

Research on the Impact of Digital Economy on Local Fiscal Pressure

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Abstract

Based on provincial panel data from 2011 to 2022 in China, this article uses the entropy method to calculate the digital economy index of 30 provinces, and adopts a two-way fixed effects model to empirically analyze the impact mechanism of the digital economy on inter regional fiscal pressure. The research results indicate that the digital economy can alleviate regional fiscal pressure, but there are significant differences between regions, with its impact being more significant in the eastern region and relatively weaker in the central and western regions. Further intermediary testing shows that the development of the digital economy has reduced financial pressure between regions by promoting the rationalization of industrial structure. In addition, moderation analysis shows that population concentration weakens the negative impact of the digital economy on fiscal pressure, while increasing human capital levels enhances the negative impact of the digital economy on fiscal pressure.

Keywords

Digital Economy; Local Fiscal Pressure; Industrial Structure.

1. Introduction

Against the backdrop of accelerated global digital transformation, the digital economy has become a key force driving economic growth and restructuring regional competition patterns. With the rapid development of information technology, the digital economy has not only changed traditional production and consumption patterns, but also become an important field for countries to seize the high ground in the new round of global competition. According to statistics from International Data Corporation (IDC), the global digital economy has surpassed \$34 trillion, accounting for over 40% of global GDP, and its growth rate is significantly higher than that of traditional economic sectors. Under this trend, the rise of the digital economy is not only a natural result of technological progress, but also an inevitable choice for countries to cope with economic transformation, social change, and globalization challenges.

In recent years, the impact of the digital economy on fiscal pressure among regions has become the focus of academic attention. The digital economy has significantly promoted regional economic growth by enhancing production efficiency and optimizing resource allocation, thereby effectively alleviating local fiscal pressure. Chen Xudong et al. (2024) pointed out that the digital economy can enhance the inclusive growth of regional economies and provide new impetus for the sustainable development of local finances. Zhang Weiliang and Song Liying (2023) took 286 prefecture-level cities in China as the research object and found that the digital economy can not only increase fiscal revenue but also improve the efficiency of fiscal expenditure, thereby effectively alleviating local fiscal pressure. Gu Cheng et al. (2022) further emphasized that enhancing the intensity of tax collection and administration can significantly increase the positive impact of the digital economy on tax revenue. In terms of regional differences, Li Jianjun et al. (2023) conducted a quantitative analysis of the value-added tax inflow indicators in the lower regions of the digital economy using the consumption approach.

They found that large cities, with their abundant resources, complete infrastructure, and high market concentration, can more effectively attract and retain tax revenue. The research by Liu Jianmin et al. (2021) indicates that the development of the digital economy has significantly promoted the sustainable improvement of local finances and provided a guarantee for the long-term stability of local finances. Therefore, the digital economy can effectively promote the quantity and effort of fiscal absorption, providing new growth points for local finances. In summary, existing research indicates that the development of the digital economy has had a complex impact on inter regional fiscal pressures.

2. Theoretical Analysis and Research Hypotheses

2.1. The Direct Impact of the Digital Economy on Fiscal Pressure

The development of the digital economy has a significant direct impact on regional fiscal pressure. First of all, the application of digital technology can significantly enhance production efficiency, optimize resource allocation, and thereby promote economic growth and an increase in fiscal revenue. For instance, the intelligent transformation of the manufacturing industry has reduced waste in the production process and enhanced the efficiency of resource utilization. The digital transformation of the service industry has enhanced service quality and customer satisfaction, attracted more consumers, and thereby increased the revenue and tax revenue of enterprises. In addition, the development of the digital economy has created new job opportunities and increased the income level of residents. Meanwhile, the application of digital technologies in government governance, such as e-government and smart city management, has enhanced government efficiency and reduced the pressure of fiscal expenditure. However, the easing effect of the digital economy on fiscal pressure shows significant differences in different regions. Due to the well-developed digital infrastructure, optimized industrial structure and abundant talent reserves in the eastern region, the development of the digital economy has a more significant effect on alleviating fiscal pressure. The eastern region has a high coverage rate of network infrastructure, and the construction of new infrastructure such as 5G and big data centers is relatively mature, providing a solid foundation for the development of the digital economy. In addition, the eastern region is densely populated with universities and research institutions, which have strong innovation capabilities and can provide technical support and talent reserves for the development of the digital economy. In contrast, the digital infrastructure in the central and western regions is relatively weak, and the industrial structure is still dominated by traditional agriculture and resource-based industries. These industries have a low reliance on digital technology and are difficult to transform, making it hard for them to achieve rapid growth through the digital economy. Meanwhile, due to the relatively low level of economic development in the central and western regions, it is difficult for them to attract and retain high-end talents, resulting in a significant lag in the development speed of the digital economy compared to the eastern regions. In addition, the market scale in the central and western regions is relatively small, and the consumption capacity of residents is limited, making it difficult to form a scale effect for the development of the digital economy. This further restricts the role of the digital economy in alleviating fiscal pressure. Therefore, this article proposes:

H1: The digital economy will alleviate regional financial pressure.

