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Strategies for the Decoupling Effect of Carbon Emission and Low Carbon in the Logistics Industry of Jiangxi Province: From the Perspective of Environmental Protection

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ABSTRACT

Being one of the main sources of carbon emissions, logistics industry is an important area to reduce greenhouse gas emissions and the environment pollution. Studying the decouple relation between carbon emission and economic growth can provide a theoretical basis for energy conservation and low carbon economy development. The LYQ analysis framework was introduced into the OECD and Tapio decoupling model to measure the decoupling effect between the carbon emission in logistics industry and the economic growth of Jiangxi Province China during the past 25 years (1989-2013). In the LYQ analysis framework, the decoupling elastic coefficient between the carbon emission in logistics industry and the regional GDP was converted into the products of the elastic coefficients of energy conservation, emission reduction, and value creation. The result shows that the relationship between the carbon emission and economic growth of Jiangxi Province is involved in overall decoupling status, in which the positive effects of the elastic coefficient of energy conversation and the elastic coefficient of emission reduction are the main factors, and the low elasticity coefficient of value creation at the early period becomes an obstacle to the decoupling status. What is more, several low carbon development strategies are put forward in the logistics industry from the perspective of environmental protection. This study has great theoretical and practical significance for the development of low-carbon economy in Jiangxi Province, China.

INTRODUCTION

Climate warming has left a serious impact on global climate. This phenomenon also leads to the increasing occurrence of extreme weather conditions, including typhoon, cold current, snowstorm, sand storm, and hazy weather, which not only cause enormous loss in social economy, but also pose threats to human existence. The IPCC (Intergovernmental Panel on Climate Change, IPCC) has already conducted four assessment reports on climate change. These reports reveal that the emission of greenhouse gases, particularly carbon dioxide, is responsible for climate warming. Reducing carbon dioxide emission became a trend because of the sustainable and irreversibly negative impact of global warming on social economy and human progress.

As one of the main sources of carbon dioxide emissions, the logistics industry is a key area in reducing emission, mitigating climate change, and protecting the ecological environment. The key role of the logistics industry in national economy and its function of connecting supply chains determine its essential role in energy conservation and emission reduction for other areas. Jiangxi Province is currently striving to develop an ecological and low-carbon economy. The success of Jiangxi Province relies on the support of a low-carbon logistics industry. This study calculates the decoupling relationship between carbon emission in the logistics industry and overall economic development. The dependence of economic growth on the energy consumption of the logistics industry is investigated. The strategy of developing a low-carbon logistics industry is explored based on the perspective of environmental protection.

OVERVIEW OF THE STUDY AREA

Carbon emission in the logistics process has been emphasized in low-carbon logistics studies. This topic has been widely investigated by domestic and foreign scholars. McKinnon & Woodburn (1996) designed a model that includes commercial, transportation resource, and structural and operational factors to quantify carbon emissions in the logistics process. External and functional factors have been added to conduct an empirical analysis of carbon emissions in simulated cases, namely, road freight transport in 2020 in normal, pessimistic, and optimistic emotional situations. Based on the environment assessment criteria of PAS2050, Chu et al. (2010) calculated carbon footages in seven functional links in the supply chain by measuring product life cycles. Three models were introduced to restrict the logistics industry and to decrease its carbon emission. Zhou et al. (2011) measured carbon emission coefficients, factors of different fuels, and carbon emissions during operations. Zhang & Zhou (2013) calculated the main inputs in the logistics system and studied overall carbon dioxide emission performance and its fluctuation in different regions.

