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Research on Gradient Transfer of China's Processing Trades Industries

Wenwen Liu

School of International Economics and Trade, Shandong University of Finance and Economics, Jinan, China
Email: liuwenwen888999@163.com

Abstract

Geographical imbalance of China's processing trade industries has become increasingly prominent in recent years. Chinese industrial gradient situations can be estimated by industrial gradient coefficient. The transferred industries between high-gradient region and low-gradient region are decided by industrial concentration index. Based on the analysis, this article proposes the countermeasures for promoting the transferring of China's processing trade industries.

Keywords

1. Introduction

After more than 30 years of development since 1978, China's processing trade industries have been developing rapidly, which plays an important position in China's foreign trade. The total volume of processing trade has increased from $1.666 billion in 1980 to $1.3052 trillion in 2011 with an increase of about 783 times. However, the geographical distribution of processing trade industries in China is in imbalance with a large part of processing trade industries concentrated in the eastern regions. In recent years, some processing trade industries in eastern region began to shift to the central and western regions in China along with the rising production costs of processing trade enterprises in coastal areas and the need of processing trade industries upgrading in coastal cities. Compared to the situation of production material shortage in eastern region, the central and western regions have great advantages in its production costs aspect, so the provinces in the two regions are available to undertake some labor-intensive or resource-intensive processing trade industries.

In this case, from 2007 to 2010, the China's Ministry of Commerce issued three processing trade policies

which encouraged the processing trade industries shifting from the eastern region to the central and eastern regions in order to form a rational layout of the processing trade industries in China.

Under the function of low cost attraction and policy guidance, the proportion the central and western regions taken in processing trade volume increased from 2 percent of 2005 to 4 percent of July 2010. The processing trade volume of the 31 provinces undertaking industries accounted for more than 30 percent in the central and western regions and the average processing trade industry export volume grew 46.4 percent which was 14 percent higher than the average level of the whole country. Gradient transfer of processing trade industries has achieved initial success in terms of quantity, but there are still problems in the transferring periods of processing trade industries, such as: which region should shift industries out and which region should undertake industries; what industries should be shifted to other regions and what industries should be undertaken? The problems in the process of industry shifting and industry undertaking have become the focus in the current situation.

This article introduces the sample data and calculations firstly, then calculates Chinese processing trade industry's gradient situation by industrial gradient coefficient. Chinese processing trades are divided into formative stage industries, strengthening stage industries, degradation stage industries and inferior stage industries which are decided by industrial static concentration index and industrial dynamic concentration index. This article analyzes the transferred industries between high-gradient region and low-gradient region, and proposes countermeasures for promoting the transferring of China's processing trade industries in the end of this article.

2. Description of Sample Data and Calculations

2.1. The Gradient Illustration of Processing Trade Industry

Gradient theory shows the differences of the economic development level among different regions which is the objective theory basis of industry gradient transfer (Vernon, 1966). This article analyses the processing trade industrial gradient situations in China. The data covers 23 typical processing trade industries[1].

The industrial gradient situation in a region is reflected by industry gradient coefficient which is mainly affected by two factors: one is the innovation factor reflected by comparative labor productivity; the other is the industry cluster factor, which also means the degree of production specialization, reflected by location quotient (Zhang, Feng, & Wang, 2006; Dai et al., 2003). The specific formula is expressed as[2]:

$$CLP = \frac{x_{ij}\Big/\sum_j x_{ij}}{y_{ij}\Big/\sum_j y_{ij}} \tag{1}$$

$$LQ_{GDP} = \frac{x_{ij}\Big/GDP_i}{\sum_j x_{ij}\Big/GDP} \tag{2}$$

$$IGC = LQ \times CLP \tag{3}$$

2.2. Indicators of Industrial Concentration

- Industrial static concentration index

Regional industry concentration index is the basic analysis for evaluating whether an industry in a region has an advantage (He, Jiang, & He, 2010). It is first proposed and applied in location analysis by P. Haggett which reflects an industry's existing production capacity of a certain region and the proportion the industry's output takes in the whole country. It is the stock index for measuring the current distribution of industrial production.

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[1] Apply the methods from "Research on Regional Industrial Transfer" written by Dai et al. (2003).

[2] CLP stands for comparative labor productivity; LQ_{GDP} stands for location which is quotient calculated with the data of GDP; IGC stands for Industrial gradient coefficient; X_{ij} stand for the output value of i industry in j area; Y_{ij} stands for the labor of j industry within i region; $\sum_j Y_{ij}$ stands for the labor of I industry in the whole country; $\sum_j X_{ij}$ stand for the output value of i industry in the whole country; GDP_i stands for the GDP of i region; GDP stands for the GDP of the whole country.