2.2. Indirect Impact of Digital Economy on Fiscal Pressure

First of all, the rationalization of industrial structure is an important intermediary mechanism for the digital economy to alleviate fiscal pressure. The digital economy has significantly enhanced production efficiency and added value by promoting the digital transformation of traditional industries. Meanwhile, the digital economy has given rise to emerging industrial

clusters. These emerging industries have attracted the collaborative aggregation of a large number of upstream and downstream enterprises, forming a complete industrial chain and further enhancing the overall competitiveness and tax contribution capacity of regional industries. In addition, the deep integration of the digital economy with other industries, such as platform economy and shared manufacturing, has created more growth points and employment opportunities, expanded the value creation space for cross-border industrial integration, not only directly increasing fiscal revenue but also providing sustainable solutions for the long-term relief of fiscal pressure. Secondly, population concentration and the level of human capital have a significant moderating effect on the digital economy. Although population agglomeration can bring about the expansion of the market scale and the concentration of economic activities, it may also lead to the uneven distribution of resources and the increase of infrastructure costs. For instance, densely populated areas may encounter problems such as traffic congestion and tight public service resources, all of which will increase the financial expenditure pressure on the government. Furthermore, population concentration may intensify competition for talent, leading to an increase in business operation costs and thereby weakening the role of the digital economy in alleviating fiscal pressure. In contrast, the improvement of human capital levels can significantly enhance the positive effects of the digital economy. A high level of human capital implies stronger digital skills and innovation capabilities. This not only enhances the application efficiency of digital technologies but also promotes the development of emerging industries and the transformation and upgrading of traditional industries, thereby strengthening their role in alleviating fiscal pressure. Therefore, this article proposes:

H2: The development of the digital economy can alleviate financial pressure between regions by promoting the rationalization of industrial structure;

H3: Population concentration will weaken the negative impact of the digital economy on fiscal pressure, while increasing human capital levels will enhance the negative impact of the digital economy on fiscal pressure.

3. Research Design

3.1. Model Construction

To investigate the impact of digital economy development on local fiscal pressure, this article constructs the following model:

$$fin_{it} = \alpha_0 + \alpha_1 del_{it} + \sum \alpha_2 control_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (1)$$

Among them, i represents the province, t represents the year, is the fin_{it} dependent variable, represents the t fiscal pressure of the i province in the year, del_{it} is the core explanatory variable, and represents the digital economy development index. Representing $control_{it}$ control ε_{it} variables, representing μ_i individual fixed effects, representing δ_t time fixed effects, representing random perturbation terms.

3.2. Variable Definition

3.2.1. Explained Variable

Local financial pressure (fin), this article refers to the calculation method of Li Xiangju and Li Xingbo (2025), and measures it by the proportion of the difference between general public budget expenditure and general public budget revenue to regional GDP.

3.2.2. Explanatory Variables

The Digital Economy Development Index (del) is constructed using the methods of Zhao Tao et al. (2020), Pan Weihua et al. (2021), and Wang Jun et al. (2021) to measure the digital economy development index of 30 provinces in China from 2011 to 2022 from different dimensions. The entropy method is used to measure the level of digital economy development between different regions.

Table 1. Evaluation Indicators for Digital Economy Index

indicators	attribute
Internet broadband access rate	+
Internet penetration	+
Scale of mobile phone facilities	+
Mobile phone penetration rate	+
Length of long-distance optical cable per unit area	+
Number of IPV4	+
Per capita total telecommunications services	+
Express delivery volume	+
Number of electronic information manufacturing enterprises	+
Software business revenue	+
Scale of personnel in the information technology service industry	+
Number of websites per hundred enterprises	+
Proportion of enterprises engaged in e-commerce transactions	+
E-commerce transaction volume	+
Digital Financial Inclusion Index	+

