Exploring the environmental impact of China's exploitation and utilization of mineral resources

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Abstract. With the development of economy, China has become one of the largest exploitation and utilization of mineral resources in the world. The exploitation and utilization of mineral resources also bring great destruction to the ecological environment while effectively supporting the rapid development of China's economic society. How to avoid the environmental impact caused by the exploitation and utilization of mineral resources is an important breakthrough in the construction of ecological civilization in China. This paper USES the panel data model, from the industrial structure, technological progress and the government management three dimensions of theoretical analysis and empirical test, inspected the China environmental impacts of exploitation and utilization of mineral resources. The results show that the environmental pollution of China's mineral resources exploitation and utilization has obvious effect on the environmental impact of the current period. For different kinds of mineral resources, the environmental impact of energy and mineral exploitation and utilization is the largest, and the metal mineral is second. At the same time, in the development and utilization of mineral resources in the process of the formation of the environmental impact of industrial structure is the important cause of environmental pollution, and advances in technology have a positive effect in the control environmental pollution. In terms of government management, government management in the eastern region has a strong inhibitory effect on environmental pollution, while the effect in the central and western regions is not obvious.

Keywords. Mineral resources; Development and utilization; Environmental impact; from the industrial structure; Technical progress.

1. Introduction
By 2020, we will build a moderately prosperous society in all respects. China will be at the peak of industrialization, and mineral resources will be close to the peak of consumption. Mineral resources development and utilization is a "double-edged sword", it in promoting economic growth at the same time, led to some countries or areas appeared in different degrees the depletion of resources, environmental pollution, ecological destruction and the decline of regional development, and thus found themselves lost in a trapped trap of "the winner's curse". To effectively conserve resources and protect the environment and promote the sustainable and sound development of China's mineral resources exploitation and economic society has attracted the attention of the Chinese government.
In this paper, on the basis of existing research, from the national to regional level of China's mineral resources development and utilization of the environmental impact of the overall effect and regional differences, in order to reveal the different regional mineral resources development and utilization of formation and evolution characteristics of the environmental impact. This is of great significance for optimizing the development and utilization of mineral resources in China and improving the national sustainable development capacity and ecological civilization level.

2. Literature review
With the rapid growth of the world economy, environmental pollution has been widely concerned as a "by-product" of economic growth. Scholars at home and abroad have made some achievements in exploring the environmental impact of exploitation and utilization of mineral resources. Stephen E Kessler defines the environmental effect of exploitation and utilization of mineral resources, and establishes the basic framework of environmental effect theory of mineral resources exploitation and utilization [1]. Kang constructed an environmental effect factor weight quantification model and provided a basic frame for the quantitative evaluation of environmental impact of exploitation and utilization of mineral resources [2]. In addition, Lanolin Gee and Chris Rios [3] and Sergei Sabayon use the system of environmental impact assessment method, respectively, for coal and mineral surface structure, as a result of the development and utilization of oil shale, climate change, water pollution and land use change on the measure [4]. These studies have improved the accuracy and scientificity of environmental impact analysis of mineral resources exploitation and utilization.

However, despite the existing literature directly or indirectly, the environmental impact of mineral resources development and utilization are pointed out, however, these studies lack on the basis of a comprehensive theoretical analysis, the effective judgment of different kinds of mineral resources exploitation and utilization of the environmental impact, no effect on the formation of the economic mechanism to make further explanation. At the same time, the research of the existing literature rarely divides the object of analysis into the specific region of a certain country, thus making the research of the problem abstract and subjective. As the largest developing country, China's mineral resources development and utilization scale is large, the intensity is high, and the associated environmental pollution is serious [5]. In this paper, the mineral resources development and utilization of the environmental impact into one based on the theory of industrial structure, technological progress and the government management framework, explaining in established under the action of economic variables, different kinds of mineral resources development and utilization of the environmental impact of the overall effect and the regional difference, revealing the mineral resources development and utilization of the environmental impact of inner drive mechanism, break through the existing research.

3. Theory and hypothesis
We can understand from two aspects of mineral resources development and utilization of environmental impact: on the one hand is a natural physical effects of mining production on the environment, namely in without considering the effects of social and economic factors, mining production department directly accessible for mineral resources and mining, smelting, manufacturing process production of minerals on the impact of the natural environment; On the other hand, some key factors that determine the utilization of mineral resources in the economic system such as industrial structure, technological progress and government management are the factors that affect the natural environment. We should consider how some key economic variables in the economic system can directly or indirectly affect the utilization process of mineral resources and produce environmental impacts.

In the process of exploitation and utilization of mineral resources, industrial structure is an important cause of environmental pollution. Under the condition that the pollution control mechanism is not sound, the regional industrial structure level is different, and the environmental impact of exploitation and utilization of mineral resources will produce regional difference. Technological
progress has a reverse effect on environmental change, and technological progress may have a positive effect in controlling the environmental impact of exploitation and utilization of mineral resources. The higher the level of technological progress in regional development, the less environmental impact will be caused by the exploitation and utilization of mineral resources. The government management behavior in mineral resources exploitation and utilization can play a role in controlling environmental pollution. However, these functions depend on the attitude and degree of local government in the management of resources and environment.

4. The empirical test
Based on the panel data of 20 provinces and cities in China, this paper sets up a dynamic panel data model to investigate the impact of mineral resource development and utilization on the environment, and sets the following measurement model:

$$ Legit = a_0 + \text{legit} - 1 + \beta_1 \ln M_{mit} + \beta_2 \ln N_{mit} + I_t + \varepsilon $$

(Pit represents the industrial pollution index I province at time t. The Pit -1 is the value of the lag phase. Mm it, Nit respectively I save the production of metal minerals, non-metal t years. It said I province first t in the environmental impact of other explanatory variables, namely the this article third part expounded by the industrial structure, technological progress and the government management of mineral resources development and utilization of the environmental impact factors.

The indicators in this paper are mainly derived from the China environmental statistics yearbook and the Chinese university financial database. For the missing values of individual indicators, the mean method was used to repair them. In order to eliminate the heteroscedasticity in the data, the data of each variable was logarithmically processed in the data analysis. In addition, this paper adopts the LLC root test method to investigate the stability of variables.

According to the division of China’s three major zones, the eastern region includes Beijing, Hubei, Shanghai, Jiangