ISRG Journal of Economics, Business & Management (ISRGJEBM)

ISRG PUBLISHERS

Abbreviated Key Title: Isrg J Econ Bus Manag

ISSN: 2584-0916 (Online)

Journal homepage: https://isrgpublishers.com/isrgjebm/

Volume – IV Issue - II (March-April) 2026

Frequency: Bimonthly

Study on the Coordinated Development of New Productive Forces and the Logistics Industry in Panzhihua

WU Jinpu[1*], MA Guangxia[1]

[1] Panzhihua University, Panzhihua 617000, China

| **Received:** 01.03.2026 | **Accepted:** 05.03.2026 | **Published:** 15.03.2026

***Corresponding author:** WU Jinpu

Abstract

New quality productivity drives high-quality development with high technology and high efficiency. As a basic industry, the high-quality development of the logistics industry is crucial to regional economies. Studying the coordinated development of new quality productivity and the logistics industry is of great significance for promoting the high-quality development of the logistics industry and cultivating new quality productivity. This paper takes Panzhihua City as the research object and explores the coordinated development of new quality productivity and the logistics industry from 2018 to 2022. By constructing an evaluation index system for their coordinated development and using methods such as the entropy value method and the coupling coordination degree model, an empirical analysis of their coordinated development is conducted. The research results show that: (1) During the research period, the comprehensive development level of new quality productivity increased from 0.445 to 0.579; the comprehensive development level of the logistics industry rose year by year, from 0.208 to 0.838. (2) The coupling degree of the two systems has always been at a high level of coupling, and the coupling coordination degree rose from 0.552 to 0.838, leaping from a barely coordinated stage to a well-coordinated stage. This indicates that the coordination degree between the two is trending towards being good and a benign interactive coordinated development pattern has gradually formed. This study can provide empirical evidence and policy references for promoting the coordinated development of new quality productivity and the logistics industry in Panzhihua City.

Keywords: New Quality Productivity, Logistics Industry, Coordinated Development, Coupling Coordination Model.

INTRODUCTION

Faced with major challenges such as the new round of technological revolution and industrial transformation, intensified competition among major powers, and the transformation of China's economic development mode, General Secretary Xi Jinping first proposed the strategy of "accelerating the formation of new quality productivity and enhancing new drivers of development" at the Symposium on Promoting the Comprehensive Revitalization of Northeast China in the New Era in September 2023[1]. In January 2024, during the 11th collective study session of the Political Bureau of the Communist Party of China Central Committee, General Secretary Xi Jinping emphasized: "Developing new quality productivity is an inherent requirement and important focal point for promoting high-quality

DOI: 10.5281/zenodo.19029038

development"[2]. The cultivation of logistics new quality productivity requires driving management innovation, model innovation and institutional innovation through technological innovation, promoting the transformation of the logistics development model from price competition to value competition, exploring new paths for cost reduction and efficiency improvement in the logistics industry, and injecting strong impetus into the high-quality development of modern logistics[4]. Against this backdrop, researching the coordinated development of new quality productivity and the logistics industry holds significant theoretical and practical value.

Therefore, this paper takes Panzhihua City as the research object to analyze the current status of the coordinated development between its new quality productivity and the logistics industry. The entropy weight method is adopted to determine the weight of each indicator, and the coupling degree model and coupling coordination degree model are applied to analyze the coupling and coordination relationship between new quality productivity and the logistics industry. Subsequently, the obstacle degree model is used to identify the main factors affecting their coordinated development. From the perspective of adapting to local conditions, this paper proposes to advance the high-quality development of the logistics industry by virtue of new quality productivity, and at the same time give play to the supporting role of the logistics industry to boost the sustainable growth of new quality productivity, thus providing certain decision-making references for the development of the logistics industry in Panzhihua City.

RESEARCH STATUS

At present, scholarly research on new quality productivity and the logistics industry has mostly focused on the national level or large regional scales such as the Yangtze River Economic Belt and the three northeastern provinces, while relevant studies targeting individual cities remain relatively scarce. Furthermore, most existing literatures only explore the one-way impact of new quality productivity on the logistics industry, whereas studies on their coordinated development are comparatively limited. Therefore, based on the Synergetic Development Theory, this paper adopts the Entropy Weight Method to determine indicator weights, and employs the Coupling Degree Model, Coupling Coordination Degree Model and Obstacle Degree Model to analyze the level of coordinated development between new quality productivity and the logistics industry in Panzhihua City from 2018 to 2022. By revealing the interaction mechanism and influence paths between the two, this paper intends to provide a scientific basis for Panzhihua City to formulate policies for coordinated development, promote the sustainable and high-quality development of the logistics industry by virtue of new quality productivity, boost the accelerated formation of new quality productivity at the same time, and ultimately achieve positive interaction and synergistic progress between them.

