

The Impact of Fiscal Expenditure and Technological Innovation on High Quality Economic Development

Zejiang Zhou, Wenhui Lu*

School of Economics, Anhui University of Finance and Economics, Bengbu, China

*Corresponding Author: 3202300028@aufe.edu.cn

ABSTRACT

In order to explore the mechanism and transmission path between fiscal expenditure, scientific and technological innovation and high-quality economic development, based on the connotation of fiscal expenditure, scientific and technological innovation and high-quality economic development and related theoretical basis, this paper discusses the theoretical mechanism of fiscal expenditure and scientific and technological innovation affecting high-quality economic development and the panel data of 31 provinces in China from 2013 to 2022, and uses spatial econometric model to analyze the impact of fiscal expenditure and scientific and technological innovation on high-quality economic development. The results show that fiscal expenditure has a spatial spillover effect on high-quality economic development.

KEYWORDS

Fiscal Expenditure; Scientific and Technological Innovation; High Quality Development.

1. INTRODUCTION

High quality development is a new expression put forward by the 19th national congress, which shows that China's economy has successfully entered a high-quality development stage from high-speed growth. In March, 2022, Li Keqiang pointed out in the government work report that "we should promote scientific and technological innovation, break through the supply constraints, and improve the quality of development by relying on innovation." in 2021, the high-quality development of Anhui Province achieved remarkable results, the national economy continued to recover stably, the innovation vitality was constantly released, and the role of science and technology in promoting development was increasingly enhanced. In January 2022, wangqingxian, the governor of Anhui Province, pointed out that "we should adhere to innovation driven development and promote high-quality development" and "turn the potential energy of scientific and technological innovation into new drivers of high-quality development and take new steps in the construction of innovative Anhui". In the first half of 2022, the economic operation of Anhui Province is generally stable, the structure is excellent and the trend is upward.

As a key factor affecting the level of scientific and technological innovation, fiscal expenditure plays an obvious role in making up for market failure and supporting the development of specific industries. It can stimulate the scientific and technological innovation power of market players and is the key factor to ensure the orderly development of scientific and technological innovation activities. At the same time, finance is the cornerstone of national governance. It plays an important role in promoting high-quality economic development by promoting economic transformation and upgrading, strengthening regional coordinated development, and focusing on ensuring and improving people's livelihood. In the process of promoting high-quality development, scientific and technological

innovation still has some problems, such as insufficient scientific research investment, difficult to effectively improve innovation ability, huge cost and so on. In order to improve the ability of scientific and technological innovation, local governments actively support the development of scientific and technological innovation with finance, effectively improve the development level of scientific and technological innovation, and effectively promote high-quality economic development.

2. LITERATURE REVIEW

Romer (1989) [1] obtained relevant data from 22 developed countries or regions through a large number of data collection and carried out empirical analysis. The results showed that with the further expansion of the number of people engaged in scientific research, the economic growth rate also increased. Wallsten S J (2000) [2] analyzed the government financial allocation for science and technology and enterprise innovation, and found that with the expansion of the scale of financial allocation, more and more enterprises' R&D investment was squeezed out, seriously affecting enterprise innovation activities. Yulin Liu (2021) [3] believes that traditional industries also play an important role in the process of achieving high-quality economic development, but the primary premise is the deep integration of scientific and technological innovation technology with the production line. Lu Meinong and Yanyan Zheng (2021) [4] analyzed the development of private enterprises in Hebei Province and believed that measures such as increasing R&D investment, encouraging school enterprise cooperation and strengthening talent introduction could help improve the quality of economic development in Hebei Province. Lifeng Yu (2021) [5] based on the relevant data of 30 provinces (autonomous regions and municipalities) in China from 2003 to 2015, conducted an empirical analysis on the specific role of industrial structure adjustment and technological innovation, and found that technological innovation was beneficial to high-quality economic development. Zeira J (2011) [6] believes that the advanced scientific and technological innovation in developed countries is due to the high attention and strong support of the government for scientific and technological innovation activities; Xiaojiang Zhuang and Lu Dai (2020) [7] analyzed the effect of fiscal expenditure on science and technology based on China's 2009-2018 panel data classification, and pointed out that fiscal expenditure on science and technology showed a significant incentive effect on industrial enterprises' scientific and technological innovation, but did not significantly promote the improvement of the innovation level of colleges and universities; Lina Hu (2020) [8] and Shaohang Liu (2020) [9] based on their full understanding of the basic situation of scientific and technological innovation and financial investment data in various regions of China, they believed that the forward development of scientific and technological innovation could not be separated from the strong support of Finance in the field of scientific and technological innovation.