The increasing awareness of environmental protection drives people to reach a consensus, namely, to promote future low-carbon competitiveness. This awareness attracts many scholars to explore a dynamic equilibrium between carbon emission and economic growth by researching the relationships between the two. From the perspective of long-term economic development, 1% increase in GDP leads to a 0.36% increase in carbon emission. In short-term economic development, a dynamic adjustment mechanism exists between GDP and carbon emission, and a long-term equilibrium exists between them because of the existence of disequilibrium error terms (Zhao et al. 2011). Economic growth is the driving force of carbon emission in China. However, the continuous growth of Chinese economy and carbon emission in recent years failed to guarantee an increase in GDP, which proves that the growth rate of carbon emission is lower than that of economic growth (Li et al. 2010). The EKC model is applied to calculate the curve correlation between economic growth quality and carbon emissions per capita, thereby obtaining an "N" type of cubic curve relationship between the economic growth of China and carbon emission per capita, which currently enjoy a synchronous growth (Yang et al. 2011). Given that economic growth is a key factor in carbon emission, EKC and IPAT models are mainly used to measure the response facilitation effects of the former to the latter. The proper use of these models can ensure the control of carbon emission under the premise of economic growth. Fan discussed the disadvantages of the two models and created the SS-STIRAT model to analyse the elastic coefficient fluctuation between carbon emission per capita and GDP per capita in China from 1980-2008; the influence of factors in many aspects on this fluctuation was also discussed (Fan 2012).

OECD (Organization for Economic Co-operation and Development) presented the concept of "decoupling" and studied the possibility of decoupling between economic growth and the environment to explore the short-term features of the relationships between economic development and environmental pollution. The existing conflicts between the two can be solved systematically. Tapio (2005) proposed the concept of "decoupling elasticity" by applying decoupling indicators to define various combinations of environmental pressure indicators and economic development indicators. Li (2011) utilized the decoupling model by Tapio and analysed the decoupling relationships between economic growth and carbon emission from 1995-2007 in Central China, East China, and West China. The separation of the decoupling indicators indicates that economic growth in the three regions maintains a weak decoupling relationship with their carbon emissions, and the speed of economic growth exceeds that of carbon emission. Zhao (2012) built an EKC model based on the three-cubed relationship of carbon emission and GDP per capita in China. The relationship among total carbon emission, carbon emission per capita, and GDP per capita exhibits an "N" curve without any inflection point. An extended Tapio decoupling model was built to study the decoupling elasticity in carbon emission, economic growth, and energy consumption. The findings reveal that the decoupling elasticity between energy consumption and economic growth in China is the major reason for the decoupling between carbon emission and economic growth (Zhao 2012). Therefore, studying on carbon emission in the logistics industry and its relationship to economic growth have several accomplishments. However, few studies have been published on the decoupling between carbon emission in the logistics industry and economic growth and on the measures for achieving a low-carbon logistics industry.

ANALYSIS ON THE DECOUPLING BETWEEN CARBON EMISSION AND ECONOMIC GROWTH IN THE LOGISTICS INDUSTRY OF JIANGXI PROVINCE

Data sources: We apply the census method used by the National Bureau of Statistics of China. The numerical values of transportation, storage, and post industry are chosen to represent the entire logistics industry. All data on energy consumption, freight turnover, average population, and gross value of production were obtained from Jiangxi Statistical Yearbook. This study covers data from 1989-2013. GDP are dealt with using GDP deflators. Data in 1989 were used as the base period. The IPCC research report demonstrates that the total carbon emission is nearly equal to the carbon emission of fossil fuels. According to Jiangxi Statistical Yearbook, energy consumption in Jiangxi Province mainly consists of three types, namely, coal, petroleum, and electricity. Therefore, the estimation formula of the carbon emission in the logistics industry of Jiangxi Province can be expressed as follows:

$$Et = \delta f \times Ef + \delta m \times Em + \delta n \times En \quad ...(1)$$

Et represents the total carbon emission in the logistics industry of Jiangxi Province, δf the conversion coefficient of carbon emission, *Ef* the standard quantity of the coal converted from coal consumption and δm the conversion coefficient of the carbon emission from petroleum consumption. *Em* the standard quantity of the coal converted from petroleum consumption, δn the conversion coefficient of carbon emission from electricity consumption, and *En* the standard quantity of coal converted from electricity consumption.

Construction of the decoupling model: We should accelerate the transformation of economic development pattern to realize a tunnel-type development in the evolution path of the carbon emission in the logistics industry of Jiangxi Province. Environmental benefits should be promoted to achieve a decoupling state between the economic development in Jiangxi Province and carbon emission in the logistics industry. Thus, an ecological deficit peak can be achieved with the realization of ecological surplus. This study applies decoupling theory to explore the in-depth interactions between carbon emission and economic growth. This study analyses the relationship between carbon emission in the logistics industry of Jiangxi Province from 1989 to 2013 and the regional GDP. At present, decoupling theory is mostly applied in the aspects of energy conservation and emission reduction to pursue ecological economy, green economy, and cyclic economy. Two decoupling models mainly exist, namely, OECD decoupling model and Tapio decoupling model.

