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Supply Chain Finance and the Sustainable Growth of Chinese Firms: The Moderating Effect of Digital Finance

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Sustainable development is crucial to the survival and healthy development of enterprises, which is closely related to their financing situation. Supply chain finance is an effective way to improve and enhance the financing situation by easing financing constraints and reducing financing costs. As an important source of supply chain short-term financing, trade credit plays an important role in enterprise production and circulation. Taking Chinese listed companies from 2011 to 2020 as samples, this paper studied the impact of trade credit on sustainable growth and its internal mechanism. Furthermore, we analyzed the moderating effect of digital finance development on the influence of trade credit on sustainable growth. It is found that receiving trade credit benefited firms' sustainable growth. Furthermore, study found that receiving trade credit has a greater positive impact on the sustainable growth of enterprises in regions with higher levels of financial development, high-tech industries, state-owned enterprises and small enterprises. Whereas, the provision of trade credit had an obvious inhibiting effect on the sustainable growth of enterprises in the regions with low level of financial development, non-high-tech industries, private enterprises and small enterprises. The results of the influencing mechanism showed that receiving trade credit promoted firm's sustainable growth by "agency cost reducing effect," while providing trade credit inhibited firm's sustainable growth by "forcing effect." In addition, the development of digital finance weakens the positive impact of trade credit financing on enterprises' sustainable growth but strengthens the negative impact of providing trade credit on sustainable growth. From the perspective of sustainable growth, this paper explained the role of trade credit financing in alleviating the financing dilemma of enterprises, which is urgently needed by most emerging economies pursuing high-quality development. Therefore, in order to give full play to the role of trade credit financing, the government should actively create a good credit environment. At the same time, the government should vigorously develop digital finance to enhance its ability to serve the real economy.

Keywords: supply chain finance, trade credit, sustainable growth, mandatory effect, digital finance

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1 INTRODUCTION

Growth is the eternal theme of the enterprise, and whether sustainable growth can be achieved is related to the fate of the enterprise's future development. In the context of the global financial crisis and the pursuit of economic recovery and sustainable growth, the economic growth model based on sustainable growth is proposed to achieve sustainable growth. Sustainable growth refers to the realization of ecological balance and economic and social development on the premise of coordinated development between the speed and scale of economic and social development and the ecological environment. The concept of agricultural and environmental sustainability refers to minimizing the degradation of natural resources while increasing crop productions (Abbas et al., 2022). Currently, fertilizers account for about half of the total input energy in maize production in Pakistan (Abbas et al., 2020), and reducing overuse of farm inputs is a potential sustainable crop production strategy (Abbas et al., 2021). The real economy is the mainstay of sustainable growth. The sustainable growth of enterprises refers to that in the process of pursuing survival and development, enterprises should not only achieve their business objectives but also maintain their continuous profitability, and ultimately ensure the long-term prosperity of enterprises. The realization of sustainable growth goals is conducive to improve enterprises' ability to create wealth, increasing employment, improving the quality of economic growth and social and economic value (Xiao and Wang, 2004), which is of great significance to promote the healthy development of real economy. In the process of economic transformation from high-speed growth stage to high-quality development stage, how to realize the sustainable growth of enterprises and inject sustainable impetus into the high-quality development of China's real economy has become an important issue. Therefore, it is of great theoretical and practical significance to explore the factors affecting the sustainable growth of enterprises to prevent the financial risks of enterprises and promote the healthy development of entity enterprises. The production and operation of enterprises need funds, and the financing capacity determines the sustainable growth prospects of enterprises. Due to the existence of credit rationing, enterprises are often excluded from the traditional financial system due to their weak conditions, and indirectly obtain limited financial services. In addition, the direct financing channels of equity and creditor's rights are not perfect. The current financing problem is still the key factor restricting the sustainable development of Chinese enterprises.

Supply chain finance is a professional field of commercial bank credit business, but also a financing channel for enterprises, especially small and medium-sized enterprises. It is a financing model that can provide flexible financial products and services, and a systematic financing arrangement for all members of the supply chain. Supply chain finance is a series of technology-based business and financing processes that link transaction buyers, sellers and financing institutions with the aim of easing corporate financing constraints, reducing financing costs, and optimizing working capital (Tang and Zhuang, 2021). Supply chain financing types include bank credit financing and trade credit financing (Tang et al., 2017). Under the trade credit financing mode, enterprises often transfer credit to the upstream and downstream enterprises in the supply chain in the form of short-term credit. But bank credit financing makes it difficult for enterprises to obtain loans because of harsh lending conditions. Therefore, trade credit financing is more common and important for enterprises, and is more conducive to supply chain coordination (Chang and Rhee, 2011). As an important source of short-term financing in the supply chain, trade credit financing plays a role in accelerating capital turnover and lubricating production and circulation in industrial development, which is of great significance to short-term financing for enterprises in a vulnerable position in the supply chain (Liang et al., 2016). Therefore, this paper discusses the impact of trade credit based on supply chain finance on firm's sustainable growth.

Trade credit is a kind of direct finance which is born in the entity enterprise. Companies can alleviate short-term capital shortages by occupying capital from upstream and downstream enterprises, thus reducing financing problems. In particular, the advantages of convenient financing and fewer restrictions are favored by more and more enterprises. Studies have confirmed that more than 65% of American enterprises and 75% of British enterprises use trade credit as a financing method in the production and sales process (Atanasova and Wilson, 2003). Moreover, the contribution of trade credit financing to economic development is no less than that of bank credit (Ge and Qiu, 2007). Trade credit financing can realize higher resource allocation efficiency than bank loan (Shi and Zhang, 2010). Therefore, especially for the immature financial development of China, the use of trade credit is of great significance to realize the sustainable growth of enterprises.

Digital finance is a new financial mode in which traditional financial institutions and Internet companies use digital technology to realize financing, payment, investment and other financial activities (Huang and Huang, 2018). Traditional financial development is the foundation of digital financial development, the better traditional finance develops, the faster digital finance develops (Wang et al., 2021). Trade credit financing is an effective supplement to traditional finance and plays an alternative financing role. Therefore, it is necessary to further subdivide the impact of trade credit on sustainable growth under different levels of financial resources. Based on this, this paper further analyzes the impact of trade credit on sustainable growth of enterprises at different levels of digital finance development.

Compared with the article of Huang et al. (2019), our research contributes to the literature in three aspects. Firstly, this paper discusses the impact on the sustainable growth of enterprises from the dual perspective of trade credit supply and demand. It enriches the research perspective of the influencing factors of enterprises' sustainable growth and provides theoretical support for enterprises' sustainable growth policy formulation at the level of trade credit. Secondly, it enriched the research on the economic effect of trade credit and confirmed the influence mechanism and intermediary effect of trade credit on sustainable growth. More

importantly, it discusses the moderating effect of digital finance development on trade credit and sustainable growth, and expands related research on trade credit from the perspective of regional financial development.