CURRENT STATUS ANALYSIS

Analysis of the development status of new quality productivity in panzhihua city

As a resource-based city, Panzhihua City has exhibited distinct characteristics in terms of investment in scientific and technological innovation and the development of innovation entities during the process of transforming to new quality productivity. Relevant data from the Panzhihua Statistical Yearbook for the period 2018-2022 are selected for an in-depth analysis herein. The investment soared from 144 million yuan in 2018 to 1.473 billion yuan in 2022, with an average annual growth rate of 78.9%. This fully reflects Panzhihua City's high attention to scientific and technological innovation work, and the sustained and large-scale financial investment has effectively promoted the improvement of regional scientific and technological innovation capacity and the optimization and upgrading of the industrial structure.

Overall, the development of new quality productivity in Panzhihua City has achieved preliminary results. However, it still faces challenges such as insufficient sustainability of R&D investment, the suboptimal structure of innovation entities, low transformation rate of scientific and technological achievements, and shortage of high-tech talents. In the future, focus should be placed on these issues to formulate practical and feasible policies and measures, so as to realize leapfrog development toward new quality productivity.

Analysis of the development status of the logistics industry in panzhihua city

As an important hub city at the junction of Sichuan and Yunnan, the logistics industry in Panzhihua City occupies a significant position in the regional economy. Relevant data from the Panzhihua Statistical Yearbook and the Statistical Bulletin of National Economic and Social Development of Panzhihua City for 2018–2022 are selected to analyze the development status of the city’s logistics industry. The gross output value of the logistics industry in Panzhihua City exhibited a “rise–fall–rise” trend from 2018 to 2022. In 2019, the gross output value of the logistics industry in Panzhihua City exceeded 4 billion yuan, with a year-on-year growth rate of 4.08%, which reflected the sound development of the city’s logistics market to a certain extent. After 2020, global lockdown measures led to supply chain disruptions and declining consumer demand, which severely affected the entire logistics sector. By the end of 2022, the logistics industry in Panzhihua City had recovered to a relatively stable development level.

In recent years, the logistics industry in Panzhihua City has maintained a sound development momentum. Nevertheless, the industry still faces problems such as inadequate supporting infrastructure, unreasonable transportation structure, and low level of informatization. For the future, to promote the high-quality development of the logistics industry in Panzhihua City, key breakthroughs need to be made in multiple dimensions.

Based on the above analysis of the current status of coordinated development between new quality productivity and the logistics industry in Panzhihua City, it is necessary to construct a scientific and rational evaluation index system to scientifically assess the level of coordinated development of the two systems. In the process of constructing the index system, this paper comprehensively considers the applicability of systematic evaluation methods and strictly selects indicators in accordance with the basic principles of objectivity, comparability, accessibility and relevance. The establishment of this evaluation system will provide a scientific basis for subsequent in-depth research and help to systematically grasp the internal mechanism and optimization paths of the coordinated development of the two systems.

CONSTRUCTION OF THE EVALUATION INDEX SYSTEM

DOI: 10.5281/zenodo.19029038

Construction Of The Evaluation Index System For New Quality Productivity

Based on the connotation and characteristics of new quality productivity, referring to the research methods of scholars such as Wang Meiying [5] (2025) and Xie Qianyi [6] (2025), and considering the difficulty of data acquisition, this paper constructs a comprehensive evaluation index system for new quality productivity from three dimensions, namely new quality laborers, new quality objects of labor, and new quality means of labor, as shown in Table 1.

Table 1 Comprehensive Evaluation Index System for New Quality Productivity.

Criterion Layer	Indicator Layer	Unit	Attribute	Number
New Quality Laborers	Fiscal Expenditure on Science and Technology	10k Yuan	+	A1
	Ratio of Education Expenditure to Total Fiscal Expenditure	%	+	A2
	Number of Students Enrolled in Institutions of Higher Education	Person	+	A3
	Per Capita GDP	Yuan	+	A4
	Average Wage of On-the-Job Employees	Yuan	+	A5
	Ratio of Employment in Tertiary Industry to Total Employment	%	+	A6
	Number of R&D Personnel	Person	+	A7
				A8
New-type Objects of Labor	Number of Enterprises with R&D Institutions	Unit	+	A9
	Number of Enterprises with R&D Activities	Unit	+	A10
	Ratio of Environmental Protection Expenditure to Government Public Fiscal Expenditure	%	+	A11
	Ratio of Industrial Waste Water Discharge to GDP	%	−	A12
	Ratio of Industrial Waste Gas Emissions to GDP	%	−	A13
New-type Means of Labor	Mobile Phone Users	10k Households	+	A14
	Number of Patent Applications	Piece	+	A15
	Full-time Equivalent of R&D Personnel in Industrial Enterprises above Designated Size	Person-years	+	A16
	R&D Investment	10k Yuan	+	A17
	Expenditure on Technical Transformation	10k Yuan	+	A18
	Ratio of Internal R&D Expenditure to Main Business Income	%	+	A19

Establishment of Logistics Industry Indicator System

By reviewing relevant literature and based on the research findings of scholars such as Dai Deyi [3] (2025) and Tang Genli [8] (2025), this paper constructs a comprehensive evaluation indicator system for the logistics industry from three dimensions: economic development level, logistics infrastructure and logistics development scale, as detailed in Table 2.

