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Coupling Synergistic Effect Analysis of Global Value Chain Embedding and Carbon Emission Reduction in China

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Abstract

The upgrading of global value chain and carbon emission reduction are the dual challenges faced by China's manufacturing industry. In order to achieve the goal of advancing to the middle and high end of global value chain and "dual carbon", at the same time to achieve the win-win situation of global value chain embedded and carbon emission reduction, it is of great theoretical and practical significance to play the coupling and coordination role of the two. Based on the theory of coupling coordination, this paper constructs the evaluation index system of global value chain embedded and carbon emission reduction system, and analyzes the development status of global value chain embedded and carbon emission reduction in 21 sub-sector industries from 2005 to 2014. The results show that most industries are in the moderate coordination stage, and the lag of global value chain is the key factor restricting their coordinated development. Labor-intensive industries have the best coupling coordination degree, forming a situation of mutual promotion of development, followed by technology-intensive industries and labor-intensive industries. Therefore, improving the level of green technology, breaking through the technological blockade and improving the position of Chinese industries in the global value chain are conducive to forming a positive interaction between the two.

Keywords: Global Value Chain; Carbon Reduction; Degree of Coupling Coordination

Introduction

As the world's largest manufacturing country, China is also an active participant in the global value chain and a promoter of green development. "Accelerating green development and participating in the reform of the global economic governance system" has an important and far-reaching significance to promoting sustainable and healthy development of economic and social development. However, due to the excessive dependence on imported intermediate inputs and the weak absorption capacity of local enterprises and other factors, the "low-end locking" problem of China's manufacturing industry in the global value chain division system is prominent, coupled with the two obvious characteristics of "high energy consumption, high pollution", manufacturing transformation and upgrading situation is grim.

Although existing studies have recognized the connection between the division of global value chain and carbon emission, they have not yet made an introduction and analysis from the perspective of collaborative development. Facing the dual pressure of manufacturing value chain upgrading and "dual carbon" goal realization, it is necessary to conduct research on the relationship between the two goals and whether the synergistic development of value chain upgrading and carbon emission reduction can be realized. This paper focuses on the synergistic relationship between global value chain upgrading and carbon emission reduction, calculates and analyzes the degree of coupling synergy between them, analyzes the heterogeneity of subdivided industries, and proposes countermeasures for the synergistic development of global value chain upgrading and carbon emission reduction targets in the manufacturing industry, in order to provide decision-making support for the realization of the dual goals of global value chain upgrading and carbon emission reduction. Theoretically, this paper analyzes manufacturing upgrading under the dual framework of global value chain division system and carbon emission reduction required by the "dual carbon" goal. Based on the perspective of collaborative development, it emphasizes that "carbon locking" and "low end locking" should be taken into consideration when participating in the division of global value chain, which makes up for the research results on the one-way impact of global value chain on carbon emission reduction. In practical application, this study provides a decision-making basis for various government departments to formulate measures to promote the upgrading of global value chain of manufacturing industry and the coordinated development of carbon emission reduction targets, and also provides new enlightenment for handling the relationship between economic development and carbon emission reduction.

Literature Review

The concept of value chain was first proposed by Porter in his book Competitive Advantage in Poter ME [1]. Later, rich achievements have been made on the dynamic mechanism, mode, trajectory and governance model of global value chain upgrading Gereffi [2]; Humphrey & Schmitz [3]; Sturgeon & Lee [4]. Feenstra & Hanson [5] more precisely defines the key concepts in global value chains. Since 2011, China's Ministry of Commerce has led the organization of a systematic study on the accounting of trade added value and related issues. Scholars have extensively studied China's traditional industries such as clothing industry and light industry as well as high-tech industries such as general aviation manufacturing industry, electronics industry and equipment manufacturing industry, and reached a consensus that China's manufacturing industry as a whole is at the low end of the global value chain. Part of contract manufacturing is gradually moving towards self-owned brand production, but problems such as "high-end reflux", "low-end diversion" and "poverty growth" are prominent [6].

