Research on Coupling Coordination and Barrier Degree of Digital Economy and Rural E-commerce in Zhejiang Province under High Quality Development

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Abstract. The article examines the coupling coordination level in Zhejiang Province from 2015 to 2021 from the standpoint of high-quality development. It does this by building two evaluation index systems for the development levels of rural e-commerce and the digital economy, respectively, using the coupling coordination degree model and the entropy power method. It also examines the primary factors that impede the development of the coupling coordination in these two areas. The findings indicate that, from 2015 to 2021, the overall system integrated development level of the digital economy and rural e-commerce increased steadily. The main factors impeding the system's development are the full-time equivalent of R&D personnel, the number of employment in the information and communication industry, the number of rural logistics employees, and rural delivery routes, which should be tackled with effective measures in the process of high-quality development.

Keywords: high-quality development; digital economy; rural e-commerce; coordinated development; coupling coordination degree; obstacle degree

1 Introduction

An important contributing component to China's recent economic growth has been the digital economy, and has injected new kinetic energy into China's high-quality rural development through its integration with social development, e-commerce has grown in importance as a means of selling agricultural goods as a result of the widespread use of digital technology, and rural e-commerce has emerged as a fresh force for rural economic development. The 20th Party Congress has made high-quality development a top priority, building a modernized industrial system, encouraging broad rural revitalization and quickening the growth of the digital economy. Data from the China E-commerce Report (2021) indicates that e-commerce is spreading swiftly into rural areas. In 2021, China's rural online retail sales surpassed 2 trillion yuan, signaling the start of a period of steady growth. Rural physical online retail sales also increased by 11% year over year to 1.86 trillion yuan. In the long run, rural e-commerce is becoming a significant factor in driving rural investment in the economy. In order to support the high-quality development of China's rural areas and realize common prosperity, it will be extremely important to study the synergistic development level of Zhejiang Province's digital economy and rural e-commerce, as

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the province is a demonstration area for the construction of common wealth and high-quality development.

2 Literature Review

Currently, the digital economy has become a hot content in academia, and the research involves connotation, evaluation and even application and value[1-4], and several research suggest that the digital economy may encourage high-quality economic development [5,6], However, research on how the digital economy functions in rural places is still ongoing. Tomal M (2022)[7], from the perspective of sustainable development, showed through empirical data that Polish rural areas are still in the stage of slow coupled and coordinated development and need to take certain measures for improvement. Guo Kaikai et al. (2021)[8] and Wu Di (2022)[9] provided recommendations and solutions for the existing problems and challenges after analyzing the state of rural e-commerce development in the context of the digital economy and high-quality development. Zhan Jing et al. (2022)[10] used the double fixed-effects regression model and the entropy power method to investigate the relationship between the digital economy and a rise of rural e-commerce , and evaluated the impact of the digital economy on both the heterogeneity of community growth and the expansion of rural e-commerce in China. Using data from 2017, Qin Fang et al. (2022)[11] investigated the effects of rural e-commerce upon farmers' income from a micro viewpoint, demonstrating the broad nature of the role that rural e-commerce plays in promoting rural economies.Aker JC et al. (2016)[12] explored that ICT technology can bring better information services to farmers while issues such as information reliability also affect the development of traditional agriculture. According to existing research, there is less empirical and more theoretical study on rural e-commerce as a particular use of the digital economy to support rural development. This paper will draw on existing literature from the perspectives of high-quality development using the entropy weight method, coupled coordination - obstacle degree model to the two, respectively, in each of the three dimensions of the indicator selection criteria. The goal is to build an evaluation index system for the synergistic development of the digital economy and rural e-commerce in Zhejiang Province. Furthermore, the research will employ the obstacle degree model to identify and examine the contributing elements that restrict the two's coordination.

