Research on Comprehensive Development of "Five Modernizations " in Xinjiang

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Abstract. As China's economy enters the new normal era, Xinjiang is now more focusing on the coordinated development of industrialization, urbanization, and modernization in agriculture, information and infrastructure. The paper starts from analyzing the development in the "five modernizations", and figures out the theoretical model of "five modernizations". By setting up an index system of the "five modernizations", the authors try to estimate the level and synergy degree of Xinjiang's "five modernizations" based upon Xinjiang's "five modernizations" synergy aspects. The empirical results show that, the value of the "five modernizations" is constantly improving. The level of Xinjiang's "five modernizations" is relatively low. Since the coupling and coordination level is in the primary stage in 2014, the level in Xinjiang has been continuously improving.

1. Background of Study

1.1 Introduction

In the past 40 years China's economy as well as people's living standards has been developing rapidly. In the process of our five modernizations, we need to follow a path of sound development that emphasizes both quality and quantity. In particular, the coordinated development of the "five modernizations" system is related to the overall situation of the modernization drive. The northwest region is vital for China's western region development, and Xinjiang is an extremely important link, it also plays an important role in the development of *"One Belt and One Road".* As the development of Xinjiang is relatively backward, the research on the simultaneous development of "five modernizations" is in response to the national strategy and out of practical needs. At present, Xinjiang is still in the primary stage of industrialization, and its development is not coordinated in terms of industrial structure. In recent five years, the urbanization rate of Xinjiang has been maintained at around 40%, with a moderate development speed. However, there are problems such as unreasonable industrial structure and weak urban economy. Xinjiang is a big agricultural province, but the degree of agricultural modernization is still in the embryonic stage.

1.2 Mechanism of coordinated development of "five modernizations"

The coordinated development of the "five modernizations" is a powerful driving force for national economic and social development under the new normal [4,5]. The deepening degree of industrialization is conducive to the rapid development of advanced production factors and technologies and the improvement of agricultural production efficiency. New urbanization is an important development platform for the five modernizations. Urbanization provides elements and product markets for industrial development. The new urbanization into information to provide high intelligence level talents [6]. Agricultural modernization is the basic resource base for "five modernizations". Agricultural modernization and industrialization promote each other, showing a positive correlation; Informationization is the intelligent control center of the coordinated development of "five modernizations". With the improvement of information technology, the

automation level of related manufacturing and infrastructure industries has been improved. Greening is the banner of civilization for the coordinated development of "five modernizations". First, "clear water and green mountains" mean "mountains of gold and silver". Greening is an important link in the construction of ecological civilization [7,8]. Second, we should reduce energy consumption and pollution in industrialization, make scientific a1nd rational use of resources, and build a beautiful China with blue sky, green mountains and green water as soon as possible.

2. Method

2.1 Weight determination and evaluation calculation

There are many methods to assign weight to indicators, such as expert scoring method, factor analysis method, entropy method and so on. Entropy method is adopted in this paper. Entropy method is to determine the weight by the information provided by the index. Information entropy is inversely proportional to the information provided by this index. Therefore, the smaller the information entropy is, the more information is provided, and the larger the corresponding weight is, and vice versa. The calculation process is as follows [9].

Proportion value of the J in the I year P_{ij}： $P_{ij} = Y_{ij}/\sum_{i=1}^{n} Y_{ij}$ （1）

Information entropy of index J G_j： $G_j = -K\sum_{i=1}^{n} P_{ij} ln P_{ij}, K = 1/\ln(n)$ （2）

Difference degree of index J H_j： $H_j = 1 - G_j$ （3）

Evaluation value of index J in year I L_{ij}： $l_1 j = w_j \times P_{ij}$ （4）

Synthesis of systems in the first year L_i： $L_i = \sum_{j=1}^{m} L_{ij}$ （5）

Where is the weight of each index, and is the comprehensive evaluation value of the *J index* in the first year. W_j is the weight of each index, and L_{ij} is the comprehensive evaluation value of the *j index* in the *I year*.

2.2 Coupling coordination model

According to the system coupling model in physics, the degree of interaction between the coupling elements of the five systems reflects the degree of their mutual coordination, and is defined as the degree of coupling of the five systems. Its formula is：

$$C = \left\{ \frac{(s_1 \times s_2 \times s_3 \times s_4 \times s_5)}{\frac{(s_1 + s_2 + s_3 + s_4 + s_5)^5}{5}} \right\}^{\frac{1}{5}} \quad （6）$$

s_i respectively represents the development level index of the five subsystems of new industrialization, new urbanization, agricultural modernization, informatization and greening. *C* belongs to (0,1), and the larger *C value* indicates the greater degree of interaction between the systems [9]. Th*e degree of coupling C* sometimes does not reflect the actual level of development of each. The coupling coordination degree model can not only reflect the degree of coupling coordination between each transformation, but also truly reflect the relative level of development of each transformation. Its formula is as follows:

$$D = \sqrt{C \times T} \quad （7）$$

$$T = \lambda_1 S_1 + \lambda_2 S_2 + \lambda_3 S_3 + \lambda_4 S_4 + \lambda_5 S_5 \quad （8）$$

Where *D* is the coupling coordination degree, T is the comprehensive development level index of "five modernization", and is the undetermined coefficient [10]. According to the internal mechanism of coupling and coordination development of "five modernizations" as

explained above, this paper summarizes the *D value* between (0,1). When the D value approaches 1, the coordination degree of "five modernizations" is the highest, and when it approaches 0, the coordination degree is the lowest.

3. Results and Discussion

3.1 Measurement results of index weight of coordinated development of "five modernizations" in Xinjiang

According to formula (1) - (7), the weights of indicators in the "five modernizations" system in Xinjiang from 2002 to 2014 were calculated. Such as table 1.

Table 1: Comprehensive evaluation index weight of coordinated development of "five modernizations" in Xinjiang

First level index	second level index	third level index	Entropy weight
New industrialization subsystem	Industrialization level and structure	GDP per capita	0.09
		Industrial added value per capita	0.114
		Rate of industrialization	0.01
		The proportion of non-farm employment	0.004
	Technological content and human potential	The number of patent applications approved for ten thousand people	0.279
		The proportion of R&D expenditure in Xinjiang's GDP	0.074
		Every 100,000 people with a college degree or above	0.033
	Industrial economic benefit	Profit margin of industrial cost	0
		Full labor productivity of industrial enterprises above scale	0.175
	Resource consumption	Ten thousand yuan of industrial added value energy consumption	0.003
		Ten thousand-yuan GDP water consumption	0.082
	The environmental protection	The total investment in environmental pollution control accounted for the proportion of Xinjiang's GDP	0.116
		Comprehensive industrial "three wastes" emission index	0.021
Subsystem of new urbanization	Economic urbanization	Proportion of non-agricultural industries	0.001
		GDP per unit built-up area	0.052
	Social urbanization	Participate worker basic endowment insurance coverage rate	0.51
		Number of hospital beds per 10,000 people	0.056
	Spatial urbanization	The number of urban populations absorbed by unit built-up area	0.01
		Per capita living space of urban residents	0.008
	Urbanization of life	Harmless disposal rate of municipal solid waste	0.32
		Green coverage rate of built-up area	0.01
	Urban-rural integration	Population urbanization rate	0.016
		The ratio of urban per capita disposable income to rural per capita income	0.002
		Urban and rural Engel coefficient ratio	0.015
Agricultural modernization subsystem	Agricultural production input level	Mechanical power per unit cultivated land	0.057
		Water-saving irrigation area ratio	0.025
		Rural per capita fixed assets investment in agriculture, forestry, animal husbandry and fishery	0.079
	Agricultural science and technology level	Proportion of agricultural and agricultural technicians	0.019
		The number of teachers per ten thousand people in rural areas	0

Agricultural production level	Agricultural productivity	0.024
	Land yield	0.035
Level of social development	Commodity rate of agricultural products	0.026
	Processing rate of agricultural products	0.014
Living standard of farmers	The per capita net income of farmers	0.243
	Engel coefficient	0.013
Level of sustainable development	The proportion of soil erosion control area	0.391
	Forest pest control rate	0.074
Information subsystem	Information resources and equipment	A hundred people have a collection of books in the public library	0.021
		Number of mobile phones per 100 persons	0.228
		The proportion of Internet users	0.359
		Comprehensive population coverage of TV programs	0
	Information technology application and industry	The electronic and communication equipment manufacturing industry accounted for a percentage of GDP	0.266
		Information transmission, computer services and software accounted for a percentage of GDP	0.021
	Information on the subject	Ten thousand R&D full-time personnel	0.099
		The proportion of employees employed in information transmission, computer service and software industry	0.007
Green subsystem	Water supply and drainage system	Urban sewage treatment rate	0.005
		Average length of drainage pipe per 10,000 people	0.136
	Garden sanitation system	Health technicians per 10,000 people	0.014

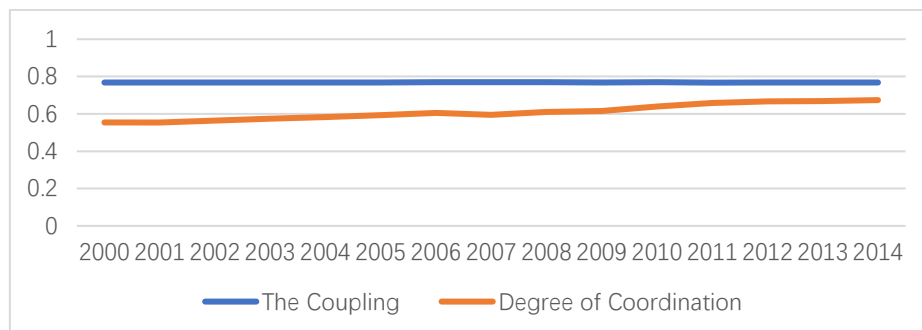## 3.2 Measurement results of coupling coordination degree of "five modernizations" in Xinjiang

Figure 1: The coupling co scheduling of "five modernizations" in Xinjiang from 2000 to 2014

