Mineral Economic Regionalization in the Context of Resource Crisis and Sustained Economic Growth

Meng Song[1, 2], Baoshun Liu[1], Junyu Zhang[2], Keqing Li[1, *]

[1] Civil and Resource Engineering School, University of Science and Technology Beijing, Beijing, China

[2] Chinese Academy of Natural Resources Economics, Beijing, China

*Corresponding author e-mail: res_study@foxmail.com

Abstract. As mineral resources are the material basis of social and economic development, the study on the correlation between the mineral resource industry and the regional economy, which aims at a scientific division of economic zones and a clear understanding of industrial characteristics, is crucial in addressing issues related to the management of resources and economy such as regional industrial development and territorial and spatial planning. By discussing the relation between dependence on mineral resources and national economy development, this study divides the Chinese mainland into three resource-based regions, nine resource-assisted regions and 19 non-resource-based regions based on quantified regional differences underpinned by the theory of threshold effects for measurement data. Furthermore, policy recommendations are proposed to pave the path for differentiated regional development after considering multiple factors including features of regional economy and resource potential. In addition to better serving and supporting economic development, territorial and spatial planning and the strategy of mineral resources, such recommendations are expected to provide differentiated development strategies for different types of regions.

1. Introduction

Mineral resources are an important part of natural resources and constitute the material foundation for economic and social development [1]. The study on the correlation between dependence on the mineral resource industry and regional economic development realises a science-based territorial and economic division of mineral resources and clarifies industrial distribution [2, 3]. Such work can better serve and support economic development, national territorial and spatial planning, as well as manage mineral resources. Differences in endowment of production factors, regional division of production and level of regional economic development are the embodiment of spatial division of labour in society, and they are the foundation for economic regionalisation. As a result, a proper choice of indicators and methods used to determine regional boundaries based on how mineral resource industries and economic development are related is crucial in addressing issues related to economic regionalisation of resources [4]. Global interest in the research and application of regional economic characteristics has surged since the 1990s, and recent work has focused on the relation between regional resource industries and economic growth, as well as the economic regionalisation based on resource industries. Numerous meaningful studies have been conducted so far.

In terms of research on the relation between regional resource industries and economic growth, Cockx [1] propose the hypothesis of resource curse, claiming that the increase in resource dependence can significantly reduce economic growth rate and divert capital and labour force from industries including manufacturing. When trade, education and industrial structures are impeded, economic recession occurs [2, 3]. Meanwhile, resource exploitation might cause institutional corruption and reduce operating efficiency [4–7]. However, some studies have pointed out that the negative correlation between resource dependence and long-term economic growth is not justified, and there is no convincing evidence to testify the inevitable institutional factors for corruption [8, 9]. In China, research results in the later stage disapproved early empirical research fuelled by inter-provincial data, which supported the resource curse hypothesis, because the effect of regional resource curse has not been established [10–12]. Contrary to Brown [13], who believed that abundance in regional resources has a positive spill-over effect on neighbourhood cities, some scholars stated that necessary policy intervention can transform the development of resource industry into a positive driving factor [14–16]. With the arrival of in-depth data to facilitate research, Peretto and Valente (2011) found a noteworthy inverted U-shaped curve to represent the relation between dependence on resource industry and economic growth. Similarly, Zhou (2019) reported a phased correlation between resource industry and economic growth through an empirical analysis of 37 countries where the method of inflection point detection was adopted for multiple breakpoints. In general, causes and transmission mechanisms of resource curse vary from country to country, which changes this correlation in different development phases. Abundant resources can power the economy but fluctuate long-term economic growth [19, 20].

As for the study of economic regionalisation of resources, Janin and other scholars [21, 22] worked on the influence of economic globalisation, network society and resource issues on contemporary regional policy and planning. They believed that the development of resource industry should be incorporated into territorial planning to coordinate industrial development and territorial space and balance economic growth, territory and environmental quality [23]. According to the status quo of resources and environment, the International Union for Conservation of Nature divides protected areas into three classifications and seven categories, including areas under strict protection, areas under general protection and areas for sustainable use [24]. In line with the principle of embryology, the Academy of Macroeconomic Research (China) differentiated between resource-based cities (118 cities) and non-resource-based ones in China. In a research conducted by Abdulahi (2019) and other scholars, 14 resource-rich African countries were objects, and the rule of law was a key variable. They applied the model of threshold effects to identify different regional types and explain the nonlinear relation between resource rent and economic growth in different regions. Zhang et al. (2018) applied the method of systematic index evaluation in the regionalisation of mining resources and divided Wumeng Mountain into three categories, namely, the area of restricted exploitation, area of protective development and key area for development, after considering resource abundance, ecological environment and transport.