3 Digital economy and rural e-commerce development evaluation index system

With the deep application of the Internet, as a key factor in promoting industrial change and reshaping the economic structure, especially after the COVID-19 outbreak at the end of 2019, digital economy as a national economy "stabilizer" and "gas pedal" role is more significant. The digital economy, an emerging information technology-based business model, has emerged as a prominent trend in global economic development when combined with the "14th Five-Year Plan for the Development of Digital Economy." This plan is divided into four parts: First, there is digital industrialization, which is the process of making the information and communication sector more marketable and encouraging the growth of the digital sector, which is exemplified by big data, cloud computing, and artificial intelligence. digital industry development; the

second is industrial digitization, which includes advancing the modernization and digital transformation of established industries, integrating digital technology into the actual economy, implementing the reform of informatization and digitization on the supply and demand sides of the industry, and improving output efficiency and results; the third is digital governance, which is achieving digital public services through data sharing and encouraging data fusion to realize the digital transformation of the city; the fourth is data valorization, which is creating a more comprehensive data resource supply chain system to enable the production and distribution of intangible data with actual value, thereby benefiting businesses financially. Rural e-commerce, as an important link under the construction of digital countryside, has become an important engine for promoting rural economic development, which can effectively shorten the urban-rural gap and help poor areas realize leapfrog development. Rural e-commerce is a new form of e-commerce with the goal of serving the three rural areas, and the essence is to use mobile Internet information technology as a support to open up the "up and down" channel of agricultural products, to help the rural areas in the promotion and sale of agricultural products, and it is an important sales channel and means of operation for agricultural products.

Based on this, the assessment index system for the corresponding level of development of the digital economy and rural e-commerce is built by combining the meaning and traits of the two sectors, referencing previous research, and adhering to the scientific, systematic, and representative principles[1-3,5,6,9-13]. An index system for evaluating the progress of the digital economy system was created using research on the three components of the digital economy: infrastructure, industrialization, and innovation power. It comprises 12 indicators. Twelve indicators covering three dimensions of rural economy, production science and technology, and rural logistics were used to construct an evaluation index system for the development of the rural e-commerce system. Two systems totaling six dimensions (the guideline layer) and twenty-four indicators made up the evaluation index system of the synergistic development of the digital economy and rural e-commerce in Zhejiang Province, as indicated in Table 1.

Table 1. Evaluation index system and weights of synergistic development of digital economy and rural e-commerce

System layer	Guideline layer	Indicator layer	Weights
Digital Economy	infrastructure	Mobile Internet users (million) X_1	4.83%
		Number of IPv4 (million) X_2	8.13%
		Cell phone penetration rate (units per 100 people) X_3	7.21%
		Internet penetration rate (%) X_4	8.86%
	industrialization	Ratio of ICT industry investment to total fixed asset investment (%) X_5	7.94%
		Software business revenue (billion yuan) X_6	7.89%
		Number of people employed in ICT industry (10,000) X_7	8.16%
		Number of digital enterprises (pcs) X_8	11.76%
	innovativeness	Growth rate of electronic information manufacturing industry (%) X_9	6.59%
		R&D expenditure (billion yuan) X_{10}	8.19%
		Full-time equivalent of R&D personnel (10,000 person-years) X_{11}	9.83%

		Technology market turnover (billion yuan) X_{12}	10.62%
Rural E-Commerce	Rural Economy	Value added of primary industry (billion yuan) Y_1	6.05%
		Total output value of agriculture, forestry, animal husbandry and fishery (billion yuan) Y_2	6.33%
		Per capita disposable income of rural residents(Yuan) Y_3	7.66%
		Rural e-commerce sales (billion yuan) Y_4	9.37%
	Production Technology	Rural Internet broadband access users (households) Y_5	9.40%
		Total rural post and telecommunications business (billion yuan) Y_6	11.32%
		Total power of agricultural machinery (million kilowatts) Y_7	8.75%
		Agricultural output efficiency (million yuan/thousand hectares) Y_8	5.95%
	Rural Logistics	Rural freight volume (million tons) Y_9	8.58%
		Road mileage (km) Y_{10}	6.78%
		Number of rural logistics employees (million people) Y_{11}	7.44%
		Rural delivery routes (km) Y_{12}	12.37%

This paper uses relevant data from sources like the National Bureau of Statistics and the 2015–2021 Statistical Yearbook of Zhejiang Province to evaluate the degree of coupling and coordinated development as well as the degree of obstacles of the digital economy and rural e-commerce in Zhejiang Province. Regression analysis is used to determine the corresponding alternative values for each missing data point based on the trend of data changes.