In the research field of the impact of international trade on pollution emission under the global value chain, the first is to analyze the environmental effect of foreign trade, namely the scale effect, structure effect and technology effect [7]. The second is to discuss the problem of "pollution refuge" between developed and developing countries Copeland & Taylor [8] and the related hypothesis of "pollution paradise" and "pollution halo". The degree of global value chain embedding can reflect the depth of a country's participation in the division of labor in the global value chain. Chinese scholars have conducted a wealth of studies on this from the perspective of manufacturing subdivisions, but the conclusions are not the same. Pan An [9] pointed out that with the deepening of China's participation in the global value chain, the scale of carbon emissions implied by trade will also expand. On the contrary, Xie Huiqiang [10], Sun Huaping [11] argue that the degree of global value chain embedding improves the carbon productivity of China's manufacturing industry. Some scholars further subdivided the degree of global value chain embedding. Lv Yue [12], Cai Li [13] concluded that the degree of global value chain embedding is helpful to reduce the implied carbon and carbon emissions of export trade through the forward correlation model. However, the backward correlation model will lead to the increase of carbon and carbon emissions in export trade.

According to the existing literature, scholars have studied the upgrading of global value chains and the close relationship between global value chains and pollution emissions, which lays a foundation for further research. However, it should also be noted that: first, from the perspective of value chain upgrading and carbon emission measurement indicators, there are many and fragmented indicators, which is not conducive to the complete identification of basic facts; Second, scholars mainly focus on the unidirectional correlation between global value chain and carbon emission reduction, and there is a lack of specialized research on the coupling relationship and collaborative mechanism of the two.

Construction of Coupling Coordination Degree Model

Standardization of Index

The range standardization method is adopted to standardize the original data and eliminate the influence of data size, dimension and content-crossing direction. Assuming that the numble of objects to be evaluated is m, and the numble of evaluation indexes is n in the evaluation system, among them i= 1,2... m; j= 1,2... , n. For the forward

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and backward indicators, their standardized calculation formulas are shown in (1) and (2) respectively:

Positive index:

$$y_{ij} = \left(x_{ij} - min\,x_j\right) / \left(max\,x_j - min\,x_j\right) \quad (1)$$

Negative index:

$$y_{ij} = \left(max\,x_j - x_{ij}\right) / \left(max\,x_j - min\,x_j\right) \quad (2)$$

Where, max x_j、min x_j represent the maximum and minimum values of indexes respectively.

Calculation of Index Entropy

$$H_j = -1/\ln m \sum_{i=1}^{m} p_{ij} \ln p_{ij} \quad (1≤j≤n) \quad (3)$$

Where, H_j is the entropy of indicator j, $p_{ij} = x_{ij} / \sum_{i=1}^{m} x_{ij}$, and m represents the number of industries, 0≤≤1.

Determination of Index Weights

$$w_j = \left(1 - H_j\right) / \sum_{j=1}^{n} \left(1 - H_j\right) \quad (4)$$

w_j satisfies two conditions：0≤ w_j ≤1 and .

Calculate the integrated index of global value chain and carbon emission reduction

According to the previously calculated standardized data y_ijand the index weight calculated by entropy weight method w_j, the multi-objective linear weighting method is adopted to calculate the environmental composite index of global value chain embedding and carbon emission reduction:

$$E_i = \sum_{j=1}^{n} w_j y_{ij} \quad (5)$$

$$GVC_i = \sum_{j=1}^{n} w_j y_{ij} \quad (6)$$

E_i, GVC_i are between 0 and 1. The larger the Ei is, the better the carbon emission reduction results of industry i, and the worse the vice versa: the larger the GVC_i is, the deeper the industry i is embedded in the global value chain and on the contrary, the shallower the industry i is embedded.

