Research on the Influencing Factors and Spatial Characteristics of Chinese Private Economy

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Abstract: First, the spatial correlation and agglomeration of private economy development in 14 cities of Hunan province of China were studied by using spatial statistics index and Moran scatter plot,And then by the use of space simultaneous regression model, this paper revealed the differences in the development of private economy in different regions of Hunan Province and the influencing factors this kind of differences. The research results show that there is spatial correlation between the development of private economy in various cities in Hunan province; The factors that obviously affect the spatial differences in the development of private economy in Hunan Province include the proportion of private enterprises above designated size, the proportion of listed private enterprises and the level of technological innovation, in addition, the number of undergraduates in private enterprises also significantly affect the development of private economy. Lastly, this paper puts forward relevant policy Suggestions for the orderly development of Chinese private economy.

1. Introduction

As the sum of various ownership economies, the private economy has become an important part of China's economy and an important force to promote China's economic development. After forty years' reform and opening up, China's non-public economy, including private economy, through rapid development, has been changed from small to big, weak to strong, has become the important component of China's market economy, and played an important role to the steady growth of Chinese economy, now, it is an important force in the transformation and upgrading of China's economic development. As a strong economy in China, Hunan provincial private economy shows strong development momentum, however, from the current status of the development of private economy of Hunan province, the small economy, the low quality and the slow growth rate does not change fundamentally, private economy is still a "short board" in Hunan provincial economic development.

On the development of private economy, many researchers have done much research on evaluation and promoting path about private enterprise's competitiveness, which consists of qualitative and quantative researches. For example, Qiu G.F. and Gao H.F. used the multi-level gray evaluation method to appraise the core competitiveness of private construction enterprises[1]. Shi Y.H. etc used improved TOPSIS method to evaluate the Comprehensive Strength of Urban Regional Economy[2]. Fan X.Y. appraised the competitiveness of private enterprises based on DEA method[3].

This paper will study two basic problems about the development of private economy in Hunan province of China, one is about the spatial correlation and spatial difference of the private economic development in Hunan province, the other is to explore the main influencing factors of Hunan provincial private economic development and the driving mechanism of Hunan provincial private economic development under the background of "The Belt and Road Initiatives".

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2. Methods

2.1 Spatial weight matrix

Spatial statistical analysis is to find the spatial correlation of objects, and spatial weight matrix is an effective tool to express spatial relationship. The spatial weight matrix is to represent the "spatial structure" between data in a quantified way. The interaction between the objects is realized through the mutual relation between them, and the spatial weight matrix is the realization method of carrying this process. Therefore, constructing spatial weight matrix is one of the basic prerequisites for studying the correlation between space objects. The space weight matrix is N by N data table,N represents the number of factors in the data set, so the corresponding value is the weight of a given array of columns, which can be measured according to the adjacent relation of the study object or the space distance of the study object[4].The common form of spatial weight matrix can be expressed as $W=[w_{ij}]_{n\times n}$

According to the adjoining standard or distance standard between objects, The element of the spatial weight matrix is used $W_{ij}=1$ when the space object i is adjacent to the space object j or within the range of the specified distance, or else $W_{ij}=0$, i.e.,

If the attribute value and spatial weight matrix of the studied object are used to define the weighted space proximity, The weighted space weight matrix is available as $w_{ij}^{*}=\frac{w_{ij}x_j}{\sum_{j=1}^{n}w_{ij}x_j}$

According to the definition of the above space weight matrix, it is a symmetric matrix.

2.2 Moran's I index

The Moran index is one of the most widely used spatial statistical parameters[5].For full spatial correlation, it can be defined as

$$Moran'sI=\frac{\sum_{i=1}^{n}\sum_{j\neq i,j=1}^{n}w_{ij}(x_i-\bar{x})(x_j-\bar{x})}{S^2\sum_{i=1}^{n}\sum_{j\neq i,j=1}^{n}w_{ij}} \tag{1}$$

For local spatial correlation,The Moran index can be defined as

$$I_i(d)=Z_i\sum_{j\neq i,j=1}^{n}w_{ij}^{'}Z_j \tag{2}$$

Where, n denotes the number of objects, x_i is the value of object i, and $Z_i=(x_i-\bar{x})/s$, $\bar{x}=\sum_{i=1}^{n}x_i/n$, $S^2=\sum_{i=1}^{n}(x_i-\bar{x})^2/n$

According to the definition of the Moran index, The value is between -1 and 1. When the index is equal to 0, there is no spatial correlation or correlation is random. When the index is greater than 0 and significant, there is a positive spatial correlation. When the index value is less than 0 and significant, there is a negative spatial correlation.