According to the above results, the establishment of an indicator system that reflects characteristics and laws for regional resource industries in compliance with the endowment of natural resources is crucial for economic regionalisation of resources [27]. On this basis, this study explores the relation between dependence on mineral resource and national economic development by quantifying territorial and spatial differences based on the theory of threshold effect for measurement data. This work seeks to provide a fresh perspective and a new method on matters of territorial and spatial division, especially on the economic regionalisation of mineral resources. Furthermore, it aims to facilitate policy-making on the differentiated regional development models.

2. Research Object and Assumptions of Economic Regionalisation

2.1. Research Object
The relation between economic growth and dependence on mineral resources is the research object for this paper and serves as the basis for the regionalisation of mineral resources to support sustainable

development of resource-based industries and optimise national territorial and spatial planning. Economic growth is measured by GDP growth rate per capita, and the dependence on mineral resources refers to how dependent a certain region is on mineral resources, or specifically, the degree of dependence on resource-based industries [11]. Given that the mineral industry at the upstream of the industrial chain plays a key role in the improvement of people's lives and the technology and service industries, this study measures the proportion of regional output for the mining industry to the total industrial output. It disregards frequently used indicators of the mining industry to GPD or the ratio of people working in the mining industry to obtain a more accurate measurement of dependence on the resource industry.

The research selected panel data of 31 provinces in China, except Hong Kong, Macao and Taiwan, from 2000 to 2017 as the sample. All data have been analysed and sorted out with reference to *China Statistical Yearbook, China Industry Economy Statistics Yearbook, China Natural Resources Statistics Yearbook* and records of Shanghai Futures Exchange from 2000 to 2017.

2.2. Assumption of Economic Regionalisation
Before systematically delving into the dependence of the mining industry and the quality of regional economic development, this study first analyses panel data of mining dependence and economic growth rate of 31 provincial administrative regions in the Chinese mainland from 2000 to 2017. This time frame is divided into three sections, namely, from 2000 to 2005, from 2006 to 2011 and from 2012 to 2017. Dynamic analysis of the relation between GDP growth rate per capita and regional economic growth on the spatial and temporal scale produces spatial–temporal distribution of inter-provincial GDP growth rate per capita and mineral resource dependence in China (Figure 1).
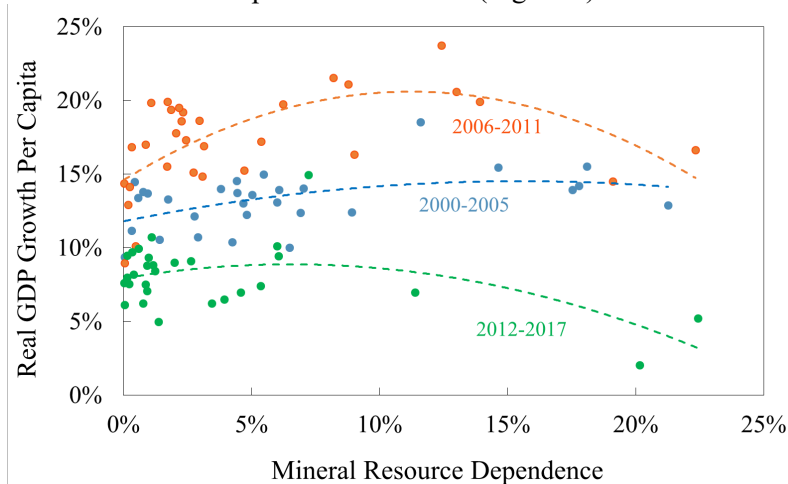

Figure 1. Spatial–temporal Distribution of Inter-provincial Per Capita GDP Growth Rate and Mineral Resource Dependence in China

This analysis unveils a nonlinear relation between the dependence on mineral resources and economic growth. From 2000 to 2005, the economic growth rate of every region was moderate, and resource dependence was relatively high, ranging from 0% to 10%. The curve describing the relation between mineral resource dependence and economic growth shows an upward trend, and these two factors display a positive correlation. From 2006 to 2011, economic growth of these regions was rapid and stable, with a growth rate generally above 10%. This period indicated a divergence in resource dependence, so the curve is in the shape of an inverted U. Thereafter, the trend of correlation began to split. When the economy slowed down from 2012 to 2017, resource dependence in most regions was concentrated within 2%, and these two factors were negatively correlated with each other. In general, an inverted U-shaped relation stretched throughout the whole research period, which shows two inflection points in economic growth rate as dependence on the mining industry increases. Therefore,

the assumption of a double-threshold effect (threshold γ1 and threshold γ2) in the correlation of economic growth and mineral resource dependence in provincial administrative regions can classify regions concerned as resource-based regions (RRs), resource-assisted regions (RARs) and non-resource-based regions (NRRs).