Table 2 Comprehensive Evaluation Indicator System of the Logistics Industry

Criterion Layer	Indicator Layer	Unit	Attribute	Number
Economic Development Level	Gross Regional Product (GRP)	100 million yuan 100 million yuan	+	B1
	Total Retail Sales of Consumer Goods	100 million yuan	+	B2
	Total Import and Export Volume	100 million yuan	+	B3
	Operating Income of Industrial Enterprises above Designated Size		+	B4
Logistics	Mileage of Classified Highways	Km	+	B5

DOI: 10.5281/zenodo.19029038

Infrastructure	Total Mileage of Expressways	Km	+	B6
	Number of Post Offices	Units	+	B7
	Logistics and Storage Land	sq. km	+	B8
	Possession of Civil Vehicles	vehicles	+	B9
	Growth Rate of Fixed-asset Investment in Transport, Storage and Postal Services	%	+	B10
Logistics Development Scale	Mileage of Classified Highways	100 million ton-kilometers	+	B11
	Total Mileage of Expressways	10 thousand tons 10 thousand tons	+	B12
	Number of Post Offices	10 thousand pieces	+	B13
	Logistics and Storage Land	10 thousand yuan	+	B14
	Possession of Civil Vehicles	100 million yuan	+	B15
			+	B16

Evaluation and Analysis on the Collaborative Development of New Quality Productive Forces and the Logistics Industry

Model Construction

1. Entropy Method

The entropy method, as an objective weighting method, can objectively and truly reflect the information implied in the indicator data, and using it to calculate the weight of each indicator can provide a basis for comprehensive evaluation [10].

(1) Standardization processing. because the original data of each indicator have different calculation units and dimensions. Therefore, the improved range method is used to standardize and normalize the indicator data, so that the processed values are between [0.001, 0.991] [7].

$$Y_{ij} = \begin{cases} \frac{X_{ij}-min(X_{ij})}{max(X_{ij})-min(X_{ij})} \times 0.99 + 0.0001, Positive\ Indicators \\ \frac{max(X_{ij})-X_{ij}}{max(X_{ij})-min(X_{ij})} \times 0.99 + 0.0001, Negative\ Indicators \end{cases} \quad (5.1$$

i=1,2,3,…,m;j=1,2,3,…,n.

In Formula (5.1),Xij is the original value of the j-th indicator in the i-th year;min(xij) and max(xij) refer to the minimum and maximum values of the j-th indicator, respectively;Yij represents the data after standardization.

(2) Calculate the proportion of the j-th indicator in the i-th year.

$$T_{ij} = Y_{ij} \div \sum_{i=1}^{m} Y_{ij} \quad (5.2)$$

(3) Calculate the information entropy of the j-th indicator.

$$e_j = -k \sum_{i=1}^{m} (T_{ij} \times lnT_{ij}) \quad (5.3)$$

In Equation (5.3),$k = \frac{1}{\ln m}$,then $e_j \in [0,1]$, and when Tij=0,let $T_{ij} \times \ln T_{ij} = 0$.

(4) Calculate the redundancy of information entropy.

$$d_j = 1 - e_j \quad (5.4)$$

(5) Calculate the indicator weight.

$$w_j = \frac{d_j}{\sum_{j=1}^{n} d_j} \quad (5.5)$$

In Equations (5.1)–(5.5), m is the total number of evaluated years, and n is the total number of indicators.

(6) Calculate the comprehensive development level of the subsystem using the comprehensive evaluation method.

$$M = \sum_{i=1}^{n} (Y_{ij} \times w_j) \quad (5.6)$$

In Equation (5.6), M represents the comprehensive development level index of new-quality productive forces or the logistics industry; Yij denotes the standardized result of each indicator; and wj refers to the weight of each indicator in the system of new-quality productive forces or the logistics industry.

2. Coupling Degree Model

The coupling degree model is a method in physics used to measure the coordination degree of motion among two or more objects or systems. It can intuitively and concisely present the intensity of interaction between two systems in a digital form and is a widely applied research method [9].

