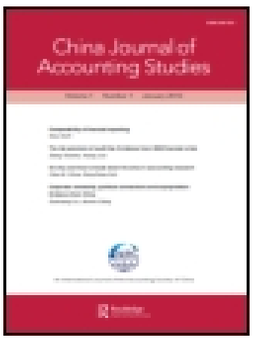

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Credit availability, signalling, and auditor choice

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ABSTRACT

Taken the cancellation of the upper limit of loan interest rates as a quasinatural experiment and based on the signal theory of auditor demand, this paper investigates how the improvement of credit availability affects the choice of auditors. Results show that, compared with low-risk enterprises, high-risk enterprises tend to choose high-quality audits because of the increased loan availability after the liberalisation of the loan interest rate ceiling, and this tendency is more pronounced in the corporations with higher financing constraints. The above results are still valid after a series of robustness tests. Further analysis reveals that high-risk companies choosing high-quality auditors do obtain more long-term loans after the loan interest rate ceiling was lifted. This study identifies the causal relationship between credit availability and auditor choice, and also provides empirical evidence for the signal function of high-quality auditors in China's credit market.

KEYWORDS

Credit availability; signalling theory; reputation mechanism; high-quality auditor

1. Introduction

The essence of China's economic system reform is the process of gradual transition from planned economic system to market economy system (Chen et al., 2012). In comparison to the product market, the reform of the financial market during this process has remained behind the wheel, resulting in the government still playing a very important role in the allocation of credit resources (Fang, 2011; Huang, 2010; Jian et al., 2013). Especially in the financial system where state-owned banks dominate, the public property rights of state-owned banks determine that bank loan decisions are more inclined to allocate and price based on government preferences (Firth et al., 2009; Chen et al., 2013). The special institutional arrangement of the transition economy makes it different from the mature market economy countries that mainly rely on market mechanisms such as law and reputation to guide resource allocation; the informal systems such as political and financial connections play a more important role in China's credit capital market (Allen et al., 2005; Deng & Zeng, 2011; Yu et al., 2012).

In order to improve the decisive role of the market mechanism in the allocation of credit resources, China has officially launched the reform of interest rate marketisation since 1996 with the issuance of the Notice on the Cancellation of the Management of the

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Interbank Offered Rate Ceiling, and has continuously promoted the process of interest rate marketisation in accordance with the principles of 'foreign currency before domestic currency, loan before deposit, long-term large sum before short-term small sum.' This marketisation process has occurred in the following areas successively: inter-bank interest rates, bond rates, loan interest rates, discount rates, and deposit interest rates. This two-decades-long reform was finally completed when the central bank announced the lift on the deposit interest rate ceiling in 2015. Throughout the entire reform process, the liberalisation of loan interest rate ceilings in 2004 has the most profound impact on micro-enterprises. When the loan interest rate ceiling is under control, banks cannot obtain high-risk premiums by raising loan interest rates, which prevent high-risk companies from the credit market. Therefore, the liberalisation of the loan interest rate ceiling can be helpful to improve the matching degree between interest rates and risks, allowing high-risk companies to gain access to the credit market for financing opportunities (Gelos & Werner, 2002; McKinnon, 1973; Shaw, 1973; Wang et al., 2018; Wang & Zhang, 2007; Zhan & Ying, 2015).

Due to the serious information asymmetry between enterprises and banks, the reputation mechanism, as a signal transmission mechanism, can effectively reduce the supervision cost of creditors by restricting the behaviour of lending enterprises under the condition that banks identify high-quality customers at higher cost (Chen, 2011; Pittman & Fortin, 2004; Ye et al., 2010). When an enterprise needs to expand the financing scale, extend the financing period, and reduce the financing cost in the credit market in order to seek its own development, it has a strong motivation to send positive signals to the bank (Jiang & Zeng, 2013; Qian et al., 2016; Yang & Tong, 2015). As a key link in modern corporate governance (Watts & Zimmerman, 1983), employing an external auditor to authenticate financial reports is one of the main ways for enterprises to transmit signals under the market mechanism (Titman & Trueman, 1986). Previous studies have shown that audit, as an important information intermediary in the capital market, has an important impact on the formation of debt contracts between banks and enterprises and even on the reduction of debt costs (Kim et al., 2013; Minnis, 2011; Zhou et al., 2016).

According to the signal theory of audit demand, when companies obtain external financing in a market-oriented manner, they are more inclined to hire high-quality auditors; otherwise, they tend to employ low-quality auditors (Francis et al., 2003). At the same time, previous studies have found that because of the prominent role of the government in bank credit distribution, politically connected enterprises enjoy the convenience of financing and they are therefore more inclined to choose low-level accounting firms (Liu et al., 2010). This means that, with the interaction between governments and enterprises, prior studies on the impact of corporate financial environments on auditor choice have serious endogeneity, and it becomes an important challenge to address the potential endogeneity in this field. The liberalisation of the loan interest rate ceiling exogenously changed the extent to which companies can obtain bank credit, and the impact on high and low risk enterprises is significantly different. This provides a unique setting for identifying a treatment group subject with such exogenous changes and a control group to conduct a difference-in-differences analysis (Bertrand et al., 2007; Chen & Ma, 2018).

In order to alleviate the interference caused by some macro factors that change over time before and after the opening of the loan interest rate ceiling, this paper adopts Chen and Ma (2018) approach, conducts a difference-in-differences model consisting of high-risk enterprises (the treatment group) and low-risk enterprises (the control group), based on the credit default risks, and combines with the audit demand signal theory to examine whether enterprises with increased credit availability are more inclined to choose high-quality auditors for signalling purposes. The empirical results indicate that, compared to low-risk enterprises, high-risk enterprises are more likely to choose high-quality auditors to send signals due to their increased credit availability after the liberalisation. When facing higher financing constraints, enterprises are more incentivised to choose high-quality auditors. And the finds are still valid after a series of robustness tests. Additional tests show that high-risk companies obtain more long-term loans by hiring high-quality auditors after the removal of the loan interest ceiling.

The theoretical contribution and academic value of this article are mainly reflected in the following three aspects.

First, existing literature mainly explores the driving factors of auditor selection based on agency theory and insurance theory in terms of corporate governance structure, transaction types, and political connections (Du et al., 2011; Fan & Wong, 2005; Zhang et al., 2012). Based on the signalling theory, this paper not only provides novel empirical evidence on the financing demand motives for choosing high-quality auditors using the unique settings of liberalised ceilings on loan interest rates in China, but also adds to the literature on signalling theory in audit demand.

Second, previous studies have shown that high-quality auditors can help improve the financing convenience of companies, and companies with different financing models or financing needs also have different motivations for hiring high-quality auditors (Chen, 2011; Knechel et al., 2008; Wang & Zhou, 2006). However, prior studies ignore the endogenous problems, which arise from these two aspects. This paper draws on the important scenario of the loan interest rate ceiling liberalisation in China, and constructs a difference-in-differences model based on the default risk to study how interest rate marketisation affects enterprises' choice of auditors, thus can be helpful to reveal the relationship between loan availability and auditor choice.

Third, based on the marketisation reform of the loan interest rate in China, this paper also constructs a difference-in-differences-in-differences (DDD) model to study the actual credit acquisition situation of enterprises after the liberalisation of loan interest rate ceilings affecting the choice of corporate auditors. The findings highlight the role that auditor reputation plays in the credit market, which goes beyond the well-documented role it plays in the share market. The results also demonstrate the effect of credit availability on enterprises' choice of auditors and suggest several conditions under which the signalling theory applies to auditor choice.

