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ONE BELT AND ONE ROAD IMPACT ON ENVIRONMENT, ECONOMY & HEALTH IN WESTERN CHINA THROUGH INDUSTRY TRANSFER

Abstract: Based on fully absorbing and learning from the relevant research results at home and abroad, this paper focuses on four aspects: the transfer of polluting industries in the central and western regions and residents' health problems. Firstly, the current pattern and development trend of regional pollution transfer in China; secondly, the economic effect of the transfer of polluting industries on the western undertaking areas; finally, from the micro and macro perspectives, the paper investigates the impact of the transfer of polluting industries on the individual health and health expenditure of residents in western China. The results show that the gap between industrial environmental and economic efficiency in the western region narrowed and gradually stabilised from 2008 to 2017. However, the gap between industrial environmental efficiency and economic efficiency in the western region widened from 2017 to 2020. The impact of environmental pollution on industrial environmental efficiency in the western provinces and regions has regional differences. Secondly, the present situation and trend of pollution control in western China are macroscopically investigated by comparing the output of general industrial solid waste and the investment in pollution control in different regions. Finally, this paper reveals the impact of the transfer of polluting industries on the health of residents in western China. Based on the characteristics of household category, age, and income of interviewees, the income growth effect of the transfer of polluting industries is less than the health loss caused by the transfer of pollution. It can be found that the transfer of polluting industries has a significant impact on the environment, economy, and the health of residents in western China.

Keywords: industrial transfer, western region, environmental economy, residents' health

Introduction

In recent years, environmental pollution and people's health problems have become the focus of worldwide concern. Due to the unbalanced level of economic development among regions, transferring polluting industries is an essential process of economic development. It has become an inevitable trend of China's economic development that polluting industries in the developed eastern regions migrate to the central and western regions [1]. By building the "One Belt and One Road" economic belt, industrial transfer and structural adjustment can be promoted, the poor areas can be transformed into essential areas for economic development, and the balanced development of the regional economy can be continuously promoted to optimise the economic pattern effectively. Undertake the industrial transfer from the eastern developed regions is a meaningful way to optimise the

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industrial layout and improve the local industrial division system in the central and western regions [2]. Compared with the developed eastern region, the western region not only has abundant resources, cheap labour costs, and a relatively broad market potential and development prospects, as a result, with the developed eastern provinces rising labour costs and the continuous improvement of environmental regulation intensity, in recent years to speed up the pace of the industry to undertake both western provinces. For the backward western regions, the use of industrial undertaking from developed regions can not only stimulate the vitality of economic development in the regions to undertake, improve the level of economic development in the regions to undertake, but also promote local comprehensive employment and directly stimulate the growth of local government's total fiscal revenue and expenditure.

However, through analysis, it is easy to find that among all the transferred industries in developed provinces, the industries with solid pollution or high energy consumption level occupy a considerable proportion and show a continuously rising trend. Even some backward production capacity explicitly eliminated and banned by the state can be successfully transferred in space after being packaged layer by layer. From the perspective of ecological balance, such a trend tends to make the western undertaking region quickly become a gathering place to transfer polluting industries [3, 4]. Therefore, once regional pollution breaks through the limit of ecological equilibrium, regional economic development is not sustainable, and the health of residents in the region will be endangered. Some scholars [5-8] respectively expounded on the transfer and flow of industries between international and domestic regions from the perspectives of the advantages of industrial transfer, its impact on the economy, differences in pollution prevention and control production costs, and differences in regional policies. Li et al. [9] believe that the new trend of international industrial transfer based on the intra-industry division of labour is gradually replacing the traditional transfer mode based on the inter-industry and intra-industry division of labour. Ehizuelen and Abdi [10] systematically analysed international industrial transfer from the perspective of spatial transformation of output and output efficiency. Rauf et al. [11] believes that, on the whole, the index ranking of the six provinces in western China lags behind that of the eastern region. However, some key indicators still have certain differentiation advantages, which also become a vital driving force to attract industrial transfer. Shi et al. [12] systematically studied domestic industrial transfer and undertaking, respectively, and explained the industrial transfer from the perspective of relative labour cost differences and regional economic and social environments. Based on this, in-depth analysis and research of pollution industry transfer-related problems and countermeasures become this study's realistic basis and background.

