

# Research on the Impact of Digital Transformation on Corporate Business Credit in the Context of Double Cycle: Based on the Moderating Effect of Outward Investment

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**Abstract.** This paper empirically examines the impact of digital transformation on business credit, using data from 2013-2022 as a sample. It also studies the impact of outward investment on the relationship between the two in the context of the double cycle. The study demonstrates that the digital transformation of enterprises has a significant positive impact on the availability of business credit. The effect of digital transformation on improving business credit of enterprises is stronger when the outward investment of the business credit market is in the upward stage. The outbound merger and acquisition mode has a more significant moderating effect on digital transformation and business credit. The analysis of heterogeneity reveals that digital transformation has a more significant enhancement effect on the business credit of non-high-tech industries, non-state-owned enterprises, and enterprises with high equity concentration that are at a financing disadvantage. Additionally, it is found that digital transformation can improve information transparency, reduce agency costs, and alleviate financing constraints, thereby enhancing the level of business credit financing for enterprises. The aforementioned findings offer valuable theoretical references and managerial insights for the implementation of digital transformation in enterprises and research related to outward investment in the context of the double-cycle.

**Keywords:** Digital Transformation; Commercial Credit Financing; Double-loop; Outbound Investment; Outbound Mergers and Acquisitions.

## 1. Introduction

Currently, industrial digitalisation in China is still in its early stages. It is of great theoretical and practical importance to uncover the process of value creation in enterprise digital transformation, within the context of the double-loop. The language used in this text is clear, objective, and value-neutral, with a formal register and precise word choice. The text adheres to conventional structure and formatting features, with consistent citation and footnote style. The sentences and paragraphs create a logical flow of information, with causal connections between statements. The text is free from grammatical errors, spelling mistakes, and punctuation errors. No changes in content have been made. This paper examines the impact of digital transformation on business credit and explores the moderating effect of outward investment on the relationship between the two in the context of the double-loop. The empirical data of listed companies during the period of 2013-2022 is used as a sample for this study.

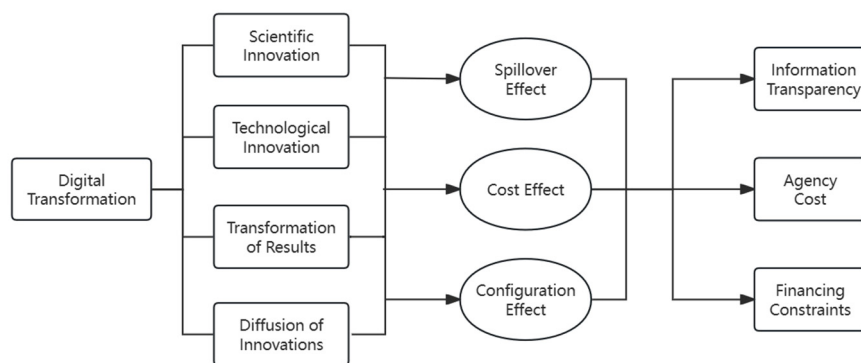
## 2. Theoretical Analysis

### 2.1. Digital Transformation and Business Credit

This paper proposes that corporate digital transformation affects business credit through three main effects as shown in Fig.1. The first is the spillover effect[10]. Digital transformation can lead to an information agglomeration effect through multi-platform docking and cross-platform integration[4]. This broadens the scope of communication and unification of standards, helping financial institutions and investors to compare enterprises in different industries and scopes in the same dimension[6]. It



also facilitates understanding of the market competitiveness of enterprises[16], promotes the improvement of information disclosure and deepens capital[17], thereby enhancing the marginal benefits of information and capital elements. Secondly, cost-effective. Enterprises can achieve digital transformation and systematic reshaping in terms of production processes[1], operations[2], organization[3], management[7], and business models[5]. This can optimize factor combinations[11], give full play to the role of the new engine and new momentum of the digital economy[24], and promote the in-depth integration of the digital economy and the real economy[12]. The result is a great leap forward in social productivity and production relations. Thirdly, the configuration effect can be observed[9]. Digital transformation can introduce advanced equipment and technology, improving the efficiency of resource allocation, reducing irrational management behaviour[13], optimizing the structure of human capital, and ultimately affecting the supply side of the economy. This promotes the improvement of resource management efficiency[14], leading to the realization of scale and long-tail effects. Based on the analysis above, this article proposes Hypothesis 1: Digital transformation can enhance business credit financing effectively.



