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Empirical Analysis of the Factors Affecting the High-quality Development of the Logistics Industry

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Abstract

This paper selects China from 2006-2023 panel data, with cargo quantity as explained variable to measure the logistics industry development level, and the social logistics total cost as a proportion of GDP, the first industry output value, the second industry output, the tertiary industry, total retail sales of social consumer goods and total import and export as the main explanatory factors, establish multiple linear regression model, the development of China's logistics industry high quality impact factors empirical analysis, and combined with the present situation of China's logistics industry development and influence factors concluded and put forward Suggestions.

Keywords

Logistics industry, High-quality development, Multiple linear regression.

1. Introduction

With the development of economic globalization and global service economy, as an emerging service sector, logistics industry is rising rapidly in the global scope. Scale and network economy have become an important trend in the development of global logistics industry. As China's strategic basic industry, the logistics industry includes road transportation, storage industry, information industry and other industries. With the continuous growth of China's economy, the development speed and professional level of the logistics industry are also constantly improving, the infrastructure conditions and policy environment have been significantly improved, and the initial formation of the modern industrial system, making the logistics industry has become an important part of the national economy. In this case, it is particularly important to study the high-quality development of the logistics industry. Through the research of the logistics industry, promote the high-quality, sustainable and healthy development of the logistics industry, so as to drive the economic development.

2. Design of Measurement Model of Influencing Factors of High-quality Development of Logistics Industry

2.1. Selection of measurement indicators

Through the investigation and study of the logistics industry, and the related field of literature reading and the preliminary scholars study full reference, this paper will be identified as cargo transport explanatory variables, and choose the social logistics total cost of the proportion of GDP, the first industry, the second industry output, the third industry output, total retail sales

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of social consumer goods and total import and export six variables identified as explanatory variables.

On this basis, the indicators of each stage of China from 2006 to 2023 were selected as the research object, and combined into panel data, so as to clearly reflect the impact of various factors on the high-quality development of China's logistics industry.

Table 1. Selected economic indicators

Economic indicator	Brief description
Volume of transport	The total amount of goods delivered by a certain mode of transport (such as land, sea, air, etc.) over a specific period of time.
The proportion of the total social logistics cost in GDP	An important indicator to measure the efficiency of logistics and economic activity in a country or region
Primary industry output value	The total output value of a country or region obtained from the natural resources such as agriculture, forestry, animal husbandry or fishery
Second industry output value	The total output value of a country or region derived from processing and production activities such as manufacturing or construction industry
Third industry output value	The total output value of a country or region derived from the service sector (such as retail, finance, education, health care, etc.)
Total retail sales of social consumer goods	The total value of various consumer goods sold in a retail industry in a country or region at a given time.
total export-import volume	The total value of all imported and exported goods of a country or region within a specific time frame

2.2. Model establishment

Through the 2006-2023 the main economic data collection, set as the cargo transport explanatory variable Y, the total cost of social logistics GDP as the explanatory variable X1, the first industry output value set as the explanatory variable X2, the second industry output value set as the explanatory variable X3, the third industry output value as the explanatory variable X4, the total retail sales of social consumer goods is set as the explanatory variable X5, total import and export is set as the explanatory variable X6, build multiple linear regression equation:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon \quad (1)$$

Where, ε is the random error term, $\varepsilon \in (0, \sigma^2)$.

3. Data Sources

3.1. Source and summary of the data

This paper takes the influencing factors of the high-quality development of logistics in China, and selects the relevant data from 2006 to 2023 for analysis, and the data are from the National Statistical Yearbook.

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Table 2. China's 2006-2023 logistics demand economic indicators data table

Year	Freight transport quantity (ten thousand tons)	The proportion of total social logistics expenses in GDP is (%)	Output value of the primary industry (RMB 100 million yuan)	Output value of the secondary industry (100 million yuan)	Output value of the tertiary industry (RMB 100 million yuan)	Total retail sales of social consumer goods (RMB 100 million yuan)	Total import and export volume (RMB 100 million yuan)
2006	2037060	18.30	23,317.00	104,361.80	91,759.70	76,827.20	140,975
2007	2275822	18.40	27,674.10	126,633.60	115,784.60	90,638.40	166,924
2008	2585937	18.10	32,464.10	149,956.60	136,823.90	110,994.60	179,921
2009	2825222	18.10	33,583.80	160,171.70	154,762.20	128,331.30	150,648
2010	3241807	17.80	38,430.80	191,629.80	182,058.60	152,083.10	201,722
2011	3696961	17.80	44,781.40	227,038.80	216,120.00	179,803.80	236,402
2012	4100436	18.00	49,084.50	244,643.30	244,852.20	205,517.30	244,160
2013	4098900	18.00	53,028.10	261,956.10	277,979.10	232,252.60	258,169
2014	4167296	16.60	55,626.30	277,282.80	310,654.00	259,487.30	264,242
2015	4175886	16.00	57,774.60	281,338.90	349,744.70	286,587.80	245,503
2016	4386763	14.90	60,139.20	295,427.80	390,828.10	315,806.20	243,386
2017	4804850	14.60	62,099.50	331,580.50	438,355.90	347,326.70	278,099
2018	5152732	14.77	64,745.20	364,835.20	489,700.80	377,783.10	305,010
2019	4713624	14.70	70,473.60	380,670.60	535,371.00	408,017.20	315,627
2020	4725862	14.67	78,030.90	383,562.40	551,973.70	391,980.60	322,215
2021	5298499	14.60	83,216.50	451,544.10	614,476.40	440,823.20	387,392
2022	5152570	14.70	88,207.00	473,789.90	642,727.10	439,732.50	416,728
2023	5569928	14.40	89,755.20	482,588.50	688,238.40	471,495.00	417,568