The remaining article is structured as: We first review the literature and develop our hypotheses in **Section 2**. **Section 3** describes the data, variable and model. **Section 4** presents the empirical results of how trade credit affects the sustainable growth of enterprises and discusses the moderating effect of digital finance development. Conclusions are provided in the final section.

2 LITERATURE REVIEW AND RESEARCH HYPOTHESES

China's financial system is dominated by bank loans, but there is a mismatch of financial resources. Enterprises' production and operation are short of capital sources and the efficiency of resource allocation is low for a long time, which is not conducive to sustainable growth of enterprises and seriously hinders the economic development process (Sui, 2017; Zhou et al., 2021). The emergence of trade credit financing can effectively make up for the deficiency of traditional finance. In the case of imperfect financial market development, insufficient supply of credit resources and limited financing channels for enterprises, trade credit assumes the supplementary function of financing and is an important external financing channel for enterprises (Sun et al., 2014). Enterprises facing financing constraints that are more inclined to replace traditional bank loans with trade credit (Zhang, 2019), and trade credit can achieve greater scale efficiency than traditional bank loans (Shi and Zhang, 2010). Fisman and Love (2003) found that in regions with relatively slow financial development, the growth rate of industries dependent on trade credit was higher. Trade credit is a kind of credit behavior frequently occurring in supply chain enterprises. It is a kind of informal financing, widely existing in the business activities of enterprises. On the one hand, enterprises obtain funds through deferred payment, advance collection and other ways to solve the problem of short-term capital shortage and reduce financing constraints. Thus, the efficiency of enterprise resource allocation can be improved (Elahi et al., 2018b) to promote the efficient investment (Tian, 2019; Liu et al., 2021; Elahi et al., 2022), and profitability and performance of system can be improved (Elahi et al., 2018a; Gao, 2019). On the other hand, the use of trade credit can add certainty to the inflow and outflow of cash. The production and operation environment of enterprises is improved, more funds will be invested in R&D and innovation activities, which is of great significance to improve market competitiveness and production efficiency (Liu et al., 2022). Therefore, trade credit financing has a positive impact on the sustainable growth of enterprises.

The separation of ownership and management leads to serious principal-agent problems between shareholders and management, which may lead to "short-sighted behavior" of management. As a result, resource allocation efficiency is low for a long time, which is not conducive to the sustainable growth of enterprises (Chen and Tang, 2006). Compared with other creditors, trade creditors have advantages in information acquisition, customer control and property recovery (Du, et al., 2021). Therefore, it can better play the supervision function of creditors and restrain agency behavior, thus effectively reducing agency cost and improving investment efficiency (Liu and Guan, 2016). Moreover, as a short-term liability, trade credit can limit managers' pursuit of profitable financial assets (Du et al., 2021). Therefore, industrial investment will be promoted and R&D investment and innovation activities of enterprises will be improved (Xu and Zhu, 2017; Xiao et al., 2021; Zhao et al., 2021; Rathnayake et al., 2022), and ultimately promote the sustainable growth of enterprises. At this point, trade credit, as a short-term liability, may affect the sustainable growth of enterprises by reducing agency costs. Therefore, we propose the first hypothesis of this paper, namely hypothesis 1.

Enterprises provide trade credit also bear credit risks. If customers intentionally occupy corporate funds, trade credit will become a malicious default to obtain corporate liquidity at a lower cost (Fabbri and Menichini, 2010). Such behavior will squeeze enterprise resources, lead to limited operating cash flow, increase operating risks, and thus adversely affect the sustainable growth of enterprises. Firstly, the role of the firm in providing liquidity may increase the risk of overdue collection and capital chain disruption, thus affecting overall efficiency (Wu et al., 2021). Secondly, providing trade credit means giving up the opportunity to earn interest income, resulting in opportunity costs. At the same time, the provision of trade credit also increases the cost of credit management. In particular, companies spend more time and money closely monitoring the flow of customers' funds. Finally, the provision of trade credit also means that enterprises have tax obligations before they get the cash flow of sales revenue, leading to the outflow of tax funds and the reduction of internal funds of enterprises, thus hindering sustainable growth. Li and Song (2021) found that the "compulsory credit" formed by debt default that was not conducive to the development of enterprises. Therefore, trade credit may be a kind of "mandatory credit," and malicious breach of contract increases market transaction costs, operational risks and resource allocation costs (Chen et al., 2016). Thus, it increases the uncertainty of enterprise production and operation and seriously hinders the sustainable growth of enterprises. To sum up, the provision of trade credit increases the risks and costs of enterprises, produces a "mandatory effect," and has a negative impact on the sustainable growth of enterprises. Therefore, we propose hypothesis 2.

There are obvious regional differences in China's economic development. Higher development level of traditional finance, there will be more perfect the financial system, and the level of credit issued by banks will also higher. The use of trade credit financing will further increase the capital of enterprises and reduce financing constraints. Thus, the guarantee of funds ensures the normal operation of production and management and promotes the sustainable growth of enterprises. In highly developed financial areas, the use of trade credit plays a "icing on the cake" role for enterprises. In areas with low level of financial development, the financial system is imperfect and financing

channels for enterprises are limited (Sheng, 2021; Sun, 2021). The provision of trade credit increases the cost and management risk of enterprises, and the production environment deteriorates further, which is not conducive to improve the sustainable growth level of enterprises.

Similarly, the response to trade credit varies by industry. High-tech industrial enterprises are characterized by high skills, high investment and high risk. They have difficulty in financing and are highly dependent on external capital (Zhang and Hu, 2020; Elahi et al., 2021). However, traditional financial institutions pay more attention to hard assets that can be secured when lending, which makes it difficult for high-tech enterprises to obtain financing from banks and they have to turn to other financing channels for financing. At this point, trade credit financing can effectively solve this problem. It can improve the capital environment of enterprises, improve the level of investment in R&D, and then promote the sustainable growth of high-tech industry enterprises. At the same time, it is worth noting that high-tech enterprises themselves are facing strong competitive pressure and are keener to carry out innovative activities to compete for market position (Zhu et al., 2019). In addition, the government's policy support for high-tech enterprises makes it easier for them to obtain government innovation subsidy funds. Therefore, the provision of trade credit has little effect on inhibiting innovation and has limited ability to reduce the level of sustainable growth. As a result, the negative impact of the provision of trade credit is more obvious in non-high-tech enterprises than high-tech enterprises.

China's financial resources are badly mismatched. Compared with private companies, state-owned enterprises are more favored by the credit sector. The better relationships with governments tend to give them access to bigger credit lines, longer loan maturities and lower interest costs. Despite their significant contribution to economic development, private enterprises are often excluded from the formal financial system due to their lack of effective collateral assets, unsecured records and poor credit histories, making it difficult for them to obtain the financial services they need. At this time, the emergence of trade credit as an informal financing method is beneficial to the development of private enterprises. It can increase the external financing channels of private enterprises and promote the sustainable growth of enterprises. There is also an empirical fact that state-owned enterprises are obliged to shoulder the burden of government policies, including some of the construction of projects in the form of overinvestment. State-owned enterprises often suffer from excessive investment and overcapacity (Liu et al., 2018), and low investment efficiency. However, the phenomenon of providing trade credit occupying their funds will reduce excessive investment behavior. As a result, state-owned enterprises can allocate capital more efficiently and invest more efficiently, thus promoting sustainable growth. Namely, the provision of trade credit significantly promoted the sustainable growth of state-owned enterprises.

