Can corporate digital transformation help curb the hollowing out of major shareholders?
——Empirical research based on China's A-share listed companies

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Abstract. Digital transformation has brought about major changes in the business model and governance mechanism of enterprises. Will this help curb the behavior of major shareholders hollowing out the company? Taking China's A-share listed companies from 2010 to 2021 as the research object, the impact of corporate digital transformation on the hollowing out of major shareholders was empirically tested. Research results show that corporate digital transformation can inhibit major shareholders from hollowing out the company; analysis of the mechanism of action shows that corporate digital transformation inhibits major shareholders from hollowing out by easing financing constraints and reducing earnings management. Heterogeneity analysis shows that enterprise digital transformation has a more significant impact on western regions and non-state-owned enterprises. The research conclusion helps clarify the impact of corporate digital transformation on corporate governance and major shareholder hollowing out, and also provides a new idea for suppressing the hollowing out behavior of major shareholders of listed companies.

Keywords: enterprise digital transformation; corporate governance; hollowing out of major shareholders; financing constraints; earnings management; Law, social and behavioral sciences Economics

1   INTRODUCTION

Many countries have a relatively concentrated ownership structure, where a small number of shareholders hold the majority of the company's shares [1]. Major shareholders (controlling shareholders) who hold a considerable proportion of shares in the company and have voting rights often obtain additional benefits by virtue of their dominant position. One of the situations is the hollowing out of major shareholders. The so-called hollowing out of major shareholders refers to the behavior of accusing shareholders of using their absolute equity or controlling position to adopt some unethical or even illegal means to divert the resources of listed companies and harm the interests of small and medium-sized shareholders [2]. These private benefits obtained by major

shareholders harm the interests of the company and small and medium-sized shareholders, which has been a problem that has long been criticized [3].

The phenomenon of concentrated ownership among Chinese listed companies is also relatively common. According to the data of China's listed companies in 2022, the average shareholding ratio of the largest shareholder is 32.16 % and the second to fifth largest shareholders The average shareholding ratio is 52.78 %. One problem caused by the concentration of ownership is that the hollowing-out behavior of major shareholders has always been prominent in China. The hollowing-out behavior of major shareholders in Chinese listed companies affects the company's normal operations and management, causing insufficient liquidity and increasing the company's financial risks.

With the development of artificial intelligence, blockchain, cloud computing, big data, etc., China has seen a wave of enterprise digital transformation in recent years. Enterprise digital transformation is when enterprises use various digital technologies such as "Internet +", Internet of Things, 5G commercial, and big data to comprehensively transform and upgrade their business processes, organizational structures, products, and services, thereby triggering changes in enterprise operating models and business models [4]. By introducing digital technologies and applications, enterprises can realize the automation of business processes, digitization of information, and efficient analysis and utilization of data, thereby improving the company's efficiency, innovation capabilities, and competitiveness.

Regarding the impact of enterprise digital transformation on corporate governance, Wei Yicheng [5]believes that enterprise digitalization can integrate information flow, connect different stakeholders, create a governance network space, and thereby improve the level of corporate governance. Shao Jianbing and Wang Lu ye [6]found that enterprise digital transformation can strengthen the role of audit governance and the supervision role of external entities, and significantly inhibit high-level shareholders' explicit corruption and implicit corruption. Scholars also proposed that corporate digital transformation can have an impact on corporate financing constraints and earnings management. Zhou Lan and Weng Ye ying [7]believe that corporate digitalization will help improve the quality of information disclosure, and at the same time, the governance effect of digitalization will drive and support the sinking of organizational rights, reduce agency problems, and ease financing constraints. Wang Jing yong [8]and others proposed that digital transformation of small and medium-sized enterprises can improve corporate information transparency, reduce financing costs, and strengthen innovation capabilities, thereby easing financing constraints. Zhang Jiawei [9]and others believe that the digital economy can significantly inhibit real earnings management and alleviate the short-sighted behavior of management. Luo Jin hui and Wu Yilong [10]found that digital operations can significantly inhibit a company's real earnings management activities.