***OECD decoupling model*:** Member countries of OECD established a set of DPSR indicators to conduct scientific measurement and quantitative analysis of decoupling by measuring decoupling state from four aspects: driving force, environmental pressure, environmental state, and impact. The formula of the model is as follows:

$$D_i = \frac{EP_t}{DF_t} / \frac{EP_0}{DF_0} \quad ...(2)$$

$$D_f = 1 - D_i \quad ...(3)$$

In Formula (2), D_i refers to the coefficient of decoupling index, EP the related aspects of environmental pressure, and DF the variables driving economic growth. The OECD decoupling model illustrates the relationship between environmental pressure and driving force. In the case of the low-carbon logistics industry in Jiangxi Province, environmental pressure is represented by the carbon emission of the industry and the driving force of regional GDP. D_f the decoupling factor that visually reflects the decoupling condition. Economic development and environmental pollution finally decouple when $D_f > 0$, whereas decoupling is impossible when $D_f \leq 0$. These two factors completely decouples when the decoupling factor is a positive number smaller than the value of 1 but close to 1. The two reaches relative decoupling when the decoupling factor is a positive number close to the value of 0. A negative number still represents a coupling state.

***Tapio decoupling model*:** Tapio decoupling model is an improvement of OECD model. In 2005, Tapio (2005) introduced the concept of decoupling elasticity as the product of industrial development elastic coefficient and industrial emission elastic coefficient when he was studying the relationship between European transportation development and carbon emission growth from 1970 to 2001. The innovative concept of decoupling elasticity dynamically reflects the decoupling relationship between economic development and environmental pollution that is free from the influence of statistical dimensional changes and time scale, which persecuted the choice of base period for the previous OECD decoupling model.

$$R_{V,G} = (\Delta V / V) / (\Delta GDP / GDP) \quad ...(4)$$

$$m_{C,V} = (\Delta CO_2 / CO_2) / (\Delta V / V) \quad ...(5)$$

$$t_{C,G} = r_{V,G} \times m_{C,V} = (\Delta CO_2 / CO_2) / (\Delta GDP / GDP) \quad ...(6)$$

In formula (4), $R_{V,G}$ represents the coefficient of transportation elasticity, *V* the volume of transportation, and GDP the gross regional product. The value of transportation elasticity demonstrates the elasticity of industrial development. This coefficient reflects the contribution of transportation to the economy. In formula (5), $m_{C,V}$ the elastic coefficient of the carbon emission of the industry, which reflects its carbon reduction capability. In Formula (6), $t_{C,G}$ the elastic coefficient of CO_2, which represents the product of the decoupling elastic coefficient between GDP and transportation volume and that between transportation volume and carbon emission volume. Tapio expressed the decoupling state in eight conditions according to exponential values.

In Table 1, Tapio made a detailed division of decoupling indicators to demonstrate clearly the variable relationship between the economic development and environmental pollution under different combinations and its impact. Through this approach, he could obtain an accurate evaluation of the impact of policy implementation on performance.

The preceding analysis reveals that both the OECD decoupling model and the Tapio decoupling model have disadvantages. The OECD decoupling model presents a slightly rough division of decoupling conditions, which is inconvenient for the exploration of the essential features of the conditions. Tapio model is too complex to be classified, and the transitional conditions are not easy for evaluation and management. This study optimizes the two models and

Table 1: Tapio model grades and the ranges of elastic coefficient.

