Research on the Synergetic Mechanism of Talent Convergence and Economic Development in Qingdao

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Abstract: Talents Convergence (TC) provides power for the development of economy, and regional economic development providess gravitational field for TC, TC and regional economic development motive each other via interactivity. In this paper, key indexes of TC and regional economic development are studied and ejected, based on using the gray comprehensive relational grade to verify the correlation between TC and regional economic development in Qingdao, the synergetic mechanism model assesses the relationship between TC and regional economic development with the help of data in year 2003~2013. The results show that the coupling of TC and economic development are optimum, and in a good development trend, but the level of Talents Convergence remains to be further enhanced to promote the economic rapidly expansion in Qingdao.

1. Introduction

Talent concentration is a centralized allocation among talent resources regions, which can promote the flow of talents and the realization of talent value. It is one of the important concepts of talent development strategy. It provides the guarantee of talent resources for regional economic development and the power source effect of economic development in the agglomeration. The regional economic development is the root cause of the phenomenon of talent agglomeration, and the gravitational field effect of talent accumulation. The two complement each other and depend on each other. Interaction and "echo effect." In recent years, research on issues related to talent gathering has been in a hot state. In the 19th report, issues related to talent gathering have been raised several times. By incorporating the level of talent agglomeration and the economic development level of the gathering place into a unified research system, this paper can better explain the coordination of the economic development of talent gathering and agglomeration. According to the "China Talents Agglomeration Report (2014)" and the relevant annual report of Shandong Province, Qingdao has a strong advantage in talent pooling and economic development. Therefore, the article takes Qingdao as the research object and uses the relevant evaluation model to quantitatively study the relationship between the two.

2. Research on the Coordination Relationship between Talent Agglomeration and Economic Development

The driving factors affecting the accumulation of talents mainly include the economic development level of the gathering place, the complete level of public facilities, employment opportunities, the number of relevant scientific research institutions, the level of educational development, the number of colleges and universities, the humanistic environment, and other interests, spirits and environment, and the economics of the gathering place. Development is the primary factor. The different stages of development of talent agglomeration will have different degrees of impact on economic development, and the different historical periods and different stages of economic development, the talent agglomeration model and the level of talent agglomeration are also different. This article will explore the relationship between talent pooling

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and economic development in Qingdao.

2.1 Selection of Indicators.

The study takes Qingdao as the target, and selects the data from the official reports such as the Qingdao Statistical Yearbook and Statistical Bulletin from 2003 to 2016 as support. The integrated indicator system constructed is divided into two parts, which are the talent agglomeration subsystem and the economic development subsystem. The selection of indicators for the talent agglomeration system is the key reference factor that influences the talent agglomeration. The selection process also considers the availability of data in Qingdao over the years. The final selected indicators include the number of registered households, the number of employees in society, the average social wage, and patents. The selection of research indicators for regional economic development takes into account the impact of economic development on the concentration of talents. It also draws on the main economic indicators of Qingdao in various statistical yearbooks and statistical publications. The final selected indicators include regional GDP. The high-tech output value of enterprises above designated size, the annual main business income of enterprises above designated size, the total profits and taxes of enterprises above designated size, the year-end balance of urban and rural residents' savings, the retail sales of social consumer goods and the total investment of fixed assets. The integrated indicator system consists of 13 items together, and its evaluation index system is shown in Table 1 [1-3].