**Fig 1. Logical framework**

## 2.2. Digital Transformation, Commercial Credit and Outward Investment

As an extension and progression of China's open-door policy, the double cycle has created a positive effect for enterprises to participate in foreign investment or import and export trade. The double cycle provides a standardized and normalized institutional guarantee for the digital transformation of enterprises, from policy design to capital financing, to build an all-round policy system<sup>[26]</sup>. Simultaneously, the double cycle is a new mode of global cooperation proposed by China. It aims to impact the digital transformation of enterprises through the construction of a closer and open regional production network in the context of the new division of labour model. Chinese enterprises' outward FDI behaviour can impact the digital transformation process through the dual mechanism of positive push and reverse push. Additionally, Chinese enterprises can achieve reverse spillover by setting up R&D centres and establishing joint ventures overseas, and manage their participation in overseas markets more proactively. Based on the analysis above, this article proposes Hypothesis 2:

Hypothesis 2. The level of commercial credit financing of firms is positively moderated by outward investment in the context of digital transformation.

Among them, the outbound investment mode of outbound M&A is generally a kind of external signal for the company to seek further business expansion or strategic transformation. According to the efficient market theory, investors will promptly, accurately, and comprehensively respond to information disclosed by listed companies. Based on the analysis above, this article proposes Hypothesis 3:

Hypothesis 3. Outbound M&A has a more significant moderating effect on digital transformation and commercial credit financing.

### 3. Empirical Design

#### 3.1. Data Description

In China, 2013 marked the beginning of a significant increase in big data usage, with various digital technologies being implemented for data generation, storage, and utilization. This research collected data from listed companies in China between 2013 and 2022. After excluding financial enterprises, firms marked as ST or ST\*, and enterprises with missing data, the dataset comprises over 22,000 observed values. The data at the enterprise level is sourced from the CSMAR, Wind, and CNRDS databases. To reduce the impact of outliers on the regression results, relevant variables undergo Winsorization and logarithmic transformation.

#### 3.2. Variable Description

##### 3.2.1. Dependent Variable: Commercial Credit Facilities Level

Following the approach of Pan Yue et al, the measure is calculated by dividing the sum of accounts payable, notes payable, and advance receipts by the total assets at the end of the year.

##### 3.2.2. Core Variable: Enterprise Digital Transformation

**Table 1.** Descriptive statistical results of main variables

Type	Variable	Explanation
Explained variable	TC	(Accounts payable + notes payable + advance receipts) / total assets
Core explanatory variable	Digit	Logarithmic frequency of occurrence of digitised feature words in annual reports
	Digit_num	1 if the organisation is digitally transformed, 0 otherwise
Moderator variable	OFDI	Logarithm of our annual outward foreign direct investment
	merge	Value of buyer expenditures for outbound mergers and acquisitions
Mechanism variables	Quality	Constructing Information Transparency System Indicators Using a Sample of Five Indicators: Corporate Disclosure Score, Number of Analyst Follow-Ups, Accuracy of Analyst Surplus Forecasts, Big Four Audits, and Quality of Corporate Surplus
	Turnover	Operating income/total assets closing balance
	SA	$SA = -0.737SIZE + 0.043SIZE^2 - 0.004AGE$
Control variables	Lev	Corporate gearing/asset
	ROT	Return on total corporate assets
	Fixasset	Fixed assets/total assets
	Size	Logarithmic value of total assets of the enterprise at the end of the year
	Growth	Revenue growth rate
	Boardsize	Number of directors on the board at the end of the year
	Indr	Number of independent directors as a percentage
	First	Shareholding ratio of the largest shareholder
	Dual	The chairman and general manager are the same as 1, otherwise it is 0
Age	Logarithmic number of years on the market	

This paper uses semantic analysis and other methods to measure the construction of the digital transformation index system at the micro level, using the "digital transformation thesaurus + engine search index". The specific construction steps are outlined below: First, we have established a

microscopic digital transformation index system and constructed a digital transformation keyword thesaurus, as shown in Table 1. Second, this paper synthesises the weights of each keyword using the entropy value method to create a comprehensive index of enterprise digital transformation. To ensure robustness, the index is logarithmically transformed. At the same time, a dummy variable (Digit\_num) is created. The digital dummy index of the enterprise undergoing digital transformation is assigned a value of 1, while the others are assigned a value of 0. This variable is used as a proxy for the robustness test. Table 1 and Table 2 show the definition of variables and the results of descriptive statistics.