2. Institutional background, theoretical analysis, and research hypothesis

2.1. Institutional background

Due to the immaturity of the financial legal system and financial markets, regulatory agencies have imposed strict credit control on the financial market for a long time in

China, and one of its prominent manifestations is loan interest rate control. During the period of interest rate control, commercial banks have very limited flexibility in adjusting loan interest rates, and can't adjust the interest rate level according to the risk of a single loan, which leads to risky small and medium-sized enterprises and private enterprises being blocked out of the credit market. Therefore, there is a serious distortion between the allocation of credit resources of financial institutions and the investment and financing behaviour of enterprises, which is not conducive to the optimal allocation of credit capital. With the remarkable expansion of China's economy and the improvement of the financial legal system, in order to better play the decisive role of the market in the allocation of resources and optimise the allocation efficiency of the scarce factor resource of credit capital, China has started the reform of interest rate marketisation since 1996 to speed up the construction of interest rate formation and control mechanism to meet market demand.

Deregulation of loan interest rates, which is at a key position in the process of China's credit control reform, is the core of the deregulation. The upper limit of the loan interest rate was limited to volatility adjustments since 1998. By the beginning of 2004, the volatility range had expanded to 70%. In October of the same year, the upper limit of volatility was further lifted. On 20 July 2013, the 0.7 times fluctuation limit on financial institutions was completely lifted, realising the complete deregulation of interest rate control in the loan market.

Removal of the loan interest rate ceiling brings reasonable exogenous shock to the credit market and has systematically different impacts on different risk enterprises: compared with low-risk enterprises, the credit availability of high-risk enterprises is improved (Bertrand et al., 2007; Chen & Ma, 2018). Therefore, this paper takes deregulation as the experimental setting, dividing enterprises into high-risk enterprises (treatment group) and low-risk enterprises (control group) based on their risk of credit default, and builds a difference-in-differences model to investigate the causal relationship between credit availability and auditor choice.

2.2. Signal sending and choice of auditors

As the basic theory of information asymmetry, signal transmission theory was proposed by the American economist Michael Spence to solve the problem of adverse selection caused by information asymmetry in the labour market. When the market mechanism is imperfect and weakly effective, there is a general problem of information asymmetry between managers (trustees), shareholders, and creditors (principals or stakeholders). In this case, it is difficult for stakeholders to identify the quality of accounting information and the reliability of financial reports. As a result, high-quality companies cannot gain the favour of stakeholders by virtue of their high-quality accounting information and reliable financial reports, and gain comparative advantages over other companies. In other words, high-performing companies are relatively disadvantaged, while low-performing companies are relatively gaining. Therefore, in order to avoid being mistaken for a 'lemon' by the market, high-performance companies often actively send positive signals to the market and stakeholders to gain a comparative advantage.

In order to alleviate the problem of information asymmetry, listed companies are forced to hire independent auditors to verify the quality of their financial reports and issue audit opinions. In the field of audit, from the perspective of signal transmission theory, if the founder or manager of an enterprise is the signal transmitter and external shareholders and creditors are the signal receivers, then high-quality audit reports should ensure the effective transmission of information. As the quality of audit provided by auditors with different characteristics is heterogeneous (Chen et al., 2011; Titman & Trueman, 1986), information users can judge the quality of audit services they provide based on the characteristics of the auditors selected by the enterprise and thereby optimise decision making. This means that the behaviour of 'choosing auditors' itself has the function of information transmission. When enterprises choose auditors to transmit signals, high-quality auditors can improve the quality of their accounting information and the reliability of their financial reports (Deangelo, 1981). However, such high-quality auditors are only attainable by enterprises that submit relatively reliable information to the market, have confidence in their future development, and demonstrate excellent performance in the market (Zhang & Li, 2010). More importantly, the better an enterprise performs, the lower the cost of acquiring a quality auditor is (Thornton & Moore, 1993; Titman & Trueman, 1986). This demonstrates that the external audit chosen for an enterprise is an effective signal that can be recognised by information users in the market.

Previous studies show that for listed companies under specific circumstances, some special factors – such as the higher stock premium they hope to obtain in an IPO or the refinancing needs they face in their daily operations – may drive them to send effective signals more actively (Beatty, 1989; Datar et al., 1991). Therefore, when companies want to be favoured by banks or other stakeholders, they are more likely to transmit positive signals by selecting high-quality auditors.

2.3. Credit availability, signal sending, and auditor choice

Under the condition of market-oriented allocation of resources, reputation mechanism is one of the important mechanisms to maintain the orderly operation of market economy. Intermediaries with a good reputation often help their clients access better resources. If good enterprises distinguish themselves from other enterprises by hiring high-quality auditors, the external information users, such as bank loan directors, institutional investors, etc., will observe the company's auditor choices and take this additional information into their loan decisions (Hu & Tang, 2007; Kim et al., 2007) or investment decisions (Balvers et al., 1988; Copley & Douthett, 2002). Therefore, companies hiring high-quality auditors to send a positive signal to the market tend to have more opportunities to reduce debt financing costs (Hu & Tang, 2007; Minnis, 2011; Pittman & Fortin, 2004) and equity financing costs (Chen et al., 2011; Khurana & Raman, 2004), and increase the scale of external financing (Chang et al., 2008).

In the transitional market, the supporting rules for market-oriented allocation of resources are still in their own evolutionary process. When these rules are not yet mature or even conflict with each other, government participation in resource allocation has become a reasonable institutional arrangement. In China, the government does not simply participate in regulation in the process of resource allocation, but also has

a great say in where and how resources are allocated. And as the transitional financial system is dominated by state-owned banks, bank loans are the main source of corporate financing. According to statistics provided by the Monetary Policy Implementation Report of the People's Bank of China, from 2000 to 2017, the proportion of bank loans in social financing is always higher than 75%. Under the condition of serious government intervention in bank loan pricing, enterprises usually gain the favour of banks and other financial institutions by establishing government–enterprise or bank–enterprise relationships (Deng & Zeng, 2011; Yu et al., 2012), rather than using market mechanisms such as reputation to send good signals, thereby reducing the usefulness of choosing high-quality auditors for financing contracts (Wang et al., 2009).

Regulation on the upper limit of interest rates leads to the isolation of high-risk enterprises from credit markets. As a result, after the removal of the loan interest rate ceiling, banks that have some market-oriented pricing right can match the capital gains with the risks, which makes them more willing to loan to high-risk enterprises and no longer directly refuse to issue loans to customers or projects that exceed the previously set credit default risk, giving these companies with high risk the opportunity to obtain bank loan funding support by paying higher loan interest rates (Chen & Ma, 2018; Wang & Zhang, 2007). In other words, the liberalisation of the loan interest rate ceiling not only improves the marketisation of bank credit resource allocation, but also improves the availability of loans for high-risk companies.

In the market-oriented bank credit market, the loan officers often evaluate the credit quality of the borrower according to the audited financial statements. Therefore, enterprises with a highly-reputed CPA service enjoy apparent advantages – in terms of their bank charge rates, loan amounts, time limit, etc. – over those without a highly-reputed CPA service (Blackwell et al., 1998; El Ghoul et al., 2016; Kim et al., 2013; Pittman & Fortin, 2004). Therefore, if there is an opportunity to use market mechanisms such as reputation to win the favour of banks, high-risk enterprises must have the incentive to hire high-quality auditors to convey high-quality corporate signals for higher credit amounts, lower credit rates or longer credit terms, thereby furthering their own development and gaining a higher profit. Hence, we present the following hypothesis:

Hypothesis 1: The incentive for high-risk enterprises to hire high-quality auditors increases significantly after they obtain higher credit availability.

The MM theorem holds that in a frictionless market environment, companies can easily obtain external financing at a very low cost, and therefore the financing structure arrangement will not affect the value of the company (Modigliani & Miller, 1958). Because of the existence of market friction such as information asymmetry, companies usually face varying degrees of financing constraints. Capital is one of the essential factors for operation and production, and the degree of financing constraints faced by an enterprise reflects its ability to obtain external financing. Therefore, severe financing constraints will have a negative impact on the timely capture of investment opportunities and on the continuous investment level in innovation and value enhancement (Jin et al., 2012; Zhang et al., 2017; Zhou et al., 2017). In China, due to the credit rationing mechanism and the government's implicit guarantee mechanism, bank credit resources flow more to state-owned enterprises, resulting in widespread financing constraints in

enterprises, especially in private enterprises (Jin et al., 2012; Lu & Yao, 2004). In order to alleviate financing constraints, existing literatures have found that companies usually increase financing opportunities through rent-seeking, building political connections, bank connections, and improving the quality of information disclosure (Fungácová et al., 2015; Wang et al., 2020; Yu & Pan, 2008; Zhu et al., 2015).

