

Analysis on the Coupling and Coordinated Development of Regional Economy-Tourism Industry-E-Commerce in Hebei Province

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Keywords: Regional economy, Tourism industry, E-commerce, Coupling coordinative.

Abstract. Regional economy, tourism industry and e-commerce are closely related to each other. Taking Hebei province as an example, this paper constructs the relevant index system, and conducts an empirical study on the coupling and coordination relationship between regional economy-tourism industry-e-commerce system from 2012 to 2018. The study found that the degree of coupling and coordination between the three subsystems increased year by year, but there was a big difference in the comprehensive development level index, and the driving effect of tourism industry and e-commerce on the economy still needed to be improved. Based on the research results, this paper puts forward some suggestions on system optimization.

Introduction

Tourism industry and e-commerce, as an important breakthrough in the upgrading and transformation of regional economy, can effectively promote the development of regional economy. Optimizing tourism industry and promoting the development of e-commerce can continuously meet people's needs for a better life. Regional economy provides an economic basis for the development of tourism industry and e-commerce, which in turn promotes the development of regional economy. There is a certain coupling between the three systems.

Literature Review

There are many researches on the coupling relationship between regional economy and tourism industry at home and abroad. Chor Foon Tang (2015) found that tourism and economic growth is cointegration, promote the measures of the government of the tourism industry can promote economic growth in Malaysia. Zhang Lingyun (2000) for social cognitive mistake for tourism industry status. Wu Guoxin (2003) made a quantitative analysis of the relationship between China's tourism development and economic growth. Zhou Lei and Wang Chong analyzed the coupling and coordination degree of tourism industry, regional economy and information industry system, but few of them consider e-commerce system. This article from the perspective of quantitative, based on the dynamic panel data in Hebei province in 2012-2018, the Hebei province E-T-E system coupling between judgment and evaluation on the coordination, based on the results of the study recommendations related to development. In this paper, the coupling and coordination relationship between regional economy, tourism industry and e-commerce system in Hebei province is analyzed by means of quantitative method, which can provide reference for relevant departments to make policies, so as to promote the coordinated development among the three systems.

Coupled Coordination Analysis Process

Indicator System and Data Source

Following the principles of data availability, representativeness and comparability, and referring to relevant studies of Zhou Cheng [1] and Han Jing [2], the evaluation index system of coupling coordination degree of Hebei E-T-E system was constructed, and the index weight was obtained by entropy value weighting method [3]. The evaluation index and weight were shown in table 1. In

2012 to the rapid development of China's e-commerce development period, the tourism also entered the stage of two-way open and deepen the reform, therefore this article selects 2012-2018 data of Hebei province E-T-E system coupling coordination of empirical analysis, the article original data from Hebei economy yearbook from 2013 to 2018, 2012-2018 national economic and social development in Hebei province statistical bulletin, Internet development report in Hebei province, Hebei province association of Internet website as well as culture and tourism in Hebei province hall website data, etc., for the lack of data, is calculated with the inverse method is pushed.

Table 1. Regional economy-tourism Industry-E-Commerce coupling coordination evaluation index

primary index	secondary index	tertiary index	unit	Index weight
Regional economic system	Economies of scale	Gross regional product	One hundred million yuan	0.1359
		Total value of imports and exports	One hundred million dollars	0.1526
		The tertiary industry's output value accounts for the proportion of regional GDP	%	0.0981
		Fiscal revenue	One hundred million yuan	0.1848
	Social and economic construction	Tertiary industry investment	One hundred million yuan	0.0991
		Road mileage	Thousands of kilometers	0.0846
	People's living standard	Private economy accounts for the proportion of regional GDP	%	0.0816
		Per capita disposable income	yuan	0.1633
Tourism industry system	Tourism market benefits	Total tourism revenue as a percentage of regional GDP	%	0.1131
		Domestic tourism revenue accounted for the proportion of the tertiary industry	%	0.0958
		Foreign currency income	Ten thousand dollars	0.1368
	Tourism scale	Number of international visitors	people	0.1409
		Domestic tourists	Ten thousand people	0.1122
	Tourism factor supply	Accommodation and catering units	pieces	0.2017
		Employment in accommodation and catering industry	Ten thousand people	0.0798
E-commerce system	E-commerce infrastructure	Number of mobile phone users	Ten thousand people	0.0950
		Internet broadband users	Ten thousand people	0.1326
		Number of Internet broadband access ports	Ten thousand pieces	0.0890
		Internet penetration	%	0.0674
	The scale of e-commerce operation	Number of sites	Ten thousand pieces	0.1731
		Delivery quantity	Thousands of pieces	0.1269
		Internet shopping penetration rate	%	0.0869
		Internet users	Ten thousand people	0.0693
	Travel booking user penetration rate	%	0.1599	