The formula is expressed as[3]:

$$LQ_{ij} = \frac{x_{ij} \Big/ \sum_i x_{ij}}{\sum_j x_{ij} \Big/ \sum_i \sum_j x_{ij}} \tag{4}$$

If the static concentration index greater than 1, it indicates a certain industry in a region has certain comparative advantage. The critical value of static concentration index can estimate the industry cluster situation in an area by applying O'Donohue and Gleave's methods to estimate whether the industry static concentration index passes the standardized test. The formula of industry static concentration index is expressed as:

$$LQ_{ij} = \frac{LQ_{ij} - \mu}{\delta} = \frac{LQ_{ij} - \frac{1}{n}\sum_i LQ_{ij}}{\sqrt{\dfrac{\sum\left(LQ_{ij} - \frac{1}{n}\sum_i LQ_{ij}\right)^2}{n}}} \tag{5}$$

Z_{ij} stands for the standardized industry static concentration index, μ and σ stand for the mean value and standard deviation of industry static concentration index. If the Z value of certain industry within a region is greater than 1.65, it means the industry is clustering in the region.

- Industrial dynamic concentration index

Industrial dynamic concentration index reflects the concentration speed of a certain industry from one region to anther within a certain period of time which also reflects the industry transferring direction and speed (Huang, 2009).

Assuming that the time span begins from 0 to T, and there are i regions and j industries. X_{ij0} and X_{ijt} stand for the industry added value's average growth rate of j industry within i regions, X_{jt} stands for the industry added value's average growth rate of j industry of China, C_{ijt} stands for the industrial dynamic concentration index of j industry within i region. The followings are the formulas and the related explanation:

$$X_{ijt} = \sqrt[t]{\frac{x_{ijt}}{x_{ij0}}} - 1 \tag{6}$$

$$X_{jt} = \sqrt[t]{\frac{\sum_{i=1}^{n} x_{ijt}}{\sum_{i=1}^{n} x_{ij0}}} - 1 \tag{7}$$

$$C_{ijt} = \frac{X_{ijt}}{X_{jt}} \tag{8}$$

If $C_{ijt} \in (1, +\infty)$, it means j industry is concentrating within i regions, and the j industry within i regions has a comparative advantage in the whole country; if $C_{ijt} \in [0,1]$, it means although j industry within i regions is developing, the developing speed is lower than the average level of the whole country; if $C_{ijt} \in (-\infty, 0)$, it means j industry regresses within i regions.

The industrial static and dynamic concentration index represent different meanings as can been seen in **Table 1**. The former is a stock index which reflects the degree of specialization of certain industry within a region compared with the whole country; the latter is a flow indicator which reflects the concentration speed of an industry from a region to another within a period of time. The industrial transfer situation within a country can be better illustrated by combining the two indicators.

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[3] LQ_{ij} stands for location quotient which is calculated with the data of industry output value; X_{ij} stand for the output value of i industry in j area; $\sum_i X_{ij}$ stands for the total output value of all industries in j area; $\sum_j X_{ij}$ stand for the output value of i industry in the whole country; $\sum_i \sum_j X_{ij}$ stand for the total output value of all industries in China.

Table 1. The stage of industrial concentration[4].

The stage of industrial concentration	The criterion	The feature of different stages
Formative stage	$Z_{ij} < 1.65$ and $C_{ijt} > 1$	Although the certain industry's degree of specialization is lower than the national average level, the growth rate of this industry is higher than the national average level in recent years which shows an obvious industrial concentration trend.
Strengthening stage	$Z_{ij} > 1.65$ and $C_{ijt} > 1$	The industry has achieved industry concentration degree and the developing level has exceeded the average level of the whole country with an obvious competitive advantage.
Degradation stage	$Z_{ij} > 1.65$ and $C_{ijt} < 1$	The industry has a certain level of specialization, but the average growth rate has lagged behind the national average level in recent years along with the lost comparative advantage.
Inferior stage	$Z_{ij} < 1.65$ and $C_{ijt} < 1$	The industrial situation of a certain industry within a region was at a disadvantage position whether from the professional production aspect or from the development situation in recent years which indicates the poor industrial competitiveness.

2.3. The Empirical Process

The calculation process of the gradient coefficient of processing trade industry in China and the industrial concentration index can be expressed by **Figure 1**.

The analysis on calculation results

The data are from China Industrial Economic Statistical Yearbook (2003, 2011) and the Statistical Yearbook of 31 provinces[5]. We selected 23 two-digit code processing trade industries as study object and the study proceeds in six eastern provinces with well-developed processing trade industries and the typical undertaking provinces from the three processing trade industries gradient transferring[6].

A. *The gradient analysis of the processing trade industry*

Economic gradient is the economic development gap between regions. The 31 provinces of China can be divided into three gradients using the industrial gradient coefficient in **Table 2**. The following are the criteria for the classification:

- The first gradient: The occurrence frequency of industry gradient coefficient greater than one ≥7;
- The second gradient: 3 ≤ The occurrence frequency of industry gradient coefficient greater than one <7;
- The third gradient: The occurrence frequency of industry gradient coefficient greater than one <3.

The gradient distribution situation of China's processing trade industry can be seen in **Figure 2**, and processing trade gradient transfer analysis will carry out between these three gradients.

B. *The analysis on China's processing trade industrial gradient transfer*

We selected six developed processing trade industry provinces in the first gradient and thirteen provinces from the second and third gradient which are the key provinces for undertaking processing trade industries identified by China Ministry of Commerce. By calculating the industrial static and dynamic concentration index of the 23 processing trade industries from all the provinces, we can identify the industries which have the transfer trend from the first gradient and which have the industry undertaking advantage from the second and third gradient.

- The transfer industry from the first and the second gradient regions

According to the calculation results (refer to **Table 3**), the provinces which have industry transferring trends are as follows.

As can be seen from **Table 3** and **Table 4**, the degrading stage industries and the inferior stage industries of the eastern region concentrate on the labor-intensive industries other than the technology-intensive and resource-intensive industries. It means that the labor-intensive industries have no longer competitive advantages in the eastern regions. In order to develop higher value-added industries, the eastern regions should transfer the disadvantaged industries to other regions.

- The industry with undertaking advantages in the second and the third gradient regions

According to the calculation results of the ten provinces from the second gradient and the three provinces

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[4]Ou Yang Zhaoxu, The Industry Relocation and the Development of Construction Zone Based on Industry Concentration of Anhui [D]. Master's Degree Thesis of Anhui University, 2010(5).

[5]Use the industrial output value to calculate the indicators in order to realize the unity of the data.
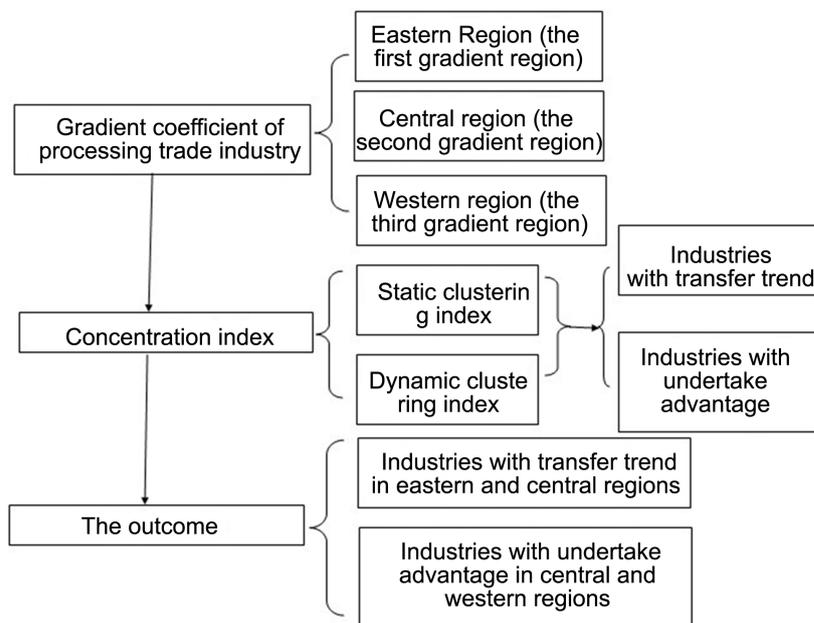
[6]The 23 specific industries.

Figure 1. Gradient coefficient of processing trade industry.

The first gradient region ▪ The second gradient region ▪ The third gradient region
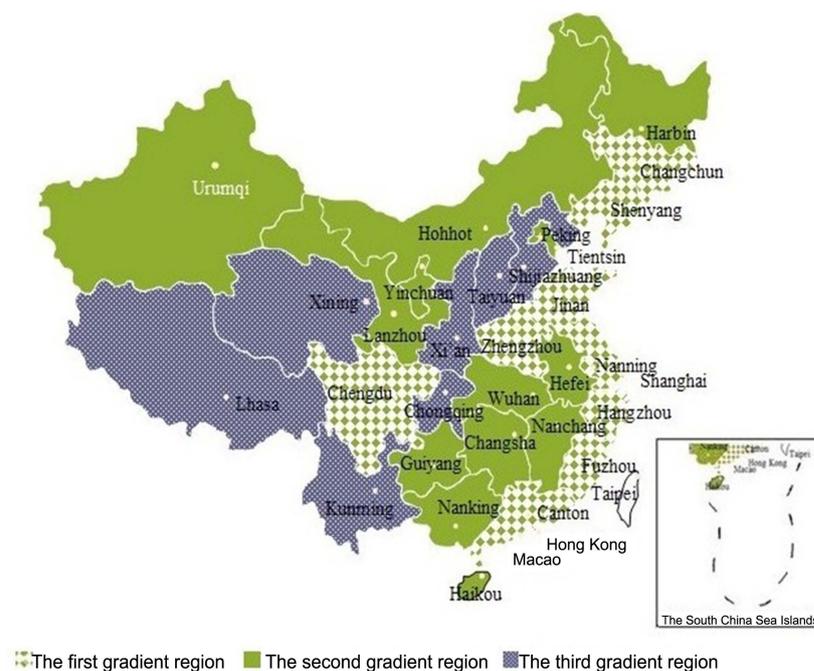
Figure 2. The distribution situation of China's processing trade industry gradient.