It can be seen that the academic community has done a lot of research on how the digital transformation of enterprises affects corporate governance, and how corporate governance affects the hollowing out of major shareholders. These studies have certain reference significance for this article, but whether the digital transformation of enterprises is conducive to curbing the expropriation of large shareholders? Shareholder

hollowing out is still an issue that needs further study. The contribution of this article is that, based on the panel data of China's A-share listed companies from 2010 to 2021, it is pointed out through empirical analysis that the digital transformation of enterprises can inhibit the hollowing out of the company by major shareholders; and the digital transformation of enterprises inhibits the hollowing out of major shareholders by mitigating Financing constraints and lower earnings management mechanisms come into play.

2   THEORETICAL ANALYSIS AND HYPOTHESIS DERIVATION

2.1   The impact of enterprise digital transformation on the hollowing out of major shareholders

In the context of enterprise digital transformation, the information environment and conditions inside and outside the company have undergone significant changes. Within the company, digital operating models and management methods reduce the time for information transmission and complex intermediaries, greatly facilitating the flow of information within the company. The connections between departments are strengthened, and different departments will also respond to information in a timely feedback [11]. At the same time, the digital information model makes it easy to save and view various data, improves the transparency of information, allows company regulatory agencies and personnel to better supervise company matters, and facilitates the board of directors, board of supervisors and independent directors to supervise and check and balance major shareholders. . After enterprises are digitized, various digital platforms also provide channels for small and medium-sized shareholders to share and obtain information, making it easier for small and medium-sized shareholders to participate more actively in corporate governance[12]. From outside the company, with the digital transformation of enterprises, more and more high-quality information is disclosed in the company. Media such as company websites, economic forums, and securities regulatory agencies are also more active, and more and more people can collect the company's information. information. The company's stakeholders can better pay attention to the company's changes and supervise major shareholders. When major shareholders seek personal gain and do things that are not conducive to the company's long-term development, these stakeholders will react and safeguard their rights [13].

Based on the above analysis, this article proposes hypothesis 1.

Hypothesis 1: Enterprise digital transformation can inhibit the hollowing out behavior of major shareholders.

2.2   The mechanism by which corporate digital transformation affects the hollowing out of major shareholders

(a) Ease financing constraints. When the degree of financing constraints of an enterprise is high, it is difficult for the enterprise to obtain sufficient funds to expand the scale of

the enterprise, and the investment efficiency of the enterprise is also low, which in turn hinders the further development of the enterprise. In this case, the major shareholders may not be satisfied with the current profit gains and resort to various methods to expropriate the interests of the enterprise and small and medium-sized shareholders. At the same time, companies with higher financing constraints not only have less external financing funds but also lack the supervision of external investors. After enterprises implement digital transformation, the use of digital technology makes it easier for enterprises to connect to Internet financial platforms and borrow funds more conveniently, thereby broadening financing channels. Digital technology is also very helpful for processes such as auditing and verification during financing, which can reduce financing costs [14]. In addition, companies that undergo digital transformation will create an image of positive development, which will help improve the company's information transparency, allow investors to better understand the company's financial status, and supervise and supervise major shareholders. constraints [15]. In general, the digital transformation of enterprises can play a positive role in financing activities and also help external investors exert a supervisory effect. and governance effects, thereby inhibiting the hollowing out behavior of major shareholders. Based on the above analysis, this article proposes hypothesis 2.

Hypothesis 2: Enterprise digital transformation can inhibit the hollowing out of major shareholders by easing financing constraints.

(b) Reduce earnings management. Moderate earnings management can reduce a company's capital costs, but excessive earnings management has various risks. It distorts some financial data, reduces the credibility and fairness of financial statements, and thus affects the efficiency of market resource allocation. In addition, earnings management is a short-term behavior that will cause companies to ignore the importance of long-term sustainable operations, thereby increasing operating risks. The company's major shareholders often conspire with the management to cover up their capital occupation behavior and whitewash performance through earnings management, thus reducing the transparency of financial reports [16]. The more funds occupied by major shareholders, the more inclined they are to conduct upward earnings management to cover up the company's operating difficulties. Enterprise digitization can help enterprises establish more complete internal control and risk management mechanisms, simplify business processes, reduce financial data errors, and improve the accuracy of company earnings forecasts. As companies undergo digital transformation, the availability of clear data increases, allowing regulators, auditors and investors to accurately understand a company's various financial changes. At the same time, with the application of data analysis and data mining technology, more visual information can be obtained, improving the transparency of financial information and audit quality [17].