According to the theoretical analysis of *hypothesis H1*, the cancellation of the upper limit of the loan interest rate allows banks to adjust the loan interest rate to match the loan risk, thereby improving the availability of loans for these enterprises with higher risk. In order to further gain the favour of banks and other financial institutions, high-risk companies have the motivation to hire high-quality auditors to send signals. Although companies choosing high-quality auditors for signalling can be favoured by banks and other financial institutions to a certain extent, the choice of high-quality auditors is often accompanied by a higher reputation premium. Therefore, companies need to weigh the costs and benefits when choosing high-quality auditors for signal transmission. Compared with companies with lower financing constraints, companies with higher financing constraints have a higher urgency to obtain external financing opportunities because of the importance of new external financing opportunities for their business development. In other words, high-risk companies with higher financing constraints will have stronger incentives to seize loan opportunities after the availability of loans increases, so their motivation to hire high-quality auditors for signalling is more obvious. Hence, we present the following hypothesis:

Hypothesis 2: Compared to companies with lower degree of financing constraints, high-risk companies with higher degree of financing constraints have a stronger motivation to hire high-quality auditors after the availability of loans increases.

3. Research design

3.1. Model design

The liberalisation of the loan interest rate ceiling in China's financial market provides an ideal quasi-natural experimental situation for identifying the causal relationship between loan availability and the choice of auditor. First of all, for enterprises, the liberalisation of the loan interest rate ceiling is exogenous and unlikely to be determined by some enterprise-level characteristics. Moreover, the liberalisation of the loan interest rate ceiling will not directly affect the choice of corporate auditors. In this sense, the quasi-natural experiment formed by the liberalisation of the loan interest rate ceiling satisfies the exogenous condition. Second, the liberalisation of the loan interest rate ceiling can directly affect the availability of loans for enterprises, thereby satisfying the relevant conditions. Therefore, following Lei et al. (2009), Wang et al. (2018), and Chen and Ma (2018), we construct model (1) to test the research hypothesis of this paper:

$$Big4_{i,t}=\alpha_0+\alpha_1 \times Hrisk_i+\alpha_2 \times Post2004_t+\alpha_3 \times Hrisk_i \times Post2004_t+\sum_{j=1}^{n}\alpha_{j+3}x_{it-1}+\varepsilon_{it} \quad (1)$$

In the above model, *Big4* is the dependent variable, which represents enterprises' choice of auditor. When the auditors are chosen from the international Big Four auditing companies (KPMG, PwC, DTT, and E&Y), the value is 1; otherwise, it is 0. *Hrisk* is a grouping variable that represents the credit default risk of enterprises. Value 1 stands for a high-risk enterprise (treatment group) and 0 stands for a low-risk enterprise (control group). *Post2004* is the time variable, representing the relative time span before and after the lifting of the upper limit of loan interest rates, with value 1 being the time span afterwards and 0 the time span before. Since removing the ceiling on loan interest rates increases the possibility for high-risk enterprises to obtain bank loans, while the availability of loans for low-risk enterprises remains unchanged, the interactive term *Hrisk*×*Post2004* represents the credit availability for high-risk enterprises after the liberalisation of loan interest rates.

This paper mainly focuses on the significance of the interaction term *Hrisk*×*Post2004* coefficient. It is expected that a_3 is positive in the equation, indicating that high-risk enterprises are more likely to hire high-quality auditors because of the improvement in their credit availability after the ceiling on loan interest rates is lifted.

3.2. Setting the variables

3.2.1. Choice of auditors

Previous literatures have shown that the international 'Big Four' auditing firms simultaneously represent higher-quality audit services and have a higher brand reputation premium (Li & Xue, 2007; Tian & Liu, 2013). According to the signal theory, enterprises with favourable information can employ high-quality auditors to transmit the signal of enterprise value to the outside world, which can be helpful in alleviating information asymmetry (Titman & Trueman, 1986) and thereby gaining the favour of banks and other financial institutions. Therefore, we use the 'Big Four' international auditing firms as the proxy variable for high-quality auditors.

3.2.2. Credit default risk

Previous studies have shown that the contingent equity model based on market information can better assess the actual default risk of enterprises (Bharath & Shumway, 2008) and is applicable to the market environment in China (Sautner & Vladimirov, 2018). The impact of interest rate liberalisation on business activities does not only affect the credit market, but also the stock market's expectation of enterprise value. Therefore, consistent with the existing literature (Bharath & Shumway, 2008; Chen & Ma, 2018), we also adopt the contingent equity model to measure the Default Risk (*DR*) of enterprises. The specific equation used is:

$$DD_{i,t} = \log\left(\frac{Equity_{i,t} + Debt_{it}}{Debt_{it}}\right) + \left(\frac{r_{i,t-1} - \frac{\sigma_{vi,t}^2}{2}) \times \sqrt{T}}{\sigma_{vi,t} \times \sqrt{T}}\right. \tag{1}$$

$$\sigma_{vi,t} = \left(\frac{Equity_{i,t}}{Equity_{i,t} + Debt_{i,t}}\right) \times \sigma_{Ei,t} + \left(\frac{Debt_{i,t}}{Equity_{i,t} + Debt_{i,t}}\right) \times (0.05 + 0.25 \times \sigma_{Ei,t}) \tag{2}$$

$$DR_{i,t} = N\left(-DD_{i,t}\right) \tag{3}$$

where *Equity* is the market value of an enterprise's equities, measured by the product of the number of outstanding shares and the closing price at the end of the year. *Debt* is the value of a business's liabilities, measured by the sum of their short-term liabilities and half of their long-term liabilities. r is an enterprise's annual return on stocks from the previous year. $\sigma_{Ei,t}$ is an enterprise's volatility of stock returns from the previous year. $\sigma_{vi,t}$ represents the volatility of an enterprise's assets. T is set to 1 year. $N(\cdot)$ is the cumulative standard normal distribution function.

According to the level of corporate default risk, we set the dummy variable *Hrisk*. If the default risk of the enterprise is higher than that of the top three enterprises in the industry, *Hrisk* will be 1, meaning that the credit default risk of the enterprise is relatively high; otherwise, it is 0.

3.2.3. Deregulation of the loan interest control

In order to identify the causal relationship between credit availability and auditor choice, we take the liberalisation of loan interest rates by the Central Bank in 2004 as the research scenario and then set *Post2004* as the variable of deregulation of the loan interest control (the value of *Post2004* is 1 after the year 2004; otherwise, it is 0).

3.2.4. Degree of financial constraints

Enterprises with greater financing constraints tend to have higher financing urgency. This paper uses the SA index to measure the degree of financial constraints enterprises face. Following Zhang and Wang (2013) and Qian et al. (2016), we divide the companies into groups according to their SA index value of the previous period, defining enterprises with a SA index over 33% as highly constrained. The SA index value is calculated in accordance with the formula provided by Hadlock and Pierce (2010): $\boldsymbol{SA = -0.737\times Size + 0.043\times Size^2 - 0.04\times Age}$, and the statistical distribution calculation conforms with Liu et al.'s calculation (L. Liu et al., 2015).

3.2.5. Control variables

Following Wang et al. (2008) and Bu and Tu (2018) and considering the data availability of the samples gathered within a one-year limit, this paper selects the following control variables that may affect the auditor choice: enterprise size (*Size*), financial leverage (*Lev*), the proportion of independent directors (*Indep*), net profit rate of asset (*Roa*), growth rate of the main businesses (*Growth*), the nature of property right (*State*), inventory turnover ratio (*Inv*), proportion of receivables (*Rec*), and the shareholding proportion of controlling shareholder (*Shrcr1*). The definition of all the above variables are presented in Table 1.