3. Empirical Design and Analysis

3.1. Model Specification
Apart from investment, consumption and import and export, known as the Troika in most countries and regions, other key factors directly driving economic development include science and technology, as well as mineral resources regarded as materials [20]. Differences in resource endowments, industrial development models and development processes result in substantial regional disparity in dependence on mineral resources. To better analyse the relation between mineral resource dependence and economic development in China, this paper draws on the Hansen threshold regression model to identify key threshold values and examine the relation between the resource industry and economic growth. Given that this study is committed to analysing the impact of resource dependence on economic growth and then basing territorial regionalisation of resources on inflection points of resource dependence, only resource dependence is applied to the threshold regressive model. Calculation of other factors is excluded from this research. The regressive model of single-threshold value uses resource dependence as a threshold variable:

$$Gdp_{it} = \mu_i + \alpha_1 \cdot Mrd_{it} \cdot I(q_{it} \leq \gamma) + \alpha_2 \cdot Mrd_{it} \cdot I(q_{it} > \gamma) + \beta \cdot Z_{it} + \varepsilon_{it} \qquad (1)$$

In this formula, Gdp_{it} represents the Real GDP growth per capita in a certain area in one year, regarded as an explained variable; Mrd_{it} is Mineral Resource Dependence, a core explanatory variable; q_{it} is the threshold variable; γ is the specific threshold value endogenously based on sample data; I ( ) is an indicative function; Z_{it} is a set of control variables, including Inv (material capital input), Em (human capital input), Ope (Opening degree), and Tec (Technological innovation level); β represents the estimated coefficient of each control variable; μ_i is the individual effect; and ε_{it} is a random disturbance.

If the original hypothesis is rejected in the single-threshold test, multiple thresholds might exist. The multiple threshold regression model is similar to the single-threshold model in which only the indicative function I ( ) needs to be altered. For example, the double-threshold model is expressed as follows:

$$Gdp_{it} = \mu_i + \alpha_1 \cdot Mrd_{it} \cdot I(q_{it} > \gamma_1) + \alpha_2 \cdot Mrd_{it} \cdot I(\gamma_1 > q_{it} > \gamma_2) + \alpha_3 \cdot Mrd_{it} \cdot I(q_{it} \leq \gamma_2) + \beta \cdot Z_{it} + \varepsilon_{it} \qquad (2)$$

Table 1. Definition of Variables

Variable	Symbol	Index	Definition
Explained variable	Gdp	Real GDP growth per capita	-
Interpretation / threshold variable	Mrd	Mineral Resource Dependence	Mining output value / industrial output value
control variable	Inv	Material capital investment	Fixed asset investment / GDP
	Em	Human capital investment	Growth of urban employment
	Ope	Opening degree	Total import and export / GDP
	Tec	Technological innovation level	Number of researchers / total population

3.2. Descriptive Analysis of Variables
Descriptive statistical results in Table 2 show unevenness of economic development in China with an average value of 12.71%, ranging from the minimum of −22.33% to the maximum of 31.46%. Regional differences in mineral resource dependence are remarkable, ranging from a minimum of only 0.01% to a maximum of 45.1%.

Table 2. Descriptive Statistics of Variables

	variable	Observed value	Mean	Sta.Dev	Min	Max
	Gdp	558	0.1271	0.6310	-0.2233	0.3146
	Mrd	558	0.0542	0.0720	0.0001	0.4510
	Inv	558	0.5452	0.2380	0.2205	1.3554
Z	Em	558	0.0034	0.0020	0.0003	0.0089
	Ope	558	0.3034	0.3787	0.0169	1.7215
	Tec	558	0.0029	0.0042	0.0006	0.0328

Note: Results in the table are rounded with four decimal places reserved

3.3. Empirical Test of Threshold Effect

As shown in Table 3, non-threshold, single-threshold and double-threshold values together with F-stat and Prob for mineral dependence are gained when the software of stata15 is applied in bootstrapping for 1,000 times. The result is not noticeable under the non-threshold scenario but shows significance under 1% in cases of single and double thresholds. Therefore, the impact of mineral resource dependence varies in different development stages.