**Table 2.** Descriptive statistical results of main variables.

variable	Obs	Mean	SD	Min	Max
TC	22050	0.149	0.107	0.00600	0.492
Digit	22050	1.591	1.407	0	5.136
Lev	22050	0.412	0.196	0.0600	0.889
ROT	22050	0.0480	0.0740	-0.306	0.241
Fixasset	22050	0.210	0.151	0.00300	0.673
SIZE	22050	22.19	1.236	19.91	26.05
Growth	22050	0.298	0.717	-0.723	4.742
Boardsize	22050	8.358	1.553	5	13
Indr	22050	37.82	5.409	33.33	57.14
First	22050	32.90	14.33	8.540	71.64
Dual	22050	0.306	0.461	0	1
Age	22050	2.004	0.911	0	3.466

### 3.3. Modelling

#### 3.3.1. Baseline Regression Model

This study employs regression models to examine the relationships between various variables. To assess the direct influence of enterprise digital transformation on business credit financing for enterprises, this article constructs the following regression model:

$$TC_{i,t} = \beta_0 + \beta_1 Digit_{i,t} + \beta_2 Lev_{i,t} + \beta_3 ROT_{i,t} + \beta_4 Fixasset_{i,t} + \beta_5 Size_{i,t} + \beta_6 Growth_{i,t} + \beta_7 Boardsize_{i,t} + \beta_8 Indri_{i,t} + \beta_9 First_{i,t} + \beta_{10} Dual_{i,t} + \epsilon_{i,t} \quad (1)$$

\*Where subscripts  $i, t$  represent enterprise, and year respectively.

\*Digit denotes the degree of digital transformation in limited enterprises, which is the core explanatory variable of this paper.

\*Controls signifies the set of control variables.

#### 3.3.2. Modelling of Moderating Effects

##### A. Modelling of Moderating effects based on OFDI

To test whether outward investment moderated the impact of digital transformation on commercial credit financing, we used a moderating effects test model.

$$TC_{i,t} = \eta_0 + \eta_1 Digit_{i,t} + \eta_2 Digit_{i,t} \times OFDI_{i,t} + \eta_3 Lev_{i,t} + \eta_4 ROT_{i,t} + \eta_5 Fixasset_{i,t} + \eta_6 Size_{i,t} + \eta_7 Growth_{i,t} + \eta_8 Boardsize_{i,t} + \eta_9 Indri_{i,t} + \eta_{10} First_{i,t} + \eta_{11} Dual_{i,t} + \eta_{12} OFDI_{i,t} + \epsilon_{i,t} \quad (2)$$

##### B. Modelling of Moderating effects based on merge

To test whether M&A moderated the impact of digital transformation on commercial credit financing, we used a moderating effects test model.

$$TC_{i,t} = \mu_0 + \mu_1 \text{Digit}_{i,t} + \mu_2 \text{Digit}_{i,t} \times \text{merge}_{i,t} + \mu_3 \text{Levi}_{i,t} + \mu_4 \text{ROTI}_{i,t} + \mu_5 \text{Fixasset}_{i,t} + \mu_6 \text{Size}_{i,t} + \mu_7 \text{Growth}_{i,t} + \mu_8 \text{Boardsize}_{i,t} + \mu_9 \text{Indri}_{i,t} + \mu_{10} \text{Firsti}_{i,t} + \mu_{11} \text{Duali}_{i,t} + \mu_{12} \text{merge}_{i,t} + \epsilon_{i,t} \quad (3)$$

## 4. Empirical Results Analysis

### 4.1. Analysis of Baseline Regression Results

#### 4.1.1. The Direct Impact of Enterprise Digital Transformation on Enterprise Commercial Credit

The empirical results of the baseline regression results are presented in Table 3. In column (1), the regression results without any control variables are shown, while columns (2) display the results after incorporating complete control variables. Throughout the stepwise regression process, the impact of digital transformation on enterprise commercial credit consistently remains significant at the 1% level, demonstrating a significant positive effect on enterprise commercial credit. This finding supports the hypothesis that digital transformation can substantially increase enterprise commercial credit. Digital transformation is a key factor in the development of the digital economy. It contributes significantly to local economic growth and enhances commercial credit financing. It is important to maintain an objective tone and avoid subjective evaluations. Thus, the basic research hypothesis H1 is substantiated.