4 Measurement and Comparison of Coupled and Coordinated Development of Digital Economy and Rural E-Commerce

4.1 Research Methodology

(I) Weight method.

The study uses the entropy weight method, with the following precise processes used to establish the weights of each measure of the two digital economy and rural e-commerce systems:

(1) The scales of the various indicators differ from one another, and in order to remove the impact of these scale differences, the indicator layer data must be standardized. Since all of the indicators chosen for this work are positive indicators, the data is solely processed using the extreme difference method of positive indicators; the formula is as follows:

$$Z_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} \tag{1}$$

Where x_{ij} is the original value, $\max(x_{ij})$ and $\min(x_{ij})$ indicate the maximum and minimum values of the indicator's original value, respectively, and Z_{ij} indicates the data of each indicator following standardization.

(2) Determine the ith indicator value's weight under the jth indicator P_{ij}:

$$P_{ij} = \frac{Z_{ij}}{\sum_{i=1}^{m} Z_{ij}} \tag{2}$$

(3) For the jth indicator, determine the entropy value, or e_j:

$$e_j = -\frac{1}{\ln(m)}\sum_{i=1}^{m} P_{ij} ln(P_{ij}))\ \ (0 \le e_j \le 1) \tag{3}$$

(4) Determine the indicator weights W_j:

$$W_j = \frac{1-e_j}{\sum_{j=1}^{n} 1-e_j} \tag{4}$$

(5) Calculate the integrated system development index H:

$$H = \sum_{j=1}^{n} Z_{ij} W_j \tag{5}$$

(II) Coupling coordination degree model.

The model uses the complete development indicators of the two systems to determine the coupling coordination degree of the growth of the digital economy and rural e-commerce system as well as the system barrier factor, which are obtained by the entropy weighting method and expressed by HX_i、HY_i, respectively. The model establishment process is as follows:

(1) Calculate the system coupling degree C:

$$C = 2 \times \left(\frac{HX_i \times HY_i}{(HX_i + HY_i)^2}\right)^{\frac{1}{2}} (0 \le C \le 1) \tag{6}$$

(2) Determine how well the system D has been created with coordination:

$$T = \alpha HX_i + \beta HY_i (0 \le T \le 1) \tag{7}$$

$$D = \sqrt{C \times T} (0 \le D \le 1) \tag{8}$$

According to the magnitude of C, there are five stages to the coupling relevance of the digital economy and rural e-commerce. T is the system synergy effect of these developments. α and β are need to be identified parameters, and their respective sizes indicate the importance of rural e-commerce and digital economy in the process of high-quality growth. This paper believes that both are equally essential, therefore $\alpha = \beta = 0.5$, based on the existing literature and the importance of China's rural e-commerce and digital economy at the moment[3,6,14,15].The value of D, which reflects the coupling coordination degree between the advancement of the digital economy and the rural e-commerce system, indicates the level of synergistic combination of the digital economy and rural e-commerce through a dysfunctional to a coordinated stage. The specific coupling coordination degree level division standard is displayed in Table 2.

Table 2. Coupling coordination level classification criteria and system stage types

C-value interval	Coupling relevance	D-value interval	Coupling coordination	D-value interval	Coupling coordination
0	Irrelevance	(0.0～0.1)	Extreme dissonance	[0.5~0.6)	Barely coordinated
(0.0～0.3]	Low level	[0.1~0.2)	Severe dissonance	[0.6~0.7)	Primary coordination
(0.3～0.5]	Antagonistic	[0.2~0.3)	Moderate dissonance	[0.7~0.8)	Intermediate coordination

(0.5～0.8]	Abrasive	[0.3~0.4)	Mild dissonance	[0.8~0.9)	Good coordination
(0.8～1]	High level	[0.4~0.5)	Near dissonance	[0.9~1.0)	High grade coordination

(III) Relative development degree model.