Note: *The above data are integrated from the National Statistical Yearbook*.

3.2. Explanatory variables and Explained variables

(1) Explanatory variables

Y: Freight transport quantity (unit: 10,000 tons)

(2) Explained variables

X1: Proportion of total social logistics cost in GDP (unit:%)

X2: Output value of the primary industry (unit: 100 million yuan)

X3: Output value of the secondary industry (unit: 100 million yuan)

X4: Output value of the tertiary industry (unit: 100 million yuan)

X5: Total retail sales of social consumer goods (unit: 100 million yuan)

X6: Total import and export volume (unit: 100 million yuan)

4. Empirical Analysis of Influencing Factors of High Quality Development of Logistics Industry

4.1. Regression model estimates

To estimate the model parameters, the least squares regression equation is used based on the collected statistics, and the results are shown in the table below：

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Table 3. Regression results of multivariate models

Variable	Coefficient	Std.Error	t-Statistic	Prob.
C	934399.5	2385365.	0.391722	0.7027
X1	-1788.552	134518.2	-0.013296	0.9896
X2	-2.287489	19.50760	-0.117261	0.9088
X3	18.22809	8.189050	2.225910	0.0479
X4	-12.45649	2.464955	-5.053434	0.0004
X5	12.37405	4.929475	2.510216	0.0290
X6	-3.404198	5.146064	-0.661515	0.5219

As shown from the figure above, the regression model is:

$$Y = -1788.552X_1 - 2.287489X_2 + 18.22809X_3 - 12.45649X_4 + 12.37405_5X_5 - 3.404198X_6 + 934399.5$$

$$R^2 = 0.983516 \text{Adjusted } R^2 = 0.974524 F = 109.3830$$

4.2. Multiple ollinearity test and correction of the model

(1) Multiple ollinearity test of the model

From the above, the model is R2=0.983516, and the correction factor is 0.974524, indicating that the method has a good fitting effect.

Observe from the influence of all factors, under a given significant water α=0.05, F test P value of 0.0000000, less than 0.05, regression formula through the F test, which is the social logistics total cost proportion of X1, the first industry output X2, the second industry X3, the third industry output value X4, total retail sales of social consumer goods X5, total import and export X6 the six economic index factors together have a significant impact on the logistics total demand.

From the influence of a single factor, the proportion of the total social logistics expenses in GDP X1, the output value of the primary industry X2 and the total import and export volume x6 did not pass the t-test. After the analysis, the model is likely to have severe multicollinearity. Conduct the correlation coefficient analysis using EViews software to calculate the correlation coefficient of each explanatory variable and obtain the following table:

Table 4. Matrix of correlation coefficients between variables

	X1	X2	X3	X4	X5	X6
X1	1	-0.89677	-0.90128	-0.93510	-0.94970	-0.82652
X2	-0.89677	1	0.99441	0.98704	0.98299	0.97609
X3	-0.90128	0.99441	1	0.99130	0.98728	0.98323
X4	-0.93510	0.98704	0.99130	1	0.99227	0.96322
X5	-0.94970	0.98299	0.98728	0.99227	1	0.94641
X6	-0.82652	0.97609	0.98323	0.96322	0.94641	1

The above table shows that the correlation coefficient of the explanatory variables is high with each other, confirming that there is indeed serious multicollinearity. Need to undertake its econometrics inspection and correction.

(2) Multiple ollinearity correction of the model

To overcome the effect of multivariate collinearity, we use stepwise regression linearity. Using EViews software, stepwise regression analysis was performed to determine the ideal model as:

$$Y = 748918.0 + 14.69001X_5 - 12.69268X_4 + 13.29021X_3$$

$$R^2 = 0.982816 \text{Adjusted } R^2 = 0.979134 \quad DW = 2.393779 \ F = 266.9101$$

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The explanation of the coefficient estimate is as follows: under other conditions, the cargo transport volume of the total retail volume increases by 1469001 million tons; if the output value of the tertiary industry increases by the 100 million yuan, the cargo transport volume decreases by 1269268 tons; for the 100 million yuan increase of the secondary industry, the cargo transport volume increases by 1329021 million tons.