There exists "scale discrimination" in the allocation of financial resources in China. Small enterprises are small in scale, lack of effective asset guarantee, and have low quality of external information disclosure. Therefore, it is difficult for them to obtain traditional bank credit. As an informal financing mode, trade credit has positive impact on the sustainable growth of small enterprises. However, due to their low market position, small enterprises are often forced to provide trade credit to large enterprises, resulting in their capital encroachment. Moreover, it is difficult for small enterprises to obtain external capital, leading to a high possibility of capital chain fracture. Therefore, the provision of trade credit has a greater negative impact on the sustainable growth of small businesses. Therefore, we propose hypothesis 3 about heterogeneity.

Whether the use of trade credit can promote the sustainable growth of enterprises is also closely related to digital finance. With the application of digital technology, digital finance occupies a considerable position in China's modern financial system and has a significant impact on China's economic development. Digital finance has financial attributes and does not change the essence of financial services. However, different from traditional finance, digital finance can cover customers that are difficult to be covered by traditional finance, cover more long-tail groups, and improve the convenience and availability of financial services (Chen et al., 2021). China's financial system is dominated by commercial banks. In areas with low level of digital finance development, enterprises rely more on traditional bank loan financing mode. With the improvement of the development level of digital finance, Internet finance, online lending and other network services continue to occupy the traditional banking business (assets, liabilities, and intermediate business). The development of digital finance makes traditional financial institutions compete with each other for market share, actively carry out digital transformation, and constantly improve the efficiency and quality of financial services (Wu, 2015). Therefore, the financing difficulty of enterprises is reduced (Tang et al., 2020), thus weakening the positive impact of informal finance-trade credit financing on sustainable growth.

In areas with a high level of digital finance development, online services such as Internet financial products are increasing. As the real economy is struggling and inefficient, enterprises invest more money in online financing in pursuit of higher short-term returns and profit maximization. The development of the real economy was not given much attention. Moreover, the financial products chosen may face higher risks, for example, some Internet loan asset-backed securities are highly leveraged. Chen and Ye (2016) found that the interest rate fluctuations of online loans have agglomeration and risk accumulation effects. Loan market has strong risks, but market participants have weak awareness of risk identification and are prone to temptation of high returns. One of the most direct evidences of the negative impact of the development of digital finance is the explosive phenomenon of P2P products. It reduces the possibility for enterprises to recover capital, including principal and interest, resulting in credit risk, resulting in a shortage of capital flow needed for production and operation. Thus, the development of digital finance reinforces the negative impact of the provision of trade credit on sustainable growth. In summary, our assumptions are given as follows:

Hypothesis 1: Receiving trade credit has a positive impact on sustainable growth, which may be achieved through a channel of reducing firm's agency costs.
Hypothesis 2: The provision of trade credit is not conducive to the sustainable growth of enterprises.
Hypothesis 3: The impact of trade credit on sustainable growth has obvious regional differences and enterprise characteristics differences.
Hypothesis 4: The development of digital finance weakens the positive effect of obtaining trade credit financing on sustainable growth of enterprises, while strengthens the negative effect of providing trade credit on sustainable growth.

3 MATERIALS AND METHODS

In this stage, sample data, variable definitions and econometric models used in this paper are introduced in three sections respectively.

3.1 Data and Sampling

This paper takes listed non-financial companies in China from 2011 to 2020 as research samples. To eliminate the effects of variable outliers, we also winsorize all main continuous variables at 1% level. The main financial data obtained from the China Stock Market and Accounting Research Database (CSMAR), the property of ownership indicators is derived from CCER China Economic and Financial Database. The data of digital finance index come from "The Peking University Digital Financial Inclusive Index of China (PKU-DFIIC)" released by Peking University Digital Finance Research Center, which has been widely used by Chinese scholars. Grouped variable-financial development level data were obtained from China Statistical Yearbook.

3.2 Definitions of Variables

3.2.1 Sustainable Growth

The dependent variable "sustainable growth of firm," denoted as SGR. Chinese scholars found that sustainable growth rate refers to the maximum sales growth rate that an enterprise can achieve without increasing external equity funds (Guo and Guo, 2002). Most of the existing literature adopts the sustainable growth model proposed by Higgins (1988) and Van Horne (1988). In this paper, the model constructed by Higgins is used to calculate the dependent variable in the basic regression. It is explained the sustainable growth rate as the maximum sales growth rate an enterprise can achieve without exhausting its resources, which is a balanced growth and reveals the financial factors that restrict the growth of an enterprise. In a robustness test, we used Van Horne' model to calculate the sustainable growth rate, emphasizing the target value of sustainable growth.

3.2.2 Trade Credit

This paper studies trade credit from the perspective of supply and demand, which can be divided into "access to trade credit" (AP) and "provision of trade credit" (AR). Among them, the independent variable AP is measured as the sum of accounts payable, notes payable and advance receivable scaled by total assets, and AR is measured as the sum of notes receivable, accounts receivable and prepayments scaled by total assets (Lu and Yang, 2011; Liu, 2021).

3.2.3 Digital Finance

We adopt the PKU-DFIIC as a proxy variable to measure the level of digital finance of each city, which is compiled by a joint research team composed of the Peking University Digital Finance Research Center and Ant Financial Group. The data, which started in 2011 and is updated until 2020, can effectively measure the development of digital finance in China (Guo et al., 2020). In the analysis, we not only use aggregate index (Fin) to describe the digital finance level of each city, but also use first-level indicators including coverage_breadth (B), usage_depth (D), and digitization_level (S). In order to avoid the influence of excessive value and improve the fitting of regression, we take logarithm of digital finance index.

3.2.4 Control Variables

According to the existing literature on the sustainable growth of enterprises, control variables including return on total assets (ROA), leverage ratio (LEV), net fixed assets (FA), dividend distribution ratio (DDR) and enterprise size (SIZE) are selected. The specific meaning of each variable is presented in **Table 1**.

3.3 Econometric Model

3.3.1 Basic Regression Model

Benchmark model was used to estimate the impact of trade credit on the sustainable growth of enterprises (Fisman and Love, 2003).

$$SGR_{it} = \alpha_0 + \alpha_1 AP_{it} + \alpha_2 Control_{it} + \alpha_3 \sum year + u_i + \varepsilon_{it} \quad (1)$$

$$SGR_{\mathrm{it}} = \beta_0 + \beta_1 AR_{it} + \beta_2 Control_{it} + \beta_3 \sum year + u_i + \varepsilon_{it} \quad (2)$$

Here subscripts i and t respectively represent individual enterprise and year. SGR represents sustainable growth of enterprise. AP and AR represent the acquisition and provision of trade credit, respectively. Control represents the control variables that may affect the sustainable growth of an enterprise. U is the individual effect of the enterprise, which is used to control the characteristics of the enterprise that do not change with time and cannot be observed. In addition, we control for year. ε is the random error term of the model.