The coupled coordination degree method can demonstrate the degree to which rural e-commerce and the digital economy are inherently linked, though it can be challenging to assess the relative progress of the two. This study uses the notion of relative development degree in order to evaluate the relative development of the digital economy relative to rural e-commerce. The precise formula is as follows:

$$E = {HX_i}/{HY_i} \tag{9}$$

E for the evaluation of the relative development degree of the two systems of the digital economy and rural e-commerce relative development status, ideally the two should be synchronized and optimized, but in the actual situation is difficult to achieve complete synchronization, there will be digital economy development ahead of or lagging behind the development of rural e-commerce, the specific system development stage division type is detailed in Table 3.

Table 3. Types of system development stages

Relative development degree	Type of system development
0<E≤0.8	Digital economy development lags behind rural e-commerce, system degradation
0.8<E<1.2	Digital economy and rural e-commerce are in synchronous development stage, mutual promotion
E≥1.2	Digital economy development is ahead of rural e-commerce, system degradation

(IV)Barrier degree model.

To identify the primary barriers impeding Zhejiang Province's efforts to raise the standard of its digital economy and rural e-commerce system and to propose solutions and countermeasures, the study employs obstacle degree modeling to determine the barriers to these developments. The formula for determining these barriers is as follows:

$$O_{ij} = \frac{W_j \times (1 - Z_{ij})}{\sum_{i=1}^{m} W_j \times (1 - Z_{ij})} \tag{10}$$

Where $1 - Z_{ij}$ denotes the indicator's deviation degree and the larger value denotes the higher deviation degree of the indicator; O_{ij} is the indicator layer's barrier degree, which measures the extent of indicator j influence on the ith data item's current degree of system development.

4.2 Analysis of digital economy and rural e-commerce development measurement

(I)Coupling coordination degree.

Firstly, the extreme difference method was used to standardize the results and eliminate the impact of the size of the two digital economy and rural e-commerce systems in Zhejiang

Province between 2015 and 2021. the entropy weight formulae (1) through (4) were used to determine the weight values of each indicator (refer to Table 1). Subsequently, as indicated in Table 4, the standardized values and each weight were computed using formulas (5) to (8) to derive the system integrated development index (HX, HY), coupling degree (C), and coordinated development degree (D) of the digital economy and rural e-commerce in Zhejiang Province from 2015 to 2021.

Table 4. Coupling and coordination of digital economy and rural e-commerce system development in Zhejiang Province, 2015-2021

Year	HX	HY	C	Coupling stage	D	Coordination stage
2021	0.867525	0.696981	0.994041	High level coupling stage	0.881811	Good coordination
2020	0.745863	0.599278	0.994045	High level coupling stage	0.817658	Good coordination
2019	0.600004	0.612440	0.999947	High level coupling stage	0.778582	Intermediate coordination
2018	0.400280	0.444512	0.998628	High level coupling stage	0.649474	Primary coordination
2017	0.294517	0.321916	0.999012	High level coupling stage	0.554898	Barely coordinated
2016	0.216358	0.295532	0.987966	High level coupling stage	0.502857	Barely coordinated
2015	0.051333	0.320058	0.690258	Abrasion stage	0.358020	Mild dissonance

The province's degree of development for both rural e-commerce and the digital economy has been steadily rising, as seen in Table 4, with the former expanding more quickly than the latter. Both the digital economy and rural e-commerce in Zhejiang Province had increases in their respective comprehensive development indices from 0.051 in 2015 to 0.868 in 2021 and from 0.320 in 2015 to 0.697 in 2021, respectively. The foundation for the rapidly expanding digital economy was laid by China's "Internet Plus" plan in 2015 and the defining of the term at the G20 Summit in Hangzhou the following year. Following the trial operation in 2013 and the chaotic development in 2014, a number of e-commerce enterprises and the General Chamber of Commerce for Supply and Marketing essentially completed the layout of rural e-commerce by the end of 2015, e-commerce platforms have been competing with each other more fiercely, which has advanced the development of rural e-commerce.

Particularly, both the rural e-commerce and the digital economy are in a high level of coupling stage, with the exception of 2015. However, it should be noted that both systems are in the start-up phase prior to 2018, and the combination of "low-low" produces an artificially high coupling phenomenon, which is further demonstrated by the degree of coordination between the two. In comparison to the coupling degree, the coordination degree of the digital economy and rural e-commerce has changed significantly. The amount of coordinated development between digital economy and rural e-commerce was low prior to 2018, but it has been increasing annually in terms of coupling and coordination, and it has made great progress from the mildly dysfunctional state of 2015 to the well-coordinated stage in 2020 and has been maintained. This phenomenon is mainly due to the fact that the mobile Internet has just been laid on a large scale in 2015-2018, the concept of the digital economy is still unclear, the development of rural e-commerce is in the ascendant, and the future development model of the digital economy and rural e-commerce are still in the groping stage, how to cooperate with each other and make

common progress is the main problem at the current stage, and the subsequent years have gradually determined that the digital technology empowers the drive of rural e-commerce, the Rural e-commerce to promote the development mode of digital village construction, the development of the digital economy has helped the construction of rural sales network, so that e-commerce in rural areas can be carried out smoothly, to achieve efficient and rapid product sales. The changes in the digital economy and rural e-commerce system coupling and coordination in Zhejiang Province from 2015 to 2021 are depicted in Figure 1.

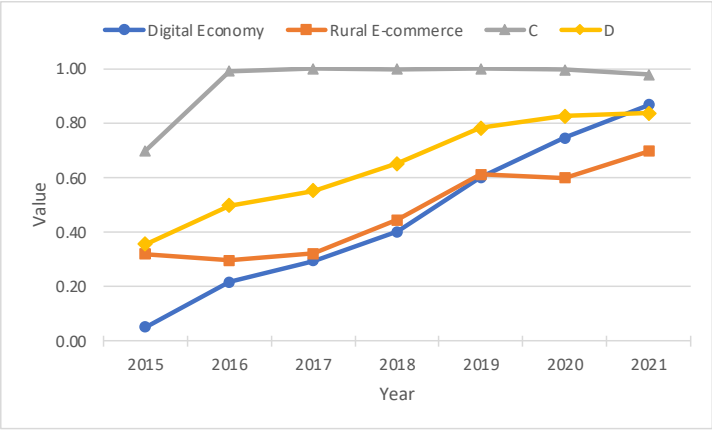

Fig. 1. Map of the development and coupling of the digital economy and rural e-commerce system to coordinate changes

(II)Relative development degree.

The relative development degree (E) is obtained by comparing the comprehensive development index of digital economy and rural e-commerce system in Zhejiang Province from 2015-2021 based on formula (9), as shown in Figure 2.

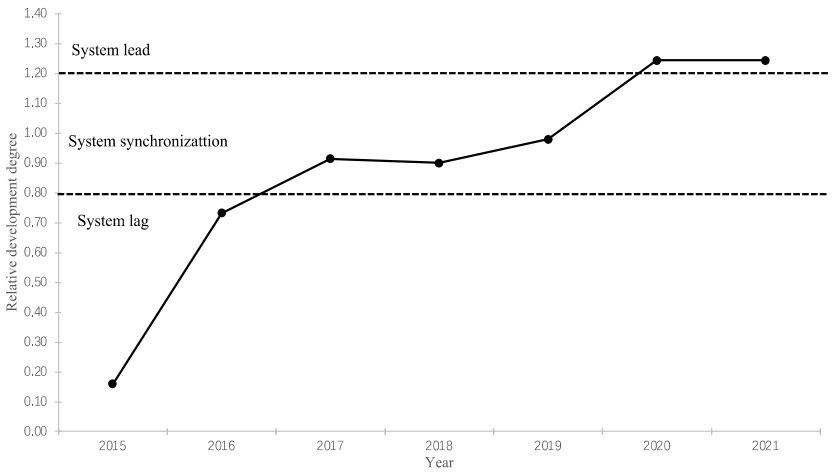

Fig. 2. Comprehensive development index of digital economy and rural e-commerce system in Zhejiang Province