To understand the interaction between new-quality productive forces and the logistics industry in Panzhihua, a coupling degree model is constructed, with the formula as follows:

$$C = 2\sqrt{\frac{M_1 \times M_2}{(M_1+M_2)^2}} \quad (5.7)$$

In Equation (5.7), represents the comprehensive development level index of new-quality productive forces; C stands for the coupling degree.

The closer the value of C is to 1, the better the coupling degree between new-quality productive forces and the logistics industry; otherwise, the worse the coupling degree. The division of coupling degree grade intervals is shown in Table 3.

Table 3 Division of Coupling Degree Grade Intervals

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Coupling degree	Types of Coupling Degree States
0＜C≤0.3	Low-level coupling
0.3＜C≤0.6	Antagonistic coupling
0.6＜C≤0.8	Running-in coupling
0.8＜C≤0.9	Preliminary coupling
0.9＜C≤1.0	High-level coupling

3. Coupling Coordination Degree Model

The coupling degree can only indicate whether there is interaction between subsystems and the intensity of their interaction; it cannot reflect the level of coordination, nor can it reveal the presence of benign interaction and coordinated development between systems. Therefore, to better evaluate the coordination and development status between the two systems, the coupling coordination degree of the two is further calculated. The calculation formula is as follows:

$$G = \propto M_1 + \beta M_2 \quad (5.8)$$

$$D = \sqrt{C \times T} \quad (5.9)$$

In Equations (5.8) and (5.9),G represents the comprehensive coordination index of new-quality productive forces and the logistics industry;αandβare undetermined coefficients. This study holds that the new-quality productive forces system and the logistics industry system are equally important, soα=β=0.5 is determined；D is the coupling coordination degree. The larger its value, the higher the coupling coordination degree between the two systems and the stronger the interaction. The division of coupling coordination degree grade intervals is shown in Table 4.

Table 4 Division of Coupling Coordination Degree Grade Intervals

Coupling coordination degree	Development types	Coupling coordination degree	Development types
0≤D＜0.1	Extreme imbalance	0.5≤D＜0.6	Reluctant coordination
0.1≤D＜0.2	Severe imbalance	0.6≤D＜0.7	Primary coordination
0.2≤D＜0.3	Moderate imbalance	0.7≤D＜0.8	Intermediate coordination
0.3≤D＜0.4	Mild imbalance	0.8≤D＜0.9	Good coordination
0.4≤D＜0.5	Near imbalance	0.9≤D≤1.0	High-quality coordination

4. Barrier Degree Model

To further analyze the barrier factors affecting the coordinated development of new-quality productive forces and the logistics industry in Panzhihua City, intuitively observe the main obstacles in the coordinated development, and clarify the direction of future improvement, the barrier degree model is specially introduced as follows:

$$F_j = w_j \quad (5.10)$$

$$I_j = 1 - Y_{ij} \quad (5.11)$$

$$Q_{ij} = \frac{F_j \times I_j}{\sum_{j=1}^{n}(F_j \times I_j)} \times 100\% \quad (5.12)$$

In Equations (5.10), (5.11), and (5.12),w_j is the weight of the j-th indicator,Y_{ij} is its standardized value. F_j is the factor contribution degree,I_j is the indicator deviation degree, Q_{ij} is the barrier degree. The larger its value, the higher the barrier degree of indicator j to the coordinated development of the two systems; on the contrary, the lower the barrier degree.

Data Sources

All data used in this study are derived from the public statistical data of the Panzhihua Statistical Yearbook and the Statistical Communique of the National Economic and Social Development of Panzhihua City from 2018 to 2022. All data have undergone strict screening and verification to ensure the accuracy and reliability of the research data.

Result Analysis

1. Index System and Weight Analysis

Based on the relevant data of each indicator of new-quality productive forces and the logistics industry, and in accordance with the calculation steps of the entropy method, Excel spreadsheets are used for calculation. The weights of each indicator of new-quality productive forces and the logistics industry in Panzhihua City from 2018 to 2022 can be obtained, as shown in Table 5.

Table 5 Table 5 Weights of Each Indicator of New Quality Productive Forces and Logistics Industry in Panzhihua City from 2018 to 2022

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New quality productive forces			logistics industry		
Criterion Layer	Indicator Layer	Weight	Criterion Layer	Indicator Layer	Weight
New Quality Laborers (0.378)	A1	0.057	Economic Development Level (0.413)	B1	0.060
	A2	0.113		B2	0.063
	A3	0.063		B3	0.136
	A4	0.046		B4	0.060
	A5	0.048			
	A6	0.060			
	A7	0.052			
New Quality Labor Objects (0.352)	A8	0.056	Logistics Infrastructure (0.314)	B5	0.044
	A9	0.052		B6	0.086
	A10	0.048		B7	0.037
	A11	0.050		B8	0.086
	A12	0.087		B9	0.053
				B10	0.059
New Quality Means of Labor (0.270)	A13	0.061	Logistics Development Scale (0.273)	B11	0.045
	A14	0.036		B12	0.041
	A15	0.036		B13	0.055
	A16	0.031		B14	0.055
	A17	0.068		B15	0.054
	A18	0.037		B16	0.067