Objectively assessing the impact of the transfer of polluting industries on the economic development and the health of residents is an essential guarantee for the scientific formulation of industrial undertaking policies, the maintenance of regional ecological balance, and the health of residents in the central and western regions of China. Based on the static assessment and dynamic analysis, this paper studies the trend of the overall transfer of China's pollution industries to the west. This transfer is not only reflected in the increase of the total pollution transfer but also in the differentiation and diffusion trend of the transfer is obvious. Although the undertaking of polluting industries brings opportunities to the economic development of central and western regions, the empirical analysis also shows that the promotion effect could be more sustainable. The empirical findings show that although the prevalence rate of residents in the areas where polluting

industries are undertaken in the central and western regions has not significantly increased at this stage, the probability of residents feeling that their health is getting worse has a significant upward trend. The income growth effect of polluting industries in central and western China is greater than the health expenditure effect caused by pollution.

However, the potential risk of health deterioration of the host population must be paid timely attention to.

Methods and materials

Since industrial enterprises above the designated size constitute the main body of China's industry, the following analysis in this paper is mainly based on the data of industrial enterprises above the designated size in 12 provinces and regions in western China [13] from 2008 to 2020. In this paper, the output is divided into expected output and non-expected output: gross industrial output is taken as the expected output, and pollution emissions are included in the whole production process, including the production of added value and the production of intermediate inputs [14]. In this paper, industrial pollution emissions mainly refer to industrial wastewater, waste gas, and solid waste discharge. Due to the limitation of data availability, only exhaust pollution is considered in this paper.

As industrial SO_2 is the most actual pollutant emission in the industrial waste gas, it is closely monitored by all provinces in China, and its data has good statistical characteristics. Therefore, we selected the SO_2 emission of industry in the western provinces as the undesired output indicator of the industry. The data came from the China Statistical Yearbook, 55 Years of Statistics of New China, China Statistical Yearbook of Industrial Economy, and China Environmental Yearbook.

In order to facilitate the comparative analysis, this paper measures the industrial environmental and economic efficiency of 12 provinces and regions in western China with the DEA-SBM model [15-17] considering pollution emission. The calculation and analysis tool is DEA-SOLVE, developed by Saitech-Inc - professional Version 5.0 software. Economic efficiency refers to the ratio of the actual output of an economy assuming a set of input elements under a given condition to the maximum output under the same input hypothesis. The closer this ratio is to 1, the higher the economic efficiency is. Economic efficiency considering pollution discharge" is called "environmental efficiency" [18-20].

At the same time, the economic growth function of industrial transfer is used to calculate some economic indexes.

In addition, considering the relative lack of micro health survey data of domestic residents at the present stage, this paper chooses the data released by the China Health and Aging Tracking Survey (CHARLS) project of Peking University for research. The effective samples of CHARLS are mainly over 45 years old. Compared with the young and middle-aged samples, the physical characteristics of these groups are more sensitive, so they can accurately reflect the entire response range of the transformation of the pollution industry in order to reflect the whole health level of residents in the central and western regions of China comprehensively and objectively, combined with the options of the CHARLS questionnaire. In this paper, health changes, self-rated health, chest pain, new diseases, physical dysfunction, and cognitive health were selected to evaluate residents' health comprehensively.

Analysis of results

Under the background of One Belt and One Road, the industrial transfer has an important impact on the environment and economic development in western China, reflected by the industrial environmental and economic efficiency in western China. In this context, the reasons for industrial transfer include environmental regulation, internal transaction cost, labour, market, and other factors.

According to the calculation formula of total labour productivity (total labour productivity = industrial added value/average number of all employees), this paper calculates the annual average employees of industrial departments in different provinces. In addition, some literature also considers the input of energy or resources when studying the total factor productivity of industry [21-23]. Since this paper selects the industrial gross output value as the expected output, and the input of energy or resources is only assumed to be the primary source of the unexpected output, this paper adds intermediate input in addition to the selected classical production input factors, capital and labour. Intermediate inputs include energy or resource inputs, so there is no need to consider energy or resource inputs separately. By contrast, increasing the intermediate input factors of production can more accurately reflect the actual situation of China's industrial environmental efficiency. The intermediate input in this paper is obtained by subtracting the total industrial output value from the industrial added value. Table 1 gives the descriptive statistics of the input and output of industrial enterprises in 12 provinces and regions in western China from 2008 to 2020.