**Table 3.** regression results.

Variables	(1)	(2)	(3)	(4)
Digit	0.0027***	0.0021***	0.0022***	0.0057***
	(0.0008)	(0.0007)	(0.0008)	(0.0085)
Control variables	uncontrolled	controlled	controlled	controlled
OFDI			0.0007**	
			(0.0010)	
Digit×OFDI			0.0009***	
			(0.0004)	
merge				0.0004***
				(0.0003)
Digit×merge				0.0011***
				(0.0006)
cons	0.1945***	0.2151***	0.1760***	0.1213**
	(0.0105)	(0.0612)	(0.0643)	(0.0512)
N	22050	22050	20315	20301
adj.R2	0.0610	0.1779	0.1782	0.1285

\*, \*\*, \*\*\* denote statistical significance at 10%, 5%, and 1%, respectively; (.) is the t-value calculated from robust standard errors.

To investigate the moderating effect of outward investment on digital transformation and commercial credit financing, this paper focused on explanatory and moderating variables. The results of the moderating effect test of the outward investment index are presented in column (3) of Table 3, indicating that the degree of outward investment has a positive moderating role in the relationship

between enterprises' digital transformation and commercial credit financing. It is important to note that this paper adheres to conventional academic structure, clear and objective language, and precise word choice. Enterprises that invest more outwardly in the market environment tend to have more mature network effects. This can reduce transaction costs and enhance the enterprise's ownership and internal empowerment advantages. As a result, investment and financing channels are broadened. Therefore, the impact of digital transformation on enterprise commercial credit financing is more significant in this environment, which verifies Hypothesis 2.

The regression results in column (4) indicate that outbound M&A outward investment has a positive moderating effect on digital transformation and commercial credit financing. The regression coefficient of outbound M&A is larger compared to the moderating effect of outward investment, suggesting that markets with a higher degree of outbound M&A play a stronger role in promoting digital transformation and commercial credit financing. This verifies Hypothesis 3.

#### 4.1.2. Robustness Tests

The regression results suggest that digital transformation has a significant positive impact on the level of business credit financing for enterprises. To ensure the robustness of the research conclusions, the following verification approaches were adopted, and the results are shown in Table 4:

The replacement variable method. The explanatory variables now include a dummy variable (Digit\_num) in place of the digital transformation indicator (Digit). The results are consistent with the main regression results.

Lagging processing. To address the endogeneity problem in this study, we lagged the digital transformation variable (Digit) by one period and front-loaded the enterprise commercial credit financing variable (TC) by one period. The regression coefficients of the explanatory variables remained positive and significant at a 1% confidence level, thus confirming the main hypothesis once again.

**Table 4.** Robustness tests

	(1)	(2)	(3)	(4)	(5)
	TC	TC	TC_lag	TC	TC
Digit			0.0006***	0.0024***	0.0021***
			(0.0010)	(0.0008)	(0.0008)
Digit_lag		0.0012***			
		(0.0004)			
Digit_num	0.0050***		0.0050***		
	(0.0012)		(0.0012)		
Control variables	controlled	controlled	controlled	controlled	controlled
cons	0.2173***	0.2096***	0.2173***	0.2240***	0.1924***
	(0.0628)	(0.0627)	(0.0628)	(0.0630)	(0.0622)
N	22050	22049	22050	22050	22050
adj.R2	0.1783	0.1777	0.1783	0.1779	0.1628

Adjusting the sample interval. Based on the 'Guiding Opinions on Actively Promoting the Internet + Action' issued by the State Council in 2015. As the digital economy has entered a rapid development

stage, the regression analysis in this paper focuses on the 2015-2022 sample. The results are consistent with the main regression results.