Table 3. Test Results of Threshold Effect

Model threshold	Threshold effect test					
threshold	BS times	F-stat	Prob	10%	5%	1%
No threshold	1000	0.070	0.945	-	-	-
One threshold	1000	16.752	0.000	2.557	3.552	6.577
Two thresholds	1000	15.628	0.000	2.665	4.050	7.183

Figure 2 is a sequence chart showing the estimated threshold value and likelihood ratio in 95% confidence interval with dependence on mineral resources used as a threshold variable. When the double-threshold test is performed, the threshold estimate is γ as the likelihood ratio statistic is close to 0 based on the principle of likelihood ratio function. Therefore, two threshold variables in this study are 3.528% and 15.049%.
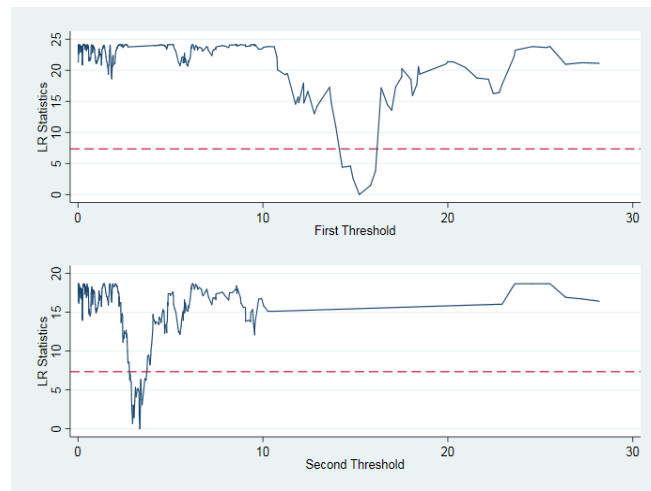
Figure 2. Estimate of the Double-threshold Model for Mineral Resource Dependence

3.4. Analysis of Results

When Mrd_{it} (mineral resource dependence) and Gdp (GDP growth rate per capita) are counted as key indicators in economic regionalisation, 31 provincial administrative regions can be classified into three groups, namely, RR, RAR and NRR, according to two threshold values produced by the double-threshold model. On this foundation, the role played by various kinds of mineral resources in economic development in the past 18 years can be determined (Table 4).

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Table 4. Classification of Chinese Provincial Regions

Type	RR	RAR	NRR	
Province	Shanxi (20.97%) Tibet (20.21%) Qinghai (15.41%)	Gansu (5.10%) China average (5.46%) Anhui (5.86%) Ningxia (6.82%) Yunnan (7.03%) Guizhou (8.95%) Shaanxi (9.97%) Inner Mongolia (11.36%) Heilongjiang (12.82%) Xinjiang (13.19%)	Shanghai (0.03%) Guangdong (0.21%) Zhejiang (0.30%) Tianjin (0.36%) Jiangsu (0.41%) Beijing (0.48%) Fujian (0.85%) Hubei (1.13%) Guangxi (1.78%) Sichuan (2.29%)	Jilin (2.37%) Hainan (2.43%) Liaoning (2.60%) Chongqing (2.60%) Hunan (2.68%) Shandong (2.72%) Hebei (2.94%) Henan (3.11%) Jiangxi (3.38%)

Meanwhile, results can be reached by using the double-threshold regression model (Table 5): 1) When resource dependence is <3.528%, the coefficient of impact on economic development is 0.0194, which is significant at 1% level; when it is between 3.528% and 15.049%, the impact coefficient is 0.0066, which is significant at 1% level; when it is >15.049%, the coefficient is 0.0015, which is significant at 5% level. 2) The influence coefficient of fixed-asset investment is −0.1539, which is negatively correlated with economic development and is significant at 1% level. This result might be due to the following reasons [28]. Liu et al. [29] believe that a huge amount of ineffective investment since 2000 severely squeezed urban and rural residential consumption. As a common tool for counter-cyclical adjustment, fixed-asset investment is often taken into a stimulus package in an economic downturn [30]. 3) Influence coefficients for technological innovation, growth of human resources and openness are 0.0326, 0.1731 and 0.0819, respectively, which are all significant at 1% level. These values indicate that the impact of scientific and technological innovation is relatively small. Thus, input in scientific and technological innovation faces difficulties in bringing in short-term economic benefit [31].

Table 5. Estimation of Panel Threshold Regression Results

	Variable	coef	std	t	prob
	mrd_{it}<3.528%	0.0194	0.0041	4.7492	0.0000
	3.528%<mrd_{it}<15.049%	0.0066	0.0015	4.3068	0.0000
	mrd_{it}>15.049%	0.0015	0.0006	2.5213	0.0120
	inv	-0.1539	0.0183	-8.3944	0.0000
	tec	0.0326	0.0097	3.3515	0.0009
Z	em	0.1731	0.0290	5.9629	0.0000
	ope	0.0819	0.0223	3.6795	0.0003

The results show that growth of human resource (especially urbanisation) is the biggest driving force and influencing factor for economic growth in China. From the perspective of analysing historical data, most regions in China are not yet driven by innovation. Dependence on resources in provincial regions may positively influence economic growth, but it suffers from clear marginality that the impact coefficient decreases as dependence rises. The Chinese mainland has three RRs, nine RARs and 19 NRRs that hugely differ in resources and economic growth. It necessitates individual research to determine future development routes.