4.3. Autocorrelation test and correction

Improved model autocorrelation test

(1) DW checkout

From the regression results after eliminating multicollinearity, DW = 2.393779. Because n=18, k=3, take the significance level =0.05, the table is dL = 0.93, dU = 1.69, 4-dU <DW <4-dL in the model, can not determine whether the autocorrelation exists.

(2) BG checkout

BG tests for multicollinearity adjusted models whose results are shown in Table 5.

Table 5. Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.352538	Prob. F(2,12)	0.2953
Obs*R-squared	3.311195	Prob. Chi-Square(2)	0.1910

From the table, there are no higher-order autocorrelations in the model.In conclusion, the revised results are:

$$Y = 748918.0 + 14.69001X_5 - 12.69268X_4 + 13.29021X_3$$

5. Conclusions and Suggestions

5.1. Conclusions

After verifying the modified model, it is found that the national cargo transportation volume is related to four influencing factors: the total retail sales of social consumer goods, the output value of the tertiary industry and the output value of the tertiary industry. Among them, the total retail sales of social consumer goods is the leading influence factor. If other conditions remain unchanged, the transportation volume of goods increases by an average increase of 106 million yuan for 100 million yuan; if the output value of the tertiary industry increases by 100 million yuan, the average volume of goods transportation decreases by 1269268 tons; if the average increase of 100 million yuan in the output value of the secondary industry, the transportation volume of goods increases by 1329021 million tons.

Total retail sales of social consumer goods is all retail sales to the final consumers of goods and the total amount of the service, usually the index can be used to measure the vitality of the consumer market, with the increase of total retail sales of consumer goods, the demand for logistics is increasing, the logistics industry to establish broader and effective logistics network system, meet the market demand, but also promote the efficiency of logistics industry, constantly improve their service level, to more effectively promote the logistics industry upgrading, industry vitality, promote the development of industry with high quality.

The tertiary industry usually refers to the service industry. With the development of the economy and the change of the social structure, the proportion of the tertiary industry in the national economy gradually increases and becomes the main component of the modern economy. Can be seen from the model, the third industry output and cargo transport is negative, probably because the demand of the third industry requires logistics enterprises to provide more rapid and more accurate service, the instability of the third industry and market volatility increased the risk of logistics industry supply chain, at the same time, the third industry market competition will make the logistics enterprise service fluctuations. The existence of the above

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problems will make logistics enterprises face higher labor demand and labor costs. Therefore, the high-quality development of the logistics industry requires the logistics enterprises to establish a more effective logistics network, effectively control the cost, improve the efficiency of resource utilization and improve the service quality, so as to meet the needs of China's future economic transformation.

The secondary industry is usually worth the industry, including the manufacturing industry and the construction industry, covering the production, processing, manufacturing and related resource development, energy utilization and other links. The development of the secondary industry leads to the production and flow of more goods, expands the scale of the logistics industry, and plays a positive role in the scale expansion of the logistics industry.

5.2. Suggestions

(1)Improve the construction of the logistics network system and strengthen supply chain management. Improving the construction of logistics network system and strengthening supply chain management will improve the overall logistics and transportation efficiency, reduce transit links, and reduce transportation costs. At the same time, it can track the whole link of the transportation process, improve the transparency of logistics and transportation links, reduce risks, and improve the service quality of the industry. Through the construction of a perfect logistics network and strengthening supply chain management, catering to China's 2025 industrial upgrading policy, logistics enterprises can enhance their competitive advantages, the healthy development of the logistics industry, and better respond to market competition and challenges.

(2) Improve the efficiency of scientific and technological development and promote the application of innovative technologies. Introduce advanced logistics technology, such as the Internet of Things, big data analysis, artificial intelligence, etc., to improve the logistics efficiency and intelligence level, and adapt to the future development trend. The development of science and technology will broaden the business boundary of logistics enterprises, such as cross-border e-commerce, intelligent logistics, cold chain logistics and other emerging business areas are in urgent development of science and technology; at the same time, science and technology innovation will greatly reduce the operating costs of logistics enterprises, help enterprises to insight into market dynamics, and realize the sustainable development of logistics enterprises.

(3) Provide customized services. With the development of science and technology and social progress, the market demand for logistics also presents a diversified development trend, such as cold chain logistics, pharmaceutical logistics, etc. The logistics industry should also actively respond to the market changes, provide customized and diversified services, and improve the service quality to achieve the sustainable development of the industry.

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