Controlling individual effects. To address the issue of potential omitted variables in the model, individual effects are controlled for in the regression model. The regression results remain robust.

#### 4.1.3. Discussions on Endogeneity

Instrumental variable approach. This paper uses the ratio of research and development expenditure to operating income (rd) as an instrumental variable to be tested. As shown in Table 5, the test results suggest that the instrumental variable (rd) is not weak, and it can be further analysed by least squares regression analysis. The impact of digital transformation on the level of business credit financing of enterprises is significantly positive at the 1% level under different models.

**Table 5.** Hausman(1978)specification test

	<b>Coef.</b>
<b>Chi-squar etest value</b>	<b>528.458</b>
<b>P-value</b>	<b>0</b>

Difference model. This paper uses a first-order difference model to control for the impact of firm fixed factors that do not vary over time on the facilitating role of digital transformation and corporate credit financing. The results remain robust, as seen in Table 6.

**Table 6.** Tests on endogeneity

	(1)Digit	(2)TC	(3) $\Delta$ TC
rd	0.00218***		
	(0.000)		
Digit		0.00418***	
		(0.001)	
Control variables	controlled	controlled	
$\Delta$ Digit			0.002***
			(0.000)
$\Delta$ Control variables			controlled
_cons	0.183***	0.241***	0.0207*
	(0.017)	(0.022)	(1.94)
year			Yes
IndCodeC			Yes
Waldchi2	530.21	727.140***	
N			18299
adj.R2			0.185

## **4.2. Mechanism of Action Regression Results**

### **4.2.1. Mechanism of Action based on Information Transparency**

According to signal transmission theory, the digital transformation of enterprises can produce an 'information effect', optimizing the information environment and enhancing transparency. On one hand, digital technology can greatly improve the quality and speed of information circulation by integrating information across platforms using big data, mobile internet, cloud computing, and other technologies[18]. Digital technology can significantly enhance the efficiency of enterprise information transmission, thereby improving the transparency of enterprise information. This can help to reduce the information disadvantage of investors and effectively decrease the degree of information asymmetry between them and the enterprise. As a result, investors may be more willing to invest, and the pressure on the enterprise's funds to maintain its operational and innovative activities can be alleviated. However, digital technology can effectively integrate internal business information within an enterprise and process it into standardized information, improving transparency and usability. Additionally, digital technology can aid in in-depth analysis of this information, allowing for the identification of market trends and risks. A significant amount of standardised and integrated information can better serve the enterprise's investment decision-making process, providing an optimal information environment for management to better understand market trends for business and investment decisions. This will enable enterprise management to make more accurate and informed decisions.

To test the mechanism effect of information transparency on the relationship between digital transformation and business credit financing of enterprises, as shown in Table7, the regression results indicate that a higher degree of digital transformation leads to higher information transparency of enterprises. This, in turn, has a positive mechanism effect on business credit.

### **4.2.2. Mechanism of Action based on Agency Cost**

The modern separation of powers enterprise system results in an agency problem between enterprise management and owners[15]. This is because different positions lead to enterprise management and shareholders having different interests to pursue. Enterprise digital transformation can effectively mitigate the agency problem. The impact of digital transformation on enterprise credit financing is a topic of interest. According to the principal-agent theory, digital transformation enhances information communication and the ability to process information within and between enterprises. External investors can obtain more adequate information about the enterprise and efficiently supervise management's operation and management activities, effectively constraining management's irrational behaviour and alleviating the agency problem of the enterprise. Additionally, digital transformation can alleviate the agency problem of the enterprise. Simultaneously, the digital transformation of enterprises offers an efficient means for external supervision by investors and other stakeholders. For instance, the internet platform provides a convenient way for investors to express their opinions, reducing the cost of investor supervision and improving its efficiency. This effectively mitigates the agency problem, reducing agency costs. The more the agency problem is mitigated, the more rational and scientific the enterprise's investment and financing decisions become. This, in turn, leads to more rational and scientific investment and financing decisions, as well as more reliable commercial credit financing from external sources. The paper concludes that the digital transformation of enterprises can affect the level of commercial credit financing by reducing agency costs.

The test results indicate that firms with higher levels of digital transformation experience lower asset turnover rates. Additionally, digital transformation can help mitigate the agency problem and facilitate commercial credit financing.