Analysis of the coupling coordination degree between global value chain and carbon emission reduction

Coupling refers to the interaction of two (or more) systems through various influences.

$$C = \left\{ f(U)g(E) / \left[\left(f(U)g(E) \right) / 2 \right]^2 \right\}^{1/2} \quad (7)$$

$$T = \alpha f(U) + \beta g(E) \quad (8)$$

$$D = \sqrt{CT} \quad (9)$$

Where, f(U) represents the global value chain subsystem, g(E) represents the carbon emission subsystem, C represents the coupling degree between global value chain embedded and carbon emission reduction, T represents the integrated coordination index of global value chain embedded and carbon emission reduction, D represents the coupling coordination degree of global value chain embedded and carbon emission reduction, and and respectively represents the contribution share of global value chain embedded and carbon emission reduction.

Coupling Analysis of Coordinated Development between Global Value Chain and Carbon Emission Reduction

Construction of evaluation index system

This paper draws on the existing literature and builds the global value chain system and carbon emission reduction system following the principles of systematic, scientific and data availability. As shown in Table 1, the main data are from UIBE GVC database, and the data on carbon dioxide emissions by industry are from the carbon emission data supplemented by WIOD in 2019. In this paper, we selected the 56 industries panel data of China from 2005 to 2014 as samples, and classified and merged the industries into 21 sub-sectors, in order to conducting an empirical study on the coupling coordination relationship between global value chain embeded and carbon emission reduction.

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	Index	Positive or Negative index	Index weight
Carbon reduction system	Carbon emissions	Negative index	0.4891
	Trade implied carbon	Negative index	0.5109
Global value chain system	Value added of export	Positive index	0.2227
	Openness to trade	Positive index	0.2455
	GVC Engagement (forward)	Positive index	0.0932
	GVC Engagement (backwards)	Positive index	0.1599
	Total production length	Positive index	0.0734
	Average production length	Positive index	0.0741
	Value added capability index	Positive index	0.1312

Table 1: Comprehensive evaluation index system of global value chain embedded system and carbon emission reduction system.

Referring to the paper of LV Yanfang [14] to classify the development stages and levels of coupling coordination, we divide the degree of coordination into five stages, as shown in Table 2.

Type		Subtypes	Sub-subtype	
Coordinated development	0.8<D≤1	Advanced coordination	g(E)-f(U)>0.1	Advanced Coordination-lag in Global value chain embedded
			f(U)-g(E)>0.1	Advanced Coordination-lag in Carbon reduction
			0<|f(U)-g(E)|≤0.1	Advanced Coordination
	0.6<D≤0.8	Moderate coordination	g(E)-f(U)>0.1	Moderate coordination-lag in Global value chain embedded
			f(U)-g(E)>0.1	Moderate coordination-lag in Carbon reduction
			0<|f(U)-g(E)|≤0.1	Moderate coordination
Transformation and development	0.4<D≤0.6	Primary coordination	g(E)-f(U)>0.1	Primary coordination-lag in Global value chain embedded
			f(U)-g(E)>0.1	Primary coordination-lag in Carbon reduction
			0<|f(U)-g(E)|≤0.1	Primary coordination
Uncoordinated development	0.2<D≤0.4	On the verge of disorder	g(E)-f(U)>0.1	On the verge of disorder-Global value chain embedded blocked
			f(U)-g(E)>0.1	On the verge of disorder-Carbon reduction blocked
			0<|f(U)-g(E)|≤0.1	On the verge of disorder
	0<D≤0.2	serious disorder	g(E)-f(U)>0.1	serious disorder-Global value chain embedded blocked
			f(U)-g(E)>0.1	serious disorder-Carbon reduction blocked
			0<|f(U)-g(E)|≤0.1	serious disorder

Table 2: Coupling type division of global value chain embedded and eco-environment.