from the third gradient, we got the industries with undertaking advantages of the thirteen provinces.

As can be seen from **Table 5** and **Table 6**, the processing trade industries with undertaking advantages in the central and western regions concentrate on labor-intensive industries, which can resolve the problems of industrial transfer of the eastern region. Corresponding provinces can drive their industrial economic development by undertaking the transferred industries from eastern region actively according to their own industrial advantages.

- The industry the second and third gradient regions should undertake

We can get the undertaking industries of the second and third gradients by comparing the transferring industries of the first gradient and the advantaged undertaking industries of the second and third gradient.

Table 2. The industry gradient situation of china's processing trade industry.

The first gradient region		The second gradient region		The third gradient region	
Province	The occurrence frequency of Industry Gradient coefficient > 1	Province	The occurrence frequency of Industry gradient coefficient >1	Province	The occurrence frequency of Industry gradient coefficient ≥ 1
Shandong	19	Jiangxi	6	Shanxi	1
Jiangsu	13	Anhui	6	Yunnan	2
Shanghai	9	Hunan	6	Shanxi	1
Zhejiang	16	Hubei	4	Chongqing	2
Fujian	7	Inner Mongolia autonomous region	4	Qinghai	1
Guangdong	10	Heilongjiang	3	Tibet	1
Henan	14	Guangxi	3	Hebei	2
Liaoning	8	Hainan	3		
Sichuan	7	Ningxia	3		
Jilin	7	Xinjiang	3		
Tianjin	7	Guizhou	4		
		Gansu	3		
		Beijing	3		

Source: 2011 Statistical Yearbook of 31 Provinces.

Table 3. The processing trade industries with transfer trend of the first gradient region.

Province	The industries with transfer trend
Shandong	Degradation stage industries: C13(1.88, 0.98); Inferior stage industries: C15(−0.48, 0.97); C16(−1.57, 0.88); C28(−1.59, 0.13); C36(0.41, 0.87); C39(−0.30, 0.95);
Jiangsu	Inferior stage industries: C13(−1.04, 0.76); C14(−1.43, 0.61); C15(−1.04, 0.83); C17(0.84, 0.90); C22(−0.41, 0.92); C25(−1.28, 0.99); C31(−0.87, 0.81); C35(0.33, 0.85); C36(−0.05, 0.93);
Shanghai	Inferior stage industries: C13(−1.30, 0.54); C14(−0.11, 0.54); C15(−0.80, 0.58); C17(−1.13, 0.19); C22(−0.73, 0.66); C25(0.11, 0.60); C26(0.11, 0.73); C27(−0.21, 0.61); C28(−1.26, −0.28); C31(−0.90, 0.56); C32(−0.48, 0.39); C33(−1.03, 0.51); C34(0.14, 0.52); C36(0.31, 0.79); C39(0.17, 0.68); C41(0.47, 0.54)
Zhejiang	Inferior stage industries: C13(−0.87, 0.61); C14(−0.69, 0.86); C15(−0.47, 0.63); C16(−0.55, 0.89); C22(0.15, 0.88); C25(−0.59, 0.90); C26(−0.22, 0.98); C27(−0.26, 0.81); C31(−0.56, 0.79); C33(−0.37, 0.87); C34(0.22, 0.88); C35(0.17, 0.80)C36(−0.41, 0.65); C39(0.26, 0.86); C40(−0.74, 0.88)
Fujian	Inferior stage industries: C16(−0.07, 0.71); C26(−0.87, 0.88); C27(−1.00, 0.95); C33(−0.84, 0.91); C34(−0.52, 0.84); C36(−0.53, 0.93); C37 (−0.76, 0.84); C39(−0.58, 0.90); C40(0.30, 0.64)
Guangdong	Degradation stage industries: C40 (1.88, 0.97) Inferior stage industries: C13(−0.77, 0.73); C14(−0.24, 0.81); C15(−0.44, 0.77); C17(−0.41, 0.83); C22(0.43, 0.96); C25(−0.35, 0.98); C26(−0.36, 0.82); C27(−0.63, 0.75); C28(−1.00, 0.70); C31(−0.28, 0.80);

Source: The result is calculated by the author and the data is from China Statistical Yearbook and Statistical Yearbook of the corresponding provinces (2003, 2011). Note: The former number in the brackets is the industrial static concentration index; the latter number in the brackets is the industrial dynamic concentration index.

