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Research on Coordination of Digital Economy and Common Prosperity in Zhejiang Province Based on Entropy Weight TOPSIS and Coupling Mechanism

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Abstract: *With the development of the digital economy, it should mutually promote the development level of shared prosperity in theory. Therefore, it is of great significance to study the coordination degree between the digital economy and shared prosperity to narrow the regional economic gap and promote the overall high-level development of cities. This paper takes all provinces and cities in Zhejiang Province in 2020 as the research object. It constructs the measurement index system of the digital economy and shared prosperity, respectively. The digital economic index and the development level of shared prosperity are measured by the Entropy -TOPSIS method. Then, the degree of coordination between the digital economy and shared prosperity is studied by using the coupling mechanism. The empirical results show that the development level of the digital economy, the level of shared prosperity, and the level of coupling coordination show a stepped distribution of "high in the north and low in the south" and "high in the east and low in the west." The digitalization and standard prosperity levels of neighboring cities are similar, but regional differences in agglomeration exist. The digitalization level and average prosperity level of Hangzhou and Ningbo lead in the whole Province. Finally, we provide relevant suggestions for Zhejiang Province to enhance the status of the digital economy, promote shared prosperity, and improve the development of new patterns.*

Keywords: *Digital economy, Shared prosperity, Coupling coordination*

1. Introduction

From a historical view, every significant technological change will significantly improve labor productivity, thus contributing to economic development. But to a certain extent, this will lead to the expansion of income distribution and the wealth gap. Studying the coordination between the digital economy and shared prosperity can further promote the sustained and rapid development of digital economic transformation, thus forming a positive cycle of mutual promotion. Yi Song; Tu Chen (2022) [1] propose that the digital economy should empower shared prosperity from four aspects: promoting independent technology research and development, optimizing the industry development environment, perfecting ethical norms and systems, and distinguishing digital public and private attributes. Ru Liu; Weizhang (2022) [2] Propose verifying the transmission mechanism of the digital economy to shared prosperity through the Bootstrap mediated effect analysis method. Yongjian Li (2022) [3] propose that it is necessary to strengthen the anti-monopoly supervision of digital platforms, clarify data ownership, promote the fair distribution of data elements' income, etc., and improve the policy system. Tao Chen (2022) [4] proposes that digital economy enterprises' price discrimination policy can promote the shared prosperity of urban and rural areas. Jiechang Xia; Cheng Liu (2021) [5] proposed that the digital economy can promote shared prosperity by fostering general macroeconomic growth, regional industrial decentralization, urban-rural coordination, and making up for the shortcomings of public services.

Based on the existing references, the index system of the digital economy index and shared prosperity development level of Zhejiang province is constructed by TOPSIS, and its fluctuation trend is analyzed according to relevant data. The entropy TOPSIS method is used to measure the digital economy index and shared prosperity degree of Zhejiang province, and then the related results of each index are obtained. Then, we use the coupling mechanism to analyze the weight of the digital economy and shared prosperity, study the degree of coordinated development between them, and put forward practical suggestions for Zhejiang Province to accelerate the digital economy's growth and promote shared mutual prosperity coordination.

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2. Theory

2.1. Evaluation index system

This paper takes the panel data of 11 cities in Zhejiang Province in 2020 as samples. All the data come from the statistical yearbook, EPS database, and CEIC database of Zhejiang Province. This paper adopts the trend extrapolation prediction method for the missing data to fill in. This quantitative and concrete analysis is based on the statistical index system to objectively and genuinely reflect the relationship and importance among the multiple performance characteristics of the research object.

In this paper, the digital economy is divided into five first-level indicators: infrastructure, digital industrialization, industrial digitalization, new formats, new modes, and digitalization of government and society, and ten second-level indicators are selected. And shared prosperity is divided into three primary hands: development, sharing, sustainability, and ten secondary indicators. Among them, the product includes two indicators essential for the sustainable development of a region. Digital government, the basic idea of the entropy-TOSIS method is to determine the objective weight according to the variability of indexes. Generally speaking, the smaller the information entropy of an index, the greater the degree of variation of the index value, the more information it provides, the more significant the role it can play in the comprehensive evaluation, and the greater its weight. The coupling degree model is used to analyze the level of coordinated development of things. Coupling degree refers to the interaction and influence between two or more systems, which can realize the dynamic correlation of coordinated action and reflect the degree of interdependence and mutual restriction between systems. Coordination degree refers to the degree of benign coupling in the coupling interaction, reflecting the quality of coordination.

Table 1: Digital Economy and Shared Prosperity Index System

Primary index	Secondary index	weight coefficient	Primary index	Secondary index	weight coefficient
Infrastructure	Network infrastructure	9.35%	Expansibility	Affluence	18.62%
	Digital network popularization	6.31%		Sharedness	12.81%
Digital industrialization	Innovation ability	11%	Sharing	Culture and Education	12.47%
	Quality benefit	10.32%		Infrastructure	8.54%
Industrial digitalization	Industrial digital input	9.78%		Medical health	7.20%
	Industrial digital application	10.37%		Information level	8.55%
New format and a new mode	E-commerce	10.53%		Social security	4.24%
	Digital finance	6.75%	Sustainability	S&T innovation	9.73%
Government and social digitalization	Digital livelihood	11.67%		Development quality	9.64%

3. Empirical Analysis

3.1. Digital economy index and the development level of shared prosperity

Table 2: Measurement results

City	Digital economic index	The development level of shared prosperity
Hangzhou	0.676	0.739
Ningbo	0.512	0.696
Wenzhou	0.444	0.460
Jiaxing	0.439	0.420
Huzhou	0.454	0.346
Shaoxing	0.401	0.445
Jinhua	0.431	0.340
Quzhou	0.399	0.275
Zhoushan	0.360	0.340
Taizhou	0.359	0.481
Lishui	0.289	0.232

According to the entropy TOPSIS method, based on the index system of digital economy index and shared prosperity index system, it can be seen from Table 2 that the cities with the highest and lowest digital economy index are Hangzhou and Lishui, which are 0.676 and 0.289, respectively. The cities with

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the highest and lowest level of joint development are Hangzhou and Lishui, 0.789 and 0.232, respectively. From the above results, we can see that the allocation level of the three digital economy indexes and shared prosperity indexes in Zhejiang Province lacks regional balance, and the corresponding indexes in 2020 are in the state of East > Central > West, North > Central > South. We can see from Table 1 that the top three weight coefficients of digital economy development are digital livelihood, e-commerce, and industrial digital application. The maximum three weight coefficients of joint expansion are affluence, commonness and culture, and education.

3.2. Analysis of coupling coordination

Based on applying the TOPSIS method of entropy weight to obtain the economic index of the digital economy and the development level of shared prosperity, the financial index of the digital economy and the development level of joint capital in Zhejiang, Province are further generated. The higher the corresponding index, the lower the regional color concentration. According to Figure 1 and Figure 2, the digital economy development index and the development level of shared prosperity in Zhejiang Province show a distribution trend of "high in the east and low in the west" and "high in the north and low in the south."

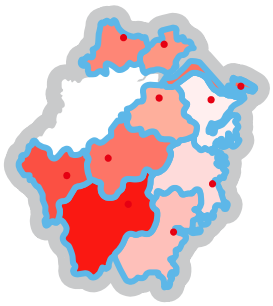

Figure 1: Development level of the digital economy

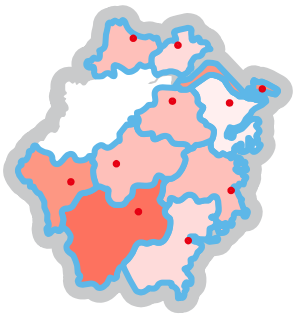

Figure 2: Development level of shared prosperity

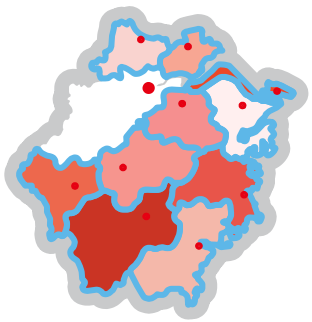

Figure 3: Coupling coordination degree

The digital economy development index and the development level of shared prosperity in the eastern and northern regions are relatively high. The development of the digital economy and shared prosperity in central China are linked with progress, enhancing the degree of high concentration. And in the western and southern regions, the internal digital economy development linkage is less, and the development level of the digital economy and shared prosperity is relatively slow. There is a significant gap between the eastern and northern regions. On this basis, the map of coupling coordination degree is further generated. According to Figure 3, the coupling coordination degree in the eastern and northern regions

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of Zhejiang Province is higher, and the development of the digital economy and shared prosperity are more balanced.

4. Conclusions and policy recommendations

Based on the panel data of 11 cities in Zhejiang Province in 2020, the empirical conclusions are the coupling coordination degree of the digital economy development level. And shared prosperity development level is in the eastern region > central region > western region, northern region > central region > southern region, and neighboring cities' digital economy development level. As for the gap between the development level of the digital economy and the shared prosperity of the eastern and northern regions, the central area is gradually narrowing while the western and the southern regions are progressively expanding.

Strengthen regional cooperation to achieve joint development. Implement regional collaboration and explore the regional coordinated development model of the digital economy. Improve the digital economy development policy and give policy support according to local conditions. According to the geographical location, resource ownership, and industrial structure characteristics of the region, rationally plan and improve the top-level design of the digital economy, strengthen the Internet infrastructure in the low-level areas, improve the digital skill level in the low-level areas. The weight of different residents' quality of life in various stages of economic development needs to be adjusted dynamically.

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