The Effect of Environmental Regulation in Regions of Different Resource Curse Degrees

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Abstract. The unbalanced distribution of natural resources, human resources, industrial structure and other factors leads to the unbalanced economic development of different regions in China. In order to promote the sustainable and coordinated development between regions and the rational development of tourism resources, this paper uses panel data from 29 provinces in China from 2000 to 2015 to build a mixed regression model to verify the difference of environmental regulation effects in regions with different degrees of resource curse. The result shows that the effects of environmental regulation and its role in different regions of the resource curse are also different. In areas with severe resource curses, environmental regulations have the best inhibitory effect on resource curses, followed by resource curse marginal areas.

Keywords: Environmental regulation · Resource curse · Tourism · Regional difference

1 Introduction

Resource curse hypothesis is a well-known proposition in development economics, which generally refers to the adverse impact of natural resources on economic growth. This concept was first proposed by Auty. The Auty study found that abundant mineral resources are not an entirely favorable condition for the economic development of some countries, which may lead to the trap of slow economic growth or even recession [1]. In recent years, Chinese researchers have begun to pay attention to the resource curse phenomenon in China. Due to the excessive dependence and development of tourism resources, China's regional economic development is unbalanced, and the economic growth rate in the resource-rich areas is generally slower than that of resource-scare areas. Resource-rich regions have achieved rapid economic growth at the expense of consuming a large amount of resources. However, the extensive economic growth mode has brought about negative effects such as low production efficiency, resources depletion, and environmental degradation. Finally, the resource blessing may gradually turn into the resource curse [2]. On the contrary, some regions with relatively scarce resources have vigorously developed manufacturing and service industries, and achieved rapid economic development.

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As an important part of the tertiary industry, the impact of tourism on regional economy has always been the focus and hot issue of tourism economics. As tourism resource development is "sustainable" to a certain extent, and tourism itself is characterized by strong comprehensiveness and high industrial correlation, many countries and regions regard tourism as a “sunrise industry” [3]. Similar to some traditional industries, the development of tourism is also based on resources, namely tourism resources. Tourism resources include natural resources such as geomorphology, hydrology, climate and biology, as well as cultural and social resources such as cultural landscape, cultural traditions, customs, sports and entertainment [4]. Economic benefits can be obtained by exploiting tourism resources, therefore, tourism is also a “resource-dependent” industry in essence. The more abundant the tourism resources are, the more likely there will be resource curse phenomenon. Over-reliance on tourism resources will lead to over-exploitation of tourism resources, resulting in “crowding out effect”. Over-exploitation of resources will also cause a series of ecological environmental problems, and the influx of a large number of tourists makes it possible to deteriorate the environment.

With the development of tourism resources in China, ecological problems and environmental pollution are becoming more and more prominent. The Chinese Communist Party and Chinese government attach great importance to environmental protection and pollution control. Since the 18th National Congress, the Central Party Committee with President Xi Jinping as its core has integrated the construction of ecological civilization into China’s five-point strategy for building socialism with Chinese characteristics, and promoted the National People’s Congress to incorporate the ecological progress into the Constitution. The 19th National Congress made it an important task for China’s current and next stage of economic development to promote historic, turning and overall changes in the protection of ecological environment, and set a grand goal of building a beautiful country. In addition, Chinese government has not only enacted a series of environmental protection laws, including Law on Energy Conservation (2007), Atmospheric Pollution Prevention and Control Law (2015), Environmental Protection Tax Law (2018), Mineral Resources Law (2019), etc., but also established a central environmental protection supervision system. Environmental regulation is an important way to restrict resource development activities, lower natural resources dependence and achieve sustainable development [5]. Environmental regulation is not only the inherent requirement to drive resource development sector and manufacturing sector to realize industrial transformation and upgrading, but also the fundamental policy to promote [6].