As can been seen from **Table 7**, among all the undertaking industries with advantages of the second and third gradients, some technology-intensive industries have certain advantages. Because the regional transportation and the basic infrastructures are less convenient in the second and third gradient than the third gradient, it is conducive to the continued development of the technology-intensive industries which means the second and third gradient should undertake labor-intensive industries.

Table 4. The processing trade industries with transfer trend of the second gradient region.

Province	
Jiangxi	Inferior stage: C16(−0.43, 0.69); C25(−0.66, 0.91); C28(−0.97, 0.74); C32(−0.32, 0.98)
Anhui	Inferior stage: C16(0.63, 0.94); C17(−0.64, 0.98); C20(0.61, 0.97); C25(−1.00, 0.81); C28(−1.00, 0.89); C29(0.09, 0.80);
Hunan	Inferior stage: C25(−0.68, 0.66); C28(−1.26, 0.33); C29(−1.13, 0.89); C43(0.13, 0.78);
Hubei	Inferior stage: C19(−1.53, 0.71); C20(−0.46, 0.79); C21(−1.21, 0.44); C22(−0.31, 0.81); C23(0.39, 0.90); C25(−0.43, 0.79); C27(0.47, 0.82); C28(−1.31, 0.42); C31(0.40, 0.98); C33(−0.42, 0.97)
Guangxi	Inferior stage: C13(1.76, 0.87); C26(−0.24, 0.98); C27(0.05, 0.83); C28(−1.33, −1.63); C29(−0.97, 0.94); C33(0.95, 0.98)
Heilongjiang	Degradation stage: C13(1.80, 0.82); C14(1.95, 0.61) Inferior stage: C13(1.80, 0.82); C14(1.95, 0.61); C15(0.78, 0.38); C16(−0.03, 0.43); C17(−0.80, −1.31); C18(−0.83, −1.25); C19(−0.79, −1.53); C20(1.38, 0.88); C21(−0.09, 0.30); C22(−0.42, −0.33); C23(−0.54, −0.28); C24(−0.57, 0.59); C26(−0.35, −0.04); C27(0.64, 0.16); C28(−0.88, −2.34); C29(−0.45, −0.22); C30(−0.47, −0.10); C31(−0.18, −0.02); C32(−0.48, −0.81); C33(−0.77, −0.33); C42(−0.73, −0.32)
Ningxia	Degradation stage: C33(2.56, 0.70) Inferior stage: C14(0.83, 0.98); C15(0.07, 0.82); C18(−0.91, 0.75); C22(0.91, 0.76); C26(0.59, 0.95); C28(−0.94, −5.21); C29(0.88, 0.37); C33(2.56, 0.70); C42(−0.94, −4.29)
Hainan	Inferior stage: C13(0.15, 0.61); C14(0.36, 0.49); C15(−0.09, −0.07); C17(−0.56, −0.29); C18(−0.46, 0.26); C20(−0.33, 0.35); C26(−0.10, 0.95); C27(0.95, 0.66); C28(−0.31, −0.13); C29(−0.53, 0.88); C30(−0.48, 0.22); C32(−0.56, −0.05); C33(−0.58, −0.03); C42(−0.51, −0.53); C43(−0.59, −1.37);
Xinjiang	Inferior stage: C13(0.10, 0.89); C14(0.42, 0.83); C15(0.14, 0.90); C17(−0.17, 0.64); C18(−0.62, 0.69); C19(−0.57, 0.43); C21(−0.40, 0.18); C22(−0.43, 0.60); C23(−0.44, 0.44); C27(−0.53, 0.67); C29(−0.51, 0.29); C30(−0.19, 0.74); C31(0.06, 0.84); C33(−0.37, 0.67); C43(−0.63, −1.37)

Source: The result is calculated by the author and the data is from China Statistical Yearbook and Statistical Yearbook of the corresponding provinces (2003, 2011). Note: The former number in the brackets is the industrial static concentration index; the latter number in the brackets is the industrial dynamic concentration index.

3. Conclusions and Recommendations

A. The conclusions

We can conclude the overall situation of transfer industry and undertaking industry from different gradients from the above analysis which can be seen in **Table 8**.

As can be seen in **Table 8**, the degradation stage industries and inferior stage industries of the first gradient region and the second gradient region mainly concentrate on labor-intensive industries, followed by resource-intensive industries and technology-intensive industries. The labor shortages and resource constraints restrict the development of some processing trade industries in the first gradient, so the processing trade industries which are suffocated in the first gradient region and the second gradient region in order to develop more technology-intensive and high value-added industries.