3.2.3. The Remaining Variables

Considering the impact of other factors on local fiscal pressure, this article selects the following control variables: (1) Economic development level (plg), expressed as the logarithm of per capita regional GDP; (2) Resident income level (pcdi), expressed as the logarithm of per capita disposable income in each province; (3) The industrial structure is represented by the proportion of the tertiary industry to GDP; (4) Population growth rate (grop), expressed as the natural population growth rate of each region; (5) The number of enterprise units (comp), expressed as the number of registered legal persons of enterprise units in various regions; (6) Government intervention level (gov), expressed as the proportion of local fiscal general budget expenditures to GDP; (7) high-level opening-up (open), it is measured by the proportion of the total volume of local imports and exports to the regional GDP; (8) Market index(market), derived from Fan Gang's China Market Index report;

The rationalization of industrial structure (theil), referring to the calculation method of Gan Chunhui et al. (2011), measures the degree of rationalization of industrial structure through the Theil index, and the calculation formula is as follows:

$$theil = \sum_{i=1}^n \left(\frac{Y_i}{Y} \right) \ln \left(\frac{Y_i}{L_i} / \frac{Y}{L} \right), i = 1, 2, 3 \quad (2)$$

Among them, Y_i is the i output value of the tertiary industry, L_i is the gross domestic product of the industry, Y is the gross domestic product of the industry, L_i is the i number of people employed in the tertiary industry, and L is the total number of people employed in the industry. The closer the value of theil is to 0, the higher the degree of rationalization of the industrial structure.

The level of human capital (hum), based on the research of Liang Yanan and Zhang Cheng (2022), is expressed as the ratio of the number of students in regular higher education institutions to the total population.

Population aggregation (bp) is expressed as the ratio of the year-end resident population to the land area in each region.

3.3. Sample Selection and Data Sources

This article selects panel data from 30 provinces (cities, autonomous regions) in China from 2011 to 2022, mainly sourced from the China Statistical Yearbook, China Tax Yearbook, China Urban Statistical Yearbook, and Wind database. To eliminate the influence of extreme values, all variables were truncated by 1% before and after, and the results are shown in Table 2.

Table 2. Descriptive Statistical Analysis

Variable	symbol	sample	mean	sd	min	max
local fiscal pressure	fin	360	0.146	0.109	0.016	0.593
digital economy development index	del	360	0.143	0.110	0.016	0.577

4. Empirical Result Analysis

4.1. Benchmark Regression

In order to conduct an in-depth analysis of the impact of digital economy development on local fiscal pressure, this article used a fixed effects model for empirical testing, and the benchmark regression results are shown in Table 3 below. Among them, column (1) did not include control variables, and the results showed that the coefficient of the core explanatory variable del was -0.455, which passed the 1% significance test, indicating that the development of the digital economy may alleviate inter regional fiscal pressure. Column (2) only includes year fixed effects, and the results show that there is still a significant negative correlation between digital economic development and regional fiscal pressure. On the basis of adding control variables, column (3) introduces bidirectional fixed effects, and the estimated regression coefficient is -0.053, which is significant at the 1% level. This means that for every unit increase in the digital economy index, local fiscal pressure will decrease by 0.053 units, further supporting the establishment of H1.

Table 3. Benchmark Regression Analysis

variable	(1)	(2)	(3)
	fin	fin	fin
del	-0.455***	-0.665***	-0.053***
	(-11.661)	(-12.666)	(-2.693)
control variable	NO	NO	YES
R-squared	0.212	0.338	0.995

Note: *, **, *** respectively indicate significance at the 10%, 5%, and 1% levels, with t-values in parentheses. Same below.

4.2. Robustness Test

Replace explanatory variables. This study is based on the above model (1) and uses principal component analysis (delp) to recalculate the digital economy development index. Column (1) of Table 4 shows the regression results after using alternative indicators, with significantly negative coefficients, confirming the robustness of the conclusions drawn in this paper.

Add control variables. This article introduces technological innovation capability (inov) as a new control variable in the robustness test, measured by taking the logarithm of the number of patent applications in each region in the current year. The results are shown in column (2) of Table 4, with an estimated regression coefficient of -0.069. Through a 1% significance test, it indicates that the empirical results of this study are robust.

Reduce the sample interval. Considering the increased complexity and uncertainty of economic activities during the pandemic, which may lead to statistical and accounting biases in some data, this section excludes data from 2020 and subsequent years and re uses a two-way fixed effects model for regression analysis. The results in column (3) of Table 4 show that the estimated results after excluding the impact of the epidemic are consistent with the original conclusion, further verifying the robustness of the results of this study.