Table 1 The synergetic mechanism model assesses the relationship between TC and regional economic development

Primary indicator	**Secondary indicators**	**unit**	**variable**
Talent gathering subsystem X_1	Household registration population	Ten thousand people	*X11*
	Social employment	Ten thousand people	*X12*
	Average social wage	Yuan/year	*X13*
	Number of patent licenses	Piece	*X14*
	Important scientific and technological achievements	item	*X15*
	Number of students in colleges and universities	Ten thousand people	*X16*
Economic development subsystem X_2	GDP	Billion	*X21*
	High-tech output value of enterprises above designated size	Billion	*X22*
	Annual main business income of enterprises above designated size	Billion	*X23*
	Total profits and taxes of enterprises above designated size	Billion	*X24*
	Year-end balance of urban and rural residents' savings	Billion	*X25*
	Retail sales of social consumer goods	Billion	*X26*
	Total fixed assets investment	Billion	*X27*

In order to verify whether there is a strong correlation between the talent pooling subsystem and the economic development subsystem in Qingdao, and to explore the correlation between talent agglomeration and economic development, this paper selects the gray comprehensive relevance evaluation method for preliminary testing for subsequent evaluation. Work lays the foundation.

2.2 Determination of the Relevance of the Integrated System.

Grey relational analysis is a mathematical method to measure the degree of correlation of factors.

It can quantitatively analyze the degree of correlation and development trend between two factors, and is suitable for the study of dynamic history [4].

First of all, the weighted summation of the talent pooling and economic development system in Qingdao was obtained, and the comprehensive scores of talent pooling and economic development in Qingdao in various years from 2003 to 2016 were obtained.

Principal component analysis of the indicator subsystem shows that the cumulative contribution rate of the two principal components extracted by the talent agglomeration subsystem reaches 88.58%, while the economic development subsystem extracts a principal component with a contribution rate of 98.58%, both exceeding 80%. The cumulative contribution rate of the evaluation system index is replaced by the cumulative contribution rate of the principal component, and the obtained comprehensive score is shown in Table 2.

Table 2 Each year's composite score of Talent Convergence and Economic Development in Qingdao

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
X_0	-3.399	-1.986	-1.518	-0.700	-0.389	-0.397	0.235	-0.193	0.366	0.630	0.987	1.245	2.359	2.761
X_1	-3.558	-3.214	-2.772	-2.331	-1.844	-1.293	-0.534	0.328	0.658	1.387	2.285	2.904	3.635	4.348

Calculate the absolute relevance. It is used to express the similarity level between system factors. The larger the value, the more similar the factors are. The absolute correlation between subsystems is: ξ01=0.985.

Calculate the relative relevance. It is used to indicate the relationship between each factor and the rate of change of the starting point. The rate of change is positively related to the relative degree of gray. The relative correlation between subsystems is: r01=0.992.

Calculate the comprehensive relevance. It can comprehensively express the degree of connection between sequences X0 and X1, including the degree of similarity and the closeness to the rate of change of the starting point, and more comprehensively characterize the relationship between X0 and X1, as shown in formula (1). Show:

$$\Gamma 0i=\theta\xi 01+(1-\theta)r0i,\ i=1, 2, \ldots, m. \quad (1)$$

There are three kinds of comprehensive correlation between sequences: when $1>\gamma 0i\geq 0.8$, the sequences are highly correlated, showing a greater degree of correlation between the systems; when $0.8>\gamma 0i\geq 0.3$, the sequences are moderately correlated, showing The degree of association between the systems is centered; when $0>\gamma 0i\geq 0.3$, the correlation between the sequences is low, showing a low degree of correlation between the systems [5]. Generally, θ = 0.5, and the absolute level of similarity and rate of change at this time are equally valued. At this time, γ01=0.989.

The value of γ01 when θ takes different values is shown in Table 3:

Table 3 The γ_{0i}'s different value with different score of θ

θ	0.1	0.2	0.3	0.4	0.6	0.7	0.8	0.9
γ_0	0.9	0.9	0.9	0.98	0.9	0.9	0.9	0.9
1	918	910	903	96	882	875	868	861

It can be seen that the magnitude of θ and γ01 exhibits a negative correlation. As θ increases, the value of γ01 becomes smaller, but γ01 is always greater than 0.9, both between 1 and 0.8, indicating that there is a high positive correlation between the talent pooling subsystem and the economic development subsystem in Qingdao. In order to further explore the coordinated development of talent agglomeration and economic development, this paper selects the coupling correlation degree model to measure, and further reveals the long-term cointegration relationship between talent pooling and economic development in Qingdao.

