

# Research on the Mechanism of Enhancing the Sustainable Development Capacity of Local Finance through Digital Economy

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**Abstract:** As an important component of the national fiscal system, local finance is currently facing challenges such as intensified income and expenditure contradictions, prominent debt risks, and dependence on land finance. The digital economy provides new opportunities to enhance its sustainable development capabilities. This article takes panel data from 30 provinces in China from 2013 to 2023 as samples, and uses the entropy method to measure the level of digital economic development and the index of local fiscal sustainable development capacity. Through a two-way fixed effects model, mediation effect test, and robustness test, the relationship and mechanism between the two are explored. Research has found that the digital economy has a significant positive impact on the sustainable development capacity of local finance, which can be achieved through three paths: firstly, directly increasing fiscal revenue; The second is to indirectly empower through saving and optimizing fiscal expenditures; The third is to effectively reduce the debt burden of local governments. The robustness test further validated the reliability of the conclusion. Based on this, this article proposes the following suggestions: empowering high-quality development of local economy through digital transformation, creating a favorable tax policy environment for digital economy, strengthening inter-regional exchanges and cooperation through digital economy, deepening the reform of fiscal management system through digital finance construction, and providing reference for resolving local fiscal difficulties and enhancing fiscal sustainable development capabilities.

**Keywords:** Digital economy; Local fiscal; Financial Sustainable Development Capability

## 1. Introduction

Local finance, as an important component of the national financial system, plays a significant role in promoting regional economic development and social stability. Against the backdrop of increasing downward pressure on the economy, local governments need to seek new economic growth points. As an important engine for promoting the transformation of old and new driving forces and economic development in China, the digital economy provides such opportunities for local governments. This article verifies the positive effect of the digital economy on the sustainable development of local finance, and proposes targeted policy recommendations on how to further enhance the sustainability of local finance through the use of the digital economy. This not only responds to society's concerns about the sustainable development of local finance, but also provides reference for resolving local financial difficulties and enhancing the sustainable development capacity of local finance, which has certain practical value.

## 2. Literature review

Mainstream literature often examines the factors that affect changes in fiscal sustainability from the perspectives of fiscal policy, fiscal expenditure efficiency, and economic development. In terms of fiscal policy, Ball C et al. (2020) studied the relationship between debt and fiscal sustainability by constructing a model and found that fiscal policy is an important factor affecting fiscal sustainability; Li T. and Du T. (2021) found that vertical fiscal imbalances are not conducive to improving the sustainable development capacity of local public finance. In terms of tax policy, relevant literature focuses on the impact of tax incentives and tax management on the sustainable development capacity of local finances.

Nugraha N. A. and Darono A. (2022) found that achieving local fiscal sustainability requires tax policies to provide funding for government expenditures, which is conducive to increasing local government tax revenue sharing or strengthening tax management policies, and helps to enhance the sustainable development capacity of local finances. In terms of fiscal expenditure efficiency, Antonelli M.A. and De Bonis V. (2019) found that there is room for improvement in fiscal expenditure efficiency in all countries, and more efficient government expenditure efficiency can effectively enhance fiscal sustainability. In terms of economic development, Jianjun Li et al. (2018) found that due to the growth of per capita GDP, local finance departments receive a significant increase in tax revenue, which will help enhance the sustainable development capacity of local and regional finance.