Based on the above analysis, this article proposes hypothesis 3.

Hypothesis 3: Enterprise digital transformation can inhibit the hollowing out of major shareholders by reducing earnings management.

3   RESEARCH DESIGN

3.1   Sample selection and data sources

This article selects China's A-share listed companies from 2010 to 2021 as a sample, and uses Stata1 5.0 to process the data and conduct model regression analysis. The enterprise data comes from the CSMAR database, and a total of 29,595 regression samples were obtained. Furthermore, this paper processes the data as follows: first, removes special financial companies; second, removes ST, *ST, PT processing and companies that have terminated listing; third, removes IPO observation values; fourth, removes key financial companies Variables with missing observations. At the same time, to ensure data quality, this article only retains samples that have no missing data for at least five consecutive years. In addition, in order to avoid the influence of outliers, this paper performs [1%, 99%] quantile shrinking processing on continuous variables.

3.2   Variable setting

(a) Explanatory variables. This article uses the degree of digital transformation of enterprises (DT) as an explanatory variable. How to measure the degree of digital transformation of enterprises is a difficult point, and different scholars adopt different methods. This article draws on the practice of Zhao Chenyu [18]and others to conduct word frequency statistics on keywords for enterprise digital transformation, and use word frequency to construct an enterprise digital transformation index. The larger the value, the higher the degree of digitalization of the listed company.

(b) The explained variable. The explanatory variable in this article is tunneling by major shareholders. This article draws on the research of Ye Kangtao [19]and Zheng Guojian [20], etc., and uses the proportion of other receivables in total assets as the variable for major shareholder hollowing out.

(c) Control variables. Based on the research results of other scholars, this article selects the following variables as control variables: enterprise size (Size), enterprise age (Age), return on assets (Roa), financial leverage (Lev), Proportion of independent directors (Indr), equity checks and balances (S1), equity concentration (Top 10), two positions in one (Dual). The selection of variables in this article is shown in Table 1 Variable Description.

Table 1. Variable Description.

	variable name	variable code	variable description
explained variable	major shareholders hollowed out	tunnel	proportion of other receivables to total assets
explanatory variables	enterprise digital transformation degree	DT	the frequency of relevant words in the annual report is weighted and summarized, then 1 is added to take the natural logarithm

control variables	enterprise size	Size	the total assets of listed companies at the end of the year, and take the logarithm
	enterprise age	Age	the number of years since the company was established, take the logarithm
	return on Assets	Roa	the ratio of annual net profit to total assets of listed companies
	financial leverage	Lev	the ratio of total liabilities to total assets of listed companies at the end of the year
	proportion of independent directors	Indr	ratio of independent directors to the total number of board members
	equity checks and balances	S1	The total shareholding ratio of the top two to ten largest shareholders as a percentage of the shareholding ratio of the largest shareholder
	ownership concentration	Top 10	Shareholding ratio of top ten shareholders
	two jobs in one	Dual	whether the chairman and general manager are concurrently appointed, if concurrently appointed, it is 1
moderator	financing constraints	FC	using Kz indicator
	earnings management	DA	use a nonlinear model

3.3   Model design

In order to study the impact of corporate digitalization on the hollowing out of major shareholders, this article constructs the following panel model (1):

$$Tunnel = \beta_0 + \beta_1 DT + \beta_2 \sum Controls + Year_t + Industry_u + \varepsilon_{i,t} \qquad (1)$$

In model (1), Tun n el represents the degree of hollowing out of the company's major shareholders, D T represents the degree of digital transformation of the company, Controls is the set of control variables, YEAR t is the year dummy variable, Industry u is the industry dummy variable, ε i,t are error terms.

In order to test the mechanism of financing constraints and earnings management on corporate digital transformation and the hollowing out of major shareholders, model (2) and model (3) are used to test:

$$Tunnel = \beta_0 + \beta_1 DT + \beta_2 \sum Controls + \beta_3 FC + \beta_4 DT \times FC + Year_t + Industry_u + \varepsilon_{i,t} \tag{2}$$

$$Tunnel = \beta_0 + \beta_1 DT + \beta_2 \sum Controls + \beta_3 DA + \beta_4 DT \times DA + Year_t + Industry_u + \varepsilon_{i,t} \tag{3}$$

Among them, FC is the financing constraint indicator, DA is the earnings management indicator, and the remaining variables are the same as model (1).