	Conditions	ΔCO_2	ΔGDP	Coefficient of elasticity
Negative decoupling	Expansive negative decoupling	>0	>0	>1.2
	Strong negative decoupling	>0	<0	<0
	Weak negative decoupling	<0	<0	0 < t < 0.8
Decoupling	Weak decoupling	>0	>0	0 < t < 0.8
	Strong decoupling	<0	>0	<0
	Recessive decoupling	<0	<0	>1.2
Coupling	Expansive coupling	>0	>0	0.8 < t < 1.2
	Recessive coupling	<0	<0	0.8 < t < 1.2

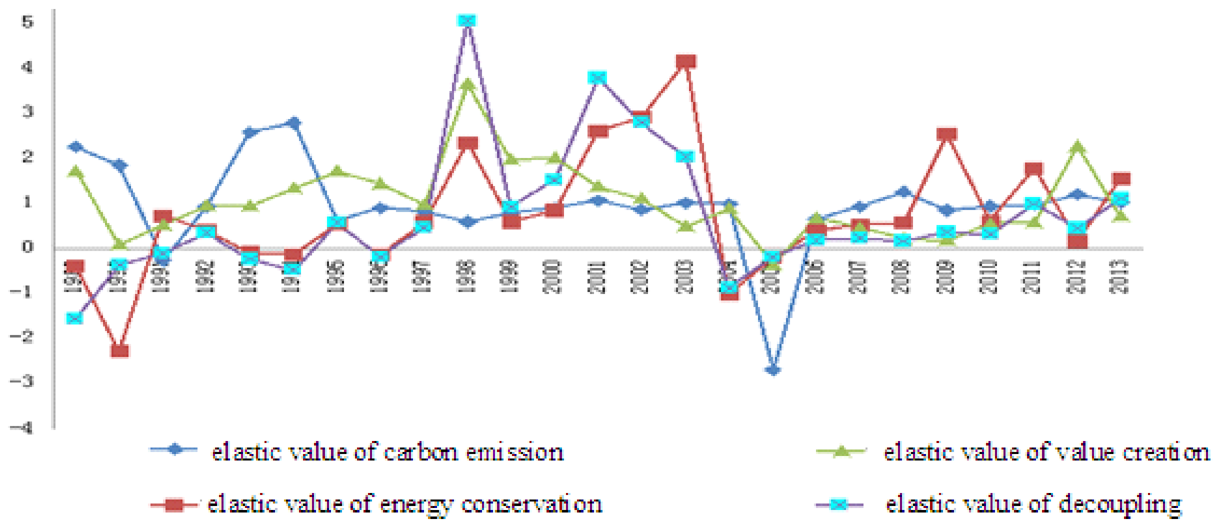

Fig. 1: Elastic decoupling exploded view.

distinguishes six divisions, namely, expansive negative decoupling, strong negative decoupling, weak negative decoupling, weak decoupling, strong decoupling, and recessive decoupling. The first three belong to coupling state, whereas the remaining three belong to decoupling state.

EMPIRICAL ANALYSIS

This study introduces the LYQ analysis framework into the decoupling model and applies the optimized decoupling division to evaluate various decoupling conditions. The LYQ analysis framework aims to introduce an intermediate variable between environmental pressure and economic driving force and evaluate the decoupling elastic value from the variables. This study converts the decoupling elastic coefficient of carbon emission in the logistics industry of Jiangxi Province and regional GDP into the products of the elastic coefficient of energy conservation, emission reduction, and value creation. The formula is as follows:

$$t_{C,G} = \frac{\Delta CO_2 / CO_2}{\Delta GDP / GDP} = \frac{\Delta CO_2 / CO_2}{\Delta EC / EC} \times \frac{\Delta EC / EC}{\Delta LG / LG} \times \frac{\Delta LG / LG}{\Delta GDP / GDP} \quad ...(7)$$

In formula (7), EC represents the total energy consumption of the logistics industry. LG represents the production value of the logistics industry. The elastic coefficient of carbon emission is the ratio of the growth rate of carbon emission in the logistics industry to that of energy consumption. When the quantity of carbon emission in the logistics industry slows down or when carbon emission growth rate is lower than energy consumption growth rate, the elastic coefficient of carbon emission is in a decoupling state. This state indicates that carbon reduction has achieved a remarkable performance. Similarly, the elastic coefficient of carbon emission reaches a decoupling state with the ratio of energy consumption growth rate in the logistics industry to energy conservation growth rate as the elastic value of energy conservation when the quantity of energy consumption reduces or energy consumption growth rate is lower

Table 2: 1989-2013 Elastic decoupling between carbon emission and economic development.

Years	Elastic coefficient of carbon emission	Status	Elastic coefficient of energy conservation	Status	Elastic coefficient of value creation	Conditions	Elastic coefficient of decoupling	Status
1989	2.252	recessive decoupling	-0.402	strong decoupling	1.720	expansive negative decoupling	-1.556	strong decoupling
1990	1.843	recessive decoupling	-2.286	strong decoupling	0.088	weak decoupling	-0.370	strong decoupling
1991	-0.274	strong decoupling	0.724	weak decoupling	0.520	weak decoupling	-0.103	strong decoupling
1992	0.931	weak decoupling	0.394	weak decoupling	0.939	weak decoupling	0.344	weak decoupling
1993	2.581	recessive decoupling	-0.096	strong decoupling	0.941	weak decoupling	-0.234	strong decoupling
1994	2.787	recessive decoupling	-0.130	strong decoupling	1.344	expansive negative decoupling	-0.488	strong decoupling
1995	0.613	weak decoupling	0.544	weak decoupling	1.713	expansive negative decoupling	0.572	weak decoupling
1996	0.900	weak negative decoupling	-0.144	strong decoupling	1.451	expansive negative decoupling	-0.188	strong decoupling
1997	0.814	weak decoupling	0.588	weak decoupling	0.974	weak decoupling	0.467	weak decoupling
1998	0.590	weak decoupling	2.349	expansive negative decoupling	3.657	expansive negative decoupling	5.064	expansive negative decoupling
1999	0.787	weak decoupling	0.595	weak decoupling	1.975	expansive negative decoupling	0.926	weak decoupling
2000	0.897	weak decoupling	0.844	weak decoupling	2.015	expansive negative decoupling	1.525	expansive negative decoupling
2001	1.062	expansive negative decoupling	2.608	expansive negative decoupling	1.367	expansive negative decoupling	3.785	expansive negative decoupling
2002	0.862	weak decoupling	2.908	expansive negative decoupling	1.114	expansive negative decoupling	2.794	expansive negative decoupling
2003	1.011	expansive negative decoupling	4.161	expansive negative decoupling	0.483	expansive negative decoupling	2.032	expansive negative decoupling
2004	0.982	weak negative decoupling	-1.010	strong decoupling	0.884	weak decoupling	-0.876	strong decoupling
2005	-2.705	strong decoupling	-0.198	strong negative decoupling	-0.358	recessive decoupling	-0.191	strong decoupling
2006	0.659	weak decoupling	0.404	weak decoupling	0.680	weak decoupling	0.181	weak decoupling
2007	0.926	weak decoupling	0.528	weak decoupling	0.472	weak decoupling	0.231	weak decoupling
2008	1.256	expansive negative decoupling	0.568	weak decoupling	0.224	weak decoupling	0.160	weak decoupling
2009	0.845	weak decoupling	2.537	expansive negative decoupling	0.170	weak decoupling	0.364	weak decoupling
2010	0.937	weak decoupling	0.606	weak decoupling	0.554	weak decoupling	0.314	weak decoupling
2011	0.970	weak decoupling	1.780	expansive negative decoupling	0.576	weak decoupling	0.994	weak decoupling
2012	1.196	expansive negative decoupling	0.165	weak decoupling	2.279	expansive negative decoupling	0.448	weak decoupling
2013	1.005	expansive negative decoupling	1.554	expansive negative decoupling	0.710	weak decoupling	1.109	expansive negative decoupling
Mean value	0.949	weak decoupling	0.784	weak decoupling	1.060	expansive negative decoupling	0.692	weak decoupling

than production value growth rate. This finding indicates a remarkable performance in energy conservation. Output efficiency improves with the ratio of the growth rate of production value of the logistics industry to that of gross regional product as the elastic value of value creation when the elastic value of value creation is in a decoupling state.

Therefore, we can apply formula (7) to measure the elastic decoupling explosion between carbon emission and economic growth in the logistics industry of Jiangxi Province, China. We can achieve this by calculating data from 1989 to 2013 in the logistics industry of Jiangxi Province, including carbon emission, energy consumption, production value, and GDP from Jiangxi Statistical Yearbook.