In recent years, with the continuous development of information technology, the digital economy is causing profound changes in production and lifestyle at an unprecedented speed, and has also had a wide-ranging and far-reaching impact on the sustainable development capacity of local finances. Bertani F. et al. (2019) found that the digital economy has disrupted the means of production and significantly improved production efficiency and local fiscal sustainability. Xiaoqin Liang (2020) found that digital inclusive finance can help broaden the tax base and improve the efficiency of tax collection, thereby significantly increasing local tax revenue. Jianmin Liu et al. (2021) analyzed the relationship between the digital economy and the sustainable development capacity of local finance from a spatial perspective, and found that the digital economy has a positive impact on the sustainable development capacity of local finance and neighboring local finance. Yu Xiang et al. (2023) used data from 225 prefecture level cities in China to empirically study and found a strong positive correlation between the development level of local digital economy and the sustainable development level of local finance. The fundamental reason is that the digital economy can effectively increase fiscal revenue and improve fiscal expenditure efficiency. Yang Yang's (2024) study revealed a significant coupling and synergy between the growth of the digital economy and the sustainable development capacity of finance. Lasheng Li et al. (2025) used panel data from 30 provinces in China from 2012 to 2022 as a research sample, and found that digital empowerment can promote the sustainable development capacity of local finance through increasing local fiscal revenue and investing in local science and technology.

Existing research generally supports that the digital economy can enhance the sustainable development capacity of local finance, but there is still insufficient research on the mechanism and path of digital economy enhancing the sustainable development capacity of local finance.

### 3. Theoretical analysis and research hypotheses

As China's economic development enters a new normal, the digital economy, with its innovation and diffusion, has become a key force in promoting high-quality economic development. At the macro level, the digital economy achieves economic growth through increasing factor inputs, improving allocation efficiency, and enhancing production efficiency; At the meso level, the digital economy promotes economic growth by fostering the development of emerging industries and driving industrial structural transformation and upgrading; At the micro level, the digital economy continues to generate new business models, increase residents' income, stimulate consumption, reconstruct enterprise profit models, and create new economic growth points. Through these channels, the digital economy not only promotes income growth and industrial upgrading throughout society, but also improves production efficiency. The deep penetration of the digital economy into various aspects provides strong support for the sustainable development of local finance. The following hypothesis H1 is proposed: The digital economy directly enhances the sustainable development capacity of local finance by effectively increasing fiscal revenue.

The thriving digital economy has endowed local governments at all levels with powerful capabilities in collecting, analyzing, and utilizing financial statistics and information, greatly enhancing the scientific and accurate nature of fiscal budgets, and making fiscal expenditures more reasonable and efficient. The digital economy can significantly optimize the efficiency of administrative review and financial management processes, and digital tax management greatly reduces tax collection costs; The digitization of financial management and online supervision of local financial operations can significantly reduce redundant links and administrative expenses. In addition, through big data and artificial intelligence technology, social welfare resources can be more accurately identified and allocated, reducing errors and waste, and improving the efficiency of fiscal fund utilization. Therefore, we propose the following hypothesis H2: The digital economy indirectly enhances the sustainable development capacity of local finance by saving and optimizing fiscal expenditures.

The development of the digital economy can promote the transformation and upgrading of local economic development by promoting the digitization and intelligence of traditional industries, enhancing the endogenous driving force of economic growth, and providing more reliable sources of income for local finance, reducing dependence on debt. The widespread application of digital technology has improved the transparency and openness of fiscal data. Open and transparent fiscal information helps the general public to more effectively supervise government behavior, thereby reducing inappropriate local government debt. Meanwhile, with the support of digital technology, local governments have more sophisticated means to control expenditures, which helps reduce implicit debt risks. With the widespread application of digital technologies such as the Internet of Things, big data, artificial intelligence, remote healthcare, and online education, the investment demand for traditional infrastructure and public service projects has been reduced, significantly improving the efficiency and quality of public services, thereby effectively reducing the expenditure pressure and debt burden of local governments. In addition, the digital economy can significantly curb the expansion of local implicit debt by enhancing financial asset allocation, promoting entrepreneurship, and cracking down on illegal transactions (Guoping Zhu et al., 2022). Based on the above analysis, we further propose the following hypothesis H3: The digital economy enhances the sustainable development capacity of local finance by effectively reducing the debt burden of local governments.

