

Can Environmental Regulations Force the Upgrading of the Industrial Structure?

Yixuan Zhang^{1*}

¹ Xi'an Gaoxin No.1 High School, Xi'an, Shaanxi, 710100, China

*Corresponding author. Email:2479215020@qq.com

ABSTRACT

The low-carbon development model as a representative of environmental regulatory policies will also affect the upgrading of the economy's industrial structure. Based on the panel data of 233 prefecture-level cities in China from 2005 to 2017, this article uses the "low-carbon city" construction pilot policy as the starting point, and utilizes the double difference method to examine the impact of China's environmental regulatory policies on the upgrading of industrial structure. The results show that low-carbon city policies have significantly inhibited the upgrading of China's overall industrial structure.

Keywords: Environmental regulation, low-carbon city, industrial structure upgrade, double difference

1. INTRODUCTION

The rapid growth of extensive investment in various industries across the world in the past has resulted in rapid economic development, but it has also had a serious impact on the ecological environment. The "three highs" characteristics of the economy's high investment, high consumption, and high pollution have gradually caused problems such as excessive consumption of resources, deterioration of the ecological environment, inefficient allocation of resources, and strained social relations. The concept and model of low-carbon development emerged at the historic moment, and has become an important means for many developed countries to enhance the competitiveness of cities and countries. The low-carbon development model featuring low energy consumption, low pollution and low emissions will also become China an important direction for economic development and transformation and upgrading. Under the background that China's economy has shifted from a high-speed growth stage to a high-quality development stage, the low-carbon development model as a representative of environmental regulatory policies will also affect the transformation and upgrading of the industrial structure of the economy, thus becoming the core driving force for China's future economic development. One of the key factors to overcome the middle-income trap.

In order to accelerate the transformation of economic development mode and economic structure

adjustment, it is necessary to accelerate the establishment of an industrial system characterized by low carbon emissions; actively promote the introduction, innovation, research and development, digestion, demonstration and industrialization of low-carbon technologies; actively use low-carbon technologies to transform and upgrade traditional industries; cultivate and expand strategic emerging industries such as energy conservation, environmental protection, and new energy. During the "Two Sessions" in 2010, the Chinese government identified the low-carbon development path as a major strategy for economic and social development, and the low-carbon development path with Chinese characteristics has been included in the "Twelfth Five-Year Plan". In 2010, the National Development and Reform Commission issued the "Notice on Launching Pilot Work in Low-Carbon Provinces and Regions and Low-Carbon Cities (Fagai Climate [2010] No. 1587)", and two batches of pilot provinces and cities have been launched. The first batch of pilots has been implemented since 2010, covering 81 cities; the second batch of pilots has been implemented since 2013, covering 33 cities. This article considers that the existing literature rarely studies the impact of China's low-carbon city policies on the upgrading of industrial structure. Therefore, this article will use regression panel data to study the areas where China's low-carbon city policies are implemented, demonstrating its impact on the upgrading of China's industrial structure, and providing reference data and

recommendations to help improve environmental regulatory policies.

The possible contributions of this paper are mainly reflected in: First, from a research perspective, there is currently a lack of relevant research on the impact of the establishment of low-carbon cities on the upgrading of industrial structure in the academic community. This paper takes China's low-carbon cities as the research object and explores its impact on the domestic industrial structure. Whether the upgrade will have a significant impact, to help analyze the economic effects of the establishment of low-carbon cities in China. Second, from the perspective of research methods, in order to clarify the relationship between the establishment of low-carbon cities and the upgrading of industrial structure, this article uses double differential processing the panel data of 233 prefecture-level cities during 2005- 2017 in China, completed the demonstration to alleviate the endogenous problem as much as possible.

2. LITERATURE REVIEW

According to the existing literature, environmental regulation can promote the optimal allocation of resources to realize the gradual evolution from the primary industry to the dominant position of the secondary industry and the tertiary industry, thereby enhancing the upgrading of the industrial structure. First, strict environmental regulations have pushed up the prices of pollution-intensive production factors, greatly increasing the cost of pollution-intensive small and medium-sized enterprises, and even forced them to suspend production or transfer, thereby driving the redistribution of production factors and gradually shrinking the share of pollution-intensive industries to realize the effective adjustment of the industrial structure [1]. Second, high-standard environmental measures may promote the development of environmental protection services and related service industries for polluting companies [2], thereby enriching the region's industrial system characterized by low carbon emissions and improving the region Single industrial structure. Third, with the promotion of energy conservation, emission reduction and cleaner production concepts, the environmental protection and green awareness of the whole society will generally increase [3], and low-carbon and green lifestyles and consumption patterns are actively promoted, and then Green services and related industries for residents have also emerged.