3. SPATIAL EFFECT TEST

3.1. Spatial Correlation Test

3.1.1. Global Spatial Autocorrelation Test

Before selecting and testing the spatial econometric model, it is necessary to judge whether there is spatial correlation between the explained variable and the explanatory variable. If the spatial correlation is significant, it is necessary to analyze the spatial econometric model. This paper uses the mainstream method of spatial correlation test moran's I to judge whether there is spatial correlation between fiscal expenditure and high-quality economic development. The value of Moran index I is between $[-1, 1]$. The larger the value, the stronger the correlation. When Moran index approaches 1, it indicates that there is a strong positive spatial correlation between variables. When Moran index approaches 0, it indicates that there is no correlation between variables in various regions. Positive

and negative values indicate positive and negative correlation. The Moran index calculation formula is as follows:

$$I = \frac{\sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{(x_i - \bar{x})^2}$$

Where, w_{ij} represents the spatial weight matrix; x_i Represents the observed value of the variable x in the region i ($i=1,2,3,...,n$); x_j Represents the observed value of the variable x in the region j ($j=1,2,3,...,n$); $\bar{x}$ Represents the mean value of the variable. In order to determine the spatial correlation characteristics of high-quality economic development and fiscal expenditure, stata18.0 was used to calculate the global Moran index.

It can be seen from table 1 that under the economic distance matrix, the Moran index results of high-quality economic development are significantly positive, indicating that high-quality economic development has a global spatial positive correlation. Except for 2020, the Moran index of fiscal expenditure is significantly positive in other years, indicating that fiscal expenditure also has a positive spatial correlation in the whole region. Therefore, it is necessary to explore the impact mechanism of fiscal expenditure on high-quality economic development from the spatial dimension.

Table 1. Global Moran index value

	Fiscal expenditure for high-quality			Economic development		
Year	I	Z	P-value	I	Z	P-value
2013	0.296	2.673	0.007	0.303	2.442	0.015
2014	0.173	1.809	0.070	0.266	2.205	0.028
2015	0.183	1.876	0.061	0.197	1.653	0.098
2016	0.171	1.852	0.064	0.336	2.515	0.012
2017	0.230	2.277	0.023	0.301	2.316	0.021
2018	0.250	2.460	0.014	0.215	1.776	0.076
2019	0.287	2.674	0.007	0.212	1.748	0.080
2020	0.289	2.403	0.016	0.169	1.484	0.138
2021	0.328	2.886	0.004	0.260	2.064	0.039
2022	0.223	2.028	0.043	0.269	2.094	0.036

3.1.2. Local Spatial Autocorrelation Test

Through the global Moran index of the explained variable and the explanatory variable, the basic overall characteristics of the two variables have been obtained, but the spatial correlation degree between specific regions and regions cannot be described. Therefore, under the condition of confirming the global spatial correlation, the spatial autocorrelation of various regions in Anhui Province in 2013 and 2022 is tested and analyzed based on the economic distance matrix.

Table 2 contains the names of regions in each quadrant in 2013 and 2022. It can be seen that most of the regions related to high concentration are regions with relatively developed economic development

levels. For example, Hefei, the capital city of Anhui Province, has a higher economic development level than other regions. There are many low-level related regions, and the high-quality economic development level of these regions is relatively low, and the high-quality economic development level of the adjacent regions in these regions is also relatively low. There are few regions in the second and fourth quadrants. In the second quadrant, the level of high-quality economic development in the region is low, while the level of high-quality economic development in adjacent regions is high, such as Tongling and Huainan; The fourth quadrant is that the high-quality economic development level of this region is relatively high, while the high-quality economic development level of adjacent regions is relatively low, such as Anqing, Chuzhou, Suzhou, etc. It can be seen that the agglomeration effect of high-quality economic development is relatively stable from 2013 to 2022, and the difference is not obvious.

