

Logistics and Economy in China

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China's economy has stepped up from the high-speed growth stage to the high-quality development stage. There are great regional differences in high-quality economic development, high-quality logistics development and their coupling coordination degree in China. In the areas with high-quality economic development, the logistics industry is not necessarily high quality, and the coupling coordination degree between the logistics industry and high-quality economic development is generally not high. The main reason for this is that the coordination between the logistics industry and high-quality economic development is poor. While vigorously improving the high-quality level of the logistics industry, it should strengthen the high-quality connection between the logistics industry and the economy, so as to form a situation of mutual promotion and common development.

logistics industry

high-quality economy

coupling coordination degree

1. Introduction

After more than 40 years of medium and high-speed growth, China's economy has achieved remarkable results, and the level of industrial and agricultural productivity has been greatly improved. However, China's early economic development has mostly relied on the drive of traditional factors and investment pull, with extensive development as the main factor. In 2015, the Fifth Plenum of the 18th Central Committee of the Communist Party of China clearly proposed the "Five" development concepts of innovation, coordination, green, openness and sharing. In 2017, general secretary Xi Jinping clearly pointed out in the 19th National Congress of the Communist Party of China: "China's economy has shifted from high-speed growth stage to high-quality development stage". The outbreak and spread of COVID-19 across the world in 2020 aggravated the adjustment of the world economic structure and intensified international competition. To speed up the construction of a double circulation pattern, the key is to deepen the reform of China's current market scale and production system, optimize the market allocation, open up all links of the supply chain, and promote the optimization, upgrading and docking of industries.

The linear economic model of the industrial revolution has brought negative impact on the environment and resources, and the concept of high-quality economic development includes the concept of sustainable economic development and improving environmental pressure, although the current research on high-quality development is dominated by Chinese scholars, it coincides with the concept of global sustainable development. Sustainability has emerged as an important term in the logistics industry, hence pressurizing the entire sector to reconsider their existing practices to be more environmentally, socially and economically responsible ^[1]. In the context of logistics, the understanding of sustainability is limited ^[2], and the concept of high-quality development further improves the connotation of sustainability of the logistics industry. Industry 4.0 has become one of the main forces to build a

social, economic and technological environment after 2010 [3]. Some scholars have proposed Logistics 4.0 [4], which also shows that the logistics industry will put more emphasis on all-round management and more efficient and comprehensive services. With the requirements of China's high-quality economic development, the logistics industry will move towards high-quality development, and the service of the logistics industry makes it impossible to achieve high-quality development in isolation, which involves all enterprises upstream and downstream of the supply chain, macro-regional and even international logistics activities, as well as fields such as industry, agriculture, social production and consumption. How to guide the industrial upgrading and development to meet the requirements of high-quality development through the coupling and coordinated development of the logistics industry and economy and the linkage between the logistics industry and other industries is a problem worthy of consideration.

2. Coupling and Coordination between Logistics Industry and Economy in the Background of High-Quality Development

2.1. High-Quality Development of Economy

The research group of the provincial and ministerial level cadre training class of the Central Party School believed that the quality of economic development in a broad sense is the result of the increase in a country's or a region's economic aggregate, the improvement of economic efficiency, the optimization of economic structure, the continuity of economic development and the sharing of economic development achievements. In a narrow sense, it is the degree to which products and services meet the needs of residents. This view represents the opinions of other scholars and is the consensus of academic circles on the quality of economic development. At present, it is generally accepted that high-quality economic development should include innovation, coordination, openness, green and sharing. This view can more comprehensively describe the connotation of high-quality economic development and provide more comprehensive guidance for the measurement of high-quality economic development level.

On the measurement of high-quality economic development level, from the perspective of spatial scope, it can be divided into four categories. One is to measure and compare the high-quality economy of each country [5][6][7], the second is to focus on measuring the high-quality development of China's economy as a whole [8][9], the third is to measure the high-quality development of provinces [10][11][12], the last is to measure the high-quality economic development of an economic region [13].

From the perspective of the index system, the worldwide index system emphasizes international comparability. Although it is based on the basis of five development concepts—innovation, coordination, green, openness and sharing [5][6]—there is no unified opinion on the specific content of the index system. There are four types of measurement systems focusing on the high-quality development level of domestic and even regional economies: one is to take total factor productivity as the main index to measure the level of high-quality economic development [14], the second is the index system established on the basis of five development concepts or related concepts,

such as innovation, coordination, green, openness and sharing [15], the third is the index system established from the kinetic energy, structure and results of economic growth [16], and the fourth is the index established from the two dimensions of economic growth fundamentals and social results [17][18]. Some other index systems were established by integrating some aspects of the above categories [19]. Due to the small number and the lack of a unified view, it will not be repeated here one by one. Among them, the index system established according to the five development concepts of the second type is the most, but a unified opinion has not been formed. First, the secondary indexes contained in the primary indexes are different, and the specific measurement indexes are different. In terms of the number of measurement indexes alone, there are only 10 [20], and some as many as 50 [21].