3.3. Sample selection

This paper selects the A-share listed companies from 2001 to 2007 as the initial sample, and removes the sample of the year when the loan interest rate ceiling was cancelled. The selected sample period started in 2001 and ended in 2007 is to maintain the balance of the time dimension of the panel data before and after the loan interest rate ceiling was cancelled. The Central Bank of China cancelled the loan interest rate ceiling in 2004, and

Table 1. Variable definitions.

Types of variables	Variable symbols	Meaning of the variables
Dependent variable	*Big4*	When the auditing firms chosen are one of the international Big 4, the value is 1; otherwise, the value is 0.
Explanatory variables	*Hrisk*	Dummy variable for high-risk enterprises. If the default risk (DR) of the enterprise is higher than that of the upper third enterprises in the industry, *Hrisk* will be 1; otherwise, *Hrisk* will be 0.
	Post2004	Dummy variable of marketisation of loan interest rates. The value is 1 after the ceiling on loan interest rates is lifted; otherwise, the value is 0.
Control variables	*Size*	The size of the enterprise is equal to the natural logarithm of the total end-of-term asset.
	Lev	The asset-liability ratio is equal to the ratio of total end-of-term liabilities to total end-of -term assets.
	Indp	Proportion of independent directors is equal to the ratio of independent directors to the number of directors.
	Roa	Net profit rate of asset is equal to the ratio of annual net profit to end-of-term total asset.
	Growth	The growth of the enterprise is equal to the growth rate of main business income.
	State	Dummy variable for nature of property right. For state-owned enterprises, the value is 1; otherwise, the value is 0.
	Inv	Inventory turnover rate is equal to the ratio of end-of-term inventory to main business income.
	Rec	Proportion of accounts receivable is equal to the ratio of end-of-term receivables to end-of-term total asset.
	Shrcr1	Shareholding proportion of controlling shareholder is equal to the ratio of the shares owned by the controlling shareholder to the total shares.

the sample interval happened to be three years before and after the event period. Financial data is obtained from the China Stock Market & Accounting Research (CSMAR) database, and the original samples are screened as follows. First, financial enterprise samples are excluded due to their special nature and form of financial report. Second, samples that are missing financial data are removed. Third, observed values that are missing other data are removed. In order to avoid the influence of extreme values on the results of this paper, all continuous explanatory variables are winsorised at 1% and 99% and each regression is treated with a 'cluster' procedure to correct the standard error of coefficient estimates.

Table 2. Descriptive statistics of the main variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
Big4	5 205	0.051	0.219	0	1
Hrisk	5 205	0.326	0.469	0	1
Post2004	5 205	0.549	0.498	0	1
Hrisk×Post2004	5 205	0.182	0.386	0	1
Lev	5 205	0.498	0.188	0.097	0.894
Size	5 205	21.183	0.912	19.663	24.794
Roa	5 205	0.022	0.059	−0.138	0.162
Indp	5 205	0.241	0.148	0	0.5
Growth	5 205	0.186	0.398	−0.459	1.606
State	5 205	0.693	0.461	0	1
Inv	5 205	0.153	0.13	0.002	0.630
Rec	5 205	0.141	0.105	0.001	0.385
Shrcr1	5 205	0.410	0.163	0.119	0.702

4. Empirical tests and results analysis

4.1. Descriptive statistics

Table 2 presents the descriptive statistical results of the main variables. Consistent with the findings of existing literature, the mean value of the *Big4* auditors was 0.051, which means that about 5.1% of the total sample enterprises selected the big four firms to verify their financial statements during the three years before and after the ceiling of loan interest rates was lifted in 2004. The mean value of *Post2004* was 0.549, indicating that 54.9% of the samples were selected after the ceiling on loan interest rates was lifted. The mean value of *Hrisk* is 0.326, which is consistent with the above assumption. Among the control variables: the mean value of enterprises scale (*Size*) is 21.183; the mean value of asset-liability ratio (*Lev*) is 0.498; the mean value of return on assets (*Roa*) is 0.022; the mean value of proportion of independent directors (*Indp*) is 0.241; the mean value of the growth rate of main business (Growth) is 0.186; the mean value of enterprise property rights (State) is 0.693; the mean value of inventory turnover rate (Inv) is 0.153; the mean value of accounts receivable ratio (Rec) is 0.141; the mean value of largest shareholder ratio (Shrcr1) is 0.410.

4.2. Parallel tendency chart

Before conducting the difference-in-differences test, this paper uses graphs to describe the time trend of the auditor's choice during the process of interest rate liberalisation.

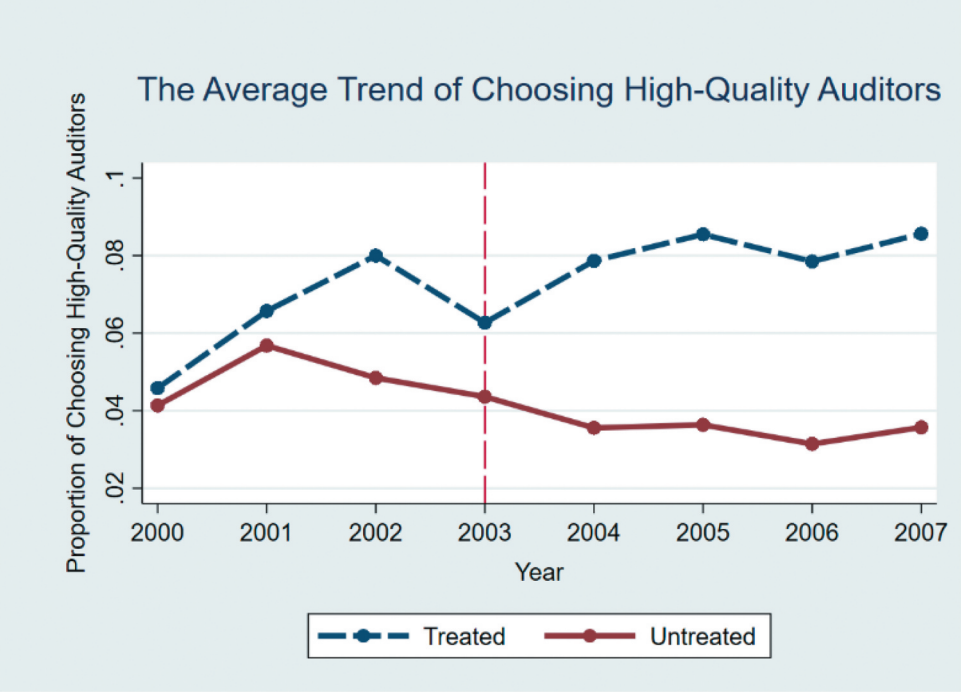

Figure 1. The cancellation of the upper limit of loan interest rates and auditor choice.

Figure 1 represents the changing trend of the proportion of both high- and low-risk enterprises that chose high-quality auditors during the period before and after the ceiling of loan interest rates was lifted in 2004. The diagram shows the trend of both high- and low-risk enterprises' choice of auditor is kept consistent before the policy implementation. In the period after the policy implementation, a significantly higher proportion of high-risk enterprises chose high-quality auditors compared to low-risk enterprises. This trend proves that enterprises tend to choose high-quality auditors for signal transmission after their credit availability is improved.

4.3. Hypothesis testing and result analysis

Table 3 reports the results of *hypothesis H1*. It reveals that the regression coefficient of the interactive item *Hrisk×Post2004* is 0.710, significantly positive at the 5% level. This demonstrates that compared with low-risk companies, high-risk companies are more inclined to choose high-quality auditors after the loan interest rate ceiling is released (Big4), which supports the prediction of *hypothesis H1*; that is, when loan availability improves, companies have the motivation to hire high-quality auditors for signalling.