4. Territorial and Economic Characteristics
In this section, estimated threshold values and classification of three different areas are assessed based on the threshold effect upon selection of resource and market data as samples. Characteristics of economic development in three types of areas are analysed.

4.1. Territorial Characteristics of Three Types of Areas

The GDP growth rate per capita in the eastern and northeastern regions is relatively low compared with that in the central and western regions in China (Figures 3a and 3b). Dependence on mineral resources generally increases from the east to the west. The fully developed eastern and northeastern regions in contrast to underdeveloped central and western regions are in economic transformation where economic growth rate and resource dependence are falling normally. The declining rate of GDP growth per capita in the northeast region is greater than that in the east region, and this difference is partially explained by local resource depletion (such as in Heilongjiang Province, Table 6). This situation also proves difficulties in regional economic transformation.
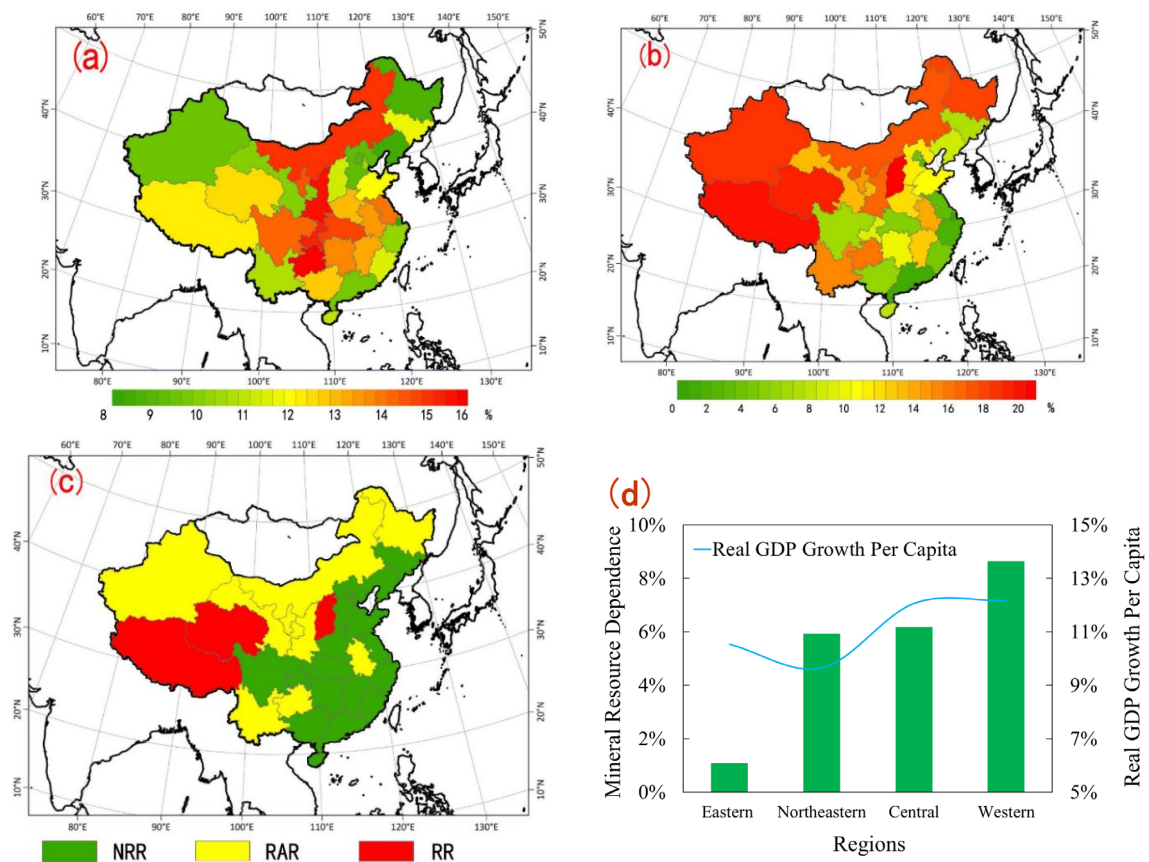

Figure 3. Territorial Characteristics of Mineral Resource Industry and Economic Development in Various Regions in 2000–2017

