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Research on the Relationship between the Gathering of Scientific and Technological Talents and the High-Quality Development of Regional Economy—Taking Henan Province as an Example

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Abstract: *Promoting China's economy from high-speed growth to high-quality development is an important judgment made by the 19th National Congress of the Communist Organization of China on China's economic development. Based on the panel data of 14 regions and cities in Henan Province from 2010 to 2017, this paper first calculates that the quality of economic growth in each province has spatial autocorrelation, and then uses a two-way fixed effect model to empirically test the quality of economic growth by gathering scientific and technological talents. The research results show that there is a significant positive correlation between scientific and technological talents gathering and the quality of economic growth in each city, And the level of regional economic development is the core factor affecting talent flow; Based on this, this paper puts forward relevant policy recommendations to promote the rational and orderly flow of scientific and technological talents and improve the quality of economic growth in various provinces.*

Keywords: *High-quality economic development; Gathering of scientific and technological talents; Henan Province*

1. Introduction

The report of the 19th National Congress of the Communist Organization of China pointed out: "China's economy has shifted from a stage of rapid growth to a stage of high-quality development." This is an important judgment on China's economic development through the analysis of domestic and international environmental changes [1]. Since entering the new normal, the structure of factors on which China's economic growth depends has undergone significant changes. The extensive economic development that relies on scale expansion, high consumption, high investment and high pollution as the cost no longer meets the needs of China's future economic development [2]. At the present stage, China's macro-economic objectives are more turning to the driving force of economic growth and improving the quality of economic growth. Scientific and technological talents are the subjects who have certain scientific and cultural knowledge, professional knowledge and skills, and are engaged in relevant scientific and technological innovation activities, making outstanding contributions to scientific and technological progress [3]. The orderly and reasonable flow of scientific and technological talents plays a vital role in the optimal allocation of human and material resources and in promoting the development of productivity in China [4]. The dynamic process of the flow of scientific and technological talents is essentially a process of continuous recombination of workers and means of production. In this process, it is not only conducive to realizing the value of high-end talents, optimizing the talent structure and talent distribution pattern, but also helpful to improving the relationship between talent resources and other production elements [5]. Therefore, the study on the relationship between the flow of scientific and technological talents and the quality of economic growth is of practical significance for improving the policy of talent introduction in various regions and improving the quality of economic growth.

The research results of domestic scholars on the agglomeration effect of domestic scientific and technological talents are relatively rich. The representative ones are: Niu Chonghuai, Jie Min, etc. After analyzing the phenomenon of scientific and technological talents agglomeration, they put forward eight specific characteristics of the agglomeration effect of scientific and technological talents and made a general order of the specific characteristics of the agglomeration effect of scientific and technological talents [6]; Sun Jian and You Wen established an index evaluation system for regional scientific and

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technological talent cohesion, and believed that the regional distribution characteristics of China's scientific and technological talent cohesion are: the strongest in the eastern coastal areas, followed by the provinces in the northeast old industrial base, the weakest in the central region, and the weakest in the western region [7]; Niu Chonghuai believes that the agglomeration effect of scientific and technological talents is greatly affected by the agglomeration environment [8]; Wang Fen believes that in order to give full play to the gathering effect of scientific and technological talents, it is necessary to formulate a positive policy for the flow of scientific and technological talents, make rational use of scientific and technological talents, and optimize the gathering environment of scientific and technological talents [9]; Zhang Tongquan believes that the gathering of scientific and technological talents in an innovative team will produce appreciation effect, inheritance effect, anti-risk effect and accelerator effect. To promote the gathering of scientific and technological talents, we should pay attention to the cultivation of leading figures, strengthen the construction of innovative teams, and strive to build a carrier for gathering high-level scientific and technological talents [10]; Zhang Tiqin believes that there are positive and negative effects in the gathering of scientific and technological talents. If the interpersonal relationship and other aspects are handled improperly in the process of gathering scientific and technological talents, the positive effect of the gathering will be affected [11]. From the above research, it is not difficult to see that although people have carried out in-depth research on the agglomeration effect of scientific and technological talents in China, they have not carried out in-depth research on the relationship between the agglomeration of scientific and technological talents and economic development, especially the relationship between the agglomeration of scientific and technological talents and regional economic development. In the context of the increasingly in-depth impact of scientific and technological talents on economic development, it is impossible to reveal the relationship between scientific and technological talents gathering and economic development without studying the relationship between scientific and technological talents gathering and economic development, especially the relationship between scientific and technological talents gathering and regional economic development.