Table 4 reports the results of *hypothesis H2*. It can be found that in the enterprise group with relatively high financing constraints in column (1), the regression coefficient of the interaction term *Hrisk×Post2004* is 1.859, which is significantly positive at the 1% level; column (2) has relatively low financing constraints. In the enterprise group, the regression coefficient of the interaction term *Hrisk×Post2004* was 0.429, which failed the significance test. The difference between the groups was statistically significant at the 5% level, indicating that compared to enterprises with lower financing constraints, enterprises with a higher degree of financing constraints are more incentivised to choose high-quality auditors after their credit availability is improved, which supports the reasoning of *hypothesis H2*.

Table 3. Credit availability, signalling, and auditors choice.

Big4	Coef.	Robust Std. Err.	Z	P>|z|
Hrisk	−0.582*	0.334	−1.74	0.08
Post2004	−2.609***	0.439	−5.94	0.00
Hrisk*Post2004	**0.710****	**0.322**	**2.21**	**0.03**
Lev	−3.041***	0.974	−3.12	0.00
Size	1.592***	0.156	10.21	0.00
Roa	1.098	3.088	0.36	0.72
Indp	3.469***	1.089	3.19	0.00
Growth	−0.244	0.241	−1.01	0.31
State	0.006	0.368	0.02	0.99
Inv	−0.884	1.247	−0.71	0.48
Rec	−3.089*	1.626	−1.90	0.06
Shrcr1	−1.961**	0.845	−2.32	0.02
_Cons	−47.733***	3.227	−14.79	0.00
Year effect		Control		
Industry effect		Control		
Obs.		5 154		
Pseudo R2		0.300		

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 4. Financing constraints, credit availability, and auditor choice.

	(1)	(2)
	Dependent variable (*Big4*)	
	With higher financing constraints	With lower financing constraints
Hrisk	−0.905*	−0.235
	(−1.68)	(−0.58)
Post2004	−2.591***	−2.736***
	(−4.06)	(−4.69)
Hrisk×Post2004	**1.446*** **	**0.107**
	(2.63)	**(0.27)**
Sue Test (χ^2)	**5.12****	
(p-value)	**(0.02)**	
Lev	−4.780***	−2.219*
	(−3.19)	(−1.78)
Size	1.985***	1.314***
	(7.76)	(4.98)
Roa	0.987	−0.358
	(0.21)	(−0.10)
Indp	2.100	4.349***
	(1.43)	(3.29)
Growth	−0.034	−0.374
	(−0.09)	(−1.01)
State	−0.108	0.111
	(−0.22)	(0.20)
Inv	−0.475	−0.829
	(−0.24)	(−0.54)
Rec	−1.141	−4.752**
	(−0.52)	(−2.12)
Shrcr1	−2.509**	−1.563
	(−2.15)	(−1.33)
_Cons	−54.877***	−42.227***
	(−10.88)	(−7.66)
Year Effect	YES	YES
Industry Effect	YES	YES
Obs.	3 089	1 751
Pseudo R2	0.361	0.238

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

4.4. Additional tests

4.4.1. Dynamic balance trend test

The assumption of effective estimation using the difference-in-differences model is that parallel trends must exist in the treatment group and the control group before the event. In other words, when there is no treatment effect, the fluctuation trends of the result variables in the treatment group and the control group shall be consistent. In order to test the annual changing trends of the experimental group and control group samples, six dummy variables – *Year2001, Year2002, Year2003, Year2005, Year2006*, and *Year2007* – are set to represent the years of 2001, 2002, 2003, 2005, 2006, and 2007. These dummy variables are then cross-multiplied with the grouping variable *Hrisk* to conduct the regression test. Table 5 reports the results of the dynamic balance trend test.

The test results show that, before the event, the coefficients of the three interaction items *Hrisk×Year2001*, *Hrisk×Year2002*, and *Hrisk×Year2003* were not significant. This

Table 5. Credit availability, signalling, and auditor choice (Dynamic trend test).

	(1)	(2)
	Dependent variable: high-quality auditors (*Big4*)	
Hrisk×Year2001	−0.015	−0.251
	(−0.04)	(−0.71)
Hrisk×Year 2002	0.281	−0.019
	(0.86)	(−0.06)
Hrisk×Year 2003	0.377	0.178
	(1.17)	(0.54)
Hrisk×Year 2005	**0.718****	**0.369**
	(2.44)	**(1.22)**
Hrisk×Year 2006	**1.034*****	**0.778****
	(3.31)	**(2.40)**
Hrisk×Year 2007	**0.900*****	**0.676****
	(3.01)	**(2.20)**
Control Variables	NO	YES
Year Effect	NO	YES
Industry Effect	NO	YES
_Cons	−3.298***	−18.281***
	(−15.18)	(−27.41)
Obs.	5 205	5 154
Pseudo R2	0.014	0.134

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

indicates that the result variables of the treatment and control groups presented the same changing trends before the event, which supports the assumption of parallel trends. The coefficients of the interaction items *Hrisk×Year2005, Hrisk×Year2006*, and *Hrisk×Year2007*, on the other hand, are significantly positive, which indicates that the increase in the credit availability of high-risk enterprises as a consequence of the liberalisation of the upper limit of loan interest rates incentivised them to hire high-quality auditors. Such a trend satisfies the dynamic trend tests.

4.4.2. Placebo test

In order to effectively alleviate the inherent characteristic differences between high- and low-risk enterprises and the shortcomings of the results caused by the unobservable missing variables that are difficult to control in the test model, the following placebo test was performed (Chen & Ma, 2018). Specifically, we adjusted the actual time when the loan interest rate ceiling was loosened in 2004 forward by 1 year (that is, 2003) and backward by 1 year (that is, 2005), and then cross-multiplied with grouping variables, to perform the regression test. Table 6 reports the results of the placebo test.

The test results show that the coefficients of the interaction terms *Hrisk×Post2003* and *Hrisk×Post2005* are not significant, and the placebo test was passed, indicating that the conclusion that the improvement of credit availability incentivises high-risk enterprises to hire high-quality auditors was not compromised by the inherent differences between the two types of enterprises or the unobservable missing variables.

Table 6. Credit availability, signalling, and auditor choice (Placebo test).

	(1)	(2)
	Dependent variable: high-quality auditors (*Big4*)	
Hrisk	−0.233	−0.170
	(−0.85)	(−0.62)
Post2005	−2.299***	
	(−5.25)	
Hrisk×Post2005	**0.993**	
	(1.01)	
Post2003		−2.348***
		(−5.43)
Hrisk×Post2003		**0.060**
		(0.07)
Control Variables	YES	YES
Year Effect	YES	YES
Industry Effect	YES	YES
_Cons	−47.234***	−48.258***
	(−14.77)	(−14.86)
Obs.	5 157	5 234
Pseudo R2	0.289	0.307

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

4.4.3. Expansive test

This paper's theoretical analysis of *hypothesis H1* reveals that high-risk enterprises are more motivated to hire high-quality auditors (international 'Big Four') to send signals when the loan interest rate ceiling is liberalised and loan availability increases, so as to further gain the favour of banks and other financial institutions. To verify the above motivation, a difference-in-difference-in-differences model was built to test whether high-risk enterprises that hired one of the international 'Big Four' auditors really obtained more bank loans after the ceiling on loan interest rates was lifted. The specific test model is as follows:

$$Loan_{it}=\alpha_0+\alpha_1 \times Hrisk_i \times Post2004_t \times Big4_{i,t-1}+\alpha_2 \times Hrisk_i \times Big4_{i,t-1}+ \alpha_3 \times Hrisk_i \times Post2004_t + \alpha_4 \times Post2004_t \times Big4_{it-1} + \sum_{j=1}^{n} \alpha_{j+4} x_{i,t-1} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (3)$$

In the above model (3), *Loan* represents the long-term loan increment of an enterprise, which is equal to the value of the current long-term loan of an enterprise divided by its last end-of-term total asset. Long-term loan increment is used as the dependent variable because the regulation of the upper limit of loan interest rates mainly limits high-risk enterprises from obtaining long-term loans by means of raising interest rates. Therefore, the liberalisation of the loan interest rate ceiling mainly improves the opportunities for high-risk enterprises to obtain long-term loans. The definition of core explanatory variables is the same as that provided in model (1). Following Lu et al. (2006), we control the following variables: Enterprise Scale (*Size*), Return on Assets (*Roa*), Growth Rate of Main Business Income (*Growth*), Tangible Assets (*Tangible*), and Property Right (*State*). Given the numerous interaction items, the regression is performed by controlling the fixed and annual effects of individual enterprises. The coefficients of interactive items $Hrisk_i \times Post2004_t \times Big4_{t-1}$ are the main target of observation and are expected to be significantly positive, which suggests that hiring high-

Table 7. Credit availability, signalling, and credit increment.