4   EMPIRICAL ANALYSIS

4.1   Descriptive statistics

Descriptive statistics of variables are shown in Table 2Descriptive statistics of variables. As can be seen from Table 2, the maximum value of hollowing out by major shareholders of an enterprise is 0.241, and the minimum value is 0.000262, indicating that the governance levels of enterprises vary greatly. The average value of the degree of digital transformation of enterprises is 2.809, the minimum value is 0, and the maximum value is 6.883, indicating that most enterprises in our country are undergoing digital transformation, and only a small number of enterprises have not yet started digital transformation. The digitalization level among enterprises There are big differences, and the degree of digitalization needs to be improved. Data on return on assets (Roa) and financial leverage (Lev) show that the operating risks faced by Chinese companies cannot be underestimated, and many companies have relatively high financial risks. The average shareholding ratio of the top ten shareholders (Top 10) is 5 7.6, indicating that the phenomenon of large shareholder shareholding in China is serious. The average value of equity checks and balances (S1) is only 0.928, indicating that China's equity is relatively concentrated and lacks checks and balances among shareholders. The mean value of Dual is 0.731, which is higher than 0.5, indicating that it is common for the chairman and general manager to hold concurrent positions in Chinese companies.

In addition, the vif of each variable is lower than 5, indicating that the variables do not have a high degree of correlation, and the multicollinearity problem of the model is not serious.

Table 2. Descriptive statistics of variables

variable	Observations	mean	standard deviation	minimum value	maximum value
Tunnel	29,595	0.0223	0.0365	0.000262	0.241
D t	29,595	2.812	1.264	0	6.883
Age	29,595	2.895	0.344	0.693	4.007
size	29,595	22.22	1.317	19.69	26.23
Roa	29,595	0.0347	0.0649	-0.285	0.199
Lev	29,595	0.438	0.210	0.0557	0.939
Indr	29,595	0.382	0.0746	0.167	0.800

top10	29,595	57.60	15.30	1.310	101.116
S1	29,595	0.935	0.831	0.0090	8.056
Dual	29,595	0.731	0.444	0	1

4.2   Regression analysis

First, we conduct a simple regression analysis on digital transformation and major shareholder hollowing out, without adding control variables. Observing column (1) of Table 3 The relationship between corporate digitalization and the hollowing out of major shareholders, we can find that digital transformation and major shareholder expropriation are significantly negatively correlated at the 1% level. After adding relevant control variables and controlling for industry and year effects, column (2) of Table 3 shows that the relationship between corporate digital transformation and major shareholder hollowing out is still significant and negatively correlated. Hypothesis 1 has been verified. The correlation coefficient between company size and large shareholder hollowing out is significantly negative. This may be because the larger the company size, the more attention it pays to corporate governance, which can better restrain large shareholders from occupying company funds. There is a significant positive correlation between the age of the company and the hollowing out of large shareholders, which shows that the longer the company is established and the more mature it is, the more likely it is for large shareholders to hollow out and misappropriate the interests of small and medium shareholders. There is a negative correlation between financial leverage and major shareholder expropriation, and the relationship is significant, indicating that for companies with relatively more debt, the problem of major shareholder expropriation is more serious. The correlation coefficient between the return on assets and the major shareholder's expropriation is significantly negative. This may be because if the company's return rate is higher, the income of major shareholders will also increase, thereby reducing unnecessary occupation of funds. The relationship between the proportion of independent directors and the hollowing out of major shareholders is not significant, indicating that the restrictive effect of independent directors on major shareholders is not obvious. This is also consistent with the belief of some scholars that major shareholders can control the board of directors, thus weakening the governance role of the board of directors. The shareholding ratio of the top ten shareholders and the combination of two positions are negatively correlated with the hollowing out of large shareholders, indicating that these variables can inhibit the hollowing out of large shareholders.