#### 4. Research Design

##### 4.1 variable selection

###### 4.1.1 Dependent variable: Sustainable development capacity of local finance (Susta)

The indicators of local fiscal sustainable development capacity in this article are mainly reflected by four primary indicators: local economic growth, fiscal revenue, fiscal expenditure, and local government debt. The entropy method is used to calculate the local fiscal sustainable development capacity reflected by each secondary indicator. The specific indicators are shown in Table 4-1.

Table 4-1: Indicator System for Sustainable Development Capability of Local Finance

First-level indicator	Second-level indicator	Meaning of indicators	Attributes of indicators
Economic growth	Per capita GDP	GDP of each region/year-end total population of each region	+
	Local industrial structure	Value added of the secondary industry/regional GDP	+
Fiscal revenue	Per capita fiscal revenue	General public budget revenue/year-end total population of the region	+
	Structure of fiscal revenue	Fiscal tax revenue/general public budget revenue	+
Fiscal expenditure	Per capita fiscal expenditure	General public budget expenditure/year-end total population of the region	-
	Structure of Fiscal Expenditure	Basic public service expenditure/general public budget expenditure	-
Local debt	Local government debt burden ratio	Balance of local urban investment bonds/regional GDP	-
	Local government debt repayment ratio	Debt repayment and interest payment/general public budget revenue	-

###### 4.1.2 Core explanatory variable: Development level of digital economy (Dig)

The indicators of digital economy development level in this paper are mainly reflected by three primary indicators, namely, informatization development level, Internet development level and digital transaction development level. The entropy method is used to measure the digital economy development level reflected by each secondary indicator. See Table 4-2 for specific indicators.

Table 4-2: Indicator System for Digital Economy Development Level

First-level indicator	Second-level indicator	Meaning of indicators	Weight
Development level of informatization	Fundamentals of Information Technology	Fiber optic cable density	0.0619
		Density of mobile phone base stations	0.0693
		Proportion of information technology professionals	0.0376
	The impact of informatization	Total telecommunications business volume	0.1024
		Software business revenue	0.1596
	Fixed end Internet foundation	Internet access port density	0.0733
Internet development level	Mobile Internet Foundation	Mobile Internet penetration	0.0195
	Fixed end Internet impact	Proportion of broadband Internet users	0.0456
	Mobile Internet Impact	Proportion of mobile Internet users	0.0217
		Number of websites per hundred enterprises	0.0073
Development level of digital trading	Fundamentals of Digital Trading	Computer usage in enterprises	0.0327
		Proportion of e-commerce enterprises	0.0581
		E-commerce sales revenue	0.1304
	The impact of digital transactions	Online retail sales	0.1806

#### 4.1.3 Mediating variable

This article selects local general public budget expenditure (Exp) and local government debt balance (Deb) as corresponding mediating variables, and tests the mechanism of the mediating variables.

#### 4.1.4 Control variable

In order to objectively analyze the impact of the level of digital economic development on the sustainable development capacity of local finance and avoid estimation bias caused by omitted variables, four indicators that may affect the sustainable development capacity of local finance are selected as control variables, including the degree of openness to the outside world (Open), degree of government intervention (Gov), population density (Popd) and urbanization rate (Urb).

Table 4-3: Description of Main Variables

Variable type	Variable symbol	Variable name	Variable meaning
Explained variable	Susta	Sustainable Development Capacity of Local Finance	Fiscal Sustainable Development Capability Index
		Development level of digital economy	Index of Comprehensive Development Level of Digital Economy
Core explanatory variables	Dig	Local general public budget expenditures	Natural logarithm of local general public budget expenditures
		Balance of local government debt	Natural logarithm of local government debt balance
Mediating variable	Exp	Degree of openness to the outside world	Total import and export trade volume/GDP
		Degree of government intervention	Local fiscal expenditure/GDP
Control variable	Popd	Population density	Natural logarithm of (year-end population/area of region)
		Urbanization rate	Regional urban population/total population of the region