2.3 Spatial Simultaneous Auto-regressive Model

The Simultaneous Autoregressive model is the most basic spatial regression model[6]. Considering spatial correlation, two hypotheses can be proposed

①if Y is of spatial autocorrelation, the spatial lag model can be uses as following

$$y=\rho Wy+X\beta+\varepsilon \tag{3}$$

②if the error is spatial autocorrelation, the space error model can be used as following

$$y=X\beta+u,u=\lambda Wu+\varepsilon \tag{4}$$

Where ρ represents spatial correlation parameters, which represents the impact size of spatial autocorrelation on the model. λ represents the space error parameter, u represents a space

autocorrelation interference vector matrix. The larger the value of ρ and λ is, the greater the influence of spatial autocorrelation on the model. For spatial data, if assume λ=ρ=0 in the regression model, the spatial simultaneous autoregressive model is transformed into a classical linear regression model,that is, there is no spatial correlation between objects.

As to the test of autocorrelation of the studied objects and the choice of spatial statistical analysis model(equation (3) or (4)), we can do it with the help of Moran's I test or other statistical tests such as LMERR test, LMLAG test, etc. If the LMERR test is more pronounced than the LMLAG test, the preferred spatial error model is used for econometric analysis. Otherwise, the spatial lag model is more appropriate than the spatial error model.If the LMERR test was not significantly different from the LMLAG test, the spatial error model or the spatial lag model was further determined based on the significance of R-LMERR test and R-LMLAG test[7].

3. Spatial Correlation Analysis of Private Economy Development

3.1 The definition of the research object and the selection of the sample data

In order to analyze the spatial correlation and difference of the development of private economy in Hunan Province, we select the private economic subject of 14 cities in Hunan Province as the research objects, and take the total amount of private economy in each city as a measure of the level of private economic development in the region. In next subsection, after the sample data have been calculated according to the Hunan Statistical Yearbook in 2016

3.2 Spatial correlation analysis

The Moran's I index of the private economy of Hunan province

According to equations (1)-(2) and geographical relationship of 14 cities in Hunan province(shown in table 1), we can calculate the Moran's I index of the private economy of Hunan province to be 0.4301, which indicates that the development of private economy in Hunan Province showed a high spatial correlation.

In order to analyze the spatial correlation of the development of private economy in Hunan Province, we further drew the Moran scatter plot about the development of private economy(shown in figure 1), which is divided into four quadrants. For the 14 municipalities in Hunan Province, the level of private economy development is shown in Table 2. The conclusion of Table 2 and Fig. 1 further shows that there are geospatial interrelationships in the development of private economy in various municipalities of Hunan Province.

Table 1 geographical relationship of 14 cities in Hunan province

City No.	City Name	City No. Of adjacent Cities	City No.	City Name	City No. Of adjacent Cities
1	Changsha City	2,6,7,8	8	Yiyang city	1,2,4,11,12
2	Yueyang city	1,8	9	Shaoyang city	3,10,11,12
3	Hengyang city	5,6,7,9,10,12	10	Yongzhou city	3,5,9
4	Changde city	8,11,14	11	Huaihua city	4,8,9,12,13,14
5	Chenzhou city	3,6,10	12	Loudi city	3,7,8,9,11
6	Zhuzhou city	1,3,5,7	13	Xiangxi city	11,14
7	Xiangtan city	1,3,6,12	14	Zhangjiajie city	4,11,13

Table 2 Spatial Agglomeration Types of Private Economy in Hunan Province

Agglomeration Types	The quadrant	Cities
High-high	I	Changsha city, Yueyang city, Zhuzhou city, Xiangtan city, Hengyang city, Chenzhou city
Low -high	II	Yiyang city, Yongzhou city,Loudi city
Low -low	III	Shaoyang city, Huaihua city, Xiangxi city, Zhangjiajie city
High -low	IV	Changde city

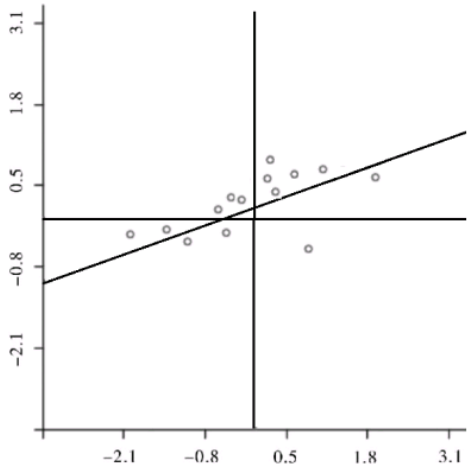

Fig. 1 the Moran scatter plot about the development of Hunan provincial private economy

In view of the above, there are obvious spatial correlation and regional differences in the development level of private economy in Hunan Province. Therefore, considering the influence of spatial factors is very important to objectively analyze the development characteristics and development level of private economy in Hunan Province.

4. The Spatial Difference and Influencing Factors of Private Economy

According to the criteria of Anselin 's judgment, we choose the spatial lag model (equation 3) to analyze the spatial factors influencing the development of private economy.