2 The Theory of Mechanism

Scholars at home and abroad have found that abundant natural resources will exert a crowding effect on economic development, including but not limited to the crowding out of talents, innovative behaviors and other industries, especially manufacturing. Some scholars found through empirical analysis that the main reason for the resource curse in Shanxi Province is the resource-based industry’s crowding out of manufacturing, technological innovation and education [7]. At the same time, the overexploitation of resources will cause environmental deterioration. Once the high-intensity resource exploitation exceeds the carrying capacity of the environment, the environmental pollution will become increasingly serious and the ecology will become more fragile. Some

scholars have found that coal mining would lead to a series of environmental problems, including land collapse, groundwater destruction, discharge of waste water, waste gas and solid waste, soil erosion and vegetation destruction[8]. According to Porter hypothesis, reasonable environmental regulation has the effect of "innovation compensation", which can force enterprises to carry out technological innovation through institutional and other compulsory means, so as to achieve the purpose of promoting economic growth.

3 Data and Methodology

3.1 Data Description

This paper uses the panel data of 29 provinces in China from 2000 to 2015 as research sample. The annual output data of primary energy for resource curse coefficient calculation in this paper were obtained from China Energy Statistical Yearbook, China Statistical Yearbook and provincial statistical yearbook. Regional output value of secondary industry was obtained from China Statistical Yearbook and provincial statistical yearbook. Data on environmental regulation were obtained from provincial statistical yearbooks. The degree of marketization comes from Wang Xiaolu's Report on Marketization Index by Provinces in China (2018). Data on human capital levels are derived from the Yearbook of Population and Employment Statistics; Transport infrastructure levels from provincial statistical yearbooks.

3.2 Econometric Model

The core issue to be explored in this paper is the difference in the effectiveness of environmental regulation between regions with different resource curse degrees. Combined with the theoretical analysis above, this paper constructs the following econometric model:

$$D_{it}(d1, d2, d3) = \alpha_0 + \alpha_1 env_{it} + \alpha_2 mp_{it} + \alpha_3 hr_{it} + \alpha_4 trans_{it} + \varepsilon_{it} \quad (1)$$

D_{it} (d1, d2, d3) is the explained variable to explain the resource curse degree of different provinces, represents the resource curse region of the ith province in the t year, and represents the resource curse degree of different provinces. In this paper, 29 provinces are divided into four categories according to the resource curse coefficient: non-resource curse area, resource curse marginal area, resource curse severe area and resource curse high risk area. The explained variable is represented by three dummy variables d1, d2 and d3. If the resource curse coefficient of a certain region is between 1 and 2 in the current year, it belongs to the curse edge region, and d1 is 1; otherwise, it is 0. If a region has a severe resource curse in the current year, set d2 to 1; otherwise, set d2 to 0. d3 represents the high-risk area of resource curse. If a certain area belongs to the high-risk area in the current year, the value is 1; otherwise, the value is 0. Env_{it} represents the comprehensive index of environmental regulation in the t year of the i province, which is constructed based on the discharge of environmental pollutants. In this paper, the environmental regulation index is constructed based on the discharge of environmental pollutants, and three single indexes of industrial waste water discharge, industrial carbon dioxide discharge and industrial soot discharge of each province are

Table 1. Statistical summary

Variable	Description of indicators	N	Mean	sd
d1	non-resource curse areas	464	0.136	0.343
d2	resource curse edge areas	464	0.151	0.358
d3	resource curse areas	464	0.112	0.316
env	(Industrial waste water volume* Standardization of industrial waste water volume + Industrial CO2 emissions* Standardization of IndustrialCO2 emissions + Industrial soot emission* Standardization of industrial soot emission)1/3	464	0.547	0.533
mp	marketization degree	464	5.921	1.822
hr	Primary *6 + Junior *9 + Senior *12 + Junior college or above *16	464	8.885	1.201
trans	Highway mileage/provincial area	464	0.634	0.417

constructed as a comprehensive environmental regulation index. Mp_{it} represents the marketization level of the i province in the t year; hr_{it} and transit are control variables, representing human capital level and transportation infrastructure level respectively. ε is the random error term.

Resource curse index is an index to measure the deviation degree between the enrichment degree of natural resources and the economic growth rate in a certain region [8]. Generally speaking, the greater the value of a region's resource curse index, the greater the degree of the region's resource curse. This paper introduces resource curse coefficient to measure the degree of resource curse of each province. Referring to the index to measure the degree of resource curse proposed by Yao Yulong [9], the calculation formula is as follows:

$$Y_i = \frac{E_i / \sum_{i=1}^{n} E_i}{S_i / \sum_{i=1}^{n} S_i} \tag{2}$$

Y_i represents the resource curse coefficient of region i; E_i represents the primary energy production in region i; S_i represents the added value of industry in region i; n indicates the number of regions (n = 29).