According to Figure 2, which represents the first year of the digital economy, the rural e-commerce system, which has been studied for two years and has a reference development, has a far higher overall development level than 2015 has. The digital economy's development prospects are becoming more apparent. In Zhejiang Province, the relative development degree of the two sectors during the 2016–2021 period is in the range of 0.732~1.245, indicating a steady increase. Overall, the lagging degree of the digital economy's development level has been gradually improving over time, while the development of rural e-commerce has gradually reached a bottleneck. The years 2017–2019 represent a critical period in the synchronized development of the digital economy and rural e-commerce system. During this time, the system's rapid growth has been hindered by issues that have gradually come to light, including weak cold chain logistics supply chains, inadequate comprehensive service systems, and regulations governing traceability. These issues have resulted in false advertising, subpar quality control, fake and shoddy products, and other incidents that have a negative impact on the system's ability to grow. It has transitioned from the stage of lagging development of the rural e-commerce to the stage of lagging development of the digital economy by 2020. The top-level design in the field of the digital economy has been gradually improved, and "development of the digital economy" has been incorporated into the "Outline of the 14th Five-Year Plan," which provides policy guidance. Through the provision of policy suggestions, it has aided in the expansion of the digital economy across several domains and dimensions. The quick growth of rural e-commerce has also brought to light a number of issues, including a lack of specialized e-commerce talent and inadequate financing options, which have slowed down the growth of rural e-commerce and prevented further advancement in its stage of development.

5 Analysis of the degree of obstacles to the synergistic development of digital economy and rural e-commerce

The index weights and index deviations are calculated in accordance with the standardized data and formula (10) to determine the barriers to the growth of the digital economy and rural e-commerce in Zhejiang Province from 2015 to 2021. The barrier degrees affecting the development of the digital economy and rural e-commerce in Zhejiang Province are represented by X_j and by Y_j, respectively. The top 5 barriers are listed in this article in Table 5.

Table 5. Main obstacle factors for the synergistic development of digital economy and rural e-commerce system in Zhejiang Province from 2015 to 2021

Year	Ranking of indicators									
	1		2		3		4		5	
	Factor	Barrier degree	Factor	Barrier degree	Factor	Barrier degree	Factor	Barrier degree	Factor	Barrier degree
2021	X_5	0.2571	X_3	0.1902	X_{11}	0.0095	-	-	-	-
	Y_{10}	0.2851	Y_9	0.2645	Y_7	0.2400	Y_{11}	0.1499	Y_8	0.0942
2020	X_1	0.1018	X_9	0.0990	X_2	0.0918	X_5	0.0882	X_8	0.0821
	Y_9	0.2578	Y_{10}	0.2347	Y_7	0.2232	Y_{11}	0.1745	Y_{12}	0.0886
2019	X_8	0.1676	X_9	0.1476	X_7	0.1462	X_{12}	0.1268	X_6	0.1070
	Y_{11}	0.2516	Y_7	0.1846	Y_{10}	0.1838	Y_9	0.1747	Y_3	0.1005