Table 2. Spatial agglomeration mode of high quality economic development in 2013 and 2022

	Aggregation Type	2013	2022
First Quadrant	HH	Hefei,Wuhu, Ma'anshan	Hefei, Wuhu, Ma'anshan
Second Quadrant	LH	Tongling, Huainan	Tongling, Huainan, Lu'an
Third Quadrant	LL	Chizhou,Huangshan, Fuyang,Bozhou,Suzhou, Lu'an, Huaibei, Bengbu, Xuancheng	Bengbu, Fuyang, Anqing, Huangshan, Bozhou, Chizhou, Xuancheng
Fourth Quadrant	HL	Anqing, Chuzhou	Huaibei,Chuzhou,Suzhou

Table 3 shows the names of the regions in each quadrant of Moran scatter chart of fiscal expenditure in 2013 and 2022. In the first quadrant of 2013, the regions with high concentration are the regions with relatively developed economic development and famous tourist spots, such as Hefei and Huangshan; Many regions in the third quadrant are regions with relatively slow economic development and insufficient resource endowment. The level of fiscal expenditure in these regions is low, and the level of fiscal expenditure in the adjacent regions of these regions is also low. It can be seen that although the fiscal expenditure in 2013 is generally significant in value, the point distribution among regions is relatively scattered, and there is no substantial change in the point distribution among regions by 2022, indicating that the agglomeration effect of fiscal expenditure indicators is relatively stable from 2013 to 2022.

Table 3. Spatial agglomeration mode of high quality economic development in 2013 and 2022

	Aggregation Type	2013	2022
First Quadrant	HH	Hefei,Wuhu, Ma'anshan, Tongling,Huangshan, Xuancheng	Hefei,Wuhu, Ma'anshan, Tongling,Huangshan, Xuancheng
Second Quadrant	LH	Bengbu, Huaibei	Bengbu,Huaibei,Huainan
Third Quadrant	LL	Chuzhou,Anqing,Bozhou, Suzhou, Fuyang, Lu'an	Bozhou,Suzhou, Fuyang, Lu'an
Fourth Quadrant	HL	Huainan, Chizhou	Anqing,Chuzhou,Chizhou

3.2. Model Construction

On the basis of spatial correlation analysis, in order to select an appropriate spatial econometric model for in-depth analysis of the spatial effect of fiscal expenditure on high-quality economic development, LM, Wald, Hausman and LR tests were carried out on the regression results, and the results are shown in Table 4. LM passed the significance test of 1%, and the spatial econometric model was applicable; The Wald test results rejected the original hypothesis at the significance level of 1%, indicating that the spatial Dobbin model (SDM) will not degenerate into the spatial error model (SEM) and the spatial lag model (SAR); Hausman test found that the regression analysis of fixed effect model was the best; Through the LR test, it is determined that the spatial econometric model uses the two-way fixed effect. Therefore, this study decided to explore the impact of fiscal expenditure on high-quality economic development by using the spatial Durbin model with two-way fixed effect.

Table 4. LM, Wald, Hausman, LR inspection results

Inspection	Statistics	P-value
LM-error	16.211	0.000
R-LM-error	10.769	0.000
LM-lag	37.731	0.000
R-LM-lag	22.288	0.000
Wald for SAR	91.770	0.000
Wald for SEM	101.270	0.000
HausmanTest	102.560	0.000
LR Both Ind	52.300	0.001
LR Both Time	228.770	0.001

This paper further constructs a spatial econometric model for line analysis. Spatial Dobbin model is a general form of spatial autoregressive model and spatial error model, which can better estimate the spatial spillover effect. According to the test results of 4, this study selects the fixed effect of spatial Dobbin model for empirical analysis. Refer to ye xiuqun's practice ^[10] to build the model in the following form:

$$Hqd_{it} = \alpha_1 + \rho w_{ij} Hqd_{it} + \phi_1 GE_{it} + \phi_2 C_{it} + \theta_1 w_{ij} GE_{it} + \theta_2 w_{ij} C_{it} + \mu_i + \eta_t + \varepsilon_{it}$$

Where, Hqd_{it} is the explained variable, indicating the high-quality economic development level of the region in the year. GE_{it} as the core explanatory variable, it indicates the fiscal expenditure level of the region in the year. C_{it} indicates the selected control variables, including the level of foreign investment, opening up, social consumption, human capital, financial development and urbanization; α_1 refers to intercept item; ρ Represents spatial autoregressive coefficient; ϕ_1 Indicates the impact of core variables on high-quality economic development; ϕ_2 Indicates the impact of control variables on high-quality economic development θ_1 , θ_2 Indicates the impact degree and direction of spatial variables on high-quality economic development; w_{ij} Represents the spatial weight matrix; μ_i

Indicates individual fixed effect; η_i Indicates time fixed effect; Represents a random ε_{it} perturbation term.

3.3. Spatial Panel Model Regression Analysis Results

It can be seen from table 5 that the main regression coefficient of fiscal expenditure is 0.090, showing a positive spatial spillover effect, indicating that the improvement of the level of fiscal expenditure can promote the high-quality economic development of the region. This is mainly because fiscal expenditure promotes the development and maturity of the entire economic industry chain and will support high-quality economic development. The spatial regression coefficient of fiscal expenditure is 0.139, showing a positive spatial spillover effect, indicating that fiscal expenditure in the region will promote the high-quality economic development of surrounding areas. This is mainly because the fiscal expenditure of various regions in Anhui Province has provided strong support for the high-quality economic development of the surrounding areas by optimizing the allocation of resources, enhancing infrastructure construction and improving the level of public services. This support has not only promoted the development of the local economy, but also led to the common prosperity of the surrounding areas and achieved the coordinated development of the regional economy.

Table 5. Estimation results of spatial Doberman model

	Main effect spatial	spillover effect
Variable	Hqd	Hqd
GE	0.090**	0.139*
	(2.26)	(1.67)
IS	-0.207**	0.558**
	(-1.98)	(2.31)
Inv	-0.473	2.600**
	(-1.10)	(2.08)
Open	0.100	-2.174***
	(1.22)	(-8.82)
Cost	-0.107	0.332
	(-1.42)	(1.56)
HC	0.624	1.135
	(0.89)	(0.64)
Fin	0.029**	-0.065**
	(2.15)	(-2.13)
Urb	-0.322**	-0.448
	(-2.54)	(-1.52)

According to the main regression coefficient and spatial regression coefficient of each control variable, the upgrading of industrial structure will inhibit the high-quality economic development of the region, but there is a significant positive spatial spillover effect on the surrounding areas; The level of foreign investment will inhibit the high-quality development of the local economy, but there is a significant positive spatial spillover effect on the surrounding areas; The degree of opening to the

outside world will promote the high-quality economic development of the region, but this effect is not obvious, and there is a significant negative spatial spillover effect on the surrounding areas; The level of social consumption will inhibit the high-quality development of the local economy, but there is a positive spatial spillover effect on the surrounding areas; The level of human capital will promote the high-quality economic development of the region, and there is a positive spatial spillover effect on the surrounding areas; The degree of financial development will significantly promote the high-quality economic development of the region, but there is a significant negative spatial spillover effect on the surrounding areas; The level of urbanization will significantly inhibit the high-quality economic development in the region, and also have a negative spatial spillover effect on the surrounding areas.

4. ANALYSIS OF SPATIAL SPILLOVER EFFECT

Table 6. Decomposition of spatial spillover effects

	Direct effect	Indirect effect	Total effect
Variable	Hqd	Hqd	Hqd
GE	0.080**	0.087*	0.168**
	(2.00)	(1.82)	(2.27)
IS	-0.279***	0.522***	0.243
	(-2.70)	(2.60)	(1.15)
Inv	-0.731*	2.258**	1.527
	(-1.75)	(2.28)	(1.53)
Open	0.335***	-1.782***	-1.446***
	(3.05)	(-8.92)	(-8.31)
Cost	-0.144*	0.299*	0.155
	(-1.83)	(1.74)	(0.97)
HC	0.579	0.774	1.353
	(0.79)	(0.55)	(0.96)
Fin	0.038**	-0.064**	-0.027
	(2.44)	(-2.46)	(-1.20)
Urb	-0.295**	-0.271	-0.566**
	(-2.36)	(-1.25)	(-2.29)

In order to further study the spatial spillover effect of fiscal expenditure on high-quality economic development in the spatial Dobbins model, this study further analyzes the direct effect, indirect effect and total effect of fiscal expenditure on high-quality economic development in various regions. It can be seen from table 6 that the coefficient of the direct effect of fiscal expenditure is 0.080, and it has passed the significance test at the level of 5%, indicating that fintech will significantly promote the high-quality economic development of the region; The indirect effect coefficient of fiscal expenditure is 0.087, indicating that fiscal expenditure has a positive spatial spillover effect on the high-quality economic development of surrounding areas, but it is not significant. That is, fiscal expenditure not only promotes the high-quality economic development of the region, but also promotes the high-quality economic development of surrounding cities. Hypothesis 4 is verified. The reason: in recent

years, Anhui Province has paid attention to the guiding role of fiscal expenditure in regional economic development. By improving the system and mechanism of coordinated expenditure between urban and rural areas, it has improved the efficiency of coordinated expenditure between urban and rural areas, and promoted the high-quality development of regional economy. For example, Anhui has increased its financial support to northern and southern Anhui, promoted the industrial upgrading and infrastructure construction in these regions, and narrowed the regional development gap. In addition, Anhui has actively undertaken the industrial transfer from Jiangsu, Zhejiang and Shanghai, vigorously introduced advanced technology and talents, accelerated the transformation and upgrading of local traditional industries, and vigorously cultivated emerging industries. These measures not only improve the level and quality of economic development in the region, but also drive the economic development of surrounding areas through the extension of industrial chain and supply chain.

5. SUGGESTIONS

5.1. Guarantee and Support of Fiscal Expenditure

After the victory of the fight against poverty in 2021, the focus of financial work will turn to rural revitalization. Local governments need to put financial security in the first place, give full play to the inclusive, comprehensive and public characteristics of public finance, increase support for "agriculture, rural areas and farmers", implement precise policies, effectively promote rural revitalization and achieve shared development. At the same time, we should optimize financial supply, focus on supporting emerging industries, and use financial subsidies, tax incentives and financial tools to improve financial supply capacity and promote high-quality economic development.

5.2. Improve the Efficiency of Scientific and Technological Innovation

We should focus on supporting high-tech fields, expand the scale of input and output, improve the ability of scientific and technological innovation, apply new technologies and other achievements to production, and promote the transformation and development of the real economy. At the same time, we should optimize the allocation of scientific and technological resources, pay attention to the central and western regions, and improve the quality of enterprise innovation. In addition, we should encourage innovation subjects, mobilize the enthusiasm of scientific researchers, ensure their treatment and status, create a good innovation environment, and encourage the output of high-quality scientific and technological achievements.

5.3. Optimize the Structure of Fiscal Expenditure

Local governments should focus on environmental protection, expand environmental protection expenditure, establish a long-term guarantee mechanism, improve environmental quality, and play a guiding role of fiscal policy. At the same time, we should increase expenditure in the field of people's livelihood, improve the quality of the population and human capital, and provide support for high-quality economic development. In addition, we should appropriately reduce the expenditure on general public services, and improve the efficiency of resource utilization through streamlining administration, delegating power, and institutional reform.

ACKNOWLEDGMENTS

This work is supported by Research Project on Innovative Development of Social Sciences in Anhui Province (Grant No: 2022CX024).

REFERENCES

- [1] Romer Paul M. What determines the rate of growth and technological change? [M]. Washington: World Bank Publications, 1989.
- [2] Wallsten S J. The effects of government industry R&D programs on private R&D: the case of the Small Business Innovation Research program[J]. The RAND Journal of Economics, 2000, 31(1): 82-100.
- [3] Liu Yulin. "Three reforms" accelerate high-quality economic development [J]. China's collective economy, 2021 (20): 5-6.
- [4] Lu Meinong, Zhengyanyan. Research on Countermeasures for high quality development of private economy in Hebei Province driven by innovation [J]. industry and Technology Forum, 2021, 20 (11): 21-22.
- [5] Yu Lifeng. Industrial structure, technological innovation and high quality economic development [J]. Journal of Hubei Institute of Technology (HUMANITIES AND SOCIAL SCIENCES), 2021, 38 (03): 41-49.
- [6] Zeira J. Innovations, Patent Races and Endogenous Growth[J]. Journal of Economic Growth, 2011, 16(2): 135-156.
- [7] Zhuang Xiaojiang, Dai Lu. Empirical Study on financial support and enterprise technological innovation [J]. cooperative economy and technology, 2020 (14): 176-178.
- [8] Hu Lina. Fiscal decentralization, fiscal expenditure on science and technology and regional innovation capability -- An Empirical Study Based on China's provincial panel data [J]. economic system reform, 2020 (05): 149-155.
- [9] Liu Shaohang. Empirical analysis of the impact of fiscal expenditure on local innovation [J]. China business theory, 2020 (15): 188-190.
- [10] Ye Xiuqun, Teng Yuhua, Liu Rongchun. Research on the impact of free trade zones and export processing zones on Regional Industrial Hollowing Out -- An Empirical Analysis Based on spatial Durbin model and intermediary effect model [J]. Journal of Central University of Finance and economics, 2022, (03): 117-128.