2.2. High-Quality Development of Logistics Industry

The high-quality development of logistics is an integral part of the high-quality development of the economy. Wang [22] first proposed the concept of high-quality development, but it involves industrial agglomeration and regional high-quality development, not the high-quality development of logistics. The real research on the high-quality development of logistics is the two pieces of literature that appeared in 2017. Since then, the number of research results has increased significantly. Generally speaking, the research span for the high-quality development of the logistics industry is relatively short. Since the 19th National Congress of the Communist Party of China proposed the research and judgment that China's economy has entered the stage of high-quality development, it has attracted extensive attention in the fields of academia and industry. The research results have increased significantly in the past two years, but the total amount of research results is still small, so it is still necessary to strengthen the research [23].

There are a few judgments and interpretations on the connotation of high-quality logistics development in China, but there is no clear concept of it and there is no consensus on the concept and connotation of it. Chen [24] believed that the connotation of high-quality logistics development must include four aspects: low cost, high efficiency, high service level and green development. Zhu et al. [25] proposed that under the background of digital technology, the connotation of high-quality logistics development includes six dimensions: time dimension, space dimension, direction dimension, wisdom dimension, integration dimension and ecological dimension. From the perspective of integrated field theory, Dong and Yan [26] proposed the whole process of the high-quality development of the logistics industry, including network chain development strategy, target design, synthetic field element, network chain maturity and network chain structure governance, including logistics chain and supply chain. Xiao [27] believed that the high-quality development of logistics includes two meanings: first, the development quality of the logistics industry is high, and second, the logistics industry can meet the economic development and people's needs with high quality.

To summarize, logistics high-quality development includes at least two meanings. First, the logistics industry has high development quality, which is reflected in high logistics benefits, high service level, strong endogenous power, sound industry, green environmental protection, etc., with the characteristics of "innovation, coordination, green,

openness and sharing". Second, the logistics industry can serve the social economy and people's lives, strongly support the national economic development and meet the people's growing need for a better life.

The high-quality development of logistics and the quality of logistics development are different concepts. The former is not simply used to improve the quality of logistics development; it is a new stage and model of logistics development. On the whole, there are a few interpretations of logistics high-quality development in China, but the understanding of the connotation of logistics high-quality development is not comprehensive and profound, there is no unified opinion on the concept, and there is no clear judgment on the concept and connotation of it, which needs to be further studied [23].

As for the evaluation system of high-quality logistics development, some studies have considered the internal and external environment of the logistics industry for evaluation. For example, the index system established by Mu [28] included the economic environment of the logistics industry, the scale level of the logistics industry, the input level of the logistics industry, the output effect of the logistics industry, etc. The index system established by Cheng [29] included economic development level, logistics demand, logistics industry scale, informatization level and infrastructure construction. Li [30] believed that the development quality of the logistics industry can be measured from three aspects: development efficiency, development structure and development environment. Li [31] and others established evaluation indexes including low-carbon logistics environment, low-carbon logistics strength, low-carbon logistics potential and low-carbon logistics level from a low-carbon perspective.

It is more evaluated from the perspective of input-output. For example, Cao [32] and others believed that relevant indexes include input (capital input of the logistics industry and labor input of the logistics industry) and output (scale of the logistics industry and quality of the logistics industry). The index system established by Lu [33] included input (labor and capital) and output (added value and goods turnover). In the index system established by Li [34], input includes capital input (fixed asset investment in logistics industry), labor input (employees in logistics industry), and energy input (energy consumption in logistics industry); output includes expected output (output value of the logistics industry) and unexpected output (CO_2 emission in logistics industry).

The corresponding analysis method is data envelopment analysis (DEA). The traditional DEA models include the CCR model [35] and BCC model [36]; the former is an efficiency model based on the constant return to scale (CRS) and the latter is an efficiency model based on the variable return to scale (VRS). The difference between the two assumptions is that the BCC model has a convex constraint to consider the difference of returns to scale. It was first applied to the efficiency evaluation of logistics enterprises [37], and then many scholars studied the research on the efficiency of the logistics industry in the derivative model of DEA (such as DEA-PCA, EBM-DEA, Fuzzy DEA, DEA-TOPSIS-LP, DEA-Malmquist model, etc.) [38][39]. DEA models can be divided into two categories, one is the general expected output model, the other is the model containing unexpected output, and the Super-SBM model considering unexpected output is more applied. It is mainly because in the actual social production, when people's physical needs are solved, it will also produce various side effects, such as wastewater, waste residue, waste gas and other pollutants. This unexpected output is what people want to avoid as much as possible, so the unexpected output model has gradually attracted the attention of relevant scholars.