Table 1

Input and output indexes of industrial enterprises above designated size in western China in 2008-2020

Index	Definition	Mean value	Standard
Gross industrial output value	The price of industrial output decreased [CNY]	2,356	2,581
Flue gas	Sulphur dioxide emissions [tonne]	163,382	308,854
Capital	Average annual balance price of net fixed assets [tonne per year]	1,478	1,170
Labor	The annual average of all employees	245	216
Intermediate input	The reduced aggregate price of intermediate inputs	1,881	1,972

The average industrial environmental efficiency in western China from 2008 to 2020 is 0.751, while the average economic efficiency is 0.861, a difference of 11 percentage points. It can be seen that the changing trend of industrial environmental efficiency and economic efficiency in western China is consistent. The variation range of industrial environmental efficiency is 0.689-0.851, the range is 0.162; The range of industrial economic efficiency is 0. Between 803 and 1, the range is 0.197. From 2008 to 2013, the gap between industrial environmental and economic efficiency in western China narrowed and gradually stabilised. From 2014 to 2017, the gap between environmental and economic efficiency has been reduced, but not to a large extent. From 2017 to 2020, the industrial environmental efficiency in western China declined, while the industrial economic efficiency rose, and the gap between the two started to widen again. This shows that the economic foundation of the western region needs to be stronger, the development of the provinces is still dominated by extensive development, and the development mode of the western region has remained

the same. It also shows that China's western region is in a conflict zone between economic development and environmental protection. The conflict between economic development and environmental protection is increasingly apparent.

For the central and western undertaking regions, an accurate assessment of the economic effect and sustained state level of the transfer of polluting industries is not only beneficial to the undertaking regions to guide the industrial transfer reasonably but also helpful to the undertaking regions to formulate industrial undertaking policies with a definite target [21]. In terms of the overall trend, the scale of the transfer of polluting industries between the eastern, central, and western regions has expanded further. In terms of the transfer scale of polluting industries, the central region is larger than the western region, and some polluting industries in the central region, such as power and heat production and supply, petroleum processing, coking, and nuclear fuel processing, have an apparent transfer trend to the west. The industries transfer situation in 2019 is presented in Table 2.

Table 2

Transference of polluting industries in various regions in 2019

Industry	Eastern region	Middle region	Western region
Power and heat industry [%]	56.35	21.52	22.13
Nonmetal mineral products [%]	48.85	35.40	15.80
Metal mineral products [%]	62.89	20.68	16.43
Chemical raw materials and products industry [%]	67.27	21.19	11.54
Textile industry [%]	67.21	19.50	10.79

Conclusion

The middle and lower industries under the construction of the "One Belt and One Road" economic belt are gradually transferred to China's western region. Among all the transferred industries in developed provinces, the industries with solid pollution or high energy consumption level occupy a considerable proportion and show a continuously rising trend. From the perspective of ecological balance, the industrial transfer has a specific gradient effect. Once regional pollution breaks through the limit of ecological balance, regional economic development is not sustainable, and the health of regional residents will be endangered.

In addition, there are apparent differences in the impact of the transfer of polluting industries on the health of different groups. The transfer of polluting industries harms the health of residents in western China, which cannot be ignored. The western region transfers the pollution industry to the agricultural registered permanent residence group, and the impact is more pronounced. The influence of the transfer of polluting industries on the age of 55-64 and 65-74 is more pronounced. Therefore, the central and western regions in undertaking the industrial transfer process, the government at the same time strengthening general environmental pollution treatment, the industry should focus on pollution continues the non-agricultural hukou for groups, the elderly, between 55-74 years old and relative income related groups such as far worse than average health, the influence of and compensation for pollution control measures in time. To sum up, in the process of industrial transfer, the western region must promote the integration of upstream and downstream industries, constantly transform traditional industries, do an excellent job in deep

processing and comprehensive utilisation of resources, pay more attention to pollution prevention and control and pay more attention to the health status of residents, and always adhere to green development.

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