Table 3. The relationship between corporate digitalization and the hollowing out of major shareholders

	(1)	(2)
	Tunnel	Tunnel
DT	-0.0014 ***	-0.000871 ***
	(0.000)	(0.000)
Size		-0.0147 ***

		(0.000)
Age		0.0152 ***
		(0.003)
Lev		0.0478 ***
		(0.002)
Roa		-0.0356 ***
		(0.003)
Indr		-0.00347
		(0.003)
Top10		-0.000188***
		(0.000)
S1		0.00341***
		(0.000)
Dual		-0.000832***
		(0.000)
_cons	0.044***	0.278***
	(0.002)	(0.012)
N	29595	29595
R2	0.0647	0.114
Year	Yes	Yes
Industry	Yes	Yes

Standard errors in parentheses * p <0.1, ** p <0.05, *** p <0.01

4.3　　Robustness check

(a) Delete the municipality sample. Because municipalities have certain particularities and are different from other provinces in terms of political and economic environments, companies located in municipalities may have higher levels of digital transformation and corporate governance. Therefore, the samples from municipalities are deleted and then regressed. Table 4(1) The column shows the regression results, and the conclusion is consistent with the previous article.

(b) Add year and industry crossover items. In order to eliminate the impact of industry cycle changes, the cross product of year and industry is added for fixed effects regression. Column (2) of Table 4 shows the regression results. The conclusion is consistent with the previous article.

(c) Since the digital transformation of enterprises requires a certain process, the impact on corporate governance after the transformation will have a certain lag effect. In order to eliminate the endogeneity problem of mutual causation between the digital transformation of enterprises and the private interests of major shareholders, and to solve the problem of inconsistency in regression parameters caused by endogeneity, this article chooses to use instrumental variables for 2SLS regression. The explanatory variable of enterprise digital transformation is lagged by one period. The lagged one period of the explanatory variable is generally not related to the random disturbance term in the current period, which meets the requirements of the exogeneity of instrumental variables. The empirical results are as shown in column (3) of Table 4.

Corporate digital transformation is still significantly negatively correlated with the hollowing out of major shareholders, indicating that corporate digitalization will inhibit the hollowing out behavior of major shareholders, and the relevant hypotheses have been further verified.

(d) Replace the explanatory variable indicators. Since there are multiple measurement indicators for digital transformation, we used the practice of scholars such as Yuan Chun [21]to select proxy variables. Column (4) of Table 4 shows the regression results, and the results still verify our hypothesis.

Table 4. Robustness check

	(1) tunnel	(2) tunnel	(3) T unnel	(4) T unnel
Dt	-0.00106***	-0.000552**	-0.000821***	-0.00118***
	(0.000)	(0.000)	(0.000)	(0.000)
Size	-0.0142***	-0.0150***	-0.0146***	-0.0149***
	(0.000)	(0.000)	(0.000)	(0.000)
Lev	0.0497***	0.0478***	0.0447 ***	0.0487 ***
	(0.002)	(0.002)	(0.002)	(0.002)
Long	-0.0354 ***	-0.0353 ***	-0.0378 ***	-0.0351 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Age	0.0152 ***	0.0199 ***	0.0175 ***	0.0146 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Indr	-0.00666 **	-0.00326	-0.00578 **	-0.0034
	(0.003)	(0.003)	(0.003)	(0.003)
S1	0.00343 ***	0.00338 ***	0.00293 ***	0.00343 ***
	(0.000)	(0.000)	(0.000)	(0.000)
dual	-0.00147 ***	-0.000597	-0.000303	-0.0009 *
	(0.001)	(0.000)	(0.001)	(0.001)
Top10	-0.000204***	-0.000191***	-0.000160***	-0.000***
	(0.000)	(0.000)	(0.000)	(-8.36)
_cons	0.261***	0.268***	0.265***	0.282***
	(0.013)	(0.012)	(0.014)	(0.012)
N	23771	29595	26382	28948
R2	0.121	0.115	0.107	0.115
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes

Standard errors in parentheses * p <0.1, ** p <0.05, *** p <0.01

4.4   Influence mechanism

(a) Financing constraints. Based on the research of Wei Zhi hua [22]and others to calculate the degree of financing constraints. The larger the KZ value, the higher the degree of financing constraints faced by the enterprise. The regression results are in column (1) of Table 5. The coefficient of the multiplication term of digital transformation and

financing constraints is significantly negative, indicating that digital transformation can inhibit the hollowing out of major shareholders by easing financing constraints, and financing constraints play a role in this. Moderating effect, hypothesis 2 was verified.