Loan	Coef.	Robust Std. Err.	T	P>|t|
$Hrisk_i$×Post2004 $_t$× $Big4_{t-1}$	**0.048*** **	**0.019**	**2.59**	**0.01**
$Hrisk_i$×Post2004 $_t$	−0.004	0.004	−0.91	0.37
$Hrisk_i$×$Big4_{t-1}$	−0.010	0.017	−0.58	0.56
Post2004 $_t$ × $Big4_{t-1}$	−0.134	0.011	−1.22	0.22
Size	0.035***	0.003	10.60	0.00
Roa	0.013	0.022	0.57	0.57
Growth	0.012***	0.003	4.45	0.00
Tangible	−0.069***	0.012	−5.86	0.00
State	−0.007	0.005	−1.37	0.17
_Cons	−0.703***	0.070	−10.06	0.00
Year effect		Control		
Firm effect		Control		
Obs.		5205		
R2		0.241		

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

quality auditors does increase high-risk enterprises' chances to obtain long-term loans after the liberalisation of the loan interest rate ceiling is lifted. Table 7 reports the results of the expansion test.

The results show that the regression coefficient of the interaction item $Hrisk_i$×Post2004 $_t$ × $Big4_{t-1}$ is 0.048 and passes the significance test at the level of 5%, proving that high-risk enterprises do get more long-term loans by choosing high-quality auditors to send signals after their credit availability is improved. Such a result supports the conclusion of this study.

4.4.4. Robustness test

In order to increase the reliability of the research conclusions, the following robustness tests are conducted.

First, the *Z-Score* based on accounting information (Altman, 1968) is used to evaluate enterprises' default risks (Li & Hang, 2019; Zhao & Wang, 2003). *Z-Score*, as a grouping variable, is used to examine how credit availability affects enterprises' auditor choice. The *Z-Score* model combines the debt paying ability, profitability, and operating capacity indexes to generate a comprehensive analysis that can predict financial crises of listed enterprises. The formula is: ***Z-Score = 1.2× Workingcapital/Totalassets +1.4× Retainedearnings/Totalassets+3.3× Earningsbeforeinterestandtax(EBIT)/ Totalassets+0.6× Totalstockmarketvalue/Bookvalueofliabilities+0.999× Salesincome/ Totalassets***. Existing literature proves that when the value of *Z-Score* is less than 2.675, the enterprise is more prone to financial crises. Therefore, if the value of *Z-Score* of an enterprise is less than 2.675, it is considered a high-risk enterprise; if the value of *Z-Score* is higher than 2.675, it is considered a low-risk enterprise. Given this categorisation, *hypotheses H1* and *H2* are tested for robustness. Table 8 reports the inspection results.

8The test results show that, in the full-sample regression shown in column (1), the coefficient of the interaction items *Hrisk*×*Post2004* is positive and significant at the

Table 8. Credit availability, signalling, and auditor choice (Z-Score model).

	(1)	(2)	(3)
	Dependent variable: high-quality auditors (*Big4*)		
	Full sample	With higher financing constraints	With lower financing constraints
Hrisk	−0.319	0.010	−0.734**
	(−1.36)	(0.03)	(−2.44)
Post2004	−2.588***	−2.143***	−3.084***
	(−5.96)	(−2.89)	(−5.46)
Hrisk×Post2004	**0.616****	**1.121****	**0.365**
	(2.11)	**(2.31)**	**(0.96)**
Sue Test (χ^2)		**2.70***	
(p-value)		**(0.10)**	
Lev	−2.939***	−5.209***	−2.059***
	(−5.67)	(−5.13)	(−3.10)
Size	1.565***	2.011***	1.483***
	(15.29)	(10.18)	(9.53)
Roa	1.369	1.462	−1.430
	(0.74)	(0.47)	(−0.63)
Indp	3.509***	1.598	4.904***
	(3.64)	(0.91)	(4.14)
Growth	−0.257	−0.196	−0.256
	(−1.10)	(−0.50)	(−0.83)
State	−0.023	−0.254	0.140
	(−0.12)	(−0.84)	(0.49)
Inv	−0.931	−0.614	−0.825
	(−1.25)	(−0.55)	(−0.77)
Rec	−2.896***	−1.080	−4.383***
	(−2.88)	(−0.69)	(−3.24)
Shrcr1	−2.005***	−2.679***	−1.300**
	(−4.13)	(−3.12)	(−2.00)
_Cons	−48.147	−55.094	−44.628
	(−0.04)	(−0.08)	(−0.12)
Year Effect	YES	YES	YES
Industry Effect	YES	YES	YES
Obs.	5 154	3089	1751
Pseudo R2	0.298	0.331	0.277

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

statistical level of 5%. In the regression of the group with higher financing constraints shown in column (2), the coefficient of the interaction items *Hrisk×Post2004* is positive and significant at the statistical level of 5%. In the regression of the group with lower financing constraints shown in column (3), the coefficient of the interaction items *Hrisk×Post2004* is positive, but not significant. The difference between the groups is significant at the level of 10%. This suggests that the following point is still valid: with credit default risks calculated by using the *Z-Score* model as grouping variables, the conclusion is that after removing the ceiling on loan interest rates, high-risk enterprises tend to choose high-quality auditors to send signals because of their improved credit availability, and enterprises with a greater degree of financing constraints are more incentivised to choose high-quality auditors.

Second, as an important dimension for measuring the auditor quality, the international 'Big Four' reflects the quality of the international firms but overlooks the audit quality in China. Therefore, instead of the 'Big 4,' the 'former Big 8' is used as a measurement of the quality of auditors (Chen et al., 2011) to test the robustness of the hypothesis.

Table 9. Credit availability, signalling, and auditor choice (Big 8).

	(1)	(2)	(3)
	Dependent variable: high-quality auditors (*Big8*)		
	Full sample	With higher financing constraints	With lower financing constraints
Hrisk	−0.061	−0.280	0.205
	(−0.31)	(−1.07)	(0.71)
Post2004	−1.002***	−0.707*	−1.209***
	(−3.62)	(−1.82)	(−2.96)
Hrisk×Post2004	**0.463****	**0.890*****	**0.009**
	(2.49)	**(3.23)**	**(0.04)**
Sue Test (χ^2)		**6.94*****	
(p-value)		**(0.008)**	
Lev	−1.024*	−1.866***	−0.037
	(−1.95)	(−2.65)	(−0.05)
Size	0.684***	0.742***	0.521***
	(7.12)	(6.13)	(2.82)
Roa	−0.349	−0.161	−0.295
	(−0.26)	(−0.10)	(−0.15)
Indp	2.395***	1.423	3.360***
	(3.49)	(1.58)	(3.33)
Growth	0.037	0.143	−0.142
	(0.33)	(1.00)	(−0.75)
State	0.078	0.019	0.105
	(0.43)	(0.08)	(0.36)
Inv	0.477	0.598	0.238
	(0.78)	(0.76)	(0.25)
Rec	0.614	1.027	−0.337
	(0.78)	(1.08)	(−0.26)
Shrcr1	−0.299	−0.776	0.554
	(−0.63)	(−1.20)	(0.80)
_Cons	−16.737***	−16.784***	−27.772***
	(−8.05)	(−6.85)	(−7.10)
Year Effect	YES	YES	YES
Industry Effect	YES	YES	YES
Obs.	5177	3415	1751
Pseudo R2	0.077	0.090	0.070

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 9 reports the test results. The test results show that, in the full-sample regression shown in column (1), the coefficient of the interaction items *Hrisk×Post2004* is positive and significant at the statistical level of 5%. In the regression of the group with higher financing constraints shown in column (2), the coefficient of the interaction items *Hrisk×Post2004* is positive and significant at the statistical level of 1%. In the regression of the group with lower financing constraints shown in column (3), the coefficient of the interaction items *Hrisk×Post2004* is positive, but not significant. The difference between the groups is significant at the level of 1%. This suggests that in using the 'Big 8' as the measurement indicator for high-quality auditors, the following points are still valid: high-risk enterprises tend to choose high-quality auditors to send signals because of their improved credit availability and high-risk enterprises with a greater degree of financing constraints are more inclined to choose high-quality auditors.