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Comprehensive Index Analysis of Global Value Chain Embedded and Carbon Emission Reduction

Figure 1 shows the average composite index of global value chain embedded and carbon emission reduction for 21 industries from 2005 to 2014. It can be seen from the GVC composite index that the GVC composite index of electronic communication equipment manufacturing is higher compared with other industries, while the GVC composite index of food and tobacco, pharmaceutical manufacturing and construction is lower. This indicates that the electronic communication equipment manufacturing industry has a high degree of GVC embedded, large export added value and strong value-added ability, while the food and tobacco industry, pharmaceutical manufacturing industry and construction industry have low participation and value-added ability in GVC. As can be seen from the comprehensive carbon emission reduction index, all industries maintain a relatively high level, indicating that the overall carbon emission reduction results of the country are good. However, power, gas and water production and supply industries, electronic communication equipment manufacturing carbon emission reduction comprehensive index is relatively low. The reason may be that firepower power generation is still the most main source of power in China, and China is a major manufacturer of electronic components, leading to the result that the carbon emission and the trade implied carbon emission of these two industries are both large, and composite index of carbon emission reduction are both low.

Analysis of Coupling Coordination Degree between Global Value Chain and Carbon Emission Reduction

It can be seen from Table 3 and Table 4 that the coordination degree of global value chain embedded and carbon emission reduction coupling of various industries presents a relatively stable and generally rising trend from 2004 to 2014. Among them, the overall rising industry includes the construction industry, other manufacturing products and scrap industry, and other industries are relatively stable. When different types of contribution shares are selected, the coupling coordination degree results of type 1 and type 2 are basically the same, and the coupling coordination degree of each industry of type 3 is generally higher. However, in terms of China’s current situation, the realization of the goal of “dual carbon” and the promotion of various industries to move towards the middle and high end of the global value chain promote and restrict each other, and the two are in the same important position, so we select the contribution share of type 2. In type 2, most of the industries are in the moderate coordination stage, and the mining industry is in the advanced coordination stage while the construction industry is in the primary coordination stage. With the exception of the electronic communication equipment manufacturing industry, other industries are lagging behind in the global value chain. This is because technological progress pushes all industries to climb to the middle and high end of the global value chain, but developed countries hold key technologies in their hands, which makes China difficult to climb to the high value-added links, thus making it difficult to effectively coordinate the global value chain embedding and carbon emission reduction.

Industry	2006	2008	2010	2012	2014
Agriculture, forestry, animal husbandry, fishing	0.77	0.75	0.74	0.74	0.74
Extractive	0.82	0.82	0.82	0.83	0.83
Food and Tobacco	0.66	0.66	0.66	0.68	0.67
Textile	0.83	0.79	0.8	0.8	0.79
Wood processing and furniture manufacturing	0.79	0.78	0.78	0.8	0.8
Paper and printing	0.74	0.74	0.75	0.76	0.76
Petroleum coking	0.77	0.79	0.79	0.8	0.79
Chemical raw material manufacturing	0.79	0.76	0.78	0.78	0.76
Pharmaceutical manufacturing	0.65	0.66	0.66	0.66	0.65
Non-metallic mineral products	0.72	0.7	0.71	0.72	0.7
Metal smelting	0.78	0.74	0.76	0.77	0.74
Electronic communication equipment manufacturing	0.79	0.76	0.79	0.79	0.78
Electrical equipment manufacturing	0.81	0.78	0.8	0.81	0.79

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Machinery and equipment manufacturing	0.78	0.76	0.79	0.79	0.77
Transportation equipment manufacturing	0.72	0.73	0.74	0.74	0.73
Electricity, gas and water production and supply industries	0.63	0.64	0.62	0.63	0.63
Other manufacturing products and waste materials	0.62	0.63	0.64	0.68	0.68
Building	0.5	0.53	0.55	0.57	0.56
Wholesale and retail, accommodation, catering	0.74	0.74	0.77	0.79	0.78
Transportation, warehousing and postal services	0.76	0.75	0.76	0.77	0.75
Other Industries	0.72	0.73	0.74	0.76	0.76

Table 3: Coupling coordination degree of global value chain and carbon emission reduction by industry from 2005 to 2014.