Table 4. Robustness Test

	(1)	(2)	(3)
	fin	fin	fin
delp	-0.003*		
	(-1.959)		
del		-0.069***	-0.101***
		(-3.416)	(-3.199)
inov		-0.007***	
		(-2.916)	
control variable	YES	YES	YES

4.3. Heterogeneity Analysis

To deeply analyze the impact of the digital economy on local fiscal pressure, this paper divides 30 provinces across the country into the eastern and central and western regions, and conducts a regional heterogeneity analysis. The results of the group regression analysis are shown in Table 5. The coefficient of del in Column (1) is -0.068, which is significantly negative at the 1% level, indicating that in the eastern region, the development of the digital economy has alleviated the financial pressure among regions. However, in the central and western regions, the impact of the digital economy is not significant. The above results indicate that the development of the digital economy has a more significant effect on alleviating regional fiscal pressure in the eastern region, while it is relatively weak in the central and western regions.

Table 5. Regional Heterogeneity Analysis

variable	(1) Eastern region	(2) Central and Western Regions
	fin	fin
del	-0.068***	-0.018
	(-3.683)	(-0.267)
control variable	YES	YES

5. Mechanism Verification

5.1. Mediation Effect Test

To verify the validity of H2, this article selects industrial structure rationalization (theil) as the mediating variable. The regression analysis results are shown in Table 6. Among them, column (1) shows the benchmark regression results of the Digital Economy Development Index (del) on regional fiscal pressure (fin), while columns (2) and (3) show the regression results after adding industrial structure rationalization as a mediator variable. All regression results passed

the 5% significance test. The empirical results show that the coefficient of industrial structure rationalization in column (2) is 0.247, indicating that the development of the digital economy will promote the rationalization of industrial structure. The coefficient of rationalization of industrial structure in column (3) is -0.056, further revealing that rationalization of industrial structure will reduce fiscal pressure between regions. Therefore, it can be concluded that the development of the digital economy can alleviate financial pressure between regions by promoting the rationalization of industrial structure. This result confirms the validity of H2.

Table 6. Mediation Effect Test

variable	(1)	(2)	(3)
	fin	theil	fin
del	-0.053***	0.247***	-0.039**
	(-2.693)	(4.019)	(-2.008)
theil			-0.056***
			(-2.858)
control variable	YES	YES	YES

5.2. Analysis of Regulatory Effects

Based on the previous mechanism analysis, this article explores the moderating effects of population agglomeration (GT) and human capital level (HU) on the relationship between digital economy and regional fiscal pressure. The regression results are shown in Table 7, where columns (2) and (3) respectively introduce the interaction terms between digital economy, human capital level, and population agglomeration. The analysis results show that the coefficient of the interaction term (del * gt) between the digital economy and population agglomeration is significantly negative at the 1% level, indicating that population agglomeration weakens the alleviating effect of the digital economy on regional fiscal pressure. On the other hand, the coefficient of the interaction term (del * hum) between the digital economy and human capital level is significantly positive at the 1% level, indicating that increasing the level of human capital will enhance the relief effect of the digital economy on regional fiscal pressure. This result confirms the validity of H3.

Table 7. Adjustment Effect Test

	(1)	(2)	(3)
	fin	fin	fin
del	-0.053***	0.035	-0.005
	(-2.693)	(1.617)	(-0.260)
del*gt		-0.003***	
		(-2.882)	
del*hum			9.510***
			(5.469)
control variable	YES	YES	YES

6. Conclusion and Suggestions

6.1. Building a New Pattern of Regional Collaboration

In view of the regional differences in alleviating fiscal pressure through the digital economy, it is suggested that the development pattern of the regional digital economy be optimized in a coordinated manner under the guidance of national strategies. First of all, increase investment in digital infrastructure construction in the central and western regions, promote full coverage

of county-level networks, enhance the popularization rate and application level of digital technologies in the central and western regions, and narrow the gap in digital economic development among regions. Secondly, build a cross-regional digital economy cooperation platform. By encouraging the eastern region and the central and western regions to carry out targeted assistance and industrial transfer in the digital economy, achieve complementary advantages among regions. Finally, formulate and improve policies and measures to promote coordinated regional development, such as fiscal transfer payments, tax incentives, and industrial support, guide resources to flow to the central and western regions, stimulate the internal driving force for the development of the digital economy in these regions, and form a favorable pattern of coordinated regional development.