2018	X_5	0.2316	X_8	0.2237	X_9	0.1961	X_{12}	0.1658	X_{11}	0.1581
	Y_{11}	0.2189	Y_{12}	0.1860	Y_2	0.1696	Y_1	0.1631	Y_4	0.1590
2017	X_{11}	0.2340	X_4	0.2197	X_8	0.2084	X_3	0.2078	X_{12}	0.2006
	Y_5	0.2609	Y_6	0.2281	Y_{12}	0.2261	Y_4	0.2207	Y_2	0.1952
2016	X_2	0.3117	X_4	0.3049	X_3	0.2758	X_{11}	0.2612	X_1	0.2573
	Y_5	0.3496	Y_6	0.2565	Y_{12}	0.2375	Y_8	0.2371	Y_3	0.2317
2015	X_1	0.3846	X_2	0.3117	X_4	0.3098	X_{11}	0.2763	X_6	0.2570
	Y_5	0.3427	Y_8	0.3174	Y_1	0.3061	Y_2	0.2948	Y_3	0.2643

Overall, a variety of factors hinder the development of the digital economy and rural e-commerce system in Zhejiang Province at different stages. The ranking of these factors varies annually, but some factors have persisted for a long time, as evidenced by the frequency of five occurrences of X11 in the last seven years, with a frequency of 71.4%, and four occurrences of X8, Y11, and Y12, all with a frequency of 57.1%. It indicates that the number of full-time equivalent R&D employees, the number of workers in the information and communication sector, the number of workers in rural logistics, and rural delivery routes are the primary impediments impeding the growth of the digital economy and rural e-commerce system during this time. Notably, the four indicators Y5(3), X1(2), X5(2), and Y11(2) have all repeatedly ranked first in the ranking of obstacle factors in each year (the number of times they appear is indicated by the number of times they appear in parenthesis). This suggests that the main obstacles impeding the growth of the digital economy and rural e-commerce are the number of people using mobile Internet, the number of people working in rural logistics, the number of people using broadband Internet in rural areas, and the ratio of investment in the ICT industry to total investment in fixed assets. Rural e-commerce and the synergistic growth of the digital economy are important concerns that should be properly taken into account when making decisions. It should be noted that prior to 2017, the majority of the barriers impeding the growth of Zhejiang Province's rural e-commerce and digital economy were related to the Internet, suggesting that China's Internet infrastructure was still being built with flaws and was not well suited to support both.

The obstacle of mobile Internet users was the biggest among the 12 indicators of barriers to the growth of the digital economy in 2015, with a value of 0.385. This indicator is gradually declining and will reach zero in 2021, indicating that the "13th Five-Year Plan" has successfully addressed this issue. With a value of 0.350, the number of rural Internet broadband access users in 2016 has the highest obstacle value among the 12 indicators affecting the development of rural e-commerce. This has become the biggest factor affecting the development of rural e-commerce for three years in a row, but it does not rank among the top five obstacles in the following years, and it will be zero in 2021, primarily due to the National Digital Rural Strategy's plan to accelerate the development of rural e-commerce in 2018. Rural Strategy, which hastens the expansion of 4G mobile and broadband networks in rural regions, significantly raises the level of rural technological development in Zhejiang Province.

In general, there are fewer barriers preventing the growth of rural e-commerce and the digital economy in 2021 compared to the data in 2015, which decreased from 20 barrier degree indicators in 2015. The mean barrier degree in 2015 was 0.268, and the mean barrier degree in 2021 is 0.186, which is a significant decrease in terms of both the number and the value, indicating that the digital economy in Zhejiang Province will grow more synergistically.

6 Conclusions and Recommendations

6.1 Conclusion

In this article, Zhejiang Province is the research object, and high-quality development is the research perspective. Six dimensions and 24 indicators are chosen from two systems of digital economy and rural e-commerce to measure the synergistic development level and comprehensive development index of these two sectors in Zhejiang Province between 2015 and 2021. The barrier degree model is used to identify and analyze the key influencing factors, and the following conclusions are drawn:

(1) From a comprehensive development standpoint, Zhejiang Province's digital economy and rural e-commerce development are both on the rise. In comparison to rural e-commerce, which began later but developed quicker, the complete development level of the digital economy has been rising year by year. This is mostly due to China's growth strategy, in which a huge number of firms have begun to carry out digital transformation and digitize their industries, while a number of new Internet enterprises intend to industrialize digital, promoting the rapid expansion of the digital economy. The development speed of rural e-commerce is not as fast as that of the digital economy, but it also shows a fluctuating upward trend, which is primarily due to a lack of clear planning at the initial stage, and the sinking of the market of e-commerce platforms, which, while promoting the development of rural e-commerce, gradually falls into internal conflict, which in turn hinders the further improvement of the development level.

(2) Except for 2015, the coupling relevance of the two systems of digital economy and rural e-commerce during the 7-year period is in the high level of coupling stage, the two systems interact with each other, the degree of relevance is high, but attention must be paid to the phenomenon of false high coupling. There has been an annual increase in the degree of coupling coordination, progressing from the somewhat dysfunctional stage to the good coordination stage, however it should be emphasized that it is still at a low level before 2019.With the increase in Internet construction and online payments, the overall level of the digital economy is steadily increasing its development prospects, and the degree of system lag is gradually improving with time. However, due to the difficulty of regulatory traceability, the weakness of the cold chain logistics supply chain, and the imperfection of the comprehensive service system, the development of rural e-commerce has gradually stalled, and it will reach a stage of lagging development in 2020. This is due to the gradual improvement of top-level design in the digital economy and a lack of impetus in the development of rural e-commerce.

(3) In regards to impediments, the ranking of impediments impacting the development of the digital economy and rural e-commerce in Zhejiang Province changes year after year. Among them, the most frequently barriers impeding the synergistic growth of the digital economy and rural e-commerce are among them the full-time equivalent of R&D personnel, the number of workers in the ICT sector, the number of individuals involved in rural logistics, and rural delivery routes. The primary challenges to the cooperative growth of the digital economy and rural e-commerce are the number of people with mobile Internet access, rural Internet broadband access users, and the share of ICT industry investment in all fixed asset investments. With the completion of the 13th Five-Year Plan, the adoption of the digital village and rural revitalization strategies, these issues have been successfully resolved.

6.2 Suggestions

To achieve high-quality development in Zhejiang Province, changes need to be made in the following aspects:

(1) play the role of government guidance to create a good development environment. In the last ten years, the digital economy and rural e-commerce have emerged as new ideas and industrial models. The government must provide Zhejiang Province with policy support and regulations to ensure high-quality development. The government should create long-term development plans, encourage the digital transformation of the province's industries, achieve cost and efficiency savings, and actively foster the growth of digital industries to support the advancement of digital technology in order to build the digital economy. In order to combat homogenous competition, improve platform supervision, combat counterfeit and subpar goods, foster a positive perception of rural e-commerce brands, and collaborate with all stakeholders involved in the development of rural e-commerce, the government should actively communicate with their respective e-commerce platforms.

(2) Raise the bar for the development of rural e-commerce. Zhejiang Province, a major e-commerce province, is currently experiencing a trend of insufficient momentum in the growth of rural e-commerce. The primary challenge facing the government and businesses is how to utilize the mature e-commerce development experience in the rural market. According to the findings, the state of rural logistics is currently the main impediment to the growth of rural e-commerce and has not fully realised the potential of logistics to propel the economy. This highlights the need to build more rural logistics infrastructure and the Internet, actively widen delivery routes, and open up business outlets in order to give farmers additional channels for selling their goods and to ensure that those goods are delivered to customers in a timely and efficient manner.

(3) Strengthen the collaboration between rural e-commerce and the digital economy. The data indicates that while the development of rural e-commerce has not greatly aided in the construction of the digital economy over the past seven years, it is still required to enhance cooperation between the two in order to achieve Zhejiang Province's high-quality development. By using the Internet of Things, 5G, blockchain, and other technologies, as well as live broadcasts, short films, online stores, and other means, we can help more people see and understand agricultural products. We can also actively promote the intelligence of rural logistics facilities, rural e-commerce, and "the first kilometer" link, which will enable real-time order tracking and traceability to allay customers' concerns about making a purchase. The growth of rural e-commerce will fuel the advancement of the digital village plan through collaboration to create a positive interaction cycle.

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