STUDY ON COUPLING RELATIONSHIP BETWEEN POPULATION STRUCTURE AND REGIONAL ECONOMY IN ORDOS, CHINA

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Abstract: Population and economy are the central issues in the new-type urbanization. Coupling degree models are used to analyze the coupling between population structure and regional economy in Ordos. The results show that the coupling shows a trend of fluctuating rise and stabilization in the bulk, undergoing a process of high-level coupling and high-quality coupling. Coupled coordination shows a slow upward trend, and can be classified into five types: severe imbalance, mild imbalance, moderate coordination, good coordination and high-quality coordination, finally achieving the characteristics of coordinated development and evolution of population structure and regional economy. It has been proposed to coordinate the development of urban and rural areas, build urban-rural integrated industrial layouts and improve the region's endogenous development momentum. Suggestions include accelerating the transformation and upgrading of traditional industries, scientifically guiding the development of emerging industries, and improving regional scientific and technological innovation capabilities.

Key words: population structure; Regional economy; Coupling coordination; Ordos

Population issue is an important foundation and core factor for the sustainable development of regional economy and society [1-2], and the change of population structure and regional economic development have a close relationship of mutual influence and mutual restriction. The evolution of the population structure in any country or region affects the sustainable development of the regional economy, and at the same time, in the process of adjusting and transforming and upgrading the industrial structure of the regional economy, it is often accompanied by a corresponding adaptive change in the population structure. At present, some scholars have analyzed the interaction between population and economy from a single research perspective such as age structure, gender structure, urban and rural structure, industrial structure and cultural structure [3-6]. Therefore, it is necessary to study quantitatively the relationship between population structure and regional economy from the macro perspective of the whole population structure.

The city of Ordos is located in the southwest of Inner Mongolia, with a total area of 87,000 square kilometers. It is an important export base for China's coal, natural gas and other natural resources, an important part of the Hohhot-Baotou-Erdos-Yulin urban cluster in the national plan, and an important node city in the Yellow River Basin ecological protection and high-quality development strategy. Under the background that the population structure is changing and the sustainable development ability of regional economy needs to be improved, exploring the

coupling mechanism of the two systems of population structure and regional economy is of great significance to optimize the population structure of Ordos and promote the high-quality development of regional economy.

1. Research methods and data sources

1.1 Index system construction

Based on the interaction between population structure and regional economy, the index system for the population structure subsystem is constructed from four aspects: urban-rural structure, gender structure, employment structure, and cultural structure, based on scientific, systematic, and data availability principles. The index system for regional economic subsystems is constructed from four aspects: economic aggregate, economic structure, economic level and economic support.

Table 1. Population Structure and Regional Economic index system

Structure Type	Indicator Type	Indicator
Population Structure	Urban-rural Structure	Urban population, Rural population, Natural growth rate of population
	Gender Structure	Male population, Female population, Gender ratio
	Employment Structure	The proportion of employment in the primary industry, The proportion of employment in the secondary industry, The proportion of employment in the tertiary industry
	Cultural Structure	Number of full-time teachers, Number of scientific research practitioners, Number of health technicians
Regional Economic	Economic Aggregate	Gross regional product, Gross secondary industry product, Gross tertiary industry product
	Economic Structure	The proportion of the primary industry, The proportion of the secondary industry ,The proportion of the tertiary industry
	Economic Level	Per capita GDP, Per capita disposable income of urban residents, Per capita disposable income of farmers and herdsmen
	Economic Support	Investment in fixed assets, Expenditure on education, Expenditure on science and technology

1.2 Data Sources

The data of population structure and regional economy indicators in this paper are all from Inner Mongolia Statistical Yearbook (2001-2023) and Ordos Statistical Yearbook (2001-2023), and some missing data are supplemented by moving smoothing method.

1.3 Research Methods

Data processing: Due to the different data dimensions and orders of magnitude of the original data, it is necessary to normalize the original data before the analysis. In this paper, standardized methods are used to process the original data.