3.3.2 Mediating Effect Model

To further explore the potential mechanism of trade credit financing affecting sustainable growth of enterprises, this paper refers to the mediation effect test model proposed by Wen and Ye (2014) to test whether trade credit can promote sustainable growth of enterprises by reducing agency costs.

$$SGR_{it} = \gamma_0 + cAP_{it} + \gamma_1 Control_{it} + u_i + \varepsilon_{it} \quad (3)$$

$$AG_{it} = \gamma_0 + aAP_{it} + \gamma_1 Control_{it} + u_i + \varepsilon_{it} \quad (4)$$

$$SGR_{it} = \gamma_0 + c'AP_{it} + bAG_{it} + \gamma_1 Control_{it} + u_i + \varepsilon_{it} \quad (5)$$

AG is the selected intermediary variable-agency cost. Other variables are defined in the same way as **Eqs 1**, **2**.

TABLE 1 | The definitions of the main variables.

Variables	Definitions
SGR	Higgins' sustainable growth rate can be expressed by the formula: SGR = P*A*T*R, P is profit margin (net profit scaled by operating income), A is asset turnover (operating income scaled by total assets), T is leverage factor (total assets scaled by beginning-of-period equity), and R is earnings retention rate
SGR1	Van Horne's sustainable growth rate can be expressed as follows: SGR = P*A*T_0*R/(1-P*A*T_0*R), P is profit margin (net profit scaled by operating income), A is asset turnover (operating income scaled by total assets), T_0 is leverage factor (total assets scaled by end-of-period equity), and R is earnings retention rate
AP	The sum of accounts payable, notes payable and advance receivable scaled by total assets
AR	The sum of notes receivable, accounts receivable and prepayments scaled by total assets
Fin	The development level of digital finance
ROA	The ratio of net profit to total assets
LEV	Financial leverage, represented by the ratio of total debt to total assets
FA	Net fixed assets, measured logarithmically by the amount of net fixed assets
DDR	Dividend distribution ratio, measured by the ratio of cash dividends per common share to earnings per share
SIZE	The size of the firm, measured by the natural logarithm of total assets
AG	Agency costs, calculated as the ratio of overhead to operating revenue
SOE	Dummy variable, which equals the value 1 if the firm is a state-owned, and 0 if the firm is private
JR	Level of financial development, expressed by the ratio of total deposits and loans in RMB of financial institutions to GDP

3.3.3 Moderating Effect Model

To further analyse the relationship between trade credit and sustainable growth of enterprises in the external environment of digital finance development, this paper sets the following moderating effect model for empirical analysis. The main method to judge whether the moderating effect exists or not is to verify the significance of interaction coefficient. In this study, it can be achieved by judging whether the interaction coefficients (δ_3 *and* θ_3) between digital finance and trade credit is significant.

$$SGR_{cit} = \delta_0 + \delta_1 AP_{cit} + \delta_2 Fin_{ct} + \delta_3 Fin_{ct} * AP_{cit} + \delta_4 Control_{cit} + \delta_5 \sum year + u_i + \varepsilon_{cit} \quad (6)$$

$$SGR_{cit} = \theta_0 + \theta_1 AR_{cit} + \theta_2 Fin_{ct} + \theta_3 Fin_{ct} * AR_{cit} + \theta_4 Control_{cit} + \theta_5 \sum year + u_i + \varepsilon_{cit} \quad (7)$$

Subscript *c* stands for city. Fin represents the development level of digital finance. The definitions of other variables are the same as above.

4 RESULTS AND DISCUSSION

In this stage, firstly, the statistical characteristics of the data are briefly analyzed. Secondly, we first analyze the effect of trade credit on sustainable growth of enterprises, including baseline regression, heterogeneity analysis and robustness analysis, and then analyze the mechanism of trade credit on sustainable growth. Finally, the moderating effect of digital finance development is analyzed. In addition, in the regression results of all our tables, standard errors are reported in parentheses, with *, **, and ** indicating statistical significance at 10%, 5%, and 1% levels, respectively.

TABLE 2 | Descriptive statistics.

Variables	N	Mean	Standard deviation	Minimum	Maximum
SGR	25,591	0.083	0.082	–0.037	0.457
AP	18,466	0.169	0.117	0.003	0.543
AR	22,872	0.183	0.122	0.002	0.554
Fin	25,554	5.303	0.420	3.987	5.773
ROA	26,853	0.047	0.047	–0.107	0.208
LEV	26,853	0.413	0.206	0.051	0.925
FA	25,614	0.289	0.307	0.000	1.869
DDR	26,845	20.061	1.712	15.230	24.771
SIZE	26,853	22.094	1.278	19.661	26.120

4.1 Descriptive Statistics

The descriptive statistics are presented in **Table 2**. The minimum value of SGR is −0.037, while the maximum value is 0.457, indicating that there are significant differences in sustainable growth among enterprises. The minimum AP value is 0.003 and the average value is 0.169, the minimum value of AR was 0.002 and the average value was 0.183, indicating that the use of trade credit by some enterprises has not reached the average level. After taking the logarithm, the minimum value of Fin is 3.987, and the maximum value is 5.773, indicating that there are obvious differences in the development of digital finance among regions. Other variables are also different in different degrees, which lays a foundation for this study. It is worth noting that when the sustainable growth of an enterprise is negative, it indicates that the company's current operating efficiency and financial policies are unreasonable. When this situation occurs, enterprises should make adjustments in time to reverse the adverse situation.

Before the multiple regressions, we report the Pearson correlation matrix in **Table 3**. The correlation between AP and SGR is significantly positive, which provides preliminary evidence that access to trade credit can help to improve the sustainable growth of enterprises. The AR is also positively

TABLE 3 | Correlation matrix.

	SGR	AP	AR	Fin	ROA	LEV	FA	DDR	SIZE
SGR	1.000								
AP	0.108***	1.000							
AR	0.069***	0.352***	1.000						
Fin	−0.035***	0.074***	0.065***						
ROA	0.629***	−0.120***	0.005	−0.018***	1.000				
LEV	0.043***	0.517***	0.047***	−0.032***	−0.359***	1.000			
FA	−0.079***	0.057***	−0.210***	0.060***	−0.109***	0.349***	1.000		
DDR	−0.304***	−0.072***	−0.057***	0.025***	0.023***	−0.188***	0.032***	1.000	
SIZE	0.029***	0.224***	−0.158***	0.128***	−0.122***	0.520***	0.734***	−0.022***	1.000

TABLE 4 | Benchmark regression results: Trade credit and sustainable growth.