Third, following the method of Kaplan and Zingales (1997) to construct the KZ index, this paper uses the Ordered Logit model to regress the company's cash, operating cash flow, dividends, asset-liability ratio and Tobin's Q, and finally uses the regression

Table 10. Financial constraints, credit availability, and auditor choice (KZ index).

	(1)		(2)
	Dependent variable: high-quality auditors (*Big4*)		
	With higher financing constraints		With lower financing constraints
Hrisk	−0.673*		−0.275
	(−1.72)		(−0.55)
Post2004	−2.911***		−2.658***
	(−5.71)		(−3.06)
Hrisk×Post2004	**1.037****		**0.067**
	(2.36)		**(0.14)**
Sue test (χ^2)		**2.75***	
(p-value)		**(0.097)**	
Lev	−2.688**		−2.908*
	(−2.45)		(−1.77)
Size	1.476***		1.834***
	(7.51)		(8.23)
Roa	−1.671		7.084
	(−0.51)		(1.10)
Indp	3.006***		5.305**
	(2.71)		(2.33)
Growth	−0.059		−0.628
	(−0.19)		(−1.29)
State	0.155		−0.290
	(0.41)		(−0.50)
Inv	−0.850		−1.896
	(−0.53)		(−1.17)
Rec	−4.236**		−1.445
	(−2.13)		(−0.60)
Shrcr1	−0.758		−3.040**
	(−0.77)		(−2.57)
_Cons	−46.545***		−51.609***
	(−11.27)		(−11.71)
Year Effect	YES		YES
Industry Effect	YES		YES
Obs.	3 417		1 622
Pseudo R2	0.256		0.368

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

parameters to calculate the KZ index. The KZ index is calculated by using the regression parameters and used to measure enterprises' financial constraints and as a grouping variable to examine to what extent credit availability affects the auditor choice of enterprises with different financial needs. Consistent with Zhang and Wang (2013) and Qian et al. (2016), the enterprises are divided into two groups based on their KZ index value: those that have an index value that is higher than 33% are identified as enterprises with relatively high financial constraints and those that have an index value that is less than 33% are identified as enterprises with relatively low financial constraints. Then, a revalidation of H2 is conducted. Table 10 reports the inspection results.

The test results show that, in the group with higher financial constraints shown in column (1), the coefficient of the interaction items *Hrisk×Post2004* is significantly positive at the statistical level of 5%. In the group with lower financing constraints shown in column (2), the coefficient of the interaction items *Hrisk×Post2004* is statistically insignificantly positive. The difference between the groups is significant at the level of 10%,

Table 11. Credit availability, signalling, and auditor choice (Shortened observation period: −2, 2).

	(1)	(2)	(3)
	Dependent variable: high-quality auditors (*Big4*)		
	Full sample	With higher financing constraints	With lower financing constraints
Hrisk	−0.456	−0.672	−0.170
	(−1.34)	(−1.24)	(−0.41)
Post2004	−1.097***	−1.085**	−1.253***
	(−4.22)	(−2.46)	(−3.44)
Hrisk×Post2004	**0.584***	**1.232****	**0.198**
	(1.86)	**(2.24)**	**(0.51)**
Sue Test (χ^2)		**2.84***	
(p-value)		**(0.092)**	
Lev	−3.248***	−5.722***	−2.111
	(−3.05)	(−3.33)	(−1.59)
Size	1.574***	2.090***	1.269***
	(9.60)	(7.43)	(4.59)
Roa	1.918	1.442	0.563
	(0.55)	(0.24)	(0.14)
Indp	3.204***	2.017	4.073**
	(2.60)	(1.29)	(2.44)
Growth	−0.364	−0.190	−0.462
	(−1.14)	(−0.48)	(−0.97)
State	0.076	−0.114	0.247
	(0.19)	(−0.22)	(0.40)
Inv	−0.453	0.313	−0.657
	(−0.34)	(0.16)	(−0.38)
Rec	−2.717	−1.368	−3.639
	(−1.44)	(−0.50)	(−1.43)
Shrcr1	−2.178**	−3.389***	−1.368
	(−2.54)	(−2.90)	(−1.12)
_Cons	−49.154***	−56.923***	−42.489***
	(−14.24)	(−10.39)	(−7.19)
Year Effect	YES	YES	YES
Industry Effect	YES	YES	YES
Obs.	3551	2130	1096
Pseudo R2	0.295	0.362	0.217

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

meaning that the conclusion that enterprises with a greater degree of financing constraints are more incentivised to choose high-quality auditors after their credit availability increases is valid.

Fourth, in the main test, the changing trends within three years before and after the event were observed to study how credit availability affects enterprises' auditor selection. In order to improve the robustness of the results, the observation period is shortened to two years before and after the event. Therefore, from 2002 to 2006 (excluding the policy year) is taken as the sample time range. Table 11 reports the inspection results.

The test results show that, in the full-sample regression shown in column (1), the coefficient of the interaction items *Hrisk×Post2004* is positive and significant at the statistical level of 10%. In the regression of the group with higher financing constraints shown in column (2), the coefficient of the interaction items *Hrisk×Post2004* is positive and significant at the statistical level of 5%. In the regression of the group with lower financing constraints shown in column (3), the coefficient of the interaction items *Hrisk×Post2004* is positive, but not significant. The difference between the groups is significant at the level

Table 12. Matching balance test results of high-risk enterprises.

		Mean		T-test	
Variable	Sample	Treated	Control	T-value	P-value
Lev	Unmatched	0.436	0.472	−4.44	0.00***
	Matched	0.436	0.433	0.38	0.72
Size	Unmatched	21.194	20.871	9.16	0.00***
	Matched	21.194	21.171	0.59	0.56
Roa	Unmatched	0.038	0.022	6.17	0.00***
	Matched	0.038	0.039	−0.32	0.75
Indp	Unmatched	0.115	0.113	0.33	0.75
	Matched	0.115	0.114	0.19	0.85
Growth	Unmatched	0.222	0.173	2.58	0.01*
	Matched	0.222	0.216	0.27	0.78
State	Unmatched	0.776	0.655	5.85	0.00***
	Matched	0.776	0.780	−0.20	0.85
Inv	Unmatched	0.142	0.140	0.40	0.69
	Matched	0.142	0.145	−0.35	0.73
Rec	Unmatched	0.130	0.160	−6.29	0.00***
	Matched	0.130	0.127	0.51	0.61
Shrcr1	Unmatched	0.447	0.419	3.67	0.000***
	Matched	0.447	0.443	0.42	0.671

Note: *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

of 10%.This result shows that, with a shortened observation period, the conclusion that high-risk enterprises tend to choose high-quality auditors to send signals because of their improved credit availability, and that enterprises with a greater degree of financing constraints are more incentivised to choose high-quality auditors, is still valid.

Fifth, a PSM-DID test was also performed. In the main test, the credit default risk is used as the grouping variable to establish the treatment and control groups. In order to improve the comparability of the two groups, the propensity score match (PSM) is used to match the control group with the treatment group and to ensure the stability of the two groups before the event. Specifically, the adjacent matching method is used to match the control group with the treatment group. Table 12 reports the matching results of the PSM. It can be seen from the matching results that no significant difference exists in the variables of the treatment and control groups after the PSM.