2.3 Subsystem Coupling Correlation Calculation.

In this paper, the original data is dimensionlessly processed by the 0~1 range difference normalization method, so that the standardized data are between 0~1, and in order to avoid the extreme values 0 and 1 in the standardization process, the index will be extremely large. The value is enlarged, the minimum value is reduced, and the variation range is 1%, so that the standardized

index values are between 0 and 1.

Since the indicators in the integrated system all have a positive effect, the normalized effect difference standardization formula is selected. Where i=1, 2, . . . , m, j=1, 2, . . . , n, i are evaluation samples, and m represents the number of evaluation index samples, j is an indicator, n represents the number of indicators, and maxxij and minxij respectively represent The maximum and minimum values of the jth indicator in the system in all samples. The talent aggregation subsystem and the economic development subsystem in the integrated system are standardized according to this formula.

The evaluation function of the secondary indicator uses: Where i = 1, 2, ..., n', . i represents the primary indicator, m' represents the secondary indicator, and x'ij refers to the standardized value of the jth secondary indicator under the i-th primary indicator, which refers to the jth secondary of the i-th primary indicator in the system.

The weight of each indicator is measured by the difference between the index values by the entropy weight method. The steps to determine the weight of the indicator are as follows:

1) dimensionless processing is given by formula (2):

$$p_{ij} = \frac{x'_{ij} + 1}{\sum_{j=1}^{m} (x'_{ij} + 1)} \tag{2}$$

Where j = 1, 2, ..., n, i = 1, 2, ..., m, and m is the number of evaluation samples, and n is the number of indicators.

2) Equation (3) for finding the entropy of the indicator gives:

$$\mathrm{E}_{\mathrm{ij}} = \frac{1}{\ln m} \sum_{j=1}^{m} P_{ij} \ln p_{ij} \tag{3}$$

3) Determine the entropy weight of the evaluation index, as shown in formula (4):

$$w_j = \frac{1 - E_j}{n - \sum_{j=1}^{n} E_j}, \sum_{j=1}^{n} w_j = 1 \tag{4}$$

Coupling relevance model

The two-dimensional spatial coupling degree function calculation of talent agglomeration and economic development is as shown in formula (5):

$$C = 2\left\{(X_1 \cdot X_2)/(X_1 + X_2)^2\right\}^{\frac{1}{2}} \tag{5}$$

The degree of coupling correlation C reflects the degree of association between talent agglomeration and economic development. In general, the C value is between 0 and 1, and the magnitude of the C value is positively correlated with the coupling. The C value generally does not reach 1 in practical applications.

The evaluation criteria of coupling correlation degree is: when C=0, it means that there is no coupling between talent agglomeration and economic development; when 0.3≥C>0, it means that talent agglomeration and economic development are low coupling, at this time talent concentration is in the emergent stage; when 0.8≥ When C>0.3, it means that talent concentration and economic development are moderately coupled, talent concentration is in the stage of mutation and coordination; when 1>C>0.8, it means that talent agglomeration is highly coupled with economic development, talent concentration is in coordination and operation stage, talent accumulation The level of the core competitiveness of economic development [6].

Construct a coupling coordination model of talent agglomeration and economic development to reflect the overall “synergy effect” of talent agglomeration and economic development. The formula

(6) is as follows:

$$D = \sqrt{C \cdot T}\ , \quad T = \alpha X_1 + \beta X_2 \tag{6}$$

Where D represents the degree of coupling coordination, C represents the degree of coupling, T represents the comprehensive reconciliation index of talent agglomeration and economic development, and represents the overall synergy of talent agglomeration and economic development, α is the weight of the level of talent agglomeration, and β is the level of economic development. The weight of the general, α = β = 0.5, indicating that talent agglomeration is as important as economic development.