Variables	(1) SGR	(2) SGR	(3) SGR	(4) SGR
AP	0.039*** (0.01)	0.044*** (0.01)		
AR			−0.014** (0.01)	−0.016** (0.01)
ROA	1.576*** (0.02)	1.541*** (0.02)	1.561*** (0.01)	1.532*** (0.01)
LEV	0.050*** (0.00)	0.041*** (0.01)	0.061*** (0.00)	0.054*** (0.00)
SIZE	0.015*** (0.00)	0.026*** (0.00)	0.012*** (0.00)	0.023*** (0.00)
FA	−0.012*** (0.00)	−0.010*** (0.00)	−0.010*** (0.00)	−0.009*** (0.00)
DDR	−0.054*** (0.00)	−0.054*** (0.00)	−0.055*** (0.00)	−0.054*** (0.00)
Constant	−0.102*** (0.02)	−0.366*** (0.02)	−0.055*** (0.02)	−0.302*** (0.02)
N	18,654	17,634	23,036	21,839
R^2	0.480	0.490	0.493	0.503
Code	Control	Control	Control	Control
Year	No	Control	No	Control

correlated with SGR. Sustainable growth (SGR) is positively correlated with return on total assets (ROA), leverage ratio (LEV) and enterprise size (SIZE), and negatively correlated with net fixed assets (FA) and dividend distribution ratio (DDR).

4.2 Basic Regression Results

The Hausmann test results indicate that the fixed effects model should be used. The fixed effect regression results after controlling the influence of other variables are shown in **Table 4**. As can be seen from columns (1) and (2) of the **Table 4**, the regression coefficient between the AP and SGR is positive and significant at 1% level. That is, the acquisition of trade credit significantly promotes the sustainable growth of enterprises, and hypothesis 1 is partially verified. The possible explanation is that the access to trade credit effectively alleviates the financial pressure of enterprises and alleviates the financing constraints. The financial situation of enterprises is improved, the level of R&D investment of enterprises is increased, the market competitive advantage is enhanced, and the sustainable growth of enterprises is promoted. There is a significant negative correlation between the AR and SGR in columns (3) and (4), indicating that the provision of trade credit has a negative impact on the sustainable growth of enterprises, which verifies hypothesis 2 proposed in this paper. This may be because the provision of trade credit increases the cost of enterprises, and the situation of capital occupation is not conducive to the guarantee of normal production and operation in the later period. That is, the provision of trade credit has a "mandatory effect," which is not conducive to the improvement of enterprises' sustainable growth ability. In the analysis of control variables, ROA, LEV, and SIZE are positively correlated with the sustainable growth of enterprises, while FA and DDR are negatively correlated with the sustainable growth of enterprises. By comparing the results of columns (1), and (2), (3) and (4), it can be seen that the impact of trade credit on sustainable growth is more obvious after year is controlled, so two-way fixed effect model is adopted in the subsequent regression.

4.3 Heterogeneity Analysis

In hypothesis 3, we assume that there are obvious regional differences and firm characteristics differences in the impact of trade credit on firm sustainable growth. Therefore, we test the hypothesis in the empirical part.

4.3.1 Heterogeneous Impact on Areas With Different Levels of Financial Development

Table 5 reports the regression results. In column (1) of **Table 5**, the coefficient of AP is significantly positive, while the coefficient in column (3) is not significant. The promoting effect of AP on SGR is more obvious in the regions with higher level of financial development. In column (2) of **Table 5**, the coefficient of AR is negative but not significant, and that in column (4) is significantly negative. The inhibition effect of AR on SGR is more obvious in enterprises in low level of financial development. The results were as expected.

TABLE 5 | Heterogeneity analysis: Level of financial development.

Variables	Areas with high financial development level		Areas with low financial development level	
	(1) SGR	(2) SGR	(3) SGR	(4) SGR
AP	0.055*** (0.01)		0.015 (0.01)	
AR		−0.002 (0.01)		−0.027*** (0.01)
ROA	1.614*** (0.02)	1.582*** (0.02)	1.481*** (0.02)	1.504*** (0.02)
LEV	0.061*** (0.01)	0.062*** (0.01)	0.029*** (0.01)	0.051*** (0.01)
SIZE	0.022*** (0.00)	0.021*** (0.00)	0.030*** (0.00)	0.024*** (0.00)
FA	−0.010*** (0.00)	−0.010*** (0.00)	−0.010*** (0.00)	−0.009*** (0.00)
DDR	−0.049*** (0.00)	−0.050*** (0.00)	−0.059*** (0.00)	−0.058*** (0.00)
Constant	−0.275*** (0.03)	−0.259*** (0.03)	−0.420*** (0.03)	−0.311*** (0.03)
N	9,972	12,393	7,872	9,689
R^2	0.520	0.521	0.475	0.496
Code	Control	Control	Control	Control
Year	Control	Control	Control	Control

TABLE 6 | Heterogeneity analysis: High-tech and non-high-tech industries.

Variables	Enterprises in high-tech industry		Non-high-tech industry enterprises	
	(1) SGR	(2) SGR	(3) SGR	(4) SGR
AP	0.080*** (0.02)		0.037*** (0.01)	
AR		−0.018 (0.01)		−0.016** (0.01)
ROA	1.388*** (0.03)	1.394*** (0.03)	1.586*** (0.02)	1.580*** (0.02)
LEV	0.0180 (0.01)	0.052*** (0.01)	0.052*** (0.01)	0.062*** (0.00)
SIZE	0.028*** (0.00)	0.022*** (0.00)	0.027*** (0.00)	0.024*** (0.00)
FA	−0.013*** (0.00)	−0.013*** (0.00)	−0.009*** (0.00)	−0.008*** (0.00)
DDR	−0.050*** (0.00)	−0.051*** (0.00)	−0.055*** (0.00)	−0.055*** (0.00)
Constant	−0.321*** (0.06)	−0.211*** (0.05)	−0.402*** (0.03)	−0.342*** (0.02)
N	3,978	5,410	13,656	16,429
R^2	0.462	0.495	0.503	0.512
Code	Control	Control	Control	Control
Year	Control	Control	Control	Control

TABLE 7 | Heterogeneity analysis: Division of enterprise ownership.