The industries which have the undertaking advantage in the second gradient mainly concentrate on labor-intensive industries, followed by resource-intensive industries and technology-intensive industries. The industries which have the undertaking advantages in the third gradient mainly concentrate on labor-intensive industries, followed by resource-intensive industries and technology-intensive industries.

B. The recommendations

It is inevitable that part of processing trade industry in the first gradient will transfer to the second and third gradient owing to the lost advantages in the first gradient and the imbalance economic development in China.

Table 5. The industry with undertaking advantage of ten provinces in the second gradient.

Province	
Jiangxi	Formative stage industries: C13(−0.24, 1.46); C14(−0.11, 1.55); C15(−0.55, 1.29); C17(−0.30, 1.81); C18(0.23, 3.29); C19(0.00, 2.23); C20(0.39, 1.24); C21(−0.40, 2.90); C22(−0.42, 1.95); C23(0.14, 1.14); C26(−0.04, 1.76); C27(0.99, 1.22); C29(−0.74, 1.58); C30(−0.57, 2.61); C31(0.61, 1.54); C42(−0.21, 1.89); C43(−0.51, 1.48)
Anhui	Formative stage industries: C13(0.55, 1.36); C14(−0.43, 1.22); C15(0.29, 1.06); C18(−0.38, 2.32); C19(−0.55, 1.57); C21(−0.69, 1.73); C22(−0.61, 1.33); C23(0.15, 1.50); C24(−0.56, 1.48); C26(−0.25, 1.24); C27(−0.42, 1.43); C30(0.20, 1.23); C31(0.07, 1.16); C32(−0.11, 1.13); C33(0.80, 1.22); C42(−0.67, 1.92)
Hunan	Formative stage industries: C13(0.50, 1.40); C14(0.40, 1.45); C15(0.12, 1.49); C17(−0.82, 1.33); C18(−0.88, 2.04); C19(−0.63, 1.61); C20(1.30, 1.33); C21(−0.10, 1.45); C22(0.69, 1.33); C23(0.18, 1.34); C24(−0.96, 3.19); C26(0.09, 1.23); C27(0.07, 1.41); C30(−0.69, 1.67); C31(0.30, 1.22); C32(−0.38, 1.07); C33(1.50, 1.15); C42(−0.83, 1.79) Strengthening stage industries:C16(3.10, 1.12)
Hubei	Formative stage industries: C14(0.40, 1.14); C17(0.35, 1.02); C18(0.25, 1.01); C24(−1.24, 1.42); C26(0.36, 1.07); C29(−0.72, 1.05); C30(−0.13, 1.11); C32(.22, 1.15); C42(−0.69, 1.55) Strengthening stage industries:C15(2.15, 1.34); C16(2.15, 1.43)
Inner Mongolia	Formative stage industries: C13(1.01, 1.32); C15(0.45, 1.53); C16(−0.34, 1.64); C17(0.08, 1.10); C18(−0.77, 1.21); C19(−0.72, 2.25); C20(0.31, 2.23); C21(−0.70, 3.42); C22(−0.39, 1.53); C23(−0.73, 1.57); C25(−0.05, 1.61); C26(0.18, 1.54); C27(0.09, 1.54); C29(−0.90, 1.18); C30(−0.51, 3.11); C31(0.26, 1.50); C42(−0.59, 1.52) Strengthening stage industries:C14(3.01, 1.10); C33(2.21, 1.44);
Guangxi	Formative stage industries: C14(−0.26, 1.28); C15(0.75, 1.65); C16(0.61, 1.26); C17(−0.93, 1.27); C18(−1.04, 3.17); C19(−0.45, 1.52); C21(−0.74, 2.62); C22(0.23, 1.16); C23(0.13, 1.86); C24(−1.02, 3.85); C25(−0.49, 1.74); C30(−0.74, 1.29); C31(0.48, 1.17); C32(0.64, 1.46) Strengthening stage industries:C20(2.90, 1.38)
Heilongjiang	Formative stage industries:C43(−0.66, 1.13) Strengthening stage industries:C25(2.47, 1.14)
Ningxia	Formative stage industries: C13(−0.32, 1.08); C16(−0.60, 1.55); C17(0.40, 1.14); C19(−0.58, 1.14); C21(−0.69, 1.78); C23(−0.66, 1.11); C27(0.02, 1.12); C30(−0.64, 1.10); C31(0.50, 1.10); C32(0.03, 1.08); Strengthening stage industries:C25 (2.26, 1.34)
Hainan	Formative stage industries: C16(−0.02, 1.21); C22(1.08, 3.06); C31(−0.03, 1.04); C35(−0.57, 1.19); Strengthening stage industries:C25(3.85, 3.84)
Xinjiang	Formative stage industries: C16(−0.19, 1.63); C20(−0.49, 1.12); C26(0.08, 1.31); C28(1.46, 4.35); C32(0.53, 1.28); C42(−0.61, 3.61) Strengthening stage industries: C25(3.99, 1.02);

Source: The result is calculated by the author and the data is from China Statistical Yearbook and Statistical Yearbook of the corresponding provinces (2003, 2011). Note: The former number of the brackets is the industrial static concentration index the latter number of the brackets is the industrial dynamic concentration index.