Based on the data in Table 5, the proportion of education expenditure in total fiscal expenditure is the largest, indicating that education investment is the key to cultivating high-skilled labor and improving scientific and technological innovation capabilities. Among the indicators of new quality labor objects, the industrial waste gas emissions/GDP has the largest proportion, highlighting the importance of ecological environment quality to modern production activities and reflecting the imminent need for green and low-carbon transformation. Among the indicators of new quality means of labor, the expenditure on technological transformation funds has the largest proportion, indicating that the upgrading of digital and intelligent production tools relies on technological research and development investment, which is the material support for achieving "hard technology" breakthroughs. Therefore, the development of new quality productive forces needs to take education investment as the talent foundation, green development as the constraint condition, and technological innovation as the tool guarantee.

1. Analysis on Comprehensive Development Level of New Quality Productive Forces and Logistics Industry

Based on Equation (5.6), the comprehensive development level index of new quality productive forces and the comprehensive development level index of the logistics industry are calculated respectively, and a trend chart of their comprehensive development levels is drawn, as shown in Figure 1.

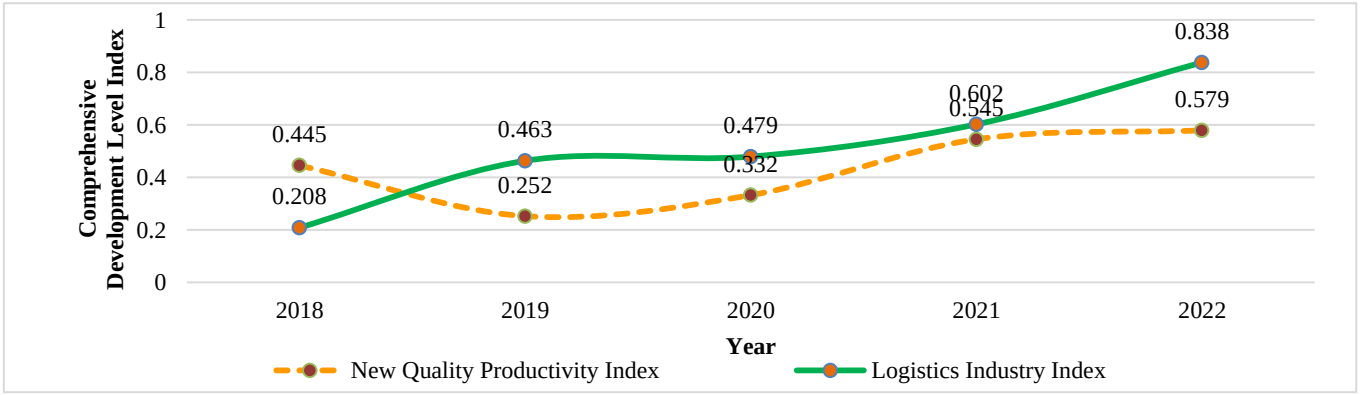

Figure 1 Trend Chart of Comprehensive Development Level of New Quality Productive Forces and Logistics Industry in Panzhihua City from 2018 to 2022

It can be seen from Figure 1 that the comprehensive development level index of new quality productive forces and the comprehensive development level index of the logistics industry in Panzhihua City showed an overall upward trend from 2018 to 2022, indicating that both achieved sound development during the research period.

The comprehensive development level index of new quality productive forces rose from 0.445 in 2018 to 0.579 in 2022. From 2018 to 2019, the index dropped from 0.445 to 0.252, which may

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be related to factors such as a substantial reduction in R&D investment, shrinkage of innovative entities, and loss of high-end talents. However, the growth rate slowed down from 2021 to 2022, due to the continuous impact of the COVID-19 pandemic on R&D activities, which slowed down the improvement speed of new quality productive forces.

The comprehensive development level index of the logistics industry continued to climb from 0.208 in 2018 to 0.838 in 2022, indicating a strong momentum of high-quality development of the logistics industry during the research period. In terms of infrastructure construction, the total mileage of expressways in the city increased from 195 kilometers to 233 kilometers in 2020, reducing logistics costs. From 2020 to 2022, under the guidance of post-pandemic economic recovery policies and the 14th Five-Year Plan for Modern Logistics Development, the comprehensive development level of the logistics industry accelerated, and the logistics industry returned to an upward track.