(a. Territorial Distribution Characteristics of real GDP Growth Rate per capita in Various Regions; b. Territorial Distribution Characteristics of Dependence on Mineral Resource Industry in Various Regions; c. Territorial Distribution Characteristics of Three Types of Areas; d. Distribution Characteristics of Dependence on Resource Industry and GDP Growth Rate per capita in Eastern, Northeastern, Central and Western Regions)

4.2. Economic Characteristics of NRR

Data of 19 NRRs, including Shanghai, Tianjin and Guangdong, are selected as samples to compare the relation between resource dependence and GDP growth rate per capita in different phases and explore characteristics of economic development. In general, NRRs are economically developed, most of which have successfully moved forward from the stage of development driven by natural resources. Although the impact of the resource industry on the local economy is minimal, resources should still be secured

because they are the material basis for economic development and production [32]. Analysis of the relation between dependence on the resource industry and GDP growth rate per capita in NRR proves that resources play a basic supporting role as an indispensable production factor in economic development when dependence on mineral resources is low. The resource industry and regional economic development are significantly positively correlated with each other. Most regions boasting low dependence on mineral resources are economically developed. Their economic structure is less dependent on mineral resources or they are backed by large resource-exporting provinces. However, the correlation of the resource industry and economic growth reveals that even economically developed regions cannot be cut off from basic resource support. When the dependence on mining resources is <0.02%, the growth rate of GDP per capita is relatively sensitive to the increase in dependence. This analysis alerts NRRs, including Shanghai, Guangdong and Zhejiang, that they should be vigilant about resource security to maintain stability of regional economic development.
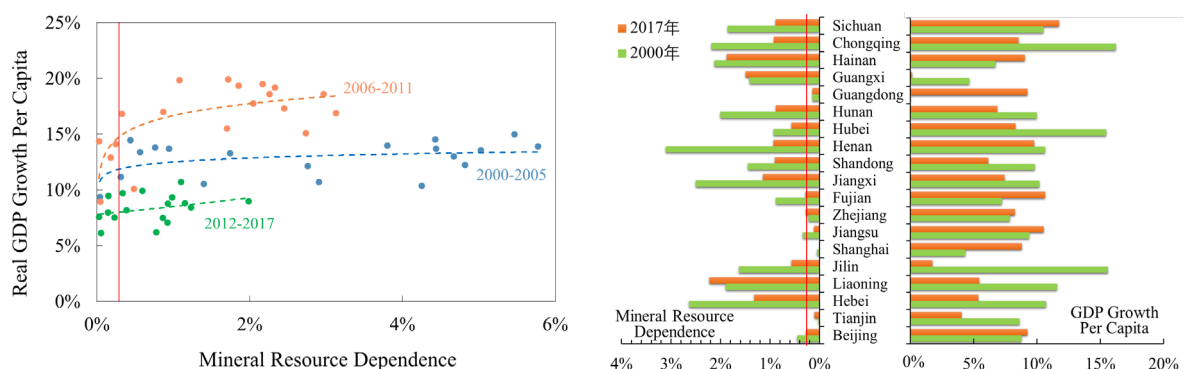

Figure 4. Comparison of Dependence and GDP Growth Rate per capita for NRR in Different Periods (a. Fitting of Scattered Points for Dependence and GDP Growth Rate per capita; b. Data Comparison 2000–2017)

4.3. Economic Characteristics in RARs

After the relation between resource dependence and GDP growth rate per capita for RARs in different periods (Figure 5) is examined, a nonlinear inverted U-shaped curve is established to represent the correlation where marginal effect is proved between the resource industry and economic growth. In the nascent stage for RARs, rapid growth in both the resource-based industry and GDP per capita is witnessed before the regional development reaches the optimal point. After the resource industry reaches a certain scale, further development could be accompanied with stabilised or downward GDP growth per capita.
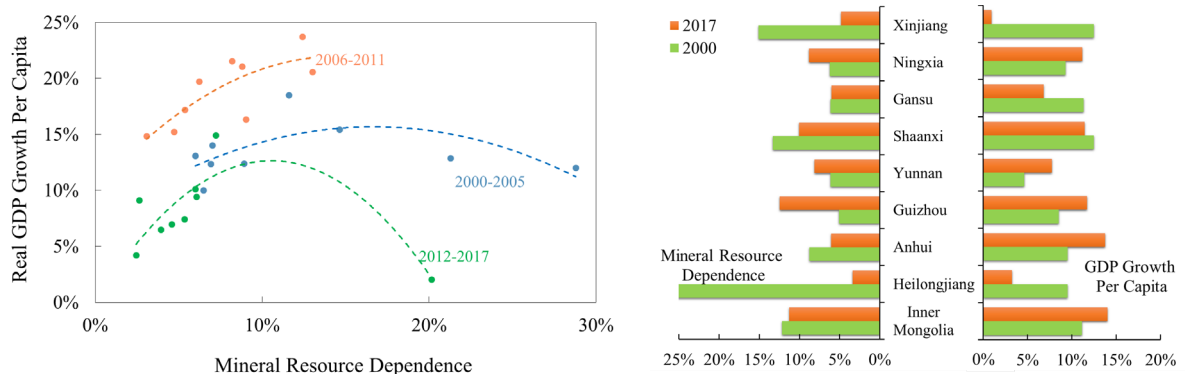