This requires the support of local government and the effort of enterprises. The processing trade industry transfer should been promoted from the following aspects:

- The recommendations for processing trade industry transfer region

1) Promote the transformation and upgrading of processing trade industry in eastern region

China's eastern region is the most developed regions of the processing trade industry. Its development not only plays an important role for their own economic development, but shoulder the important task of driving the development of processing trade industry in central and western regions, so the transformation and upgrading of processing trade industry in eastern region has a great significance for the overall development of the processing trade industry in China.

In order to realize the transformation and upgrading of processing trade enterprises successfully, on one hand, the government should eliminate the backward production capacity, and on the other hand, enterprises should

Table 6. The industry with undertaking advantage of three provinces in the third gradient.

Province	
Shanxi	Formative stage industries: C18(−0.54, 1.17); C19(−0.62, 1.69); C20(−0.54, 6.38); C30(−0.45, 1.03); C42(−0.53, 1.16); Strengthening stage industries:C25(3.43, 1.08);
Shaanxi	Formative stage industries: C13(0.14, 1.11); C14(0.73, 1.28); C15(1.13, 1.24); C18(−0.82, 1.45); C20(−0.72, 1.35); C24(−0.92, 3.31); C28(−0.78, 3.50); C29(−0.47, 1.84); C30(−0.30, 2.15); C31(0.24, 1.22); C32(−0.19, 1.21); C33(1.22, 1.30) Strengthening stage industries:C25(3.19, 1.53);
Yunnan	Formative stage industries: C14(−0.23, 1.37); C15(−0.10, 1.37); C21(−0.37, 1.21); C25(−0.19, 2.94); C32(0.02, 1.17); C42(−0.27, 3.74)

Source: The result is calculated by the author and the data is from China Statistical Yearbook and Statistical Yearbook of the corresponding provinces (2003, 2011). Note: The former number in the brackets is the industrial static concentration index; the latter number in the brackets is the industrial dynamic concentration index.

Table 7. The undertaking industry of the second and third gradient region.

The second gradient	Available undertaking industry from the first gradient	The third gradient	Available undertaking industry from the first and the second gradient
Jiangxi	C13; C14; C15; C17; C22; C26; C27; C31; C34; C35; C36; C39; C40; C41; C33	Shanxi	C13; C16; C36; C40; C41; C25
Anhui	C13; C22; C26; C27; C31; C32; C33; C34; C35; C37; C41; C39	Shaanxi	C13; C14; C15; C22; C28; C31; C32; C33; C34; C37; C39; C25
Hunan	C13; C14; C15; C17; C22; C26; C27; C31; C33; C34; C35; C36; C39; C41; C16	Yunnan	C14; C15; C25; C32; C34; C37
Hubei	C13; C14; C15; C26; C40; C41		
Inner Mongolia	C13; C15; C16; C17; C22; C25; C26; C27; C31; C32; C34; C35; C36; C37; C39; C14; C33		
Guangxi	C14; C15; C16; C25; C31; C32; C34; C36; C37; C39; C40		
Heilongjiang	C13; C16; C35; C36		
Ningxia	C13; C15; C17; C27; C31; C39; C25		
Hainan	C16; C22; C31; C35		
Xinjiang	C16; C26; C34; C39; C41		

Source: The result is calculated by the author and the data is from China Statistical Yearbook and Statistical Yearbook of the corresponding provinces (2003, 2011).

Table 8. The overall situation of three industry gradients.

gradient	industry type	industry occurrences frequency
Degradation stage industries and Inferior stage industries of the first gradient	Labor-intensive industry	35
	Resource-intensive industry	32
	Technology-intensive industry	20
Degradation stage industries and Inferior stage industries of the second gradient	Labor-intensive industry	30
	Resource-intensive industry	33
	Technology-intensive industry	29
Formative stage industries and Strengthening stage industries of the second gradient	Labor-intensive industry	50
	Resource-intensive industry	42
	Technology-intensive industry	25
Formative stage industries and Strengthening stage industries of the third gradient	Labor-intensive industry	11
	Resource-intensive industry	9
	Technology-intensive industry	4

improve the core competitiveness through technical innovation. In order to free up space for the development of high value-added processing trade industries, government should introduce high environmental standards which will eliminate the enterprises which pollutes the environment and consumes resources for profit inappropriately (Lin & Huang, 2013). On the other hand, the processing trade enterprises need to increase science and technology research and development efforts to enhance the capability of independent innovation, so that enterprises can develop their own brand gradually.