2. Analysis on the Coordinated Development of New Quality Productive Forces and Logistics Industry

Based on Equations (5.7-5.9), the coupling degree and coupling coordination degree results of the two systems in Panzhihua City are calculated, and the following results are obtained according to the division of grade intervals, as shown in Table 6.

Table 6 Coupling Degree and Coupling Coordination Degree of New Quality Productive Forces and Logistics Industry in Panzhihua City from 2018 to 2022

Year	Coupling Degree	Grade	Coupling Coordination Degree	Grade
2018	0.932	High-level Coupling	0.552	Reluctant Coordination
2019	0.955	High-level Coupling	0.584	Reluctant Coordination
2020	0.983	High-level Coupling	0.632	Primary Coordination
2021	0.999	High-level Coupling	0.757	Intermediate Coordination
2022	0.983	High-level Coupling	0.835	Good Coordination

It can be seen from Table 6 that the coupling degree had little overall fluctuation, increasing year by year from 0.932 in 2018 to 0.983 in 2022, reflecting that the interactive relationship between new quality productive forces and the logistics industry is becoming increasingly close and mature. This continuously optimized evolution trajectory indicates that with the passage of time, the synergistic effect between new quality productive forces and the logistics industry in Panzhihua City has been continuously enhanced, and a pattern of benign interaction between systems is accelerating its formation.

As shown in Figure 2, both the coupling degree and coupling coordination degree of the two systems showed a steady upward and year-by-year converging development trend, reflecting the continuous enhancement of their coordinated development level. This change is not only driven by the dual impetus of the national innovation-driven development strategy and the logistics industry transformation and upgrading policy, but also stems from the construction of Panzhihua City's localized policy system. The Panzhihua City Industrial Strong City Strategic Science and Technology Support Action Plan issued in 2019 takes scientific and technological innovation as the core driving force, focuses on the development of high-tech industries, helps the transformation and upgrading of leading industries and the rapid development of emerging industries, and promotes high-quality economic development. The Panzhihua City 14th Five-Year Plan for Modern Logistics Industry Development in 2021 clearly defined "logistics + technology" as the development direction and constructed an intelligent and digital modern logistics service system. The introduction and implementation of this series of policies not only promoted the respective development of the two major industries, but also improved the coordinated development between systems through policy synergy, realizing the continuous optimization of coupling coordination degree and the high-quality development of regional economy.

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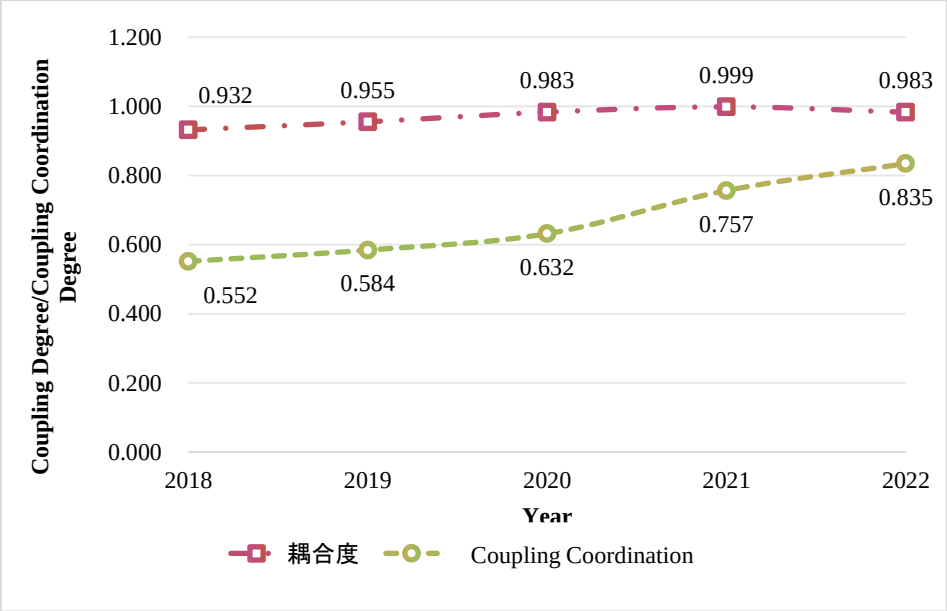

Figure 2 Trend Chart of Coordinated Development between New Quality Productive Forces and Logistics Industry in Panzhihua City from 2018 to 2022

3. Analysis of Barrier Factors in the Coordinated Development of New Quality Productive Forces and Logistics Industry

It can be seen from **Error! Reference source not found.** that the barrier degrees of logistics infrastructure, new quality labor objects, new quality means of labor and logistics development scale show a steady upward trend, while the barrier degrees of economic development level and new quality laborers show a fluctuating downward trend. By observing the barrier degrees of the six criterion layers in 2022, it can be found that to promote the benign coordinated development of new quality productive forces and the logistics industry in Panzhihua City, it is necessary to focus on the construction of logistics infrastructure and the optimization of new quality laborers in the future.