According to the relevant references, when 0.3≥D>0, it is low-coupling coordination; when 0.5≥D>0.3, it is moderately coordinated coupling; when 0.8≥D>0.5, it is highly coupled and coordinated; when 1>D >0.8, for extreme coupling coordination [7].

3. Results Analysis

It can be seen from the calculation results of gray comprehensive correlation that the gray comprehensive correlation between talent agglomeration and economic development in Qingdao is always greater than 0.9, which is highly correlated, and it is necessary to conduct an in-depth analysis of the correlation between the two. Table 5 shows that the coupling between talent pooling and economic development in Qingdao is superior. In the past ten years since 2003, the coupling between talent pooling and economic development in Qingdao has become closer and closer, and is in a good development trend.

System coupling correlation is relatively stable. Before 2005, the two systems of talent pooling and economic development in Qingdao were in the running-in phase, and talent pooling was in the emerging period. Talent pooling and industrial development were in a state of rapid development, which could not form a positive talent gathering effect. Talents gathered for the industrial economy and regions. The impact of the economy is relatively small; from 2005 to now, Qingdao's talent pooling and economic development have gradually developed into a highly coupled stage. During this period, the government attaches importance to talent introduction and industrial restructuring, and talent pooling is moving towards maturity, and urban talent attraction Constantly improving, attracting more and more talents to develop, the talent agglomeration effect is gradually emerging, and the two systems of talent agglomeration and economic development complement each other and promote each other.

System coupling coordination improves year by year. In terms of the development of coupling coordination degree, from the data from 2003 to 2016, the coupling coordination degree of Qingdao for 14 consecutive years is improving year by year, from low coordination state to extreme coordination state, following the law of development; The highly coordinated state of talent agglomeration and economic development has only begun to appear in 2006, and since the beginning of 2013, there has been an extremely coordinated state, and it is still at this stage of horizontal development. This shows that with the government's emphasis on talent work, the industrial structure is continuously optimized, the talent environment is continuously improved, and the economic development situation is gradually adapted. Talent pooling and economic development promote each other and drive each other.

4. Countermeasures to Promote Talent Pooling in Qingdao

With the continuous advancement of talent work in Qingdao and the improvement of related systems, the work related to promoting talent agglomeration has a certain foundation and effect. Talent concentration and economic development show a good coordination relationship, especially the "Decision" and "1111". After the introduction of the Talent Agglomeration Plan, local governments have increased their emphasis on talents and promoted the level of talent pooling. In order to adapt to the rhythm of rapid economic development, it is necessary to increase the

introduction of talents, build a talent support system in Qingdao, create a highland for talent gathering, optimize the industrial structure, realize the adjustment of industrial structure as soon as possible, realize the synergy effect of talent agglomeration and economic development, and give full play to The role of talent capital to promote the in-depth development of the urban economy. 1 Strengthen macroeconomic regulation and control policies. Policy is the key and effective means to gather talents, and it is the source of water for promoting talent development. It is necessary to further improve relevant policies, laws and regulations for talent work, improve urban infrastructure construction, implement talent work environment optimization projects, and form soft environment advantages; 2 form talent competitive advantages with regional characteristics, improve talent evaluation system, attract and retain characteristics Industrial talents, establish a unified, open and competitive talent market, promote the rational flow of talents in both directions and multi-directional; 3Leverage the advantages of resource endowment in clusters, and combine regional characteristics to accelerate blue ocean industry, strategic emerging industries, modern service industries, etc. Focus on the development of advantageous industries, attract high-level innovation and entrepreneurial talents, create talented industrial talents, and form a high-level talent pool in Qingdao; 4 Improve regional economic openness, improve government service level and management efficiency, enhance headquarters economic strength, and form talents “Magnetic field” attracts outstanding talents; 5Intensify investment in education and technology, implement talent training and talent-oriented mobile projects, and enhance the potential of urban talent pooling and the concentration of talents [8].

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