In addition, China's processing trade enterprises should undertake high-technical industries actively in the process of international industrial transfer, and take advantage of industrial technology spillover effect to increase the ability of foreign technology absorption, digestion and technology innovation of eastern region of China.

2) Guide the industries without advantage in eastern region shift to central and western regions

The national government and local governments have the responsibility to shift the traditional processing trade industry without advantages to other regions, but these decisions should not be based on the mandatory administrative command. The government should take advantage of a variety of economic levers to urge enterprises making decisions. For the industries which should transfer to other regions, such as the enterprises with serious environmental pollution and enterprises which waste energy inappropriately, government should impose high taxes to increase its stranded costs and to urge these enterprises transfer to other regions.

For the enterprises which shift their business without advantage to other regions, the government should give them some subsidies and incentives. And according to the specific circumstances, implement preferential policies in industrial land costs to the transfer enterprises which will appeal the enterprises transfer from the eastern region (Wang, 2013).

- The recommendation for processing trade industry undertake regions

1) Increase the infrastructure investment of central and western regions

Business development needs the convenient transport facilities and efficient communication equipment support, so in order to attract the enterprises transfer of eastern region, the government should increase the infrastructure investment of central region and western region. On one hand, the government should increase various transport investment, by developing comprehensive transportation network system consisted with highway to reduce logistics costs and increase the efficient communicate of center-west region and eastern region.

On the other hand, building processing trade free trade zone in the appropriate area can attract a large amount of investment which not only can further expand the processing trade bonded area development, but also reduce logistics costs, so that enterprises can achieve success in the fierce competition. Processing trade free trade zone can raise the industrial added value and promote the development of processing trade industry (Zhuang, 2014).

2) Strengthen the personnel development of central and western regions

Talent is very important for the development of an enterprise and it is especially important for center-west region. Only by enough talent support can an enterprise maintain the long-term sustainable development.

On one hand, the development of center-west region needs high-quality personnel from eastern region. The center-west region should attract talents by preferential recruitment conditions, such as solving the work of their family and their residence. In the same time, outstanding entrepreneurs and professionals can been invited regularly to hold seminars and technical guidance, so local personnel in centre-west region can learn advanced technology (Ma, 2014).

On the other hand, make full use of the local talent. There are many high level universities and research institutes in centre-west region; enterprises can make full use of these institutions to conduct scientific research. Using the talent resource promotes enterprise innovation ability and competitiveness.

3) Promote the development of industrial clustering in central and western regions

Industrial cluster can secure the economic competitiveness of a region, but some of the processing trade industry in center-west region have not yet form competitive industrial clusters, which is not conducive for center-west region undertaking the processing trade industry and have adverse effects for the economic development.

Choose pillar industry with large radiation effect, and extend related business on the industrial chain from both upstream and downstream link. By developing high advantage industry group, the undertaking processing trade industry can realize healthy development. The industrial cluster can enhance economic strength and prosperous regional economy.

References

China Industrial Economic Statistical Yearbook (2003, 2011). http://www.stats.gov.cn/

Dai, H. W. et al. (2003). *Research on Regional Industrial Transfer: Taking the "Beijing" Economic Circle for Example*. Beijing: China Price Press.

He, Q. Y., Jiang, Q., & He, H. B. (2010). The Choice of Undertaking Industry in the Central Regions of China. *Economic Geography, 6,* 960-964.

Huang, Z. Y. (2009). Transferring Industry: The Trends in the Eastern and the Choices of the Western—Take Chongqing for Example. *Economic Issues, 7,* 117-120.

Lin, G. J., & Huang, C. (2013). Dose Export Industry Transfer to Central and Western Regions—An Empirical Analysis Based on the Provincial Panel Data. *Journal of International Trade, 12,* 3-14.

Ma, L. Y. (2014). The Countermeasures of Undertaking Eastern Region's Industry for Western Region. *Modern Business, 1,* 139-140.

Vernon, R. (1966). International Investment and International Trade in the Product Cycle. *Quarterly Journal of Economics, 5,* 19.

Wang, Z. G., Yao, B., Liu, H., & Weng, Y. Z. (2013). The Current Situation and Transformation, Upgrading Countermeasures of China's Processing Trade. *Truth Seeking, S2,* 121-123.

Zhang, C. F., Feng, H. H., & Wang, L. G. (2006). The Empirical Research of Industrial Transfer and Industrial Agglomeration. *Statistical Research, 12,* 45-47.

Zhuang, R., Xu, Z. G., & Bai, G. Y. (2014). The Current Situation and Countermeasures of Chinese Processing Trade Industry's Transformation. *Intertrade, 1,* 18-20.