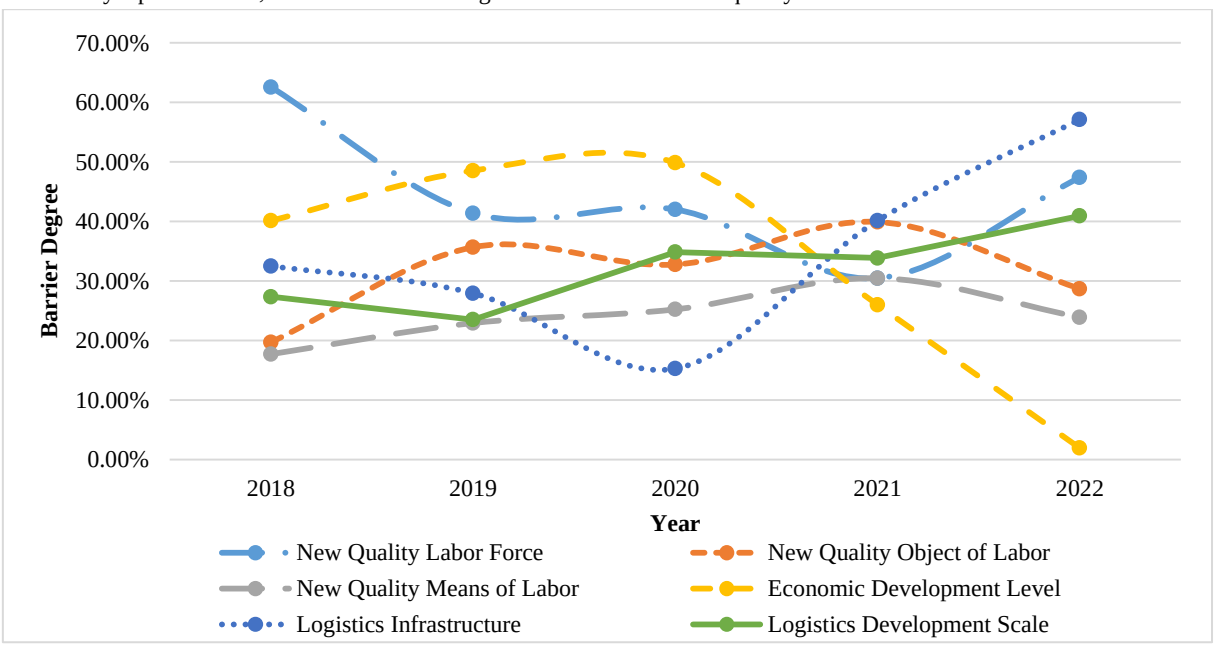

Figure 3 Situation of Barrier Degrees of Primary Indicators for Coordinated Development between New Quality Productive Forces and Logistics Industry in Panzhihua City from 2018 to 2022

After completing the barrier degree analysis of the criterion layer, the barrier degrees of each indicator in the indicator layer for the coordinated development of new quality productive forces and the logistics industry in Panzhihua City are further calculated, and the top ten barrier factors are selected, as shown in Table 7.

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Table 7 Ranking of Barrier Factors for Coordinated Development between New Quality Productive Forces and Logistics Industry in Panzhihua City from 2018 to 2022

Year	Order	1	2	3	4	5	6	7	8	9	10
2018	Obstacle Factors	A2	A6	B3	A3	A17	A5	A8	A4	A9	B6
	Obstacle Degree（%）	18.5	10.82	10.69	10.33	9.27	8.66	8.43	8.3	6.93	6.81
2019	Obstacle Factors	A2	A12	A17	A8	A6	A7/A9	B3	A11	A13	A3
	Obstacle Degree（%）	11.98	10.6	9.08	7.48	7.37	6.95	6.9	6.68	5.59	5.54
2020	Obstacle Factors	A2	A12	A3	A17	A13	B3	A11	A9	A7	A10
	Obstacle Degree（%）	16.9	13.01	9.42	9.17	9.12	7.08	6.21	4.94	4.59	4.37
2021	Obstacle Factors	A12	A13	A1	A7	A8	A14	A9	A10	A18	A15
	Obstacle Degree（%）	14.96	11.58	11.52	9.45	8.22	7.89	7.84	7.43	4.46	3.73
2022	Obstacle Factors	A2	A12	A1	A10	A18	A13	A6	A14	A16	B8
	Obstacle Degree（%）	25.97	16.96	13.51	11.38	8.77	8.53	7.41	4.75	1.62	1.4