From 2000 to 2006, the D value of coupling coordination degree of " five modernizations " was (0.5001, 0.6000), indicating that Xinjiang's " five modernizations " was in a stage of barely coordinated. From 2007 to 2014, D value was (0.6001, 0.7000), indicating that the coordinated development of Xinjiang's "five modernizations" was constantly improving and reached the stage of primary coordination. With the continuous progress of "five modernizations" and strong support from Xinjiang government, the coupling coordination degree of "five modernizations" in Xinjiang increased by 0.119568 from 0.554202 in 2000 to 0.67377 in 2014.
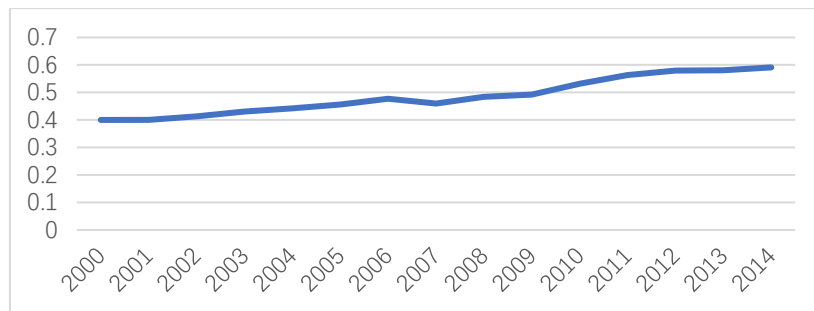
Figure 2: Xinjiang's comprehensive development level index of "five modernizations" from 2000 to 2014 (T)

As can be seen from Figure 2, from 2000 to 2014, the comprehensive development level of Xinjiang's "five modernizations" increased by 47.7% compared with that of 2000, except for a slight decline in 2007.

3.3 Discussion of the results

Table 2: Coordinated development of "five modernizations" in Xinjiang from 2000 to 2014

	New industrialization index S1	New urbanization index S2	Agricultural modernization index S3	Informationization index S4	Green index S5
2000	0.3401473	0.60010948	0.40536521	0.277339	0.339187
2001	0.33677898	0.60035313	0.41277683	0.279577	0.336755
2002	0.36325279	0.60077082	0.42315522	0.281389	0.359998
2003	0.37685846	0.61332564	0.44828964	0.299443	0.376679
2004	0.38025737	0.61125446	0.48969592	0.31773	0.379981
2005	0.39037295	0.63514264	0.51563008	0.321605	0.390171
2006	0.40112192	0.610153	0.53190613	0.328977	0.496971
2007	0.40219412	0.62696435	0.49939322	0.335764	0.401938
2008	0.42171327	0.66399371	0.51170037	0.367463	0.420521
2009	0.41097806	0.70090277	0.52367452	0.390958	0.398503
2010	0.46377939	0.73256925	0.54722784	0.425494	0.452709
2011	0.51219409	0.84117388	0.57330755	0.419914	0.409196
2012	0.50085129	0.84067688	0.58646619	0.420165	0.500343
2013	0.5018697	0.84035536	0.60240613	0.410564	0.50123
2014	0.51337533	0.84059867	0.64357677	0.396835	0.513463

Comprehensive evaluation value analysis: It can be seen from table 5, from 2000 to 2014, the overall development level of Xinjiang during the "five modernizations" period increased substantially. The level of new industrialization will rise by 1.5 times, that of new urbanization by 1.4 times, that of agricultural modernization by 1.6 times, that of informatization by 1.44 times and that of greening by 1.5 times. This shows that during the past 15 years, Xinjiang's modernization process has developed rapidly and all aspects of the "five modernizations" have achieved results. Except for slight fluctuations in the level of green development in some years, new urbanization, new industrialization, agricultural modernization and information technology are on the whole on the rise. Information level started to low because at that time, the province's overall informatization level is not high and that computer technology related industries as a share of GDP is relatively low, while the other "four modernizations" although at that time also are in the early stage of development, but the accumulation of advantages or has ever better than becoming an information based society development.

4. Conclusion

Based on the theory of synergistic development of the five modernizations, I come to the following conclusions

1. The coupling and coordination degree of Xinjiang's "five modernizations" is very low. From 2000 to 2006, the *D value* of coupling coordination degree of Xinjiang's "five modernizations" belongs to (0.5001, 0.6000), indicating that this stage is in the stage of grudging coordination. From

2007 to 2014, *D value* belongs to (0.6001, 0.7000), which is in the primary coordination stage. However, the coupling coordination degree of Xinjiang's "five modernizations" keeps improving.

2. From 2000 to 2014, the level of new urbanization has been ahead of other four modernizations, with the new industrialization and agricultural modernization at a general level, while the level of information and green development is lower, which has lagged behind other three modernizations. Information has not integrated with other four modernizations, and cannot play a huge role in promoting the development of the engine. The level of green development is very low, and the growth rate is the slowest. The gap between green development and new urbanization, new industrialization and agricultural modernization is gradually increasing, and it has not played its role as the basis for the development of other four modernizations. The degree of interaction and dependence between Xinjiang's "five modernizations" is relatively low. Until 2014, the level of coupling coordination was still in the primary coordination stage.

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