Table 13 shows the test results of the difference-in-differences (DID) regression between the treatment group and the control group after the PSM. The test results show that, in the full-sample regression shown in column (1), the coefficient of the interaction items *Hrisk*×*Post2004* is positive and significant at the statistical level of 5%. In the regression of the group with higher financing constraints shown in column (2), the coefficient of the interaction items *Hrisk*×*Post2004* is positive and significant at the statistical level of 5%. In the regression of the group with lower financing constraints shown in column (3), the coefficient of the interaction items *Hrisk*×*Post2004* is positive, but not significant. The difference between the groups is significant at the level of 10%. This indicates that when the PSM-DID method is used, the research conclusion that high-risk enterprises tend to choose high-quality auditors to send signals because of their improved credit availability, and that enterprises with a greater degree of

Table 13. Credit availability, signalling, and auditor choice (PSM-DID test).

	(1)	(2)	(3)
	Dependent variable: high-quality auditors (*Big4*)		
	Full-sample	With higher financing constraints	With lower financing constraints
Hrisk	−0.593*	−0.811	−0.326
	(−1.66)	(−1.50)	(−0.72)
Post2004	−2.617***	−2.755***	−2.559***
	(−6.00)	(−4.38)	(−4.26)
Hrisk×Post2004	**0.720****	**1.336****	**0.230**
	(2.08)	**(2.42)**	**(0.54)**
Sue Test (χ^2)		**3.22***	
(p-value)		**(0.073)**	
Lev	−2.935***	−4.638***	−2.210*
	(−3.00)	(−3.08)	(−1.74)
Size	1.572***	1.981***	1.252***
	(10.14)	(7.70)	(4.73)
Roa	1.112	1.067	−0.180
	(0.36)	(0.22)	(−0.05)
Indp	3.494***	2.445*	4.014***
	(3.13)	(1.68)	(2.86)
Growth	−0.187	−0.015	−0.265
	(−0.76)	(−0.04)	(−0.70)
State	−0.004	−0.106	0.101
	(−0.01)	(−0.22)	(0.18)
Inv	−0.850	−0.351	−0.941
	(−0.64)	(−0.18)	(−0.61)
Rec	−2.974*	−1.037	−4.606**
	(−1.82)	(−0.48)	(−2.01)
Shrcr1	−1.744**	−2.394**	−1.175
	(−2.07)	(−2.07)	(−1.03)
_Cons	−47.469***	−55.030***	−40.694***
	(−14.87)	(−10.79)	(−7.36)
Year Effect	YES	YES	YES
Industry Effect	YES	YES	YES
Obs.	5102	3071	1717
Pseudo R2	0.291	0.361	0.224

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses.*, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

financing constraints are more incentivised to choose high-quality auditors, is still valid.

Sixth, the fixed effect model is also used for testing. In the DID test, if the fixed effect of enterprises is controlled, the grouping variables will be absorbed. Therefore, the industry and annual fixed effect were controlled in the main test. In order to improve the robustness of the research conclusions, the enterprise fixed effect model is used to control the individual factors that do not change over time. Table 14 reports the test results of the fixed effect model.

The test results show that, in the full-sample regression shown in column (1), the coefficient of the interaction items *Hrisk×Post2004* is positive and significant at the statistical level of 1%. In the regression of the group with higher financing constraints shown in column (2), the coefficient of the interaction items *Hrisk×Post2004* is positive and significant at the statistical level of 1%. In the regression of the group with lower financing constraints shown in column (3), the coefficient of the interaction items *Hrisk×Post2004* is positive, but not significant. The difference between the groups is significant at the level of 10%. This indicates that when the fixed effect model is used,

Table 14. Credit availability, signalling, and auditor choice (Fixed effect of enterprises).

	(1)	(2)	(3)
	Dependent variable: high-quality auditors (*Big4*)		
	Full-sample	With higher financing constraints	With lower financing constraints
Hrisk			
Post2004	−1.244	−2.864	−0.792
	(−1.23)	(−1.16)	(−0.52)
Hrisk×Post2004	**2.045*** **	**4.663*** **	**0.888**
	(3.05)	**(3.31)**	**(0.82)**
Sue Test (χ^2) (p-value)		**2.82*** **(0.093)**	
Lev	−8.704***	−15.785***	−13.522***
	(−3.53)	(−2.98)	(−2.60)
Size	3.512***	4.168***	5.325***
	(4.60)	(3.03)	(3.51)
Roa	−13.634***	−31.354***	−13.476**
	(−2.98)	(−3.06)	(−1.96)
Indp	−5.284**	−5.639	−7.163**
	(−2.39)	(−0.98)	(−2.23)
Growth	0.189	1.108	0.130
	(0.42)	(1.12)	(0.20)
State	−1.237	−2.173	..
	(−0.74)	(−0.79)	
Inv	−8.393**	−14.744*	−7.215
	(−1.99)	(−1.79)	(−1.17)
Rec	−6.658**	−12.447**	−0.527
	(−2.18)	(−2.28)	(−0.10)
Shrcr1	−0.381	4.780	−3.373
	(−0.11)	(0.63)	(−0.69)
Year Effect	YES	YES	YES
Firm Effect	YES	YES	YES
Obs.	278	145	124

Note: All regressions used heteroscedasticity adjustment and enterprise cluster adjustment to obtain the robust standard errors. Standard errors are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

the research conclusion that high-risk enterprises tend to choose high-quality auditors to send signals because of their improved credit availability, and that enterprises with a greater degree of financing constraints are more incentivised to choose high-quality auditors, is still valid.

5. Conclusions and implications

As an important part of the marketisation of interest rates, the deregulation of loan interest rate ceilings plays a very important role in eliminating friction in the credit market and improving the financing environment for enterprises. Auditor choosing is of strategic significance to enterprises, and the degree of credit market regulation and credit resource allocation methods are important determinants of enterprise auditor choice. Therefore, this study uses the A-share non-financial listed companies in Shanghai and Shenzhen stock exchanges from 2001 to 2007 as a research sample to empirically test the impact of the liberalisation of loan interest rate ceilings on the selection of corporate auditors. After controlling endogeneity, the test results show that after deregulation of loan interest rate ceilings, high-risk enterprises tend to choose high-quality auditors to send positive signals. Further inspection also finds that after the deregulation of the loan interest rate

ceiling, high-quality auditors were hired for signal transmission mainly by high-risk companies with strong financing constraints. The above research results indicate that the promotion of deregulation of interest rates has significantly increased the degree of financial marketisation and improved the corporate financing environment. The market mechanism has begun to play a role in the allocation of credit resources, which has important positive significance for improving the efficiency of credit resource allocation in China.

The implications of this research for policymaking are as follows.

First, as China's economy enters the phase of 'new normality,' the Third Plenary Session of the 18th CCCPC has comprehensively summarised the journey and lessons from the liberalisation reform, and clearly point out that the 'market should play a decisive role in the allocation of resources and the function of the government shall be better used.' This study also validates the point that financial deregulation and the liberalisation of loan interest rates contribute to the improvement of enterprises' financial environments and allows for the more effective allocation of credit resources. Therefore, China should continue to promote the marketisation of the financial system in order to promote the free flow of capital elements and to optimise the allocation of credit resources.

Second, with the implementation of market-oriented reforms, the reputation mechanism, as one of the most basic mechanisms for maintaining the orderly operation of the market economy, is also starting to play an important role in China's credit market. However, the formation of reputation is a process of long-term accumulation and that requires effort. It is also the result of self-discipline and of cultivating the professional expertise of all auditors in accounting firms. Due to the incomplete establishment of a market mechanism and legal system in China, most accounting firms have not yet built a good reputation. In the face of the increasing demand for high-quality auditors, the government should continue to build an environment in which the reputation mechanism plays an important role. Moreover, accounting firms should strengthen their internal management and pay attention to the cultivation of their reputation.

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Correction statement

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