Based on this, this paper, on the basis of previous research and from the perspective of scientific and technological talent aggregation, constructs an indicator system of scientific and technological talent aggregation, conducts empirical tests on scientific and technological talents in various regions of China, discusses the impact of scientific and technological talent aggregation on the quality of economic growth, and takes 14 prefecture level cities in Henan Province from 2010 to 2017 as examples to empirically study the impact of scientific and technological talent aggregation on the quality of economic growth, and puts forward corresponding countermeasures and suggestions.

2. Model construction and selection of data indicators

2.1 Model construction

In order to empirically examine the relationship between talent gathering and the quality of economic growth at various levels in Henan Province, this paper first establishes the following econometric model:

$$gtfp_{it} = \beta_0 + \beta_1 sta_{it} + \sum \theta_j x_{jit} + \mu_{it} \quad (1)$$

Where, i represents prefecture level, t represents time, gtfp represents high-quality economic development, and sta represents the degree of scientific and technological talent gathering, μ Expressed as random error term, θ Is the coefficient of a series of control variables x.

2.2 Selection of data indicators

2.2.1 Interpreted variable

High quality economic development (gtfp). The existing researches have different opinions on the representation of high-quality economic development, mainly including the following three approaches: the first is to build an indicator system of high-quality economic development, and use statistical methods to synthesize comprehensive indexes; The second is to use single indicators such as GDP per capita to characterize high-quality economic development; The third type is to use total factor productivity including input indicators and output indicators. At present, due to the lack of a suitable indicator system for high-quality economic development, this paper uses total factor productivity to characterize the quality of economic development. For the calculation of total factor productivity, this paper adopts a method that is more suitable for panel data adopted by current scholars, including index method, data envelopment analysis, etc., which can divide total factor productivity into different

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components;

(1) Input indicators

The employees, fixed asset investment and total energy consumption in Henan Province were selected to represent labor, capital and energy respectively. The total fixed asset investment in Henan Province was calculated by the perpetual inventory method

(2) Output indicators

The expected output (GRP) is the gross domestic product (GDP) selected as the expected output in this study. Since the annual GDP will be inflated or inflated with inflation, scholars often use CPI index or GDP index to reduce GDP in the research process. Here, the GDP index is used to deflate and convert it into GDP output value with 2006 as the base period, which is GRP [12].

2.2.2 Explanatory variables

STA (Scientific Talent Accumulation): In order to measure the aggregation of scientific and technological talents in Henan Province, this study uses STA (scientific talent accumulation) [13] as the measurement index of regional scientific and technological talent aggregation: the specific formula is as follows:

$$sta = \frac{\left(\frac{s_{il}}{s_l}\right)}{\left(\frac{t_{il}}{t_l}\right)} \tag{2}$$

In Formula (2), Sil represents the total number of scientific and technological talents in prefecture level cities, sil represents the total number of scientific and technological talents in prefecture level cities, til represents the total number of scientific and technological talents in Henan Province, and Tl represents the total number of scientific and technological talents in Henan Province. The higher the talent aggregation index sta, the higher the degree of scientific and technological talent aggregation in the region.

2.2.3 Control variables

In order to control the impact of other factors that change over time on TFP, based on existing theories and empirical experience, this paper selects control variables from the following five aspects: scientific and technological industrial structure (psu), government intervention (gov), economic development level (pgdp), financial support (fest), and five aspects. Among them, the industrial structure is expressed by the ratio of the tertiary industry to the total industry in the region in that year; The government intervention is expressed by the proportion of local fiscal expenditure in GDP; Economic development level is measured by per capita GDP; The financial support is expressed in terms of financial science and technology expenditure (the amount of science and technology expenditure in financial expenditure).

