−0.62)	(−0.39)
Issue	0.039	0.022
	(0.24)	(0.13)
AB	1.705***	1.657***
	(5.58)	(5.28)
Constant	−40.647***	−41.696***
	(−14.00)	(−12.04)
Year	Yes	Yes
Firm	Yes	Yes
Obs.	10,481	10,481
R^2	0.384	0.384

***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively; robust z-statistics are in parentheses.

samples to be deleted. Therefore, following Bloom et al. (2013) as well as Li et al. (2019), each company is assigned a mean value of the dependent variable (*Big4*) for the years before the sample period. Specifically, we take the mean value of each company's *Big4* variable for the years before 2003 and include this variable in the regression to control for firm fixed effects. Bloom et al. (2013) notes that this approach can better control for the influence of some unobservable factors on dependent variables at the firm level. The results of controlling for firm fixed effects are shown in Table 20. It shows that the coefficients of *Mix_share* and *Mix_gov* are both significantly positive, which is consistent with the main results and further supports our conclusions.

We admit that these robustness tests can only partially alleviate – but not completely solve – the endogenous problems that the study may face. This represents one of the possible limitations of our research.

8. Conclusions

Based on the sample of 2003–2017 listed state-owned companies, we manually collect data on the nature of the top ten shareholders, shareholding ratios, and executives appointed by shareholders, which are disclosed in companies' annual reports, to quantify the degree of a company's mixed-ownership reform from the dimensions of ownership structure and governance. On this basis, we examine the impact of SOE mixed-ownership reform on auditor choice. We find that the higher the degree of mixed-ownership reform is, the more likely SOEs are to hire international 'big four' accounting firms. Moreover, this impact is more significant in the SOEs in high competition industries, in low marketisation regions and with low information transparency. Our research also finds that mixed-ownership reform has increased the financial constraints of SOEs. The test based on the mediation effect shows that mixed-ownership reform affects corporate accounting information quality through auditor choice.

The conclusions of this research have implications for the further development of SOE mixed-ownership reform in China and the improvement of accounting information quality among SOEs. First, SOEs should give full play to the supervision and governance function of non-state-owned shareholders when promoting mixed-ownership reform. Moreover, in the process of SOE mixed-ownership reform, SOEs should involve non-state-owned shareholders in corporate governance and business decision-making rather than remaining at the level of equity. Furthermore, information intermediaries (e.g., accounting firms, analysts, and media, etc.) can be further utilised to realise the transition from government control to marketisation in the mixed-ownership reform of SOEs, which should improve governance structure and operating efficiency. Finally, the results of this study suggest that mixed-ownership reform has different effects on SOEs in different industries and regions. Therefore, the government should create a fair market environment for non-state-owned capital, remove ideological barriers, and promote the further deepening of mixed-ownership reform to improve the performance of SOEs and boost economic growth.

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