Industry	Type 1 :α=1/3,β=2/3	Type 2:α=1/2,β=1/2	Type 2:α=2/3,β=1/3
Agriculture, forestry, animal husbandry, fishing	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Extractive	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Food and Tobacco	Primary coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Textile	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Wood processing and furniture manufacturing	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Paper and printing	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Petroleum coking	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Chemical raw material manufacturing	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Pharmaceutical manufacturing	Primary coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Non-metallic mineral products	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Metal smelting	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Electronic communication equipment manufacturing	Advanced coordination-lag in Carbon reduction	Moderate coordination-lag in Carbon reduction	Moderate coordination-lag in Carbon reduction
Electrical equipment manufacturing	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Machinery and equipment manufacturing	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Transportation equipment manufacturing	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Electricity, gas and water production and supply industries	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Other manufacturing products and waste materials	Primary coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded

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Building	Primary coordination-lag in Global value chain embedded	Primary coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded
Wholesale and retail, accommodation, catering	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Transportation, warehousing and postal services	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Advanced coordination-lag in Global value chain embedded
Other Industries	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded	Moderate coordination-lag in Global value chain embedded

Table 4: Coupling coordination degree of global value chain and carbon emission reduction under different coupling types.

Coupling Coordination Analysis under the Density of Factors in Different Industries

According to the weight determined by the entropy method and the calculation method of the coupling coordination degree, the coupling coordination degree of the three factor intensive industries from 2005 to 2014 was calculated. At the same time, the three industries with intensive factors were averaged over the years (as shown in Table 5), and the coupling coordination of carbon emission reduction and global value chain embedded was compared and analyzed. The 21 sub-sectors are divided into: 1) labor-intensive industries: agriculture, forestry, animal husbandry, fishery, food and tobacco, textile industry, wood processing and furniture manufacturing, paper and printing industry, wholesale and retail industry, accommodation, catering industry, transportation, storage and postal industry, construction; 2) Capital-intensive industries: mining industry, non-metallic mineral products, other manufactured products and waste materials, machinery and equipment manufacturing, electrical equipment manufacturing, petroleum coking industry, electricity, gas and water production and supply industry, metal smelting industry; 3) Technology-intensive industries: chemical raw material manufacturing, pharmaceutical manufacturing, electronic communication equipment manufacturing, transportation equipment, other industries.

Density of factors	Year	Coupling Degree	Coordination Degree	Degree of coupling and coordination
Labor intensive industry	2005	0.8285	0.7133	High level coupling stage，Moderate coordination
	2006	0.828	0.7119	High level coupling stage，Moderate coordination
	2007	0.8214	0.7027	High level coupling stage，Moderate coordination
	2008	0.8343	0.7066	High level coupling stage，Moderate coordination
	2009	0.8289	0.6978	High level coupling stage，Moderate coordination
	2010	0.8405	0.717	High level coupling stage，Moderate coordination
	2011	0.8513	0.7256	High level coupling stage，Moderate coordination
	2012	0.8538	0.7312	High level coupling stage，Moderate coordination
	2013	0.8498	0.7274	High level coupling stage，Moderate coordination
	2014	0.8476	0.7249	High level coupling stage，Moderate coordination
Capital intensive industry	2005	0.9216	0.7478	High level coupling stage，Moderate coordination
	2006	0.9163	0.7417	High level coupling stage，Moderate coordination
	2007	0.9134	0.7336	High level coupling stage，Moderate coordination
	2008	0.9253	0.7315	High level coupling stage，Moderate coordination
	2009	0.9126	0.7189	High level coupling stage，Moderate coordination
	2010	0.9255	0.7418	High level coupling stage，Moderate coordination
	2011	0.9322	0.7477	High level coupling stage，Moderate coordination
	2012	0.9333	0.7522	High level coupling stage，Moderate coordination
	2013	0.9339	0.748	High level coupling stage，Moderate coordination
	2014	0.9334	0.7414	High level coupling stage，Moderate coordination

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Technology intensive industry	2005	0.8716	0.7359	High level coupling stage，Moderate coordination
	2006	0.8724	0.7354	High level coupling stage，Moderate coordination
	2007	0.875	0.7293	High level coupling stage，Moderate coordination
	2008	0.8824	0.7271	High level coupling stage，Moderate coordination
	2009	0.8752	0.7233	High level coupling stage，Moderate coordination
	2010	0.8861	0.7446	High level coupling stage，Moderate coordination
	2011	0.8879	0.743	High level coupling stage，Moderate coordination
	2012	0.8849	0.7439	High level coupling stage，Moderate coordination
	2013	0.8833	0.7409	High level coupling stage，Moderate coordination
	2014	0.8842	0.7376	High level coupling stage, Moderate coordination

Table 5: Coupling coordination analysis under the density of factors in different industries.