Variables	State-owned enterprises		Private enterprises	
	(1) SGR	(2) SGR	(3) SGR	(4) SGR
AP	0.053*** (0.01)		0.048*** (0.01)	
AR		0.035*** (0.01)		−0.049*** (0.01)
ROA	1.533*** (0.03)	1.518*** (0.02)	1.522*** (0.02)	1.533*** (0.02)
LEV	0.047*** (0.01)	0.061*** (0.01)	0.040*** (0.01)	0.057*** (0.01)
SIZE	0.025*** (0.00)	0.019*** (0.00)	0.026*** (0.00)	0.023*** (0.00)
FA	−0.009*** (0.00)	−0.005*** (0.00)	−0.011*** (0.00)	−0.012*** (0.00)
DDR	−0.053*** (0.00)	−0.053*** (0.00)	−0.055*** (0.00)	−0.055*** (0.00)
Constant	−0.370*** (0.04)	−0.323*** (0.04)	−0.322*** (0.03)	−0.234*** (0.03)
N	6,200	7,211	10,209	12,802
R^2	0.472	0.477	0.498	0.519
Code	Control	Control	Control	Control
Year	Control	Control	Control	Control

4.3.2 Heterogeneous Impact on Different Industries

Table 6 reports the regression results by industry type. The coefficients of AP in columns (1) and (3) of **Table 6** are positive at the 1% significance level, indicating that the acquisition of trade credit has a positive impact on the sustainable growth of enterprises in high-tech and non-high-tech industries. Further, the comparison of coefficients shows that the promotion effect is more obvious in high-tech enterprises. In column (4) of **Table 6**, the coefficient of AR is significantly negative, while the coefficient in column (2) is not significant. The provision of trade credit significantly inhibits the sustainable growth of non-high-tech enterprises, but has no significant effect on high-tech enterprises.

TABLE 8 | Heterogeneity analysis: Division of enterprise size.

	Large-scale enterprise		Small-scale enterprise	
	(1) SGR	(2) SGR	(3) SGR	(4) SGR
AP	0.019 (0.02)		0.099** (0.05)	
AR		−0.010 (0.02)		−0.105*** (0.03)
ROA	1.860*** (0.07)	1.719*** (0.04)	1.443*** (0.06)	1.455*** (0.06)
LEV	0.064** (0.03)	0.018 (0.02)	−0.040 (0.03)	0.015 (0.02)
SIZE	0.032** (0.01)	0.034*** (0.01)	0.074*** (0.01)	0.069*** (0.01)
FA	−0.004 (0.00)	−0.007** (0.00)	−0.022*** (0.00)	−0.021*** (0.00)
DDR	−0.032*** (0.00)	−0.039*** (0.00)	−0.046*** (0.01)	−0.047*** (0.01)
Constant	−0.658** (0.28)	−0.587*** (0.14)	−1.125*** (0.18)	−1.021***
N	2,249	3,405	4,223	4,461
R^2	0.686	0.661	0.399	0.399
Code	Control	Control	Control	Control
Year	Control	Control	Control	Control

4.3.3 Heterogeneous Impact on Enterprises With Ownership

Table 7 reports the regression results for the differentiation of business ownership. In columns (1) and (3) of **Table 7**, the coefficient of AP is positive at the significant 1% level, indicating that access to trade credit has a positive impact on the sustainable growth of enterprises regardless of the nature of ownership. Further comparison of the coefficients showed that this effect is more obvious in state-owned enterprises. In column (2) of **Table 7**, the coefficient of AR is positive at the significant level of 1%, indicating that the provision of trade credit has a positive impact on the sustainable growth of state-owned enterprises.

4.3.4 Heterogeneous Impact on Enterprise Size

Divide the top 25% of the size of the enterprise into small enterprises and the bottom 25% into large enterprise. **Table 8** reports the results of the regression by firm size. In column (3) of **Table 8**, the coefficient of AP is positive at the significant level of 5%, indicating that access to trade credit has a positive impact on the sustainable growth of small enterprises. In contrast, in column (1) of **Table 8**, the coefficient of AP is not significant. As an alternative financing, trade credit plays an important role in increasing financing sources of small enterprises, effectively alleviating the dilemma of insufficient funds, reducing the negative impact of credit discrimination. Thus improving their sustainable growth level. Moreover, the coefficient of AR is significantly negative at the 1% level. The result verified hypothesis.

4.4 Robustness Tests

4.4.1 Measure of Substitution Variable

Since the measurement method of variables will produce bias to the results, we refer to Chen and Ma (2018) measurement of trade credit. AP is measured as the sum of accounts payable, notes payable and advance receivable scaled by operating cost, and AR is measured as the sum of notes receivable, accounts receivable and prepayments scaled by operating income. Regression results are shown in Columns (1) and (2) of **Table 9**. The sustainable growth rate calculated by Van Horne is used to measure the dependent variable in this paper, and the results are listed in columns (3) and (4) of **Table 9**. The above regression coefficients were expected and significant. The results of variable substitution show that the conclusions of this paper are still robust after the measurement methods of trade credit and sustainable growth are replaced.

4.4.2 Substitution Regression Method

To further test the robustness of our empirical results, we change regression method to help establish the causality. We use DIFF-GMM to investigate the impact of trade credit on the sustainable growth of enterprises (Yang et al., 2020). The first order lag of SGR was added into the DIFF-GMM model as an explanatory variable. The results of DIFF-GMM regression are shown in columns (5) and (6) of **Table 9**. The regression results show that the sustainable growth of the previous period is significantly positively correlated with the sustainable growth of the current period. This means that the sustainable growth of enterprises is affected by its own inertia, showing a strong self-cumulative effect. The results in the table show that AP is positively correlated with SGR, while AR is negatively correlated with SGR. The results are robust.

4.4.3 Management of Endogeneity Problem

Finally, we used the idea of controlling endogenous problems to perform robustness tests. There may be a reverse causality relationship between trade credit and sustainable growth, which leads to the bias in the research results of this paper. The omission of variables in model selection may also lead to endogeneity. Therefore, two-stage instrumental-variable regression model is used to alleviate the endogeneity problem. In this study, the selection of instrumental variables draws on the ideas of Yu (2013) and Zhang et al. (2020). Details are as follows: the mean value of AP calculated by province and industry (PIAP) and first-order lag of AP (LAP) are used as instrumental variables of AP, and the mean value of AR calculated by year and industry (SNAR) and first-order difference of AR (DAR) are used as instrumental variables of AR.

TABLE 9 | Substitution variables and regression methods.

Variables	Substitution argument		Substitution dependent variable		DIFF-GMM	
	(1) SGR	(2) SGR	(3) SGR1	(4) SGR1	(5) SGR	(6) SGR
L.SGR					0.514** (0.25)	0.640*** (0.07)
AP	0.005*** (0.00)		0.046* (0.02)		0.113** (0.05)	
AR		–0.004*(0.00)		–0.024**(0.01)		–0.401*** (0.13)
ROA	1.552*** (0.02)	1. 529*** (0.01)	1.545*** (0.05)	1.805*** (0.05)	1.632*** (0.07)	1.705*** (0.07)
LEV	0.054*** (0.00)	0.055*** (0.00)	–0.011 (0.02)	0.012 (0.01)	0.009 (0.03)	0.096*** (0.02)
SIZE	0.025*** (0.00)	0.023*** (0.00)	0.067*** (0.00)	0.070*** (0.00)	0.049*** (0.00)	0.034*** (0.00)
FA	–0.010*** (0.00)	–0.009*** (0.00)	0.003 (0.00)	0.002 (0.00)		–0.001 (0.00)
DDR	–0.052*** (0.00)	–0.053*** (0.00)	–0.082*** (0.00)	–0.117*** (0.01)	–0.054*** (0.01)	–0.058*** (0.00)
_cons	–0.333*** (0.02)	–0.292*** (0.02)	–1.462*** (0.07)	–1.492***(0.07)		
N	16,870	20,848	16,995	21,075	8,893	12,518
R^2	0.493	0.508	0.130	0.134		
Code	Control	Control	Control	Control		
Year	Control	Control	Control	Control		
AR (1)					0.010	0.000
AR (2)					0.427	0.217
Hansen					0.154	0.266

Note: AR (1), AR (2), and hansen test all show p *values.*

TABLE 10 | Regression results of instrumental variables.