Figure 5. Comparison of Dependence and GDP Growth Rate per capita for RAR in Different Periods (a. Fitting of Scattered Points for Dependence and GDP Growth Rate per capita; b. Data Comparison 2000–2017)

RARs can be broken into three categories based on resource abundance (reserves) and changing resource dependence: I. Resource-depleted areas, such as Heilongjiang and Anhui, where the resource industry is waning because major resources of coal, copper and iron are running out. Regional economic structure is forced to transform itself. II. Resource-emerging regions, such as Inner Mongolia and Xinjiang, located in the west. They are rich in reserves and their resource-based industry is so promising that they are bound to grow into major bases of energy and resources. III. Resource-stable regions, such as Shaanxi and Guizhou, where abundant resource reserves are prevented from being developed by disadvantageous ecological environment and transport. In the third category, the resource industry is moderately sized, and sustainable development is a possibility. Given that there is a remarkable diminishing marginal effect for the contribution made by the resource industry to economic growth in RARs, differentiated policies should be applied to resource-depleted, resource-emerging and resource-stable areas.

Table 6. Proved Reserves and Remaining Mining Years for Bulk Minerals in 2017

Province	mineral species	Proved reserves in 2017	Proportion in China	Remaining mining years
Inner Mongolia	coal	510.27	20.47%	66.97
	iron ore	18.17	9.04%	26.78
	copper mine	437.83	16.70%	8.21
	Phosphate rock	0.11	0.34%	-
Heilongjiang	coal	62.28	2.50%	> 100
	iron ore	0.34	0.17%	6.28
	copper mine	111.35	4.25%	5.85
	Phosphate rock	0.05	0.15%	-
Anhui	coal	82.37	3.31%	72.00
	iron ore	8.59	4.27%	8.05
	copper mine	154.7	5.90%	9.17
	Phosphate rock	0.2	0.62%	-
Guizhou	coal	110.93	4.45%	> 100
	iron ore	0.17	13.44%	60.71
	copper mine	0.17	0.01%	8.14
	Phosphate rock	6.44	19.87%	36.28
Yunnan	coal	59.58	2.39%	> 100
	iron ore	4.24	2.11%	30.42
	copper mine	298.99	11.41%	15.11
	Phosphate rock	6.27	19.35%	35.93
Shaanxi	coal	162.93	6.54%	38.67
	iron ore	3.97	1.97%	16.02
	copper mine	19.93	0.76%	> 100
	Phosphate rock	0.06	0.19%	> 100
Gansu	coal	27.32	1.10%	73.28
	iron ore	3.24	1.61%	29.81
	copper mine	132.45	5.05%	66.78
	Phosphate rock	0.48	1.48%	-
Ningxia	coal	37.45	1.50%	72.63
	iron ore	0.01	0.00%	-
	copper mine	3.7	0.14%	-
	Phosphate rock	0.01	0.03%	-
Xinjiang	coal	162.31	6.51%	> 100
	iron ore	8.26	4.11%	27.87
	copper mine	224.76	8.58%	12.42
	Phosphate rock	0.39	1.20%	-

Low level of resource reserves   High level of resource reserves

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5. Economic Characteristics of RRs

