Analysis of Economic Effects Based on Economic Data and Neural Network Models Driving the Synergistic Development of Urban Ecological Clusters

Ting Zou[1(✉)] and Chenxi Wan[2]

[1] School of Software and Internet of Things Engineering, Jiangxi University of Finance and Economics, Nanchang, China
2201904245@stu.jxufe.edu.cn
[2] School of Finance, Jiangxi University of Finance and Economics, Nanchang, China

Abstract. Tourism, as the "forever sunrise industry", has universal direct or indirect technical and economic links with many regional economic sectors, with significant industrial relevance and industrial ripple effects, and has an important strategic position in the process of regional economic and social development, and will play a role in promoting the synergistic development of the regional economy in a four-by-two way. This paper selects the comprehensive tourism industry with high correlation, strong driving force, good economic, social and environmental benefits as the link of Beijing-Tianjin-Hebei synergistic development, and drives and demonstrates the mutual cooperation and synergistic promotion among other industries, which has important theoretical and practical significance. The study has a positive mutual promotion effect on tourism and regional economic development, which provides space for tourism development and makes tourism an important factor in the comprehensive competitiveness of regional economy.

Keywords: component · formatting · style · styling · insert · Economic Development

1 Introduction

The synergistic relationship between tourism and regional economic development has been more than adequately demonstrated in the practice of Beijing-Tianjin-Hebei regions [1]. Based on system theory and synergy theory, this chapter constructs two system models of tourism and regional economic indices, selects their respective sets of characteristic variables, quantitatively measures the maturity index of the synergistic development of tourism and regional economy in Beijing-Tianjin-Hebei using the synergy model, and conducts the analysis of influencing factors in order to reveal the interaction and path between them [2]. In this context, the study of synergistic development of regional economy and tourism has expanded from a theoretical to a practical issue, as the world tourism development process has proven that tourism can play a key role in promoting regional economic development and can achieve a $1 + 1 > 2$ efficiency multiplier [3].

2   Model Construction of Synergy Degree of Tourism for Regional Economic Development

In this paper, tourism and regional economy of Beijing-Tianjin-Hebei region are combined into a composite system. Although they have different attributes, they are two interrelated, interpenetrating and interacting subsystems [4]. The specific design idea: the first step is to divide the subsystem; the second step is to determine the sequential parameters; the third step is to select the observed values and the range of variation of each sequential parameter in the observation period; the fourth step is to use the model to measure; the fifth step is to discuss the results [5].

3   Data Source and Pre-processing

3.1   Indicator System Construction and Data Sources

The selection of subsystem sequential parameters should follow the principles of systematicity, scientificity and accessibility. Systematic refers to the fact that the sequential indicators should cover all aspects of the subsystem as far as possible, and can reflect the key characteristics of scale, structure, efficiency and sustainability of development. Scientific, meaning that the sequential parameter indicators should have strong realistic significance and must be representative of certain characteristics of the subsystem. Availability, the basis for the realization of all the aforementioned ideas and requirements, lies in the availability, completeness, continuity and accuracy of the data of the sequential parameters [6]. Based on this, and with reference to the Chinese Academy of Social Sciences' China City Competitiveness Report, as well as the China Statistical Yearbook and the China Tourism Statistical Bulletin involving the selection of major economic indicators and tourism development indicators, this paper identifies two major subsystem order covariate indicators for the regional economy and tourism industry, and the selected indicators are all core indicators frequently used in economic research and tourism research, which can objectively and accurately reflect The selected indicators are the core indicators often used in economic research and tourism research, which can objectively and accurately reflect the economic development and tourism development [7].

3.2   Data Pre-processing

In this paper, based on the criteria for determining the upper and lower limits at home and abroad, 110% of the maximum value of each sequential parameter is selected as the upper limit and 90% of the minimum value of each sequential parameter is selected as the lower limit under the principle of "science and feasibility" [8]. Based on this criterion, the index preprocessing formula is used to preprocess each sequential parameter of the Beijing-Tianjin-Hebei regional economic subsystem [9].