However, there are also opinions that environmental regulations may not necessarily force the upgrading of industrial structure: industries in developing countries are still concentrated in the production and processing of primary products, at the lower end of the industrial chain, and labor-intensive and resource-intensive industries are more developed. Taking China's energy

conservation and environmental protection industry as an example, it is still in the production and manufacture of pollution-control equipment and energy conservation-and-environmental protection products. The investment in ecological restoration, environmental governance, information consultation and other service industries is not high, resulting in the development of this industry is still in the primary production and processing link. The development is lagging. In addition, from the perspective of economic structure, even though China's tertiary industry's added value accounted for more than the secondary industry for five consecutive years in 2015, Zhang Yueyou et al. [4] pointed out that, measured at constant prices, as of 2016, my country's service industry's, the proportion of actual added value has always been smaller than that of the secondary industry, and the gap between the two widen continuously. The servicing trend of Chinese industrial structure is not yet prominent. Shi Dan [5] also pointed out that if the price factor is removed, the increase in the proportion of the tertiary industry from 1978 to 2017 will be less than half of the increase in the share of the secondary industry in GDP. Although China's other industries like financial and e-commerce industry is developing rapidly, due to the increasing cost of service industry, the main driving force of the country's economy is still the secondary industry. Therefore, under the current background that the development of its country's service industry, especially the producer service industry, is relatively lagging. The construction of low-carbon cities may not be able to increase the amount of advanced industrial structure through the force of environmental regulations [5].

Based on this, this article concludes:

Hypothesis: The establishment of low-carbon cities may inhibit the local evolution from the primary industry to the secondary and tertiary industries, and is not conducive to upgrading the industrial structure.

3. THEORETICAL HYPOTHESIS

3.1. Empirical Measurement Model Setting

The question explored in this article is whether the construction of low-carbon cities will significantly affect the upgrading of urban industrial structure. A simple and intuitive method is to compare the difference between the regional industrial structure upgrades before and after the establishment of low-carbon cities (single-difference method). However, due to the implementation of the low-carbon city policy, in addition to the low-carbon city policy itself, there are a large number of factors that will simultaneously affect the level of industrial structure upgrading in the region, thus the policy effects obtained by this approach are usually inaccurate. Therefore, this article intends to use Difference-in-Differences (DID) to deal with the

endogenous issues in the policy evaluation process to explore that whether the construction of China's low-carbon cities will affect the heightening of the urban industrial structure. The core explanatory variable is a low-carbon city dummy variable. This paper constructs two dummy variables: ① Dummy variables of the experimental group and the control group. The experimental group is a low-carbon pilot city established in 2010, defined as 1; the control group is a non-pilot city, defined as 0. ② Policy time dummy variable, defined as 1 in 2010 and after, and 0 before. Since the second batch of low-carbon city pilot cities was established in 2013, in order to ensure that the estimated results of this article are the net effect of the 2010 pilot policy, we exclude the newly established low-carbon cities in 2013. The empirical model is set as follows: $Y_{i,t} = \alpha_0 + \alpha_1 did_{i,t} + \theta X_{i,t} + \delta_t + \mu_i + \varepsilon_{i,t}$.

Among them, the subscript represents the city, represents the year, is the explained variable-the industrial structure upgrade. It means that the city is a low-carbon pilot city in the year. Conversely, it means that the city is not a low-carbon pilot city in the year. Represents the set of control variables that may affect the upgrading of the regional industrial structure, and is a random error term. It is a time fixed effect, which controls the characteristics of time level that does not change with regional changes such as changes in the macroeconomic situation; represents the individual fixed effect of each city, and controls factors such as geographic location that do not change with time at the city level. In the above model, this article is mainly concerned with the value of the coefficient, which measures the net effect of the establishment of low-carbon cities on the upgrading of industrial structure. If the establishment of a low-carbon city policy does inhibit the upgrading of the industrial structure, it should be significantly negative.