From the perspective of the obstacle degree of each indicator, the ratio of educational expenditure to total fiscal expenditure, fiscal expenditure on science and technology, the ratio of industrial waste gas emissions to GDP, and the total mileage of expressways were the key factors hindering the coordinated development of new quality productive forces and the logistics industry in Panzhihua City from 2018 to 2022. This indicates that the three criterion layers—new quality laborers, new quality labor objects, and logistics infrastructure—had the strongest restrictive effects. Based on this, efforts can be made in these three aspects in the follow-up to formulate practical and feasible strategies, so as to promote the sound and coordinated development of new quality productive forces and the logistics industry in Panzhihua City.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Based on the relevant panel data of Panzhihua City from 2018 to 2022, this study examines the coordinated development of new quality productive forces and the logistics industry. The analysis focuses on the comprehensive development level index, coupling degree, coupling coordination degree, and obstacle degree of the two systems. The main conclusions are as follows:

i. In terms of the comprehensive development level index, the indices for both new quality productive forces and the logistics industry in Panzhihua City increased annually from 2018 to 2022. However, the comprehensive development level of new quality productive forces was relatively low and lagged behind that of the logistics industry. In contrast, the logistics industry developed more rapidly, with its index rising from 0.208 to 0.838, representing an average annual growth rate of 41.60%. This reflects that the logistics industry, as a fundamental supporting industry, took the lead in development and laid a foundation for fostering new quality productive forces.

ii. Regarding the coupling degree, the coupling degree between the two systems remained above 0.9 at a high level from 2018 to 2022, indicating a high-level coupling type. The overall fluctuation was minor, with the coupling degree increasing from 0.932 in 2018 to 0.983 in 2022, at an average annual growth rate of 1.34%. This demonstrates that the interactive relationship between the two systems has become increasingly close and mature

iii. From the perspective of coupling coordination degree, the value improved year by year during 2018–2022, rising from barely coordinated (0.552) in 2018 to well-coordinated (0.835) in 2022, with an average annual growth rate of 10.90%. Especially after 2020, the coupling coordination degree accelerated, reflecting continuous improvement in the quality of coordinated development and the strengthening of the benign interactive relationship between the two systems.

iv. In terms of obstacle degree, the main factors hindering the coordinated development of the two systems from 2018 to 2022 included the ratio of educational expenditure to total fiscal expenditure, fiscal expenditure on science and technology, the ratio of industrial waste gas emissions to GDP, and total expressway mileage.

Suggestions

(I) Strengthen the Construction of Logistics Infrastructure and Promote Regional Connectivity

Logistics infrastructure is the foundation for the development of the logistics industry. As a regional central city in southwestern Sichuan and northwestern Yunnan, Panzhihua should give play to its regional advantages, accelerate the access of special railway lines to industrial parks and enterprises, promote the capacity expansion and reconstruction of the Chengdu-Kunming Railway and the construction of the Yibin-Xichang-Panzhihua High-speed Railway, and strengthen the connection of freight corridors with hub cities such as Chengdu and Kunming. It is necessary to build an intelligent logistics hub and use technologies such as the Internet of Things and blockchain to realize full-process visualization and intelligent scheduling of goods, so as to reduce transit costs.

(II) Strengthen the Training of High-Tech Talents and Innovate Employment Policies

Talent training is the core driving force for the innovative development of the logistics industry. At present, the logistics industry in Panzhihua is in a critical period of transformation and upgrading, and there is an urgent demand for high-end compound

DOI: 10.5281/zenodo.19029038

logistics talents. Therefore, it is necessary to deepen the integrated cooperation of "industry-university-research-application", promote the collaboration between universities such as Panzhihua University and local logistics enterprises, and cultivate targeted talents. Meanwhile, enterprises should rely on modern teaching resources to help employees grow into compound logistics talents. In addition, the government should introduce policies such as talent subsidies and housing support to attract high-level talents from other regions and encourage the development of local talents, so as to provide intellectual support for the high-quality development of the logistics industry.

(III) Practice the Concept of Green Development and Achieve Sustainable Development

As a basic industry, the green and low-carbon transformation of the logistics industry is the key to high-quality development. As a resource-based industrial city, Panzhihua should integrate the green concept into the whole process of the transformation and upgrading of the logistics industry. It is essential to promote the construction of green warehousing facilities, adopt energy-saving materials and intelligent management systems, and reduce energy consumption and carbon emissions. Meanwhile, the government should introduce incentive policies, such as financial subsidies and tax preferences, to support logistics enterprises in increasing investment in green facilities and environmental protection equipment. It can also cooperate with research institutes to carry out research and development of new energy technologies, break through the bottleneck of high-energy-consuming transportation, and promote the sustainable development of the logistics industry.

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DOI: 10.5281/zenodo.19029038