(b) Earnings management. Drawing on the estimation method of Huang Mei and Xia Xin ping [23], the nonlinear Jones model is used to measure accrual earnings management. The smaller the value, the higher the quality of the company's accounting information. The regression results are in column (2) of Table 5. The coefficient of the intersection of digital transformation and earnings management is significantly negative, indicating that digital transformation can inhibit the hollowing out of major shareholders by reducing earnings management, and earnings management plays a role in regulating this. effect, hypothesis 3 was verified.

Table 5. Influence mechanism regression results

	(1)	(2)
	tunnel	tunnel
Size _	-0.0130 ***	-0.0149 ***
	(0.000)	(0.000)
Lev	0.0359 ***	0.0487 ***
	(0.002)	(0.002)
Roa	-0.0336 ***	-0.0361 ***
	(0.003)	(0.003)
Age	0.0127 ***	0.0153 ***
	(0.003)	(0.003)
Indr	-0.00480 *	-0.00300
	(0.003)	(0.003)
S1	0.00292 ***	0.00348 ***
	(0.000)	(0.000)
dual	-0.000765	-0.000851 *
	(0.000)	(0.001)
top10	-0.000155 ***	-0.000186 ***
	(0.000)	(0.000)
c_DT	-0.000732 ***	-0.000836***
	(0.000)	(0.000)
c_KZ	0.00112***	
	(0.000)	
KZ×DT	-0.000283***	
	(0.000)	
c_DA		0.000847
		(0.002)
DA×DT		-0.00432**

		(0.002)
_cons	0.251***	0.278***
	(0.012)	(0.012)
N	28998	27880
R2	0.107	0.116 _
Y ear	Yes	Yes
Industry	Yes	Yes

Standard errors in parentheses * p <0.1, ** p <0.05, *** p <0.01

4.5   Heterogeneity analysis

(a) Regional heterogeneity analysis. This article divides the sample into three parts: east, middle and west for regression. The results are shown in Table 6. Number (1) is the eastern region, number (2) is the western region, and number (3) is the central region. It can be seen that the degree of digital transformation of enterprises in the eastern and central areas still hurts enterprises in the eastern and central areas, but the p-value is too large and cannot pass the significance test. In the west, corporate digital transformation can significantly inhibit the hollowing out of the company by major shareholders.

Table 6. Regional heterogeneity regression results

	(1) tunnel	(2) tunnel	(3) tunnel
Dt	-0.000441	-0.00142*	-0.000600
	(0.000)	(0.001)	(0.001)
Size	-0.0138***	-0.0129***	-0.00893***
	(0.000)	(0.001)	(0.001)
Lev	0.0405***	0.0456***	0.0389***
	(0.002)	(0.005)	(0.004)
Roa	-0.0373 ***	-0.0256 ***	-0.0541 ***
	(0.004)	(0.009)	(0.008)
Age	0.0127 ***	-0.00361	0.0230 ***
	(0.003)	(0.011)	(0.008)
Indr	-0.00533 *	-0.00934	0.00359
	(0.003)	(0.008)	(0.006)
S1	0.00287 ***	0.00474 ***	-0.000477
	(0.000)	(0.001)	(0.001)
Dual	0.000240	-0.00221	-0.00342***
	(0.001)	(0.002)	(0.001)
Top10	-0.000155***	-0.000355***	-0.000106**
	(0.000)	(0.000)	(0.000)
_cons	0.258***	0.336***	0.147***
	(0.014)	(0.042)	(0.029)

N	20163	3922	4787
R2	0.099	0.131	0.094
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes

Standard errors in parentheses *p<0.1,**p<0.05,***p<0.01

(b) Analysis of heterogeneity of property rights. This article divides the samples into state-owned and non-state-owned enterprises for analysis. The results are shown in Table 7. Number (1) is the regression result of state-owned enterprises, and number (2) is the regression result of non-state-owned enterprises. It can be seen from the data in Table 7 that digital transformation can not only significantly inhibit the hollowing out of major shareholders of state-owned enterprises, but also significantly inhibit the hollowing out of major shareholders of non-state-owned enterprises. At the same time, it can be found that the inhibitory effect of digital transformation on non-state-owned enterprises is more obvious.