3.2. Variable Description

(1) The explained variable. The explained variable in this article is the upgrading of industrial structure. This article will measure this variable by using the index of the industrial structure hierarchy index to study the impact of the establishment of low-carbon cities in

China on the upgrading of industrial structure. The specific calculation formula is:

$$R_{i,t} = \sum_{m=1}^3 y_{i,m,t} \times m, m = 1,2,3.$$

It represents the proportion of the regional tertiary industry in the region's GDP during the period. The three industries are assigned values of 1, 2, and 3. This index reflects the quantitative evolution of the tertiary industries in the region, that is, from the first The dominant position of the industry gradually changes to the relative change in the proportion of the dominant position of the secondary industry and the tertiary industry. At this time, the closer to 3, the higher the industrial structure level, and the better the industrial structure; the closer to 1, the lower the structure level.

(2) Explain variables. The core explanatory variable is a low-carbon city dummy variable. According to the list of pilot cities implemented in 2010 in the "Notice on the Implementation of Low-Carbon Provinces and Low-Carbon City Pilot Work", combined with the establishment time assignment, the core explanatory variable is finally obtained.

(3) Control variables. In addition, other regional factors between the experimental group and the control group, apart from whether to implement low-carbon city construction, may also have a potential impact on the evaluation, leading to estimation bias. In this regard, based on the existing literature, the control variables that affect the upgrading of the industrial structure mainly include: ① Government scale(scale), expressed as the ratio of government public financial expenditure to regional GDP; ② The level of economic development(lpgdp), using the logarithmic value per capita Indicator expression; ③ Informatization level(infor), expressed by the ratio of total post and telecommunications business to GDP; ④ Human capital level(capital), expressed by the ratio of the number of students in ordinary colleges and universities to the total population at the end of the year; ⑤ Level of infrastructure construction(road), expressed in terms of urban road area per capita; ⑥ The degree of opening to the outside world (open) is expressed in terms of the actual use of foreign capital and the total regional production.

Table 1 Descriptive statistics of variables

Variable	Unit	Obs	Mean	Std.Dev.	Min	Max
From 2005 to 2010						
r	Index	1,165	2.2020	0.1270	1.8840	2.5900
pgdp	RMB/person	1,165	19787	14863	3163	106840
infor	%	1,165	0.0029	0.0020	0.0001	0.0421
road	M2/person	1,165	3.1730	5.0570	0.1950	64

capital	%	1,165	0.0142	0.0201	0.0003	0.1230
open	%	1,165	0.0215	0.0218	0.0000	0.1190
scale	%	1,165	0.1250	0.0516	0.0427	0.4230
From 2010 to 2017						
r	Index	1,864	2.2560	0.1360	1.8310	2.7000
pgdp	RMB/person	1,864	39567	29277	5514	216976
infor	%	1,864	0.0028	0.0030	0.0003	0.0573
road	M2/person	1,864	4.5510	6.2850	0.2390	73.0400
capital	%	1,864	0.0185	0.0249	0.0008	0.1310
open	%	1,864	0.0192	0.0381	0.0000	1.4670
scale	%	1,864	0.1790	0.0768	0.0439	0.6750

4. EMPIRICAL ANALYSIS

4.1. Basic Regression Results

This paper uses a double-difference panel model to test the impact of the establishment of low-carbon cities in China on the development of industrial structure. The specific regression results are shown in Table 2. Column (1) only controls regional fixed effects and time fixed effects, and column (2) further controls the influence of other important factors in the region. The results show that the establishment of low-carbon cities in China has a negative impact on the upgrading of industrial structure. That is, hypothesis in this paper has been verified. Specifically, according to the results of the

empirical model (2), the value of the influence coefficient of the establishment of low-carbon cities on the upgrading of industrial structure is -0.0417, which is significant at the 5% level. That is to say, from the perspective of the evolution of the proportions of the three major industrial structures, the establishment of low-carbon cities has a restraining effect in driving the evolution of the local industrial structure from a dominant position in the primary industry to a dominant position in the secondary and tertiary industries. The regression results of the control variables show that the level of economic development is not conducive to the upgrading of industrial structure, and the level of informatization has a significant role in promoting the upgrading of industrial structure.