6.2. Promote the Transformation and Upgrading of Industrial Structure

In the era of digital economy, promoting the transformation and upgrading of the industrial structure is an important way to relieve regional fiscal pressure. First of all, the government should accelerate the digital transformation process of traditional industries, encourage enterprises to adopt digital technologies to enhance production efficiency and management levels, promote the transformation of manufacturing towards digitalization and green development, and increase the added value and competitiveness of traditional industries. Secondly, it is necessary to cultivate emerging industrial clusters. Based on the resource endowments and industrial foundations of each region, efforts should be made to focus on developing various cutting-edge fields such as artificial intelligence, promote the collaborative agglomeration of upstream and downstream enterprises, and build a resilient digital industrial chain ecosystem. Finally, the government needs to deepen the integration and innovation of the digital economy and the real economy, promote the deep integration of digital technology with manufacturing, agriculture and other industries, give rise to new business forms such as platform economy and shared manufacturing, and provide sustainable impetus for fiscal revenue growth.

6.3. Optimize the Mechanism for Allocating Talent Elements

The development of the digital economy relies on the optimal allocation mechanism of talent elements. First of all, in response to the issue of insufficient talent reserves in the central and western regions, the government should guide the flow of high-end digital talents to these regions by formulating special subsidy policies and tax preferential policies, gradually narrowing the gap in talent reserves among regions. Secondly, the government needs to innovate the digital governance model of densely populated areas, dynamically optimize the allocation of public service resources with the help of digital technology, and weaken the inhibitory effect of population concentration on the digital economy effect. Finally, we should comprehensively promote the project of enhancing the digital literacy of all citizens, integrate basic digital skills education into the national education system, and popularize the basic knowledge of digital technology from the primary and secondary school stages. At the same time, we should carry out customized vocational skills training for key groups in the central and western regions to strengthen the supporting role of human capital in the development of the digital economy.

References

- [1] Chen Xudong, Shen Liyun, Qin Wenjin Digital Economy, Vertical Fiscal Imbalance, and Inclusive Growth of Regional Economy: Causal Inference Based on Dual Machine Learning [J]. Economic and Management Research, 2024, 45 (09): 61-77.

- [2] Zhang Weiliang, Song Liying Can the digital economy alleviate fiscal pressure? --Empirical evidence from Chinese cities [J]. Journal of Hubei University (Philosophy and Social Sciences Edition), 2023, 50 (01): 162-171.
- [3] Gu Cheng, Shi Xinxu, Wang Wei Analysis of the Impact of Digital Economy Development on Tax Revenue: Empirical Evidence from Chinese Cities [J]. Fiscal Research, 2022, (10): 85-99.
- [4] Li Jianjun, Zhao Xiaoyu, Li Xin Digital Economy and Horizontal Tax Distribution: Value added Effect and De branching Effect of Commodities [J]. Fiscal Research, 2023, (08): 101-113.
- [5] Liu Jianmin, Xue Yan, Liu Jiayi Research on the Impact of Digital Economy on Local Fiscal Sustainability: Based on the Perspective of "Local Neighbor" [J]. Journal of Hunan University (Social Sciences Edition), 2021, 35 (06): 46-56.
- [6] Li Xiangju, Li Xingbo Digitalization of Industries, Horizontal Distribution of Taxation, and Local Fiscal Pressure [J]. Financial Theory and Practice, 2025, 46 (02): 51-59.
- [7] Zhao Tao, Zhang Zhi, Liang Shangkun Digital Economy, Entrepreneurial Activity, and High Quality Development: Empirical Evidence from Chinese Cities [J]. Management World, 2020, 36 (10): 65-76.
- [8] Pan Weihua, He Zhengchu, Pan Hongyu The spatiotemporal evolution and distribution dynamics of China's digital economy development [J]. Chinese Soft Science, 2021, (10): 137-147.
- [9] Wang Jun, Zhu Jie, Luo Qian Measurement of the Development Level and Evolution of China's Digital Economy [J]. Research on Quantitative Economy, Technology and Economics, 2021, 38 (07): 26-42.
- [10] Gan Chunhui, Zheng Ruogu, Yu Xiangbiao The Impact of China's Industrial Structure Changes on Economic Growth and Fluctuations [J]. Economic Research, 2011, 46 (05): 4-16+31.
- [11] Liang Yanan, Zhang Cheng Population Aging, Digital Economy, and Optimization of China's Industrial Structure [J]. Economic Issues Exploration, 2022, (12): 114-131.