Coupling Coordination Degree Model

First of all, due to the different meanings of indicators and the differences in units, in order to facilitate comparison and avoid the interference of subjective factors, the data were firstly

standardized and normalized, and unified plus 0.01 was used for non-negative processing [4] , and X' was obtained. Based on the research of Zhou Lei [5] and others, this paper uses the following formula to deduce the coupling degree of Hebei regional Economy-Tourism industry-e-commerce,

$$C=3\sqrt[3]{XYZ}/(X+Y+Z). \tag{1}$$

In formula (3), X represents the regional economic comprehensive development level index, Y for the tourism industry comprehensive development level index. Z represents the comprehensive development level index of e-commerce. C is the coupling degree of the three systems, and the value range is [0, 1]. When C=1, it means that the three systems are in an optimal coupling state; when C=0, it means that the systems are in a disordered state.

The coupling degree can only reflect the interaction between systems, so it is necessary to introduce the coupling coordination degree model,

$$T=\alpha R+\beta T+\gamma M \tag{2}$$

$$D=(C+T)^{1/2}. \tag{3}$$

In the above two formulas, T represents the comprehensive evaluation index of regional economy-tourism industry-e-commerce system. D represents the coupling coordination degree of the three systems. Based on previous studies of scholars, the coupling coordination degree is divided into ten grades, as shown in table 2. α , β and γ are undetermined coefficients. As a necessary factor for the development of tourism industry and e-commerce, regional economy occupies a more important position. In addition, as the tertiary industry, e-commerce and tourism industry can promote the regional economy to a certain extent. Therefore, the two industries should take the same proportion, so $\alpha =0.4$, $\beta =0.3$ and $\gamma =0.3$.

Table 2. Reference standards for the degree of coupling coordination

The serial number	Coupling coordination	Coordination level	The serial number	Coupling coordination	Coordination level
1	0 ~ 0.09	Extreme imbalance	6	0.50 ~ 0.59	Barely coordination
2	0.10-0.19	serious disorders	7	0.60 ~ 0.69	Primary coordination
3	0.20 ~ 0.29	Moderate disorders	8	0.70 ~ 0.79	Intermediate coordinate
4	0.30 ~ 0.39	Mild disorder	9	0.80 ~ 0.89	Good coordination
5	0.40 ~ 0.49	On the verge of disorder	10	0.90 ~ 1.00	High quality coordination

Fitness Analysis Method

By measuring the elasticity coefficient of e-commerce to tourism industry, regional economy to tourism industry and regional economy to e-commerce, this paper analyzes the degree of tightness and fitness between the two. Taking the fitness analysis of e-commerce to tourism industry as an example,

$$E_1 = \frac{M_2 - M_1}{T_2 - T_1} \times \frac{T_1 + T_2}{M_1 + M_2} . \tag{4}$$

In formula (4), the E1 refers to the electronic commerce to the elastic coefficient of the tourism industry, e-commerce M1 on behalf of the previous year's comprehensive development level index,

the M2 on behalf of the comprehensive development level index of electronic commerce, T1 refers to the comprehensive development level of the tourism industry of the previous index, T2 refers to the comprehensive development level index of the tourism industry, if $E1 > 1$, indicates that electronic commerce development faster than the tourism industry. According to the existing studies [6], the reference elastic interval and corresponding fitness are shown in table 3.

Table 3. Elastic coefficient interval and fitness

Modulus of elasticity	fitness
0.8 ~ 1.0 or 1.0 ~ 1.2	High
0.6 ~ 0.8 or 1.2 ~ 1.4	Good
0.5 ~ 0.6 or 1.4 ~ 1.5	General
>0.5 or < 1.6	Not adapted

According to the above formula, the comprehensive development level index and coupling coordination degree of regional economy-tourism industry-e-commerce system in Hebei province are calculated, as shown in table 4,5 and figure 1.

Table 4. Comprehensive development level and coupling coordination degree of regional economy-tourism industry-e-commerce system in Hebei province

Year	X	Y	Z	C	T	D	Coordination level
2012	0.0615	0.0125	0.0100	0.7049	0.0314	0.1487	serious disorders
2013	0.2736	0.1195	0.1116	0.9151	0.1787	0.4044	On the verge of disorder
2014	0.4726	0.1405	0.1881	0.8688	0.2876	0.4999	Barely coordination
2015	0.5486	0.2642	0.3271	0.9525	0.3968	0.6148	Primary coordination
2016	0.6456	0.4142	0.5591	0.9835	0.5502	0.7356	Intermediate coordinate
2017	0.6841	0.6630	0.8152	0.9958	0.7171	0.8451	Good coordination
2018	0.7960	1.0100	1.0072	0.9940	0.9236	0.9581	High quality coordination

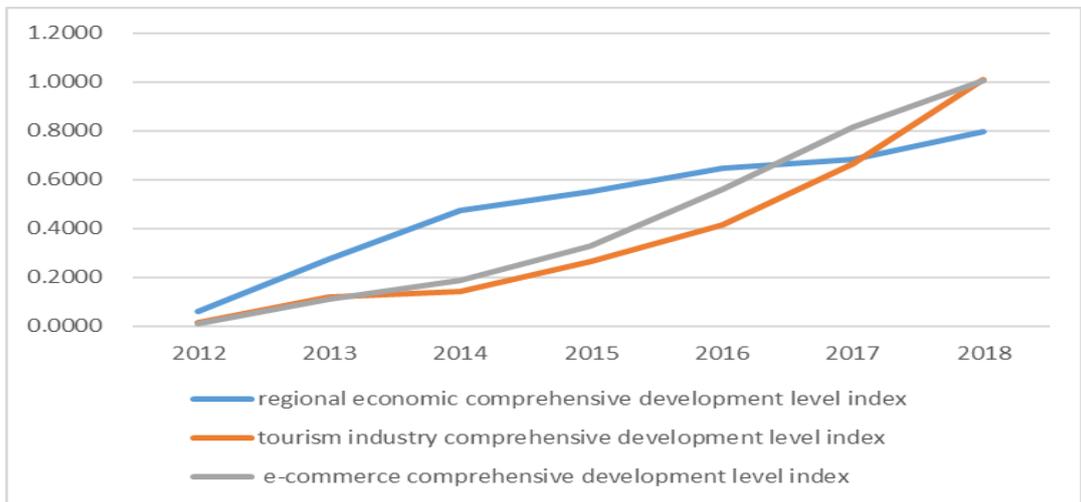


Fig.1 Comprehensive development level index of regional economy, tourism industry and e-commerce

Table 5. Adaptability of regional Economy - Tourism Industry - E-Commerce in Hebei province

Year	E-commerce - tourism industry	Regional economy - tourism industry	Regional economy - e-commerce
2013	1.031(High)	0.781(Good)	0.757(Good)
2014	3.149(Not adapted)	3.292(Not adapted)	1.045(High)
2015	0.883(High)	0.244(Not adapted)	0.276(Not adapted)
2016	1.184(High)	0.367(Not adapted)	0.310(Not adapted)
2017	0.807(High)	0.125(Not adapted)	0.155(Not adapted)
2018	0.508(General)	0.365(Not adapted)	0.473(Not adapted)