Table 7. Property rights heterogeneity regression results

	(1)	(2)
	tunnel	tunnel
D t	-0.000656*	-0.000876**
	(0.000)	(0.000)
Size	-0.0134***	-0.0118***
	(0.001)	(0.001)
Lev	0.0443***	0.0325***
	(0.002)	(0.003)
Roa	-0.0473***	-0.00988*
	(0.004)	(0.006)
Age	0.00881**	0.0107**
	(0.004)	(0.005)
Indr	-0.00812 **	-0.00135
	(0.003)	(0.004)
S1	0.00365 ***	-0.000919
	(0.001)	(0.001)
dual	0.0000166	-0.000405
	(0.001)	(0.001)
top10	-0.000229 ***	0.0000454
	(0.000)	(0.000)
_cons	0.277 ***	0.211 ***
	(0.016)	(0.021)
n	17761	11238
R 2	0.063	0.127
Year	Yes	Yes
Industy	Yes	Yes

Standard errors in parentheses * p <0.1, ** p <0.05, *** p <0.01

5   RESEARCH CONCLUSIONS AND SUGGESTIONS

This article analyzes the data of China's A-share listed companies from 2010 to 2021. The research finds that: First, the digital transformation of enterprises has a significant inhibitory effect on the hollowing out of large shareholders. Digital corporate management can inhibit large shareholders from taking advantage of the company and small and medium-sized enterprises. The interests of shareholders are misappropriated; secondly, from the perspective of the impact mechanism, corporate digital transformation can inhibit the hollowing out of large shareholders by easing financing constraints and reducing earnings management; thirdly, from the perspective of heterogeneity analysis, digital transformation can significantly inhibit The hollowing out of major shareholders in the western region also has a restraining effect on the eastern and central regions, but not significantly. For both state-owned enterprises and non-state-owned enterprises, digital transformation will significantly restrain the hollowing out of major shareholders, but it has a greater effect on non-state-owned enterprises.

Based on the above research, this article puts forward the following suggestions.

First, continue to promote the digital transformation of enterprises. In order to curb the hollowing out of major shareholders, it is necessary to continuously promote the digital transformation of enterprises. As far as enterprises are concerned, they must pay attention to the impact of digital technology and digital economy on the company, actively formulate and implement digital strategies, use technologies such as cloud computing and big data analysis to improve data analysis and decision support capabilities, and use digital technology to optimize business processes and drive organizational change. As far as the government is concerned, the government should improve digital-related infrastructure construction, vigorously build communication service facilities, provide a good external environment for enterprise development, and facilitate enterprises to carry out digital transformation.

Second, continuously improve the enterprise information environment and conditions. To effectively exert the inhibitory effect of corporate digital transformation on the hollowing out of major shareholders, corporate informatization construction must be further strengthened. It is necessary to build and maintain the company's online disclosure platform, such as the company's official website and WeChat public account, to publish the company's financial reports, annual reports, announcements, major events and other information, so that stakeholders can obtain information more conveniently. It is necessary to speed up the construction of corporate social media, provide shareholders with opportunities to leave messages, ask questions and reply, let shareholders know the company's operating conditions and financial data at any time, and allow small and medium-sized shareholders to play a more effective role in supervising large shareholders.

Third, further improve the corporate governance mechanism. To effectively curb the hollowing out of major shareholders, the corporate governance mechanism should be further improved and the board of directors, independent directors, board of supervisors, etc. should play a supervisory role over major shareholders. Enterprises should be supported in introducing institutional investors, and institutional investors should be encouraged to participate in corporate governance and exert their governance and

supervisory effects; customers, suppliers and other stakeholders should be supported in supervising the behavior of major shareholders.

Fourth, continue to promote social and economic development and enterprise reform. In the western region, it is necessary to continuously improve systems, regulations and information disclosure, organize professional teams or introduce professional institutions to provide enterprises with targeted digital training courses and consulting guidance to help them understand and improve the application of digital technology. It is necessary to intensify the reform of state-owned enterprises, support state-owned enterprises in introducing strategic investors, and adjust and improve the equity structure. Private enterprises must also improve their equity structures and governance mechanisms, and use digital transformation to curb the hollowing out of major shareholders.