2.3 Data Selection and Data Description

Due to the limitation of data availability and the lack of relevant data of some prefecture level cities in 2018, this paper selects 14 prefecture level cities in Henan Province as research samples, and the original data is mainly selected from the Statistical Yearbook of Henan Province and relevant statistical yearbooks of each prefecture level city from 2009 to 2019. After screening the data, six variables, panel data from 2010 to 2017, have been established, as shown in Table 1.

Table 1: Selection of influencing factor indicators

Indicator Attribute	Indicator Name	Indicator Explanation
Explained variable	high-quality economic development (gtfp)	Total factor productivity
Explanatory variable	scientific and technological talent aggregation (sta)	Scientific and technological talent aggregation index
Control variable	industrial structure (psu)	percentage of tertiary industry
	Government expenditure (gov)	Proportion of local fiscal expenditure in GDP
	Economic development level (pgdp)	GDP per capita
	Financial support (fest)	Science and technology expenditure in financial expenditure

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From the descriptive statistical results of variables in Table 2, it can be seen that there was a large difference between the minimum value of 0.128 and the maximum value of 16.89 in the scientific and technological talent aggregation variables from 2010 to 2017, indicating that there was a large difference in the number of scientific and technological talents between regions in Henan Province, so this study conducted a provincial heterogeneity study. The average value of industrial structure upgrading is 0.332, indicating that the ratio of tertiary industry in each province is small. There is a big gap between the minimum economic level of 12944 and the maximum economic level of 317333, which indicates that there is a big difference in economic development among regions in Henan Province.

Table 2: Descriptive Statistics

variable	Symbol	sample size	mean value	variance	minimum value	Maximum
high-quality economic development	gtfp	112	0.799	0.178	0.168	1
technological talent aggregation	sta	112	2.446	3.071	0.128	16.89
industrial structure	psu	112	0.332	0.136	0.142	1.458
Government expenditure	gov	112	0.115	0.0481	0.00652	0.213
Economic development level	pgdp	112	41,483	31,301	12,944	317,333
Financial support	fest	112	3.976	4.645	0.340	33.96

3. An Empirical Analysis of the Relationship between the Gathering of Scientific and Technological Talents and the Quality of Economic Growth

3.1 Correlation analysis

First of all, it can be seen from the correlation analysis that at the level of 1% significance, high-quality economic development is negatively related to industrial structure, that is, the ratio of industrial structure has a negative impact on high-quality economic development. This may be because: generally speaking, the production efficiency of industry is much higher than that of the service industry, while resources are certain. The development of the service industry is at the cost of crowding out industrial factor resources. The industrial structure promotes the factor resources to flow from the industry with higher production efficiency to the service industry with lower production efficiency, reducing production efficiency, increasing costs, and thus inhibiting high-quality economic development.

Secondly, it can be seen from the correlation of the gathering of scientific and technological talents that the effect of financial support on the gathering of scientific and technological talents is positive and meets the significance level of 1%. The possible explanation for this is that local governments will increase scientific and technological expenditure, increase financial support for technological innovation, vigorously develop high-tech industries, and thus promote the gathering of scientific and technological talents.

Finally, the level of economic development, financial support and industrial structure have a positive and 1% significance level, while the level of financial support and economic development have a positive and 1% significance level, indicating that the level of economic development, financial support and industrial structure promote each other, and industrial structure and financial support have a negative effect on high-quality economic development. At the same time, the interaction between these factors affects the analysis results of the degree of scientific and technological talent aggregation and the high-quality economic development of the explained variable.

Based on the results of correlation analysis, in order to solve the influence of control variables and explained variables, and the correlation between explanatory variables and control variables. Based on the panel equation model, this paper examines the effect of scientific and technological talent aggregation on high-quality economic development. Compared with the mixed effect, the solid effect model can effectively identify the relationship between the perturbation terms of various equations in practice and solve the endogenous problem. In this paper, the two-way fixed effect model is selected to compare the differences between the specific categories or categories of each autovariable and the

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interaction effects with the specific categories or categories of other autovariables, rather than infer the experimental design of other categories or categories not included in the same autovariable. Fixed effect regression is a variable method that varies with individuals but not with time in spatial panel data.