Results Analysis

Comprehensive Development Level Analysis of E-T-E Subsystems in Hebei Province

Combined with table 4 and figure 1, it can be seen that overall development level of regional economy, tourism industry and e-commerce system in Hebei province is on the rise. From 2012 to 2018, the regional economic system of Hebei province increased from 0.0615 to 0.7960, tourism industry from 0.0125 to 1.0100, and e-commerce from 0.0100 to 1.0072. As can be seen from figure 1, the level of regional economic development experienced a slow growth period from 2014 to 2016. According to the blue book issued by Hebei academy of social sciences in 2016, the economic growth rate of Hebei province was relatively slow due to the insufficient continuation of old and new industries, environmental pollution, large deficit and other reasons. E-commerce has developed rapidly after 2014, the reason may be the Hebei provincial government in 2014 issued *3 years to promote e-business development plan (2014-2016)*, puts forward some measures for promoting the development of the electronic commerce class measures, including build e-commerce platform, cultivate leading enterprises such as e-commerce, policy issue and implement, to promote the development of electronic commerce. Hebei province started to hold the tourism industry development conference in 2016, initiated the reform of tourism management system and strengthened the protection of tourists' legitimate rights and interests, etc., which effectively promoted the development of the tourism industry. As can be seen from figure 1, the tourism industry in Hebei province showed a rapid development trend after 2016. After 2017, as new industries, tourism industry and e-commerce comprehensive development level more than regional economy, regional economic development level and growth also have promoted, the tourism industry and electronic business drives the development of the economy, but the regional economic development level obviously lags behind the comprehensive development level of tourism industry and e-commerce, in Hebei province should further improve the development of regional economy.

Analysis of Coupling Coordination Degree of E-T-E System in Hebei Province

In terms of the degree of coupling, the range of system coupling is relatively small. In 2012, the degree of coupling was the lowest, and the degree of system coupling showed a steady growth trend. Due to the influence of the external environment, the economic development of Hebei province was hindered in 2014, so the degree of coupling dropped a little in 2014. Since 2015, the coupling degree has been above 0.9. The coupling degree represents the degree of interaction between the systems, which indicates that the interaction between E-T-E systems in Hebei province is strong. After 2014, tourism industry and e-commerce developed rapidly, and E-T-E system began to enter into a state of coordination, indicating that the construction of tourism service system should be strengthened, the strength of e-commerce industry should be strengthened, and the quality and coordinated development of Hebei regional economy-tourism industry-e-commerce system should be maintained.

Fitness Analysis of E-T-E System in Hebei Province

According to table 5, the e-commerce and tourism industry in Hebei province had a good fitness in 2012, and most of the other years were in a high fitness condition except the unfitness degree in 2014. From 2015 to 2018, the tourism industry in Hebei province has been at a level of discomfort

to the regional economy. After 2015, Hebei province suffered from the impact of the external environment and its economy declined. In 2017, the elasticity coefficient of tourism industry to regional economy was as low as 0.125, rising to 0.365 in 2018. From 2013 to 2014, the regional economy in Hebei province showed a high degree of adaptability to e-commerce. However, since 2015, the degree of adaptability has been maintained, and the development speed of regional economy is lower than that of e-commerce. In the same period, the development of regional economy has a greater impact on the development of e-commerce than on the tourism industry.

Results Analysis

Based on the judgment and research on the coupling and coordination mechanism of regional economy-tourism industry-e-commerce system in Hebei province, this paper finds that the system has obvious coupling characteristics, and after 2015, it presents a deep integration state. Regional economy provides economic support for the development of tourism industry and e-commerce, and the development of tourism industry and e-commerce also drives the development of regional economy, which generally presents a good coordinated development trend.

With the support of policies, the overall environment of Hebei province was improved, and the index of systematic comprehensive evaluation was 0.0314 to 0.9236. Especially after 2015, tourism industry and e-commerce have developed rapidly, and the systematic comprehensive evaluation index has been significantly improved, indicating that tourism industry and e-commerce occupy an important position in the industry of Hebei province. But in recent years, the regional economic growth is slower, comprehensive development level of regional economy of tourism industry, is a degree does not adapt to electronic business, tourist industry and e-commerce constitution that still needs to be promoted to regional economy, regional economic development level is not enough, the government should continue to take effective measures to improve the economic benefits of tourism industry and e-commerce industry, promote regional economic development to a higher level.

Acknowledgement

This research was financially supported by the Beijing Social Science Fund. (Project coding: B18HZ00090).

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