3.3 Indicator Correlation Test and Weighting Analysis

The orderliness of the subsystem is a comprehensive reflection of the values of each ordinal parameter measurement index, and since the ordinal parameters have different degrees of effect on the orderliness of the subsystem, it is necessary to assign scientific weights to each ordinal parameter. There are many methods for assigning weights to each ordinal parameter, but this paper adopts the correlation coefficient matrix method. The Pearson two-sided test is used to determine the magnitude and significance of the correlation coefficients between two sequential parameters to determine their respective weights.

The values in the table ** indicate that the Pearson two-sided test is significant at the 1% level; * indicates that the Pearson two-sided test is significant at the 5% level (the same below). From the data statistics, it is easy to find that the two indicators of Beijing-Tianjin-Hebei regional economic subsystem sequential covariates (after standardization), Zscore (ratio of actual utilization of foreign capital to GDP) and Zscore (output tax rate), cannot pass the significance test, i.e., the correlation between them and other indicators is not significant. In fact, even if the correlation coefficients between these two indicators and other indicators are significant at the 15% level, they still cannot pass the correlation test. It means that these two indicators have less influence on other indicators and subsequently on the system orderliness, and they need to be eliminated to get the corrected correlation coefficient table of subsystem order parametric indicators.

Year	Regional economic subsystem orderliness
2006	0.0933
2007	0.1506
2008	0.2209
2009	0.2603
2010	0.3377
2011	0.4515
2012	0.521
2013	0.5938
2014	0.684
2015	0.6800

3.4 Beijing-Tianjin-Hebei Regional Economic Subsystem Orderliness Measurement

Based on the formula for measuring the orderliness of the subsystem, which is the product of the pre-processed values of each indicator and the corresponding weights, the orderliness of the Beijing-Tianjin-Hebei economic subsystem for all years from 2006 to 2015 is obtained.

The calculation results reflect the objectivity and measurability of the trend of the orderliness of the regional economic subsystem in the Beijing-Tianjin-Hebei region,

which showed a steady increase from 2006 to 2015, and the upward trend is obvious. In addition, it should be noted that even during the financial crisis in 2008, the regional economic subsystem orderliness of Beijing-Tianjin-Hebei region also performed better and still maintained a high growth level.

3.5   Beijing-Tianjin-Hebei Regional Tourism Subsystem Orderliness Measurement

According to the same measurement method as the measurement of the orderliness of the Beijing-Tianjin-Hebei regional economic subsystem, this paper constructs a system of tourism scale indicators, tourism structure indicators and tourism efficiency indicators reflecting the development of tourism in the Beijing-Tianjin-Hebei region.

3.6   Comparison of Beijing-Tianjin-Hebei Regional Tourism and Regional Economic Subsystem Orderliness

In general, first, the regional economy and tourism subsystem orderliness of the Beijing-Tianjin-Hebei region both showed a steady increase during 2006–2015. Although during the financial crisis in 2008, the tourism industry in Beijing, Tianjin and Hebei was hit to some extent, and many indicators of the tourism subsystem showed a significant decline in growth, and some of them even showed negative growth (the number of tourism employees, the proportion of tourism revenue in the tertiary industry, the contribution rate of tourism revenue, etc.), resulting in a decrease of about 0.03 percentage points in the orderliness of the tourism subsystem in 2008 compared with 2007, but it soon However, it soon returned to a faster rising level. In contrast, the orderliness of the Beijing-Tianjin-Hebei regional economic subsystem performed better during the financial crisis in 2008 and still maintained a high growth level. In fact, during the financial crisis, some of the ordinal parameter indicators of the Beijing-Tianjin-Hebei economic subsystem also declined to different degrees, such as the total import and export value
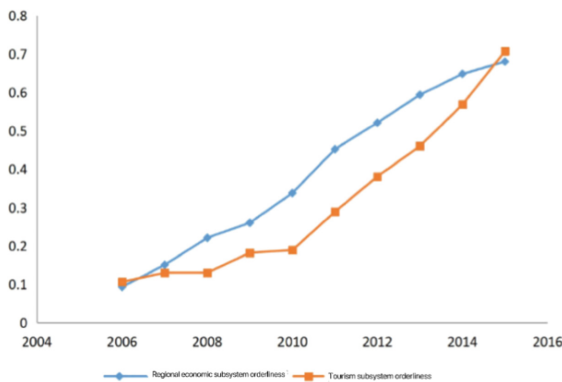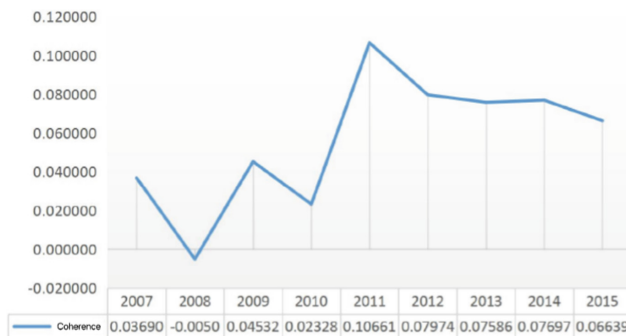