#### 4.2 Model Construction

In addition to effectively reducing the impact of unobservable effects, panel data can also reduce collinearity issues to a certain extent by increasing sample size and improving degrees of freedom, thereby improving the accuracy of regression results. This article intends to use a bidirectional

fixed effects model to reduce endogeneity issues and construct the following baseline regression model:

$$\text{Susta}_{it} = \alpha_0 + \alpha_1 \text{Dig}_{it} + \alpha_2 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (1)$$

In formula(1), i and t represent the province and year, respectively.  $\text{Susta}_{it}$  is the fiscal sustainable development capability indicator of province i in year t,  $\text{Dig}_{it}$  represents the level of digital economy development in province i in year t,  $X_{it}$  is the control variable, which includes the degree of openness to the outside world, the degree of government intervention, population density, and urbanization rate,  $\mu_i$  and  $\delta_t$  represent individual fixed effects and time fixed effects, respectively,  $\varepsilon_{it}$  is the random error term,  $\alpha_0$ ,  $\alpha_1$  and  $\alpha_2$  is the parameter to be estimated.

#### 4.3 Data source

In view of the availability and timeliness of data, this paper selects 30 provinces (autonomous regions, municipalities directly under the Central Government) in China (excluding Hong Kong, Macao, Taiwan and Xizang) as research samples. The sample data is sourced from the China Statistical Yearbook, China Financial Yearbook, China Information Industry Yearbook, Digital China Development Report, Peking University Digital Inclusive Finance Index, provincial statistical yearbooks, National Bureau of Statistics, and Mark Data Network database. The sample range is from 2013 to 2023. For missing values in some data, this article uses methods such as linear interpolation and ARIMA imputation to fill in the missing data. The descriptive statistical results of the main variables are shown in Table 4-4.

Table 4-4: Descriptive Statistics of Variables

Variables	Observed value	Minimum	Maximum	Mean	Standard deviation
Susta	330	0.2039	0.8562	0.3568	0.1303
Dig	330	0.0132	0.7318	0.1104	0.1205
Exp	330	11.6931	12.3943	12.1246	0.2395
Deb	330	2.8842	3.6661	3.4122	0.2129
Open	330	0.1123	0.5526	0.3408	0.0851
Gov	330	0.1138	0.7627	0.2716	0.1209
Popd	330	5.3268	9.6165	7.7583	0.8473
Urb	330	0.3742	0.9022	0.6191	0.1294

## 5. Empirical analysis

### 5.1 Benchmark regression analysis

The benchmark regression results of this article are shown in Table 5-1. Gradually incorporating the degree of openness to the outside world, government intervention, population density, and urbanization rate into the benchmark regression model (1), the regression analysis results in columns I to V in Table 5-1. Throughout the entire regression analysis process, the regression coefficients of the Digital Economy Comprehensive Development Level Index (Dig) remained positive and were significantly positively correlated at the 1% significance level. This indicates that the fiscal revenue of various regions in China increases with the improvement of the level of digital economy development, and thus the sustainable development capacity of local finance will also be enhanced. This result verifies hypothesis H1. In addition, as the control variables are gradually added, the goodness of fit of the model gradually increases from the initial 0.7023 to the final 0.8127, indicating that the benchmark regression model (1) has good fitting and strong explanatory power.

Table 5-1: Benchmark Regression Results

Variables	I	II	III	IV	V
	<b>Susta</b>	<b>Susta</b>	<b>Susta</b>	<b>Susta</b>	<b>Susta</b>
Dig	0.7812*** (0.0985)	0.7238*** (0.0916)	0.6853*** (0.0857)	0.6902*** (0.0874)	0.6537*** (0.1089)
Open		0.1232*** (0.0306)	0.0986*** (0.0244)	0.0937*** (0.0269)	0.0921*** (0.0257)
Gov			0.1824*** (0.0586)	0.1835*** (0.0628)	0.1893*** (0.0636)
Popd				-0.0006 (0.0361)	-0.0055 (0.0353)
Urb					0.0587 (0.0773)
Constant	0.2672* (0.0209)	-0.6847** (0.2566)	-1.3835*** (0.3438)	-1.3934*** (0.3466)	-1.4176*** (0.3495)
Observations	330	330	330	330	330
Number of id	30	30	30	30	30
R <sup>2</sup>	0.7023	0.7396	0.7605	0.7882	0.8127
Province	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes

Note: \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively.