2.3. Logistics Industry and Economy

The research on the relationship between the logistics industry and the economy has a long history. For example, Danuta [40] found that the inventory of logistics links can appropriately reflect the changes of regional economic development in the economic transition period. The research of many scholars has also shown that regional economy and logistics will affect each other and has shown a positive correlation [41].

At present, there are three main views on the relationship between logistics and the economy. First, it is believed that the economy drives the growth of logistics. Chen [42] and others believed that regional economic development is the reason for the growth of regional logistics. Zhang [43] used relevant theories to conclude that economic development promotes the development of logistics, and the development of logistics changes the growth mode of the regional economy. Li [44] and others found that rapid economic development vigorously promotes the development of logistics, but the role of modern logistics in promoting economic development is not significant in the primary stage. Taylor [45] pointed out that the growth of world trade means an increase in the demand for logistics services to provide goods. Ma [46] used the spatial Dobbin panel model to analyze the role of resource endowment and industrial structure in promoting the total factor productivity of the logistics industry. Based on the theory of system dynamics. Yang [47] and others analyzed the fact that the regional logistics industry is affected by factors such as regional industrial structure and regional residents' consumption level. Llanto et al. [48] studied the impact of ASEAN economic integration on the structure, behavior and performance of the logistics industry. Langvinienė et al. [49] analyzed the change and direction of the Lithuanian transport service industry under the background of European economic growth.

The second view is that logistics drive rapid economic growth. Pedersen [50] pointed out that logistics plays an important role in economic development. The research of Sánchez et al. [51] and Zaman et al. [52] found that different logistics performance levels have different effects on economic development. Zhou [53] used a logistic model to analyze the regional economic growth brought by the development of the regional logistics industry. Peng [54] proposed that the overall contribution of logistics capacity to economic growth is large. Fan [55] and others proved the positive spillover effect of logistics node facilities on economic growth based on the panel data of Haixi coastal port cities. Mateo-Mantecón [56] and others analyzed the impact of ports on the economy. The research results of Lee et al. [57] showed that port development is a means of promoting economic growth, trade and employment in South Africa. Sezer [58] and others believed that the logistics industry has made a great macro contribution to the national economy by creating employment opportunities, national income and foreign capital inflow. Tang et al. [59] analyzed the impact of international logistics performance on economic growth. Through elasticity analysis. Cui [60] and others found that the logistics industry has a significant positive significance in promoting GDP growth. Arya et al. [61] found that an efficient logistics system is the determinant of sustainable economic growth. The research of Saidi et al. [62] showed that transport and logistics infrastructure does contribute to the "attraction" of foreign direct investment and sustainable economic growth.

The third view is that logistics and economy are interdependent, coordinated and promoted to each other. For example, Shin et al. [63] believed that there are many direct and indirect links between the logistics sector,

economic growth and development. Xu [64] analyzed the significant correlation between the regional economy and regional logistics. Reza [65] used Indonesian data to analyze the two-way impact between logistics and economy, and Kuzu et al. [66] analyzed the two-way relationship between logistics and economy using Turkish data. Liu [67] and others verified the two-way interactive relationship between regional logistics and regional economy by using the Granger causality test. Liang et al. [68] analyzed the interactive relationship between regional economy and regional logistics and constructed a dynamic coupling model between them. Kong [69] and others used the grey system theory to analyze the correlation and coordination between modern logistics and rural economic development. Hanif et al. [70] analyzed the interaction between logistics and regions by using the VAR model. Song [71] constructed a coordination evaluation model between China's regional logistics industry and economic development based on the entropy method and composite system model. With the development of logistics and the economy, we need to pay attention to the indicators of sustainable development, such as ecological benefits [61]. How to balance the sustainability of logistics, economy and the environment needs to be further studied.

The research method on the relationship between the logistics industry and economy has changed from qualitative analysis to quantitative research. At present, the main quantitative methods used are the vector autoregressive model, the Haken model, grey correlation analysis, the compound system synergy model, the system dynamics model, the coupled coordination model [72], etc. Among them, the coupled coordination model has been recognized by many scholars, including the perspective of spatio-temporal differences in the coupled and coordinated development of logistics and economy in provinces, and the perspective of studying the coupled and coordinated relationship between economy and logistics in an economic belt or economic region [73][74].

To summarize, the interaction between economy and logistics is the focus of scholars' continuous attention, but there are some deficiencies: there is a lack of a study on the coupling and coordinated development of the two under the background of high-quality development. Most of them take the single development index of economy or logistics as the variable of model construction and do not consider the requirements of high-quality development in the system, and they are rarely evaluated as a system before coupling and coordinated analysis. At the same time, there is little analysis on the relationship between the coupling and coordination of the two industries and other factors.

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