Coupling degree model: The concept of coordination degree model of physics is used to measure the interaction and mutual influence between population structure and regional economic system.

$$C=\sqrt{\frac{U(X)\cdot E(y)}{\left(\frac{U(X)+E(y)}{2}\right)^2}}\quad;\quad T=\alpha\,U(x)+\beta\,E(y)\quad;\quad D=\sqrt{C\times T}$$

Where, ***U (x)*** is the function of population structure; ***E (y)*** is the regional economic function; ***C*** is the coupling degree; ***D*** is the coupling coordination degree; ***T*** is the comprehensive evaluation index; α and β are undetermined coefficients. This paper considers that population structure and regional economy are equally important in the system, and takes $\alpha=\beta=0.5$.

2. Result analysis

2.1 Comprehensive evaluation of population structure

The composite index of population structure in Ordos shows a slowly fluctuating rise and change process from 2000 to 2022, rising from 0.0794 in 2000 to 0.8250 in 2022. The integrated performance is three important development periods, with 2000-2009 being a period of slowly fluctuating upswing. 2009-2010 is a period of rapid growth and 2011-2022 is a period of steady, slow growth. Influenced by the continuous growth and development of the urban economy in recent years, the overall population structure shows a relatively prominent trend of continuous optimization. Overall, population structure provides an important human resource foundation for regional economic development. The urban-rural structure is an important factor limiting the sustainable development of the regional economy in the long term.

2.2 Comprehensive evaluation of regional economy

The overall trend of the regional economic composite index showed a slow and continuous rise. The regional economic composite index for 2021-2022 exceeded the population structure composite index, rising from 0.0201 in 2000 to 0.8297 in 2022, showing strong capacity for continued growth. At the same time, it can also be divided into two phases, with 2000-2016 being a period of slow growth that lags behind the integrated index of population structure for a long time; from 2016 to 2022, affected by the adjustment of regional economic and industrial structure, it shows an evolutionary feature of first declining and then rising. After 2021, the regional economic composite index is ahead of the population structure composite index, showing the strong ability of the regional economy to develop sustainably.

2.3 Comprehensive evaluation of coupling degree

The trend of the coupling degree shows a rapid fluctuation followed by a steady increase from 0.8029 in 2000 to 1.0 in 2022, indicating a good co-evolution process between the population structure and the regional economic system. The coupling degree type experienced two coupling evolution stages, namely high level coupling (2000-2005) and high quality coupling (2006-2022). The coupling between the population structure system and the regional economic system in 2006-2022 has been in the high-quality coupling phase for a long time, and a steady trend of high-quality coupling has been maintained for a long time.

2.4 Comprehensive evaluation of coupling coordination degree

The trend of the coupling coordination degree shows a slow and continuous upward

evolution, with the coupling coordination degree slowly increasing from 0.1998 in 2000 to 0.9096 in 2022 with a growth rate of 0.7098. 2000-2010 is a period of rapid growth and 2011-2022 is a period of slow growth. The type of coupling coordination degree experienced five evolution stages of coupling coordination degree, including severe coordination (2000-2003), mild coordination (2004-2007), moderate coordination (2008-2009), good coordination (2010-2020), and excellent coordination (2021-2022). In 2021-2022, the population structure system and the regional economic system have achieved coordinated development and entered an important period of high-quality coordinated development.

3. Conclusions and Suggestions

3.1 Conclusion

Based on the coupling degree model and cooperative development theory, this paper analyzes the interactive coupling relationship between population structure and regional economy by taking Ordos as an example, and draws the following conclusions: Both population structure and regional economic composite index show a good process of continuous growth and cooperative development trend, and urban and rural structure is an important factor restricting the sustainable development of regional economy in the long run; Both the degree of coupling and the degree of coupling coordination showed an increasing trend, and the ability to coordinate the development of population structure and regional economy improved significantly, indicating the positive impact of population structure change on regional economic development.

3.2 Suggestions

In line with the rural revitalization strategy, integrate the differences between urban and rural development needs, coordinate urban and rural integrated development, and increase endogenous impetus for regional development. Based on regional resources and environmental carrying capacity, and with market demand as an important guide for regional economic development, continue to optimize regional industrial structures and build urban-rural integrated industrial layouts. Vigorously develop higher education and vocational education to provide professional and technical personnel to support regional transformation and development. Make vigorous efforts to bring in high-level professionals and technical personnel to improve the regional capacity for scientific and technological innovation. Accelerate the development of the social security system and continue to optimize the population structure. Accelerate the transformation and upgrading of traditional industries, promote deep integration of advanced technologies with traditional industries, guide the development of emerging industries in a scientific way, and create new drivers for economic growth.

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