Fig. 1 illustrates a fluctuating trend of the decoupling coefficient between carbon emission and economic development and the expanded view of the elastic coefficient from 1989 to 2013 in the logistics industry of Jiangxi Province. The decoupling coefficient reached its peak both in 1998 and in 2001. In 2005, the number reached the bottom, which indicates an ideal state of complete decoupling. However, a weak decoupling condition occurred in most years at a distance from the objective of a tunnel-type low-carbon development.

The analysis in Table 2 demonstrates the following:

1. The elasticity coefficient of the emission reduction in Jiangxi Province from 1989-1995 was in a decoupling state. This result was observed despite the fluctuating trend of the elastic coefficient of emission reduction with a peak in 1994, which was caused by a rate of change in carbon emission larger than that of energy consumption that resulted from a plump in carbon emission. The elastic coefficient of emission reduction reached the bottom in 2005. The coefficient stabilized except in 2001, 2003, 2008, 2012, and 2013 when the coefficient exceeded 1. This result indicates a state of negative decoupling. In the following years, the logistics industry was confronted with obstacles in its way to low-carbon development along with a sharp increase in carbon emission. Environmental pollution also became a problem.
2. The elasticity coefficient of energy conservation was alternately in a strong decoupling condition, weak decoupling condition, and expansive negative decoupling condition with an average coefficient of 0.784. This coefficient was the best among all elastic coefficients of decomposition variables. The only exception was in 2005 when the coefficient reached 0.198, which indicates a strong negative decoupling condition that resulted from a slow energy consumption growth rate and a decreasing production value of the logistics industry. Therefore, the elasticity coefficient of energy conservation was affected negatively. Overall, the variation trend of the elastic coefficient of energy conservation is shown as a wavy line. However, this trend was generally stable, thereby contributing to a weak decoupling condition. This observation indicated that if the growth rate of energy consumption is slower than the growth rate of the production value of the logistics industry, the effect of environmental protection would be guaranteed with high-efficiency energy consumption and low emission per unit.
3. The elasticity coefficient of value creation has been in a coupling condition before 2006, wherein the elastic coefficient increased progressively until a peak value was reached in 1998 before it decreased progressively. This situation was in the condition of expansive negative decoupling. Value creation elasticity has improved in the recent years along with the structural adjustment in economy and the increase in the additional value of logistics industry. However, the average elastic coefficient remains high at 1.06, which indicates that production cost was considerably high, production factors was excessive, and the scale of production was considerably large. A large room for improvement still exists to realize low-carbon economy.
4. The analysis on the mean values demonstrated that the relationship between carbon emission in the logistics industry of Jiangxi Province and its economic development was in a weak decoupling condition. This result is attributed to the facts that the elasticity coefficient stood in the way of pursuing the decoupling condition between economic development and environmental pollution despite the positive impact from emission reduction elasticity and energy conservation elasticity.

In conclusion, the positive impact on the elasticity of emission reduction and energy conservation serves as the main driving force for the decoupling trend between carbon emission in the logistics industry of Jiangxi Province and its economic development. In the past 25 years, the elastic value of energy conservation has remained 0.784, whereas that of emission reduction was 0.949, which were both smaller than 1. Thus, both factors greatly contributed to the maintenance of the weak decoupling condition between carbon emission in the logistics industry and regional production value. Second, in the past 25 years 1989 to 2013, inconsistencies between decoupling condition and energy conservation elasticity occurred in 1999, 2000, 2005, 2009, and 2011. Inconsistencies between decoupling condition and emission reduction elasticity occurred in 1996, 1998, 1999, 2000, 2002, 2004, 2008, and 2012. Therefore, the maintenance of emission reduction and energy conservation leaves a positive impact on the pursuit of a stable decoupling condition between carbon emission in the logistics industry of Jiangxi Province and economic growth. Third, the largest obstacle is the low elasticity of value creation in the early period. In the decomposition factors, the elastic coefficient of value creation has been positive for 25 years, except in 2005 when the emergence of an expansive negative decoupling condition became highly possible. In the past 25 years, the average elastic value of value creation was 1.06, which was greater than 1. This result showed that the logistics industry was in a state of high consumption and low additional value. Therefore, we should readjust industrial structure, promote industrial efficiency, and enlarge economic benefits.