Variables	(1) AP	(2) AR	(3) SGR	(4) SGR
AP			0.192*** (0.03)	
AR				–0.109*** (0.02)
PIAP	0.212*** (0.07)			
LAP	0.369*** (0.02)			
DAR		0.468*** (0.01)		
SNAR		0.380*** (0.03)		
ROA	0.086*** (0.02)	0.135*** (0.02)	1.598*** (0.04)	1.598*** (0.03)
LEV	0.215*** (0.01)	0.088*** (0.01)	0.031** (0.01)	0.100*** (0.01)
SIZE	–0.009*** (0.00)	–0.007*** (0.00)	0.020*** (0.00)	0.011*** (0.00)
FA	–0.004** (0.00)	–0.010*** (0.00)	–0.006*** (0.00)	–0.007*** (0.00)
DDR	0.001 (0.00)	–0.002 (0.00)	–0.046*** (0.00)	–0.048*** (0.00)
N	11,915	16,426	11,915	16,426
R^2			0.543	0.575
Kleibergen-paap rk LM statistic	308.65 (0.000)	715.74 (0.000)		
Kleibergen-paap rk Wald F statistic	233.32 (11.59)	1027.75 (11.59)		
Hansen J statistic			2.186 (0.139)	1.265 (0.261)

Note: LM and F parentheses report critical values at the 15% level. Hansen shows the p *value in parentheses.*

The 2SLS regression results are reported in **Table 10**. It can be clearly seen from columns (1) and (2) in **Table 10** that there are no weak instrumental variables, under-recognition and over-recognition problems, indicating that instrumental variables are effective. In addition, in columns (3) and (4), the coefficients are in line with expectations and significant, confirming that the results are still robust.

4.5 Test of Influence Mechanism

We used the mediating effect model to verify the influencing mechanism by referring to the current common practice of scholars. The selection of intermediary variable-AG index refers to the research of Liu (2021). The mediation effect proportion was calculated by ab/c. The mediating effect mechanism results are reported in **Table 11**. In column (2) of **Table 11**, AP is negatively correlated with AG, indicating that obtaining trade credit reduces the agency cost of enterprises. In column (3) of **Table 11**, AG is negatively correlated with SGR,

TABLE 11 | Analysis of AP influence mechanism.

	(1) SGR	(2) AG	(3) SGR
AP	0.041*** (0.01)	–0.447*** (0.04)	0.038*** (0.01)
AG			–0.006*** (0.00)
ROA	1.566*** (0.02)	–0.771*** (0.09)	1.558*** (0.02)
LEV	0.046*** (0.01)	0.202*** (0.03)	0.048*** (0.01)
SIZE	0.015*** (0.00)	–0.084*** (0.01)	0.015*** (0.00)
FA	–0.011*** (0.00)	-0.043*** (0.00)	–0.012*** (0.00)
DDR	–0.054*** (0.00)	0.004 (0.01)	–0.054*** (0.00)
Constant	–0.120*** (0.02)	2.975*** (0.10)	–0.100*** (0.02)
N	17,634	17,492	17,477
R^2	0.473	0.062	0.474
Code	Control	Control	Control

TABLE 12 | Total digital finance index and "Broadband China" policy impact.

Variables	Impact of overall indicators		"Broadband China" strategic policy	
	(1) SGR	(2) SGR	(3) SGR	(4) SGR
AP	0.035*** (0.01)		0.019*** (0.01)	
AR		−0.011* (0.01)		−0.009* (0.00)
Fin	−0.007 (0.01)	−0.006 (0.01)		
Fin*AP	−0.017** (0.01)			
Fin*AR		−0.017** (0.01)		
DD			−0.005*** (0.00)	−0.005*** (0.00)
ROA	1.545*** (0.02)	1.534*** (0.01)	1.542*** (0.01)	1.528*** (0.01)
LEV	0.046*** (0.01)	0.056*** (0.00)	0.052*** (0.00)	0.058*** (0.00)
SIZE	0.026*** (0.00)	0.023*** (0.00)	0.015*** (0.00)	0.012*** (0.00)
FA	−0.010*** (0.00)	−0.009*** (0.00)	−0.010*** (0.00)	−0.009*** (0.00)
DDR	−0.052*** (0.00)	−0.053*** (0.00)	−0.070*** (0.00)	−0.072*** (0.00)
Constant	−0.315*** (0.05)	−0.267*** (0.04)	−0.129*** (0.01)	−0.088*** (0.01)
N	16,870	20,848	16,870	20,848
R^2	0.494	0.508	0.585	0.595
Code	Control	Control	Control	Control
Year	Control	Control	No	No

indicating that agency cost seriously hinders enterprises from improving their sustainable growth level. The coefficient of column (3) is lower than that of column (1). The above results indicate that agency cost plays a partial intermediary role in the process of obtaining trade credit to promote the sustainable growth of enterprises. The mediation effect accounts for about 6.54% of the total effect. Obtaining trade credit promotes the sustainable growth of enterprises through reducing agency costs.

The empirical findings show that providing trade credit inhibits the sustainable growth of enterprises, confirming the "mandatory effect" proposed in the theoretical part. However, since there is no suitable proxy variable for the "mandatory effect" in the existing literature, this stage only examines its effect from the division of large and small enterprises. If the provision of trade credit significantly inhibits the sustainable growth of small enterprises, but the inhibitory effect on large-scale enterprises is not ideal, or the inhibitory effect on large-scale enterprises is not as good as that of small enterprises, it means that "mandatory effect" is established. The regression results of columns (2) and (4) in **Table 8** are in line with expectations. In other words, the provision of trade credit produces a "mandatory effect" that inhibits sustainable growth of firms.

4.6 Analysis of External Environment of Digital Finance

To test hypothesis 4, we further explore the impact of trade credit on the sustainable growth of enterprises in the context of regional financial development from the perspective of digital finance. In the regression of moderating effect, digital financial data at city level were used and the data were decentralized.