REFERENCES

1. LaPorta, R., F. Lopez-de-Silanes and A. Shleifer. Corporate Ownership Around the World.[J]. Journal of Finance, 1999(54):471-517.
2. Johnson S., La Porta R., etc. Tunneling[J]. American Economic Review,2000,90(2):22-27.
3. Li Wanli, Guo Tianwen. An empirical study on the influencing factors of controlling shareholders' "hollowing out" behavior. Development Research. 2007, (05): 110-113 .
4. VIAL G. Understanding digital transformation : a review and a research agenda [J].The Journal of Strategic Information Systems,2019,28(2):118-144.
5. Wei Yicheng, Liu Xiaoyu, He Fan. Research on digital transformation and corporate governance level - Empirical evidence from A-share main board listed companies [J]. Financial Development Research, 2022(03):18-25.
6. Shao Jianbing, Wang Luye. Can enterprise digital transformation inhibit executive corruption? ——Based on the perspective of minority shareholders' participation in governance [J]. Journal of Shanghai University of Finance and Economics, 2023, 25(02): 64-77.
7. Zhou Lan, Weng Yeying. Enterprise digitalization and financing constraints [J]. Industrial Technology and Economics, 2023, 42(05): 20-29.
8. Wang Jingyong, Sun Tong, Li Pei, Gong Yuxuan. Digital transformation and corporate financing constraints - Empirical evidence based on small and medium-sized listed companies [J]. Scientific Decision Making, 2022(11):1-23.
9. Zhang Jiawei, Hu Dandan, Zhou Lei. Can the digital economy alleviate management's short-sighted behavior? - Empirical evidence from real earnings management. Economic Management. 2022, 44(01) : 122-139 .
10. Luo Jinhui, Wu Yilong. Digital operation level and real earnings management [J]. Management Science, 2021, 34(04): 3-18.
11. Chen Deqiu, Hu Qing. Corporate governance research in the digital economy era: paradigm innovation and practice frontier [J]. Management World, 2022, 38(06): 213-240.
12. Li Fang , Yu Yinjian, Wang Song. Will the online expression of small and medium-sized shareholders affect the earnings management behavior of listed companies? - Analysis of the intermediary effect based on the second type of agency cost [J]. Modern Finance and Economics (Journal of Tianjin University of Finance and Economics), 2023, 43 (02):75-93.
13. Qi Yudong, Xiao Xu. Enterprise management reform in the digital economy era [J]. Management World, 2020, 36(06): 135-152+250.
14. Duan Huayou, Yang Xingliu, Dong Feng. Digital transformation, financing constraints and corporate innovation [J]. Statistics and Decision Making, 2023, 39(05): 164-168.

15. Wu Ting. Major shareholder hollowing out, financing constraints and executive compensation stickiness. Accounting Communications. 2021, (20): 61-64.
16. Xu Zongyu, Shao Qingfang, Chen Weiliang. The relationship between the nature of the ultimate controller, the degree of separation of the two powers, and corporate earnings management. Accounting Monthly. 2012, (11): 11-14.
17. Ni Guoai, Jiang Yinwei. Research on the impact of enterprise digital transformation on earnings management [J]. Journal of Jilin Technology and Business University, 2022, 38(03): 37-43.
18. Zhao Chenyu, Wang Wenchun, Li Xuesong. How digital transformation affects enterprise total factor productivity [J]. Finance and Trade Economics, 2021, 42(07): 114-129.
19. Ye Kangtao, Lu Zhengfei, Zhang Zhihua. Can independent directors inhibit the "hollowing out" of major shareholders? [J]. Economic Research, 2007(04):101-111.
20. Zheng Guojian, Lin Dongjie, Zhang Feida. Major shareholders' financial distress, hollowing out and the effectiveness of corporate governance - Evidence from major shareholders' financial data [J]. Management World, 2013(05):157-168.
21. Yuan Chun, Xiao Tusheng, Geng Chunxiao, Sheng Yu. Digital transformation and enterprise division of labor: specialization or vertical integration [J]. China Industrial Economy, 2021(09):137-155.
22. Wei Zhihua, Zeng Ai min, Li Bo. Financial ecological environment and corporate financing constraints - an empirical study based on Chinese listed companies [J]. Accounting Research, 2014(05):73-80+95.
23. Huang Mei, Xia Xinping. Empirical analysis of manipulative accruals model to detect earnings management capabilities [J]. Nankai Management Review, 2009, 12(05): 136-143.