### **4.2.3. Mechanism of Action based on Financing Constraints**

Digital transformation has a 'governance effect' that can optimise the allocation of resources and funds to provide more financial security for operating activities. This, in turn, can improve the external evaluation of the long-term development of the enterprise and broaden the channels of commercial

credit financing, forming a positive cycle[19]. The digital transformation can assist enterprises in achieving standardised and rational internal control processes through the use of digital technology. Technical support can optimise the internal control environment and process, effectively restraining irrational investment and financing behaviour by management. Secondly, the use of digital technology in the enterprise's internal control system can optimise decision-making and improve its accuracy[20]. Digital transformation can also flatten the organisational structure, making it easier to supervise management and prevent irrational behaviour. Moreover, the enterprise's digital construction has led to the enhancement of its digital[22], information-based, and intelligent internal control system, which integrates environmental control, risk assessment, and information communication[25]. This perfect internal control system standardises the enterprise's decision-making procedures and improves the effectiveness of investment decisions.

The test results suggest that there is a mediating mechanism between the digital transformation of enterprises and the reduction of financing constraints, resulting in a facilitating effect on business credit. It is indicated that the higher the level of digital transformation, the lower the financing constraints of enterprises.

**Table 7.** Mediation effect test

	(1)Quality	(2)TC	(3)Turnover	(4)TC	(5)Ic	(6)TC
Digit	0.0170***	0.0021***	0.0096***	0.0014***	-0.0011***	0.0021***
	(0.0032)	(0.0007)	(0.0030)	(0.0007)	(0.0008)	(0.0007)
Quality		0.0030***				
		(0.0014)				
Turnover				0.0697***		
				(0.0049)		
SA						-0.0089***
						(0.0056)
Control variables	controlled	controlled	controlled	controlled	controlled	controlled
_cons	0.0419	0.2239***	2.2647***	0.0663	-3.2661***	0.2946***
	(0.2340)	(0.0630)	(0.2899)	(0.0598)	(0.0883)	(0.0897)
N	22050	22050	22049	22049	22023	22023
adj.R2	0.0544	0.1782	0.1142	0.2329	0.8761	0.1783

\*, \*\*, \*\*\* denote statistical significance at 10%, 5%, and 1%, respectively; (.) is the t-value calculated from robust standard errors.

### 4.3. Heterogeneity

#### 4.3.1. High-tech and non-high-tech Industries

In the context of the double cycle, scientific economic decision-making and planning can lead to a more promising pattern of economic growth. The high-tech industry is considered the key to a country's strong growth and entry into the developed world. High-tech industries contribute to the domestic macro-cycle. However, without further industrial support, the profit growth space formed by the scale effect of industries will be rapidly narrowed as China enters a new stage of development. Compared to high-tech enterprises, non-high-tech industries tend to be more traditional. They have lower technology intensity and make less use of digital technology. Their production and operation

processes are also more traditional and old-fashioned. However, this traditional approach provides greater opportunities for digital transformation. By applying digital technology, enterprises can significantly improve their efficiency and achieve simultaneous optimization of internal and external aspects. This can have a significant impact on the business credit of the enterprise. Based on previous studies, this paper categorises enterprises into two groups: high-tech and non-high-tech industries, and conducts group testing. The regression results indicate that the digital transformation of non-high-tech enterprises has a more significant impact on the improvement of business credit. Non-high-tech industry enterprises may benefit more from digital transformation as it can improve their market position in the eyes of investors, leading to higher business credit. On the other hand, high-tech industry enterprises are already at a high level of business credit financing and can obtain financing through other means after reducing information asymmetry through digital transformation.