Fig. 1. Order degree of regional economy and tourism subsystem of Beijing-Tianjin-Hebei region (2006–2015)

and the profit and tax rate of industrial output in the region. However, since the performance of other indicators was sufficient to offset the decline of these indicators, the economic subsystem orderliness still performed well in general. This also reflects from the side that the coordinated regional economic development is paid much more attention by the government among Beijing, Tianjin and Hebei regions than the coordinated regional development of tourism (Fig. 1).

3.7 Beijing-Tianjin-Hebei Tourism for Regional Economic Development Synergy Maturity Measurement

According to the subsystem synergy maturity formula, it is not difficult to obtain the coordination level of the two systems between Beijing, Tianjin and Hebei during 2007–2015, as shown in Fig. 2.

It is easy to observe Fig. 2: First, the maturity of the coordinated development of the Beijing-Tianjin-Hebei regional economic subsystem and the tourism subsystem shows obvious stage characteristics and is highly correlated with the orderliness of the tourism subsystem. 2007–2010, the maturity of the synergy between the Beijing-Tianjin-Hebei regional economic and the tourism subsystem showed a huge gap due to the impact of the world financial crisis. The main reason for this result is that the growth rate of the orderliness of the tourism subsystem is significantly lower than that of the orderliness of the regional economic subsystem (even divergence). After 2010, with the implementation of economic stimulus policies and the promulgation of the Beijing-Tianjin-Hebei regional and tourism coordinated development policies, tourism and the regional economy both expanded rapidly, and the synergistic maturity industry was able to rebound sharply and reached a stage high in 2011. Subsequently, the economic transformation and development of Beijing, Tianjin, Hebei and even the whole country caused the economic growth rate to fall back, thus reducing the orderly growth rate of the economic subsystem and eventually causing the coordinated maturity to fall back to a certain extent. Second, the maturity of the coordinated development of the Beijing-Tianjin-Hebei regional economic subsystem and the tourism subsystem implies a warning effect of falling back. Looking

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Coherence	0.03690	-0.0050	0.04532	0.02328	0.10661	0.07974	0.07586	0.07697	0.06639

Fig. 2. The coordinated development maturity of Beijing-Tianjin-Hebei economy and tourism Subsystem (2007–2015)

at the patterns of ups and downs in the coordinated maturity of the Beijing-Tianjin-Hebei regional economic subsystem and tourism subsystem over the past 10 years, it is found that the post-fall and fluctuations in coordinated maturity during the financial crisis were mainly due to the large shock to the tourism subsystem. The reason for this is the "transition pains" caused by the national economic development transformation strategy implemented since the 18th National Congress. Therefore, we need to look for reasons and breakthroughs in regional economic development for the current phased decline in synergy maturity.

4   Spatial and Temporal Comparison of the Synergy of Beijing-Tianjin-Hebei Tourism for Regional Economic Subsystems

4.1   Spatial and Temporal Comparison of the Synergy of Beijing-Tianjin-Hebei Regional Economic Subsystems

In order to better examine the synergistic development of Beijing-Tianjin-Hebei regional economy and tourism, this paper also measures the coordination maturity of economic subsystem and tourism subsystem in Beijing, Tianjin and Hebei regions as well as the whole country during 2006–2015 respectively, and conducts cross-sectional comparative analysis in order to discover the mechanism and coping strategies of each subsystem on the synergy degree. The orderliness of each regional economic subsystem is shown in Fig. 3, and the specific calculation process and intermediate results are shown in Appendix 2.