According to the results in Table 5, it can be seen that the coupling coordination degree of global value chain embedded and carbon emission reduction after averaging treatment shows the following characteristics: labor-intensive and technology-intensive industries are weaker than capital-intensive industries. From 2005 to 2014, the coupling degree of the three kinds of intensive industries showed a slow rising trend, among which the labor-intensive industry showed a zigzag change track of first rising and then falling, but generally belonging to the high-level coupling stage. Capital-intensive and technology-intensive industries grew steadily. In the past 20 years, three kinds of intensive industries have developed rapidly, but the labor-intensive industries showed the fastest growth, while the capital-intensive industries showed the slowest growth, and technology-intensive industries were in the middle.

Conclusions and Countermeasures

Main Conclusions

There is a close interaction between global value chain embedded and carbon emission reduction. It is of great theoretical and practical significance to realize the coordination of the two between global value chain embedded and carbon emission reduction in the process of realizing the goal of "double carbon" and moving towards the middle and high end of global value chain. Based on the theory of coupling coordination, this paper establishes the evaluation index system of global value chain embedded system and carbon emission reduction system, calculates the comprehensive index of global value chain and carbon emission reduction by using the linear weighting method, and analyzes the development status of 21 subdivided industries under the intensity of different industries from 2005 to 2014, and draws the following conclusions:

First, due to the importance of the realization of the "two-carbon" goal and the industry's move to the high end of the global value chain, we select the coupling coordination model of two systems that measure the same contribution share. However, under the three different contribution share types, the coupling coordination degree measured under Type 1 and Type 2 shows basically the same trend. According to Type 3, most industries are in the advanced coordination stage.

Second, most industries are in the moderate harmonized-lag in GVC stage, indicating that GVC are the key reason restricting the coordinated development of GVC and carbon emission reduction. Only the extractive industry was in the advanced coordination stage, and the construction industry was in the lower coordination stage. However, the coupling coordination degree of the construction industry maintained a steady rising trend from 2005 to 2014.

Third, from the perspective of the three kinds of factor intensive industries, there are obvious industrial differences in the degree of coupling between global value chain embedded and carbon emission reduction, and they are both in the moderate stage of coordination in the degree of coordination. From the coupling coordination data, it can be seen that the coupling coordination relationship of capital-intensive industries is the best, followed by capital-intensive industries and labor-intensive industries. The labor-intensive industry shows a tortuous trend of rising first and then declining, but the three kinds of industries are in a high level of coupling stage.

Countermeasures and Suggestions

Based on the above conclusions, the following countermeasures and suggestions are put forward: First, we need to focus on green development while moving up the global value chain. In the process of development of developing countries, development before governance is the main theme of their development, which will inevitably cause damage to the ecological environment. Therefore,

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in the future development mode, we should not only pay attention to the accumulation of innovation factors, but also improve the level of green technology in various industries.

Second, we should make use of inter-industry linkages to move to the medium-high end of the global value chain. We will give priority to developing industries with comparative advantages, fully strengthen the advantages of labor-intensive industries, and vigorously encourage the development of technology-intensive and capital-intensive industries. For technology-intensive industries such as pharmaceutical manufacturing and electronic communication equipment manufacturing, the government departments of developing countries should increase the investment in scientific and research to move towards the middle and high end of global value chain, and upgrade the technology of capital-intensive industries such as electrical equipment manufacturing and machinery equipment manufacturing, so that global value chain embedment and carbon emission reduction can develop in a coordinated way.

Fund Project

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