Table 3: Correlation Analysis

	gtfp	sta	psu	gov	pgdp	fest
gtfp	1					
sta	0.0970**	1				
psu	-0.274***	0.0450	1			
gov	0.112	0.163*	0.0290	1		
pgdp	-0.214**	-0.0450	0.752***	-0.0130	1	
fest	0.173*	0.278***	0.372***	-0.196**	0.247***	1

Note: * * *, * * and * represent 1%, 5% and 10% respectively

3.2 Model regression analysis

According to the proposed research hypothesis, a two-way fixed effect model that controls regional and annual effects is constructed to test:

$$gtfp_{i.t} = \beta_0 + \beta_1 sta_{i.t} + \beta control_{i.t} + \alpha_i + \delta_t + \epsilon_{i.t} \quad (3)$$

$Gtfp_{i.t}$ is the total factor productivity of prefecture level cities in year t; $Control_{i.t}$ is a set of control variables, taking into account the influence of other time varying factors; $\varepsilon_{i.t}$ is a random error term; $\alpha_i$and $\delta_t$is the fixed effect of city and year. The explanatory variable is $sta_{i.t.}$ It represents the education investment of city i. Therefore, the coefficient β_1 represents the impact of scientific and technological talent aggregation on gtfp, and is significantly canonical representing that scientific and technological talent aggregation promotes the significant improvement of total factor productivity. Previous studies have also found that the impact of individual differences in natural resource endowments and geographical factors that do not change over time on productivity cannot be ignored. The use of two-way fixed effect models can control these factors that are not easy to measure, and to a large extent solve the errors caused by missing variables.

3.3 Empirical results

As there are various connections between various regions in the process of actual economic operation, we use a two-way fixed effect econometric model to analyze the relationship between scientific and technological talent aggregation and the quality of economic growth in Henan Province, and use the two-way solid effect model to estimate formula (2), so as to verify the relationship between scientific and technological talent aggregation and the quality of economic growth in Henan Province, as shown in Table 3.

From the first column of Table 4, without adding the control variable that changes over time, the impact coefficient of scientific and technological talent aggregation on total factor productivity is 0.006, which is significant at the level of 1%. Scientific and technological talent aggregation can explain 10.2% of the total factor productivity difference. After controlling other variables in the second column, the impact of scientific and technological talent aggregation on high-quality economic development is still significant. An increase of 1% in scientific and technological talent aggregation can improve total factor productivity by 0.03% units, and the variance of the model residual is 0.001. Under the assumption that the production frontier remains unchanged, scientific and technological talents gather to improve high-quality economic development. Therefore, education investment is conducive to promoting the transformation of high-quality economic development mode and realizing connotative development.

3.4 Regression results of instrumental variables

Although the two-way fixed effect model can largely avoid endogenous problems caused by missing variables, there may still be endogenous problems because the gathering of scientific and technological talents depends on local areas, and the proportion of local enterprises is closely related to local development level. On the one hand, although the vast majority of scientific and technological talents are gathered in regions with good economic development, regions with high productivity and

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good economic development have the ability to increase talent training. On the other hand, the special fund for attracting scientific and technological talents should be set up to provide welfare benefits and bonuses for scientific and technological talents, which should be based on the preferential incentive policy and establish an incentive system for scientific and technological talents and advanced scientific and technological workers. These subjective and objective factors may lead to endogenous problems caused by mutual causation between talent gathering and total factor productivity.

4. Robustness test

Measurement error is an important factor affecting the accuracy of regression results. Therefore, we recalculate the explained variables and explanatory variables to test the robustness of the results. On the one hand, the total factor productivity of the explained variable is recalculated. The calculation of total factor productivity involves both input and output. There is no dispute about labor input, but the calculation of capital input is particularly critical. In the previous article, we used different depreciation rates to depreciate capital, fully reflecting the differences between regions. However, the fixed depreciation rate is also often used by the academia. Therefore, we use the 10% depreciation rate to convert capital, and use the China GDP deflator in the World Bank's development indicators to deflate GDP and recalculate total factor productivity; On the other hand, replace the explanatory variables. The gathering of scientific and technological talents is related to the expenditure of research and experimental development (R&D) funds in each city. Therefore, we use the expenditure of research and experimental development (R&D) funds in each city to estimate the impact of scientific and technological talents gathering on gtfp.

The results of the robustness test show that the total factor productivity measured by different depreciation rates and deflators for the scientific and technological talent gathering is at 5% level significantly. These findings indicate that the promotion of scientific and technological talent gathering on total factor productivity is stable.

Table 4: Gathering of scientific and technological talents and high-quality economic development

VARIABLES	(1)	(2)
	gtfp	gtfp
sta	0.06**	0.03***
	(1.79)	(2.51)
psu		-1.081***
		(-3.96)
gov		0.065
		(0.65)
pgdp		0.000**
		(2.19)
fest		0.004***
		(3.04)
Constant	0.821***	1.032***
	(54.05)	(23.98)
Observations	112	112
R-squared	0.167	0.629
Number of plc	14	14
Individual effect	Controlled	Controlled
Year effect	Controlled	Controlled
F test	0.0369	4.35e-10
F	3.032	106.9

Note: In parentheses are the robust standard errors of urban level clustering; * * *, * * and * means significant at 10%, 5% and 1% levels

5. Conclusion

Based on the correlation of the economic growth quality of each province, this paper analyzes the factors that affect the economic growth quality of each region in China. The analysis results of the two-way fixed effect model show that the model well demonstrates the estimation analysis of the

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economic growth quality and talent aggregation between regions in Henan Province. Therefore, we believe that the policy recommendations are based on the empirical results of the two-way fixed effect model. Based on the measurement and analysis of the degree of scientific and technological talent aggregation in various regions of Henan Province, combined with the panel data from 2010 to 2017, this paper uses the model to empirically study the impact of scientific and technological talent aggregation on the quality of economic growth in Henan Province. The research results show that: first, the degree of scientific and technological talent aggregation has a significant positive impact on the quality of economic growth in the province, and the economic development among regions is a fatal factor affecting talent aggregation. The phenomenon of regional talent aggregation breaks the traditional geographical distance limit, making talent aggregation more external; Secondly, the economic and industrial structure has a significant impact on the provincial economic development in the short term, and the industrial structure has a significant negative correlation on the quality of the city's economic growth.

Based on the empirical results of this study, the following enlightenment is obtained:

First, each province should formulate a reasonable talent introduction plan, create a good talent flow atmosphere, establish a flexible and sound talent flow mechanism, reduce the opportunity cost in the process of talent flow, stimulate the vitality of scientific and technological talent flow, and consider the impact on other regions to promote the rational and orderly flow of scientific and technological talents between provinces.

Second, we should give full play to the radiation role of talent gathering regions, give full play to the advantages of talent rich regions, and cooperate in the development of talent resources, so that the talent policy can be implemented more smoothly. Some provinces should give play to their policy advantages, promote the rational and effective flow of talents, and strengthen the tightness of China's scientific and technological talent network. Only by giving full play to the radiation effect of the core area of scientific and technological talents, can we make our scientific and technological talents network more stable and close.

Third, for the economic and industrial structure of each city, the local government should combine the characteristics of China's economic transformation under the new normal to improve the market system. At the same time, it also needs a good government management system, strengthen social security, optimize the talent structure, and effectively improve the quality of labor, so as to achieve a smooth transformation of China's economic structure, improve the quality of economic growth and economic operation efficiency.

Fourth, all provinces should strengthen cooperation in factor resources and promote the continuous upgrading of industrial structure. All regional governments should establish diversified consultation mechanisms to ensure the smooth implementation of cooperation, form a regional economic consortium of division of labor and cooperation based on maximizing economic benefits, and promote the reasonable and effective flow of factor resources between neighboring provinces to the secondary and tertiary industries.

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