To summarize Fig. 3, we can find that: firstly, in general, the orderliness of economic subsystems, whether nationwide or in the Beijing-Tianjin-Hebei region, or in various places within the Beijing-Tianjin-Hebei region, has shown a steady increase during 2006–2015, and the growth rate is also faster. It reflects the rapid improvement of the overall scope of the orderliness of China's economy during 2006–2015 and the continuous improvement of the orderliness of economic synergy development.
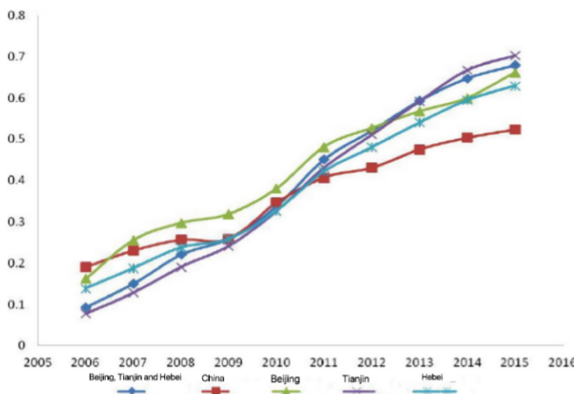

Fig. 3. Comparison of order degree of economic subsystems in different regions (2006–2015)

4.2 Spatial and Temporal Comparison of Beijing-Tianjin-Hebei Tourism for Regional Economic Synergy

First, overall, the coordination maturity of each regional economic and tourism subsystem has shown an approximate "inverted U" shape over the past 10 years, and the degree of coordination is low, far below the ideal value of 1, reflecting the low level of coordination across the country and between and among Beijing, Tianjin and Hebei regions. In comparison, the synergistic maturity of the Beijing-Tianjin-Hebei region remains at a relatively high level, and after 2012, the subsystem coordination between the Beijing-Tianjin-Hebei regions and the three regions exceeds the national average, indicating that the economic restructuring has a relatively small impact on the overall Beijing-Tianjin-Hebei region compared to the national average.

5 Conclusion

This paper first clarifies that the regional economy and tourism are both subsystems in the larger system of Beijing-Tianjin-Hebei region, and then constructs an evaluation model of Beijing-Tianjin-Hebei regional tourism for regional economic development based on system theory and synergy theory.

References

1. Pan L (2022) Analysis of the correlation between cultural and creative industries and regional economic development in Jiangsu Province. Times Bus Econ 19(05):147–149. https://doi.org/10.19463/j.cnki.sdjm.2022.05.020
2. Yang BW, Li HM (2022) Analysis of the driving mechanism of the integration of commerce and trade circulation industry on regional economic development. Bus Econ Res 10:9–12
3. Jing S (2022) Experimental analysis of the impact of high-speed rail economy on regional economic development. Bus Watch 09:55–58
4. Na Q, Jianwen H (2022) How to effectively play the role of provincial traditional media in regional economic development. J Observ 09:85–87
5. Li N, Wang YJ (2022) Study on the current situation and countermeasures of local universities in Tianjin to serve regional economic development. Future Dev 46(03):107–112+106
6. Wu Y (2022) The impact of business English on the regional economic development of hotel services in the context of "one belt and one road." Mark World 05:14–16
7. Pang Y, He L (2022) International comparison of regional economic development and regional policies in China. J Zhengzhou Inst Aviat Ind Manag 40(01):26–31. https://doi.org/10.19327/j.cnki.zuaxb.1007-9734.2022.01.003
8. Wang S (2022) A preliminary study on the relationship between college students' innovation and entrepreneurship cultivation and promoting regional economic development. Fortune Times 02:154–156
9. Zhou E, Liu C (2022) Analysis and research on logistics talent training strategy in regional economic development. Logist Eng Manag 44(02):174–176