The robust standard errors are in parentheses. The following tables are similar.

From Table 5-1, it can be seen that considering both explanatory and dependent variables, according to the regression results in column I, for every 1% increase in the level of digital economy development, the overall sustainable development capacity of local finance in China increases by 0.7812%. After gradually adding in the degree of provincial-level opening up, government intervention, population density, and urbanization rate over 11 years, for every 1% increase in the level of digital economy development, the overall sustainable development capacity of local finance in China increases by 0.7238%, 0.6853%, 0.6902%, and 0.6537%, respectively, all of which are significant at the 1% level.

## 5.2 Robustness test

Robustness testing is a key step in empirical research to verify the reliability of conclusions, with the main purpose of evaluating the stability and reliability of research results. The methods for robustness testing mainly include model replacement, variable replacement, sample adjustment, etc. This article intends to use the method of replacing core explanatory variables to conduct robustness tests on benchmark regression results. Referring to and drawing on the research method of Deng Da et al. (2021), the original core explanatory variable was replaced with the Digital Inclusive Finance Index (Digif), and it was substituted into formula(1). The regression analysis results are shown in Table 5-2, and the regression coefficients of the Digital Inclusive Finance Index (Digif) are all positive, and significant at the 1% level from column(I) to column(V), indicating that the empirical results in the previous section have good robustness. According to the regression results in column(V), for every 1% increase in the level of digital economy development, China's local fiscal sustainable development capacity will increase by 0.0536%.

Table 5-2: Results of Robustness Test

Variables	(I) Susta	(II) Susta	(III) Susta	(IV) Susta	(V) Susta
Digif	0.0824*** (0.0198)	0.0667*** (0.0172)	0.0592*** (0.0157)	0.0569*** (0.0141)	0.0536*** (0.0135)
Open		0.1683*** (0.0364)	0.1572*** (0.0358)	0.1637*** (0.0349)	0.1465*** (0.0327)
Gov			0.1233*** (0.0882)	0.1057*** (0.0851)	0.1268** (0.0764)
Popd				0.0318** (0.0461)	0.0239* (0.0392)
Urb					0.2517** (0.1524)
Constant	0.4162*** (0.0046)	-1.1235*** (0.3134)	-1.5172*** (0.4125)	-1.4784*** (0.4328)	-1.4361*** (0.4027)
Observations	330	330	330	330	330
Number of id	30	30	30	30	30
R <sup>2</sup>	0.483	0.572	0.612	0.665	0.708
Province	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes

### 5.3 Mechanism test

To further analyze the mechanism of the role of digital economy development in enhancing the sustainable development capacity of local finance, this article further selects local general public budget expenditure (Exp) and local government debt balance (Deb) as mediating variables, and tests the channel mechanism in the above hypothesis based on the mediating effect model. The specific results of the mechanism test are shown in Table 5-3.

Table 5-3: Mechanism Inspection Results

Variables	(i) Susta	(ii) Exp	(iii) Susta	(iv) Deb	(v) Susta
	Susta	Exp	Susta	Deb	Susta
Dig	0.2863*** (0.0165)	-0.3308*** (0.1036)	0.1436*** (0.0247)	-1.0132*** (0.2625)	0.2469*** (0.0304)
Exp			0.1434*** (0.0205)		
Deb					-0.0387*** (0.0046)
Constant	0.7156*** (0.0823)	3.0413*** (0.3641)	0.5228*** (0.0846)	-1.3214** (0.7825)	0.8245*** (0.0768)
Control Variable	Control	Control	Control	Control	Control
Bidirectional Fixed Effect	Control	Control	Control	Control	Control
Observations	330	330	330	330	330
Number of id	30	30	30	30	30
R <sup>2</sup>	0.9662	0.9787	0.9854	0.9583	0.9785