RRs include three regions, namely, Shanxi, Tibet and Qinghai. Resource dependence and GDP growth rate per capita are found to be poorly correlated with each other. In a study on how market factors of major resource products impact regional economic growth, Shanxi is found to be propelled by coal while Qinghai and Tibet are fuelled by nonferrous metal resources such as copper. If Datong Mixed Coal Price Index and Shanghai Metal Market index from 2005 to 2017 are utilised as objects, the GDP growth rate per capita and market index of major resource products can be presented as in Figure 6.
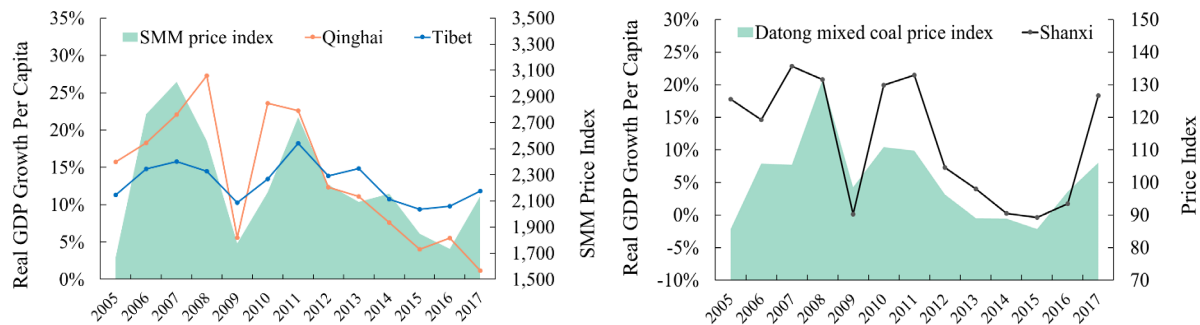

Figure 6. GDP Growth Rate per capita and Price Index of Major Resource Products in RR 2005–2017

Calculating the GDP growth rate per capita and the coefficient for price index of major resource products in RRs from 2005 to 2017 can quantitatively measure the close relation between the two variables. The range of coefficient is between −1 and 1. A positive value indicates a positive correlation. The larger the coefficient is, the stronger the correlation between the two variables. The following formula introduces the correlation coefficient:

$$R(gdp_t, pr_t) = (\sum gdp_t \cdot pr_t - \sum gdp_t \cdot \sum pr_t / N) / \{[\sum gdp_t^2 - (\sum gdp_t)^2/N] \cdot [\sum pr_t^2 - (\sum pr_t)^2/N]\} \quad (3)$$

where Gdpt represents the growth rate of GDP per capita in RRs in year t; prt is the price index of major resource products in year t; R stands for correlation coefficient; and N is the total number of years, which is 13 here.

The correlation coefficients R of Tibet, Qinghai and Shanxi are calculated to be 0.84, 0.67 and 0.66, respectively, thereby proving a significant correlation. The growth rate of GDP per capita in RRs is consistent with the pricing trend of major mineral products, and regional economic development almost entirely depends on market prosperity of resources.

6. Conclusions and Policy Recommendations

To explore the relation between economic growth and mineral resource dependence in major regions of China, this paper adopts dynamic panel data and the threshold model to verify structural differences in how the resource industry impacts national economic growth with time and space taken into account. Three types of territory for industrial development have been identified, and their corresponding economic characteristics and influencing factors have been investigated. The following results are drawn: 1) Threshold testing method can be used for territorial identification of the industry, and the results can be applied as the basis for economic regionalisation in various plans. 2) Human resource growth is the major driving force to China's economy. Resource dependence can positively promote economic growth, but it suffers from marginal effects. 3) There are significant threshold boundaries in China's regionalisation of the resource industry. Two threshold variables are 3.528% and 15.049%, based on which 31 provinces on the mainland can be divided into RR, RAR and NRR. These three regions vary hugely in economic driving factors and development routes. 4) The GDP growth rate per capita in RR is highly correlated with the prices of regional major resource products, and its economy almost entirely depends on the prosperity of resource market.

By combining conclusions with the current status of resource-driven economic development in China, policy recommendations are proposed to establish differentiated models for regional growth to achieve high-quality economic growth, sustainable development of resources and coordinated regional and territorial advancement. RRs with a low recovery rate and poor resource carrying capacity must conduct research and innovate development models to explore the transformation of the resource-service industry depending on the number of remaining years for resource exploration. RRs with rich resources can further upgrade their industry and add more value to secure long-term supply. More efforts are required to conduct investigation and preserve resources so that sustainable economic growth can be maintained. Falling into the trap of resource curse should be avoided by curbing corruption and supporting science, technology and education. As for RARs, the resource industry in resource-depleted areas are barely able to support sustainable growth, and these areas deserve additional policy support to complete the accumulation of capital and technology so that they can unleash other advantages and divert human resources and capital to emerging industries. In this way, the regional economy would be fully transformed. In resource-emerging areas, explorations should be disciplined to maximise their assets. Under the condition of preserving the environment, resources should be better explored and utilised to build national bases for a secured energy and resource supply. Against the background of the resource industry being in a disadvantage, resource-stable areas, which are regarded as regional resource supply centres, deserve a certain scope for resource development to prevent the regional resource industry from losing its functions. Finally, NRRs are expected to focus on reserving basic resources that are in immediate demand and must be kept at a short distance, such as sand and gravel. A timely plan has to be in place to secure routes and methods of supplying resources required by regional industrial development. Tapping domestic and international markets may also help secure resource supply.

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