In equation 6,Y represent the logarithm values of the total amount of private economy of 14 cities in Hunan province, and X denote the vector value of some economic indicators that affect the development of private economy in Hunan Province (shown in Table 3).

Table 3 Influencing factors of the development level of Private economy

Influencing factors	Specific meaning
Amount of private enterprises X_1	The total number of private enterprises registered in each city
The proportion of private enterprises above designated size X_2	The proportion of the private enterprises above designated sized in each city
The proportion of listed private enterprises X_3	Listed private enterprises accounted for the proportion of private enterprises in each city
Average annual operating income of private enterprises X_4	The ratio of the total operating income of private enterprises to the number of private enterprises in each city
Annual average operating growth rate of private enterprises X_5	The average growth of operating income of private enterprises in addition to the average annual turnover in each city
Average Capital Accumulation Rate of Private Enterprises X_6	The average growth rate of shareholders' equity in private enterprises in each city
The ratio of the total number of undergraduates or above in private enterprises X_7	The proportion of the total number of employees above Bachelor degree in the private enterprise
The Level of Technological Innovation in Private Enterprises X_8	Technology Innovation and R & D Investment of Private Enterprise in each city

In order to scientifically objectively model selection and make the model be more explanatory, We estimate and test the non-spatial statistical model $Y=X\beta+\varepsilon$ and the spatial lag model with different spatial weight matrices just as $Y=\rho WY+X\beta+\varepsilon$ and $Y=\rho\hat{w}Y+X\beta+\varepsilon$,respectively using the

ordinary least squares method and the maximum likelihood method. where W is the spatial weight matrix defined as (1) while $\tilde{W} = W \times diag(\frac{g_1}{\bar{g}},\cdots,\frac{g_n}{\bar{g}})$ [8], and g_i indicates the total amount of private economy in area i , $\bar{g} = \frac{1}{n}\sum_{i=1}^{n} g_i$ .Table 5 shows the model estimates and test results.

Table 4 Results of the model estimates and test

Influencing Factors	Non - spatial statistical model Y=Xβ+ε	Spatial statistical model	
		Y=ρWY+Xβ+ε	Y=ρŵY+Xβ+ε
x_1	0.0352(0.0621)	0.0408(0.0518)	0.0419(0.0515)
x_2	0.0676(0.0415)	0.0657(0.0413)	0.0661(0.0413)
x_3	0.0655(0.0469)	0.0642(0.0437)	0.0639(0.0436)
x_4	0.0542(0.0578)	0.0531(0.0603)	0.0549(0.0615)
x_5	0.0551(0.0594)	0.0608(0.0577)	0.0611(0.0582)
x_6	0.0341(0.0726)	0.0372(0.0723)	0.0383(0.0717)
x_7	0.0591(0.0514)	0.0632(0.0506)	0.0641(0.0511)
x_8	0.0551(0.0431)	0.0602(0.0422)	0.0614(0.0415)
R^2	0.9581	0.9872	0.9881
ρ		0.2803(0.0096)	0.2819(0.0095)
*Sigma*2		0.0021	0.0021
$Log-L$		793.5461	802.1964

Notes: numbers in()denote p value

As can be seen from the analysis results in Table 4 that The factors that affect the spatial difference of private economy development in Hunan Province include the proportion of private enterprises above designated size, the proportion of listed private enterprises and the level of technological innovation, These factors have a significant impact on the development level of private economy under the 5% significance level, In addition, the number of private enterprises in the number of undergraduate or higher than the level of private economic development is also more significant.

5. Conclusions and Suggestions

5.1 Analysis conclusion

The research results indicate that there are spatial correlations and differences in the development of private economy, and this kind of spatial difference is mainly manifested in the phenomenon of inter-regional private economic agglomeration. In addition, The factors that affect the spatial differences in the development of private economy include the proportion of private enterprises above designated size, the proportion of listed private enterprises and the level of technological innovation, in addition to these, The number of employee above Bachelor degree in private enterprises also has a significant impact on the level of private economic development.

5.2 Suggestions

In view of the spatial differences and the correlation during the development of private economy in Hunan Province, in order to enhance the overall private economic strength of Hunan province and let Hunan provincial private economy as a driving force for economic growth, the following suggestions must be followed

First of all, it is necessary to reduce the threshold of entrepreneurship,to expand the development of space and to promote public entrepreneurship. In order to make up for the small number of Hunan provincial private enterprises, the government should encourage private enterprises to enter

Hunan province.

Secondly, through the transfer of property rights, capital increase, reorganization of assets, etc. to actively introduce all kinds of social capital to support private enterprises to participate in the strategic reorganization of state-owned enterprises, to support state-owned capital into the high-tech private enterprises and governments at all levels should encourage private enterprises to enhance their competitiveness by fiscal support and preferential tax policies, at the same time, private enterprises should also enhance construction of themselves and acclimatize themselves to the market development to improve their competitiveness.

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