Table 2 Basic regression results

	(1)	(2)
did	-0.0377*	-0.0417**
	(-1.9284)	(-2.2281)
lpgdp		-0.5196***
		(-2.6736)
infor		0.0175*
		(1.7346)
road		-0.0194
		(-0.6711)
capital		0.0083
		(0.2230)
open		-0.0018

		(-0.4217)
scale		-0.0566
		(-1.5239)
N	3029	3029
R2	0.6255	0.6355

Note: ①***, **, * indicate that the statistical value is significant at the 1%, 5%, and 10% significance level, and the standard errors are in parentheses; ②The variables are standardized during estimation, the same below.

5. CONCLUSIONS

Combined with the uncertainty of the impact of environmental regulatory policies on industrial structure upgrading, if the negative effects of low-carbon city construction on industrial structure upgrading are widespread, it will bring severe challenges to the adjustment of industrial structure and high-quality development in China and even the world. In this context, the biggest innovation of this article is to explore the new path of regional environmental regulations affecting the upgrading of industrial structure from the perspective of the establishment of low-carbon cities. This paper uses the panel data of 233 prefecture-level cities in China from 2005 to 2017 as the research sample, and uses the double difference method to evaluate the impact of the establishment of low-carbon cities in China on the upgrading of industrial structure. The research conclusions are as follows: (1) The establishment of low-carbon cities in China. Although it has promoted the demand of enterprises for green development, it has a significant inhibitory effect on the overall industrial structure upgrade; (2) The empirical results of the geographical division show that this policy has a small negative impact on the industrial structure of the eastern region. Both the central and western regions showed obvious inhibition. On the contrary, the industrial structure of the Northeast region showed a more obvious positive impact under this policy.

Based on the above conclusions, this article proposes the following policy recommendations: First, provide a more complete service support system for low-carbon cities, and provide a good external environment for the upgrading of regional industrial structure; vigorously develop modern service industries, especially increasing support for environmental protection research institutions Strength and investment. Accelerate the research and development, demonstration, promotion and application of low-carbon technologies; establish greenhouse gas emission statistics and management systems; improve related databases and provide guarantees for relevant institutions and personnel; promote scientific research on low-carbon environmental protection technologies in academia. Secondly, it is necessary to adapt measures to

local conditions and combine the location characteristics of different regions to build low-carbon cities to ensure policy flexibility.

REFERENCES

- [1] M.C. Zhong, M.J. Li, W.J. Du, Whether environmental regulations can force industrial structure adjustment-An empirical test based on China's inter-provincial panel data, *China Population Resources and Environment*. 25(08)(2015)107-115.DOI: <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2015&filename=ZGRZ201508014&v=GXCNum2Emdwa24NqJWHnK KR72OIMR8ECkfocLxxR2YAPRBkJ9hgQyn8Nb OKvZobn>
- [2] V. Mishra, R. Smyth, Environmental Regulation and Wages in China, *Journal of Environmental Planning and Management*. (55)(2012)1-19.DOI: <https://www.tandfonline.com/doi/full/10.1080/09640568.2011.636556>
- [3] Y.J. Yuan, R.H. Xie, Research on the Industrial Structure Adjustment Effect of Environmental Regulation-Based on the Empirical Test of Chinese Provincial Panel Data, *China Industrial Economics*. (08)(2014)57-69. DOI:10.19581/j.cnki.ciejournal.2014.08.005.
- [4] Y.Y. Zhang, Q.C. Dong, M. Ni, Analysis of the development of the service industry and "structural deceleration"-Concurrently discussing the construction of a modern economic system with high-quality development, *Economic Trends*. (02)(2018) 23-35.DOI: <https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2018&filename=JJXD201802005&v=wCtS351xgXSfaBWBxBVHI84nLTFDrAKY3LxOw8%25mmd2F45jMYqFkg6rX6Tn1aPLDYpDAH>
- [5] D. Shi, Green development and the new stage of global industrialization: China's progress and comparison, *China Industrial Economics*. (10)(2018)5-18. DOI:10.19581/j.cnki.ciejournal.2018.10.001.