#### 4.3.2. Nature of Enterprise Ownership

Cull (2003) suggests that the property rights of an enterprise can affect its position in the national economy[21]. Many scholars have studied the nature of enterprise property rights and found that they have an impact on various aspects. Sun Zheng et al. (2005) discovered that the nature of corporate property rights affects the impact of local marketisation and government intervention on the debt maturity structure of enterprises. The firms' property rights can be divided into two categories: state-owned enterprises (SOEs) and non-state-owned enterprises (NSOEs). State-owned enterprises typically have more stable sources of capital and government support, which enhances their industry competitiveness and market confidence. Conversely, non-state-owned enterprises tend to prioritize market orientation and profitability, and are more interested in keeping up with the times in terms of return on investment. As a result, they are more flexible in terms of digital transformation and foreign investment. In order to gain an advantage in the competitive market, they are more likely to seize opportunities for digital transformation[8]. The paper distinguishes the sample into two groups: state-owned enterprises and non-state-owned enterprises, based on the nature of enterprise property rights, to conduct regression analysis. As shown in Table 8, the results indicate that the digital transformation has a more significant driving effect on non-state-owned enterprises. State-owned enterprises in foreign investment may have suffered from identity discrimination. Against the backdrop of rising global protectionism, various countries have gradually reduced the scale of foreign investment, especially strengthening the review of foreign investment in China's state-owned enterprises (SOEs), believing that the purpose of SOEs' overseas investment behaviour is investment behaviour on behalf of the state, which leads to insignificant promotion of SOEs' digital transformation in terms of commercial credit.

**Table 8.** Heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)
	Hightec=1	Hightec=0	Soe=1	Soe=0	Mshare=1	Mshare=0
Digit	-0.000187	0.00226**	0.00109	0.00597***	0.00357**	0.00143
	(-0.08)	(2.94)	(1.36)	(3.91)	(3.15)	(1.59)
Control variables	controlled	controlled	controlled	controlled	controlled	controlled
cons	0.493***	0.194**	0.219**	0.158	0.102	0.347***
	(3.40)	(2.83)	(3.11)	(1.20)	(1.09)	(5.16)
N	1952	20098	15512	6538	11025	11025

#### 4.3.3. Shareholding Concentration

A sound shareholding structure is crucial for ensuring stable operations and business performance. Digital transformation is a corporate strategy, and its decision-making is influenced by the strategic

vision of management. This is especially true in the case of 'one share', where management has a significant impact on the progress[23], effectiveness, and value-added effects of digital transformation. In companies where equity is highly concentrated, management tends to focus more on long-term growth and future earnings. Directors and supervisors, as the creators of corporate strategy, possess a greater long-term strategic vision when they hold a higher percentage of shares. The greater the concentration of shareholding, the more willing and motivated a company is to undergo digital transformation. Additionally, a higher shareholding concentration can have a positive impact on the investment and economic effects of digital transformation. It is important to maintain objectivity and avoid subjective evaluations when discussing these topics. This paper conducts group tests based on the proportion of management's shareholding. The regression results indicate that the 'supporting hand' effect and economic consequences of digital transformation are more prominent when the shareholding concentration is higher. This suggests that there is heterogeneity in the effect of shareholding concentration on business credit in digital transformation.

## 5. Conclusion

Based on an extensive analysis of panel data encompassing China's A-share listed companies from 2013 to 2022, this study delves into the influence of digitalization within the manufacturing sector on commercial credit. Our investigation operates on both theoretical frameworks and empirical data, leading us to the subsequent findings:

(1)The digital transformation of companies has a significant positive impact on their ability to obtain business credit financing.

(2)In a double-loop context, outward investment has a positive moderating effect on the relationship between enterprises' digital transformation and the enhancement of business credit financing. The moderating effect of outbound M&A outward investment modes on digital transformation and business credit is even more significant. Enterprises operating in markets with a higher degree of outward investment tend to exhibit more mature network effects. This can lead to a reduction in transaction costs and an enhancement of the enterprise's ownership and internal empowerment advantages. As a result, investment and financing channels are broadened, making the driving effect of digital transformation on the enterprise's business credit financing more prominent in this environment.

(3)Enterprises undergoing digital transformation can improve their commercial credit financing through three methods: enhancing information transparency, reducing agency costs, and easing financing constraints.

(4)The impact of enterprise digital transformation on business credit is asymmetric due to differences in industry characteristics, the nature of enterprise property rights, and equity concentration. In non-high-tech industries, enterprise digital transformation has a more significant promotion effect on business credit compared to high-tech industries. Similarly, in non-state-owned enterprises, the promotion effect of enterprise digital transformation on business credit is more significant than in state-owned enterprises. Additionally, enterprises with high equity concentration experience a more significant promotion effect of digital transformation on business credit compared to those with low equity concentration.

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