4.6.1 The Impact of Total Indicators of Digital Finance

In column (1) of **Table 12**, the main effect coefficient is significantly positive, while the interaction coefficient is significantly negative. This suggests that the development of digital finance has weakened the positive impact of access to trade credit on sustainable growth. It may be that the development of digital finance has improved the degree of competition in the banking (Thakor, 2020), and thus prompted financial institutions to improve the efficiency and quality of financial services, so that enterprises can meet their loan needs more effectively. The service effect of informal finance is weakened, thus weakening the promotion effect of obtaining trade credit on sustainable growth. In column (2) of **Table 12**, the main effect coefficient is significantly negative, and the interaction effect coefficient is significantly negative. The development of digital finance has enhanced the negative impact of trade credit provision on sustainable growth. The possible reason is that with the high level of development of digital finance, enterprises are vulnerable to the temptation of high-risk and high-yield internet products. As a result, enterprises will put more money into internet financial products, which may reduce the probability of the return of investment funds. The funds needed for the development of the real economy have not been met. Thus, enhancing to the negative impact of trade credit provision on sustainable growth.

4.6.2 "Broadband China" Strategic Policy

The development of digital finance is inseparable from the construction of digital infrastructure. This paper chooses the "Broadband China" strategy pilot as exogenous policy impact, and uses the difference-in-differences model to explore the impact of trade credit on the sustainable growth of enterprises in the external environment of digital finance development. Since the "Broadband China" strategy was carried out in 3 years in 2014, 2015, and 2016, the policy implementation time was different, so the multi-period DID model should be adopted for empirical analysis. DD is the impact effect of the implementation of "Broadband China" policy. The results in columns (3) and (4) of **Table 12** show that the effect of the

TABLE 13 | The structural impact of digital finance.

Variables	(1) SGR	(2) SGR	(3) SGR	(4) SGR	(5) SGR	(6) SGR
AP	0.034*** (0.01)		0.036*** (0.01)		0.036*** (0.01)	
AR		−0.011* (0.01)		−0.011* (0.01)		−0.011* (0.01)
B	0.006 (0.01)	0.005 (0.01)				
B*AP	−0.022** (0.01)					
B*AR		−0.020** (0.01)				
D			−0.023*** (0.01)	−0.019*** (0.01)		
D*AP			−0.010 (0.01)			
D*AR				−0.017** (0.01)		
S					−0.003 (0.00)	−0.002 (0.00)
S*AP					−0.010* (0.01)	
S*AR						−0.008 (0.00)
ROA	1.545*** (0.02)	1.533*** (0.01)	1.545*** (0.02)	1.534*** (0.01)	1.545*** (0.02)	1.534*** (0.01)
LEV	0.046*** (0.01)	0.056*** (0.00)	0.046*** (0.01)	0.056*** (0.00)	0.046*** (0.01)	0.056*** (0.00)
SIZE	0.026*** (0.00)	0.023*** (0.00)	0.026*** (0.00)	0.023*** (0.00)	0.026*** (0.00)	0.023*** (0.00)
FA	−0.010*** (0.00)	−0.009*** (0.00)	−0.010*** (0.00)	−0.009*** (0.00)	−0.010*** (0.00)	−0.009*** (0.00)
DDR	−0.052*** (0.00)	−0.053*** (0.00)	−0.052*** (0.00)	−0.053*** (0.00)	v0.052*** (0.00)	−0.053*** (0.00)
Constant	−0.369*** (0.04)	−0.310*** (0.03)	−0.248*** (0.04)	−0.209*** (0.04)	−0.334*** (0.03)	−0.283*** (0.02)
N	16,869	20,847	16,870	20,848	16,870	20,848
R^2	0.494	0.508	0.494	0.508	0.494	0.508
Code	Control	Control	Control	Control	Control	Control
Year	Control	Control	Control	Control	Control	Control

implementation of "Broadband China" strategy policy is the same as that of basic regression.

4.6.3 Structured Analysis

Digital finance has three first-level indicators: coverage_breadth (B), usage_depth (D) and digitization_level (S). To further analyze which dimension of digital finance plays a more obvious role, we carry out structural analysis of digital finance. It can be clearly seen from **Table 13** that B and S weaken the promotion effect of trade credit access on sustainable growth, while D has no significant effect. In addition, by comparing the coefficients, it is found that B plays a stronger role. The larger the coverage breadth is, the more "long tail customers" are covered by financial services. The problem of financial exclusion is well solved, and the alternative financing role of informal finance is weakened. In columns (2) and (4) of **Table 13**, B and D significantly enhance the negative impact of the provision of trade credit on sustainable growth, and B plays a larger role. The above results can be further interpreted as that digital finance mainly affects the impact of trade credit on the sustainable growth of enterprises through the coverage of breadth channel.

5 CONCLUSION AND POLICY IMPLICATIONS

Financing is the key factor restricting the development of enterprises. As an important part of supply chain finance, trade credit financing plays an important role in the business activities of enterprises. This paper took Chinese listed companies as research samples to explore the impact and mechanism of trade credit on sustainable growth, as well as the moderating effect of digital finance. The results showed that access to trade credit contributes to the sustainable growth of enterprises, and this relationship is more obvious in enterprises in areas with higher financial development level, enterprises in high-tech industry, state-owned enterprises and small enterprises. The provision of trade credit significantly inhibits the sustainable growth of enterprises, and this effect is more obvious in enterprises in areas lower financial development level, enterprises in non-high-tech industries, private enterprises and small enterprises. The results of influence mechanism showed that access to trade credit has an impact on sustainable growth through reducing agency cost. Providing trade credit will produce "compulsion effect," which restricts the sustainable growth of enterprises. Further analysis showed that the development of digital finance has a moderating effect on the relationship between trade credit and enterprise sustainable growth. Specifically, the higher the development level of digital finance, the weaker the positive impact of trade credit access on sustainable growth of enterprises, and the stronger the negative impact of trade credit provision on sustainable growth. As can be seen from the above results, the effect of digital finance in serving the real economy has not been fully manifested.

The empirical results show that trade credit financing significantly promotes the sustainable growth of Chinese enterprises. Therefore, trade credit financing remains a viable alternative to corporate financing in the context of imperfect financial systems in China and other countries. In order to fully mobilize the impetus of sustainable growth of enterprises and maximize the role of trade credit financing, the government must strengthen the construction of credit, enhance the quality of contract, and realize the healthy development of trade credit. At the same time, we found that the service effect of digital finance on the sustainable

growth of enterprises is not ideal. It can be seen that although China's digital finance development level is at the forefront of the world, it does not play a greater role. Therefore, governments of all countries should strengthen the construction of digital financial infrastructure, enhance the coverage of network services, fully mobilize the ability of digital finance to serve the real economy, and jointly undertake the task of high-quality economic development together with trade credit.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

TL: Conceptualization, Supervision, Validation, Project administration, funding support and Writing-review. WL: Formal analysis, Writing-original draft, Writing-review and editing. EE: Writing-review and language polishing. XL: Logicalization, content modification, review and accountability. Conceptualization, formal analysis, writing-revise, project administration. All authors contributed to manuscript revision and approved the submitted version.

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