In order to realize our country interprovincial resource curse partition,according to the above method, the resource curse coefficient of 29 provinces in China from 2000 to 2015 was calculated. According to the calculated resource curse coefficient, this paper divides the regions into non-resource curse areas, resource curse edge areas, resource curse areas, and resource curse high-risk areas. Considering the availability of data, data from Qinghai, Tibet and the Hong Kong Special Administrative Region, the Macao Special Administrative Region and the Taiwan Region of China are not included in this article. The statistical summary is in Table 1.

4 Result and Discussion

The regression result ais presented in Table 2.The regression results of panel data of 29 provincial administrative divisions in China from 2000 to 2015 show that the core variable, environmental regulation variable, passes the significance test at 1% significance level, and is negatively correlated with d1 and d2, and negatively correlated with d3. It shows that environmental regulation can break the resource curse to a certain extent in the marginal and severe resource curse areas, and has a greater effect in the severe resource curse areas, but in the high-risk areas of resource curse, it will aggravate the resource curse.

In the marginal areas of resource curse, the variables of marketization degree and the level of infrastructure transportation facilities fail to pass the significance test, which may be because the traffic and marketization in the marginal areas are not low, so they cannot restrain the resource curse. However, the level of human capital passes the significance test and is significantly negative. Talent is the core competitiveness of a country, a place to develop. Talent is an important creator and disseminator of advanced productive forces and advanced culture [10]. Talent is a valuable resource for social development, and without talent training, the national society will not progress. Therefore, the resource curse edge region can break the resource curse by increasing talent investment. Transportation can improve production efficiency, speed up the turnover of goods, and reduce people's empty time spent on transportation, which naturally contributes to economic development. Moreover, convenient transportation is more conducive to economic and cultural exchanges between various regions, improving people's mobility and mobility. The troika that has long driven China's economic development: investment, consumption, and exports are inseparable from the development of transportation. In the area with severe resource curse, the coefficient of marketization level and transportation infrastructure level is significantly negative, indicating that a higher degree of openness to the outside world and convenient transportation can break the resource curse in the area with severe resource curse. In the high-risk areas of resource curse, the coefficient of marketization degree is significantly negative, the coefficient of human capital level is significantly positive, and the level of transportation infrastructure is significantly negative at 10%. It shows that one of the ways to break the resource curse in the high-risk area is to increase the strength of opening to the outside world and improve the transportation infrastructure.

5 Conclusion

This paper adopts mixed regression model to examine the difference of environmental regulation effects in regions with different degrees of resource curse. The regression analysis indicates the effect and magnitude of environmental regulation are different in regions with different degrees of resource curse. Therefore, in the process of formulating and implementing environmental laws and regulations, we should adhere to the principle of adapting measures to local conditions so as to realize the sustainable development of tourism and regional coordinated development.

Specifically, Although human resources, transportation infrastructure and opening-up policies are important factors to drive national or regional economy, they have different

Table 2. Balance panel regression

Variables	(1)	(2)	(3)
	d1	d2	d3
env	−0.086***	−0.115***	0.137***
	(−2.95)	(−3.96)	(4.99)
hr	−0.117***	0.020	0.059***
	(−8.05)	(1.42)	(4.30)
trans	0.067	−0.170***	−0.081*
	(1.37)	(−3.52)	(−1.77)
market	−0.006	−0.058***	−0.060***
	(−0.58)	(−5.45)	(−5.92)
Constant	1.214***	0.486***	−0.076
	(10.16)	(4.11)	(−0.68)
Observations	464	464	464
R-squared	0.168	0.253	0.133
F test	0	0	0
r2_a	0.161	0.246	0.125
F	23.13	38.85	17.57

Notes Robust standard errors are reported in parentheses and ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively

effects in regions facing different degrees of resource curse, and measures should be taken according to local conditions. The intensity of environmental regulation and human capital investment should be increased in the marginal areas of resource curse, and the intensity of environmental regulation, transportation infrastructure investment and openness should be strengthened in the serious areas of resource curse. In high-risk areas of resource curse, measures should be taken to improve the level of transport infrastructure and market level. So as to achieve the rational development of tourism resources and the sustainable and coordinated development of the regional economy.

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