CONCLUSIONS AND COUNTERMEASURES

Conclusions: This study used the decoupling model of

OECD and Tapio to investigate the degree of decoupling of carbon emissions in the logistics industry and the economic development in Jiangxi Province, China. We used statistical data from 1989-2013 to examine the total carbon emissions of the logistics industry in Jiangxi Province as environmental pressure and regional GDP as the economic driving force. Furthermore, the LYQ framework was introduced in the construction of the decoupling model. The intermediate variables (energy consumption and logistics industry output) were introduced between environmental pressure and economic driving force. The decoupling elasticity of logistics carbon emissions and regional GDP in Jiangxi Province was changed according to the product of the elastic index of energy conversation, emission reduction, and value creation. The results showed that the relationship between the carbon emission and economic growth of Jiangxi Province is involved in overall decoupling status, in which the positive effects of the elastic coefficient of energy conversation and the elastic coefficient of emission reduction are the main factors, and the low elasticity coefficient of value creation at the early period becomes an obstacle to the decoupling status. The continuous positive effects of energy conversation and emission reduction are conducive to the realization of the decoupling status between the carbon emissions of the logistics industry and economic growth of Jiangxi Province, China.

Development countermeasures: At present, the economic development of Jiangxi Province in China is in a period of rapid growth. Ecological economy and environmental economic with low carbon emissions, low pollution, and low energy consumption must be developed vigorously. The critical problems include realizing the decoupling state between carbon emissions of the logistics industry and the economic growth in Jiangxi province and vigorously developing low-carbon logistics. Based on the development of low-carbon logistics, this study presented concrete policy recommendations, which include the following:

Paying attention to the use of new energy to achieve sustainable low-carbon development

At present, majority of companies in the logistics industry use oil and coal energy, which results in environment pollution. Along with the progress of science and technology, the low-carbon development of the logistics industry gradually decreased high-carbon energy consumption. By contrast, the proportion of natural gas, electricity, and other clean energy in logistics industry is increasing. Scientifically planning the energy consumption of the logistics industry may ensure a smooth and orderly transition from traditional energy to clean renewable energy in the operational aspects of logistics. This approach is also an important path for the logistics industry to gradually achieve sustainable low-carbon development and promote energy conservation and ecological environment protection.

Increased investment in logistics industry and science and technology and active guidance on the use of clean energy

The government should encourage enterprises to increase scientific investment in the equipment and facility of the logistics industry and encourage enterprises to produce transportation that uses new energy battery, hybrid power sources, and logistics warehousing equipment with mechanical equipment as power source. Similarly, the government should guide logistics enterprises to gradually eliminate logistic equipment and technology that consume high energy. The government should provide logistics enterprises with the necessary financial support, such as low-interest loans or tax cuts, and other measures for their purchasing or research equipment that can be used for energy conservation and emission reduction.

Developing operation standard of low carbon in logistics industry, decreasing carbon emission and providing environmental protection for the logistics industry

The formation of a perfect low-carbon operation standard in the logistics industry in Jiangxi Province and even in the whole country has failed at this stage. Some large logistics companies, such as SF EXPRESS Co. Ltd., have implemented relevant operation rules in energy conservation and emissions reduction. However, they solely explored and failed to form a perfect low-carbon operation standard about logistics. Therefore, logistics industry associations should formulate a set of concrete scientific low-carbon logistics operation standard to reduce carbon emissions and reduce environmental pollution by drawing logistics experience from developed foreign countries and through guidance from government departments.

Gradual improvement of logistics assessment mechanism and rewards or punishment mechanism for energy saving and emission reduction

Government departments should organize logistics industry associations to establish the corresponding appraisal level, low-carbon targets, and rewards and punishment mechanism of logistics. This objective can be achieved by constructing reasonable and effective low-carbonation assessment indicators of logistics industry and assessment method. Thus, logistics enterprises can be effectively assessed. Government departments can eventually rely on third-party professional authoritative certification bodies to authenticate and rate low-carbon logistics enterprise, thereby prompting logistics enterprises to conduct low-carbon operation and to achieve the goal of energy conservation and emissions reduction. These recommendations should benefit the ecological economy and environment.

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