In Table 5-3, the results of the mediation effect test using local general public budget expenditure (Exp) as the mediator variable are shown from column (i) to column (iii). Among them, column (ii) takes local general public budget expenditure as the dependent variable and the level of digital economy development as the core explanatory variable. The regression coefficient of the core explanatory variable is -0.3308, and it is significant at the 1% significance level, indicating that local general public budget expenditure has a significant mediating effect. The negative regression coefficient suggests that digital economy development can save local fiscal expenditure, optimize the structure of local fiscal expenditure, and indirectly enhance the sustainable development capacity of local finance. Hypothesis H2 is verified.

The (iv) and (v) columns are the results of the mediation effect test using the balance of local government debt (Deb) as the mediator variable. The regression coefficient of the level of digital

economy development in column (iv) is -1.0132, which is also significant at the 1% significance level, indicating that digital economy development can significantly reduce the balance of local government debt; The regression coefficient for the development of the digital economy in column (iv) is 0.2469, and the regression coefficient for the balance of local government debt is -0.0387, both of which have passed the significance test, indicating that the development of the digital economy can effectively reduce the burden of local government debt and enhance the sustainable development capacity of local finance. Hypothesis H3 has been verified.

## **6. Conclusions and Recommendations**

This article uses panel data from 30 provinces in China from 2013 to 2023 to measure the level of digital economic development and the fiscal sustainability index of each province using entropy weight method. The relationship between the two is thoroughly examined, and the results show that digital economic development can directly enhance local fiscal sustainability by effectively increasing fiscal revenue; The development of the digital economy can indirectly enhance the sustainable development capacity of local finance by saving and optimizing fiscal expenditures; Vigorously developing digital technology can effectively reduce the debt burden of local governments and enhance the sustainable development capacity of local finances. Therefore, this article proposes the following suggestions:

### ***6.1 Empowering high-quality development of local economy through digital transformation***

Local governments should actively embrace the digital economy, integrate resources, create conditions, accelerate the development of core industries in the digital economy, and promote the integration of digital economy and local fiscal sustainable development capabilities. Local governments should vigorously encourage the deep integration of digital economy and traditional industries, promote the digital transformation and upgrading of traditional industries, improve the production efficiency and added value of traditional industries, and enhance the core competitiveness of local industries.

### ***6.2 Creating a favorable tax policy environment for the development of the digital economy***

To encourage enterprises to engage in technological innovation and digital transformation, the government should also explore and establish a tax mechanism that adapts to the characteristics of the digital economy, improve the distribution mechanism of turnover tax, provide a favorable tax environment for the stable development of the digital economy, and further enhance the endogenous driving force of local economic development.

### ***6.3 Strengthening regional exchanges and cooperation through the digital economy***

Local governments should introduce relevant policies, establish and improve incentive mechanisms and tax coordination mechanisms for cross regional cooperation, and assist in the cross-border expansion of the digital economy to various regions, in order to fully leverage the spillover effects of the digital economy in enhancing the sustainable development capacity of local finances.

### ***6.4 Deepening the reform of fiscal management system through the construction of digital finance***

Local governments need to strengthen the construction of digital finance, improve the financial and tax management system, fully utilize big data to promote the disclosure of information on budgets, debts, audits, etc., strengthen the effective connection between budget and performance evaluation, final accounts, project management, and audit results, and continuously improve the transparency and quality of budget and final accounts preparation. At the same time, utilizing big models and big data to establish and improve the financial performance evaluation system, focusing on strengthening the performance evaluation of livelihood expenditures and key project expenditures, striving to improve the level of financial management, and continuously enhancing the sustainable development capacity of local finance.

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