Research on the Impact of Technological Innovation on High-Quality Economic Development

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ABSTRACT

This paper uses the provincial panel data from 2000 to 2019, and uses the spatial econometric model to study the impact mechanism of technological innovation on high-quality economic development. The study found that the high-quality development of China's economy has an obvious spatial correlation effect, and due to this effect, technological innovation has a significant positive impact on the high-quality economic development.

KEYWORDS: technological innovation; high-quality economic development; spatial measurement

My country's economy has transformed from a stage of high-speed growth to a stage of high-quality development. Innovation, as the source of a country's progress, is an indispensable part of promoting China's economic development in the new era. However, in the current situation of the transformation of old and new kinetic energy and the increasingly severe pressure on resources and environment, the Fifth Plenary Session of the 18th Central Committee of the Communist Party of China proposed a new development concept of "innovation, coordination, green, openness and sharing" to realize the innovation-driven development strategy and improve the economy. High-quality development is one of the main goals of current social development [1]. What impact does technological innovation have on high-quality economic development? This is the question that this article attempts to answer.

1. Research design
1.1. research hypothesis
The impact mechanism of technological innovation on high-quality economic development. The role of technological innovation in promoting high-quality economic development is mainly manifested in the effect of industrial structure upgrading, resource allocation effect, etc. From the perspective of industrial structure upgrading, technological innovation will promote the formation of emerging industries, which will lead to changes in demand structure, and thus industrial structure. To a higher level, the industrial structure will be optimized and upgraded, thereby promoting high-quality economic development [3-4]. From the perspective of resource allocation efficiency, technological innovation is the main way to improve production efficiency. Technological innovation can improve resource utilization, reduce resource consumption and waste, and promote high-quality economic development. Based on this, this paper puts forward the hypothesis

H 1: Technological innovation has a significant role in promoting high-quality economic development.

1.2. variable

1.2.1. Core explanatory variables: technological innovation

Referring to the research of Yue Yujun and Meng Miao (2022), select the number of patents granted to measure technological innovation

1.2.2. Explained variable: high-quality economic development

Refer to the research methods of Sun Hao and Gui Heqing (2020) to measure high-quality economic development, and construct an evaluation index system for high-quality economic development from five aspects: innovation, coordination, greenness, openness, and sharing (see Table 1).

Table 1 Evaluation system for high-quality economic development

Innovative development	GDP growth rate	+	Regional GDP growth rate
	R&D investment intensity	+	&D expenditure of industrial enterprises above designated size / GDP
	investment efficiency	-	Investment rate/ GDP growth rate
	Technical transaction activity	+	Technology deal value / GDP
Coordinated development	demand structure	+	Total retail sales of social consumer goods / GDP
	Urban and rural structure	+	urbanization rate
	Industrial structure	+	Tertiary industry output value / GDP
	government debt burden	-	Government Debt Balance / GDP
ECO development	Elasticity coefficient of energy consumption	-	Energy consumption growth rate/ GDP growth rate
	Wastewater produced per unit	-	Wastewater discharge / GDP
	exhaust gas produced by the unit	-	SO2 emissions / GDP
open development	Dependence on foreign trade	+	Total import and export / GDP
	The proportion of foreign investment	+	Total foreign investment / GDP
	degree of marketization	+	Regional Marketization Index
shared development	The proportion of workers' compensation	+	Workers Compensation / GDP
	Residential Income Growth Elasticity	+	Resident per capita disposable income growth rate / GDP growth rate
	urban-rural consumption gap	-	Per capita consumption expenditure of urban residents/per capita consumption expenditure of rural residents
	Proportion of people's livelihood fiscal expenditure	+	Proportion of local fiscal expenditure on education, medical and health care, housing security, social security and employment in local fiscal budget expenditure

1.2.3. Control variable:

level of financial development: measured by the proportion of loans of financial institutions in each region to GDP. Degree of government intervention: Measured by the proportion of fiscal expenditure in GDP. Urbanization level: It is measured by the proportion of urban permanent population to the total population of the region. Average years of education: (Population of primary school * 6 + population of junior high school * 9 + population of high school * 12 + population of university * 16) / total number of people.

1.2.4. Data Description

The selected sample for this study is the panel data of 30 provinces and cities from 2000 to 2019. The main sources of data are China Statistical Yearbook and China Science and Technology Statistical Yearbook.

1.3. research model

High-quality economic development may have spatial correlation, so this paper establishes a spatial econometric model for regression analysis.

1.3.1 To test the Moran I index of spatial correlation of high-quality economic development , the calculation formula is as follows:

$$Moran's\ I = \frac{N \sum_{i=1}^{N} \sum_{j=1}^{N} w_{tj(x_i-\bar{x})(x_j-\bar{x})}}{\sum_{i=1}^{N}(x_i-\bar{x})^2 \sum_{i=1}^{N} \sum_{j=1}^{N} w_{ij}} = \frac{\sum_{i=1}^{N} \sum_{j=i}^{N} w_{tj(x_i-\bar{x})(x_j-\bar{x})}}{s^2 \sum_{i=1}^{N} \sum_{j=1}^{N} w_{tj}}$$

Among them, N=30; w_{ij} is the 0-1 space weight matrix, and the matrix is a symmetric matrix; x_i and x_j are the variable observers of area i and area j respectively; $\bar{x}$ is the mean S^2 of variable observations, and is the variance of variable observations. The value range of the global index is [$Moran's\ I$ -1,1]. If the value is greater than 0, it means that the space is positively correlated, that is, the high value-low value is adjacent, and the low value-high value is adjacent; if the value is equal to 0, it means that the space is not correlated, That is, the variables are randomly distributed in space.

Table 2 The overall index of high-quality economic development in various regions $Moran's\ I$

years	$Moran's$ value	years	$Moran's\ I$ value
2000	0.288 *** _	2010	0.308 *** _
2001	0.312 *** _	2011	0.276 *** _
2002	0.273 *** _	2012	0.282 *** _
2003	0 267 **	2013	0.287 *** _
2004	0.309 *** _	2014	0.333 *** _
2005	0.322 *** _	2015	0.282 *** _
2006	0.309 *** _	2016	0.202 ** _
2007	0.354 *** _	2017	0.308 *** _
2008	0.343 *** _	2018	0.363 *** _
2009	0.322 *** _	2019	0.320 *** _

$^* p < 0.1, ^{**} p < 0.05, ^{***} p < 0.01$

values of high-quality economic development in $Moran's\ I$ all years have passed the significance test and are positively correlated , indicating that China's economic regional activities are not carried out independently, but influence each other geographically, and have an obvious positive correlation in spatial distribution, so spatial distribution should be used. The econometric model examines the relationship between technological innovation and high-quality economic development.

1.3.2 Establishment of Spatial Panel Measurement Model

$$lny_{it} = \beta_1 x_{it} + + \beta_2 a1_{it} + \beta_3 a2_{it} + \beta_4 a3_{it} + \beta_5 a4_{it} + \varepsilon.$$

$$\varepsilon = \lambda W \varepsilon + \mu, \mu \sim N(0, \sigma^2)$$

Among them, i is the serial number of different regions, t is the serial number of the period, which lny is the high-quality economic development of the region xi in the period t; is the core explanatory variable technological innovation, the $a1; a2; a3; a4$ control variable, respectively the level of financial development, the degree of government intervention, the level of urbanization, the average income Years of education; the parameter λ is the n×1-dimensional spatial error coefficient, W is the spatial weight matrix, and the 0-1 spatial weight matrix is used here , and the parameter β reflects the influence of the explanatory variable on the dependent variable; ε and μ are random error vectors .

2. Empirical Results Analysis
LM test _
be seen from Table 3 that the L M-ERR test is significant, but the L M-LAG test is not significant. Further considering the robustness correction test, it is found that the Robust L M-ERR test value is significant, while the Robust L M-LAG test value is significant. Not obvious. That is to say, it is necessary to establish a spatial error correction model (SEM) , and it is more appropriate to establish the spatial layout of the SEM model .

Table 3 Model space correlation test

Test _	Statistic _	p -value
L M-ERR	69.285	0.000 _ _
R obust L M-ERR	79.454	0.000 _
L M-LAG	0.001 _ _	0.981 _ _
Robust L M -LAG	10.170	0.001 _ _

After the Hausman test, the fixed effect is selected, and according to the different control of the fixed effect model on the two types of non-observed effects of region and time, the fixed effects of no fixed effect (n onF) , the region fixed time variable effect (s F), and the time fixed region are respectively controlled. Four effects were estimated with variable (tF) and fixed (s tF) by time and region. According to the estimation results in Table 4, the spatial error (S EM) model with time-fixed regions (tF) has the largest number of significant estimated coefficients and the highest R^2. Therefore, we select this model for the factors that affect high-quality economic development. analysis. From the results of the spatial error (S EM) model of the time -fixed area and the variable (tF) , the regression coefficient of technological innovation is significantly positive, indicating that technological innovation has a significant role in promoting high-quality economic development in China

Table 4 Spatial Panel Measurement Results

variable	n onF	s F	tF	s tF
x	0.174128 [***] _ (6.17)	-0.00879 [*] (-1.81)	0.0174 [***] (6.17)	0.00621 (1.21)
a 1	0.091863 [***] _ (10.44)	0.0284 [***] (3.16)	0.0919 [***] (10.44)	-0.00202 (-0.23)
a 2	- 0.105078 (-0.19)	0.0758 (1.46)	-0.0105 (-0.19)	0.175 [***] (3.79)
a 3	0.5330415 [***] _ (16.24)	0.311 [***] (5.31)	0.533 [***] (16.24)	0.387 [***] (7.24)
a 4	0.0241274 [***] _ (5.39)	-0.0268 [***] (-4.52)	0.0241 [***] (5.39)	-0.0131 [*] (-1.89)
λ	0.2398263 [***] _ (3.96)	0.493 [***] (12.91)	0.240 [***] (3.96)	0.0519 (0.94)
σ^2	0.0023479 [***] _ (17.18)	0.00105 [***] (16.98)	0.00235 [***] (17.18)	0.000866 [***] (17.32)
R^2	0.504 _	0.310	0.598	0.456

[*] $p < 0.1$, [**] $p < 0.05$, [***] $p < 0.01$

3. Conclusions and Implications

Using the panel data of 30 provincial-level administrative regions in China from 2000) to 2019, and fully considering the high-quality economic development, this paper uses spatial panel econometric analysis technology to empirically examine the impact of technological innovation on my country's high-quality economic development. The study found that there is a significant spatial correlation in my country's high-quality economic development, and technological innovation has significantly promoted high-quality economic development. Based on the research findings, the following recommendations are made:

Improve technological innovation capabilities. The government needs to create a good institutional environment for enterprises to carry out technological innovation, break down market barriers, further eliminate local protectionism, reduce administrative barriers to personnel mobility, increase investment in education, and better play the role of government guidance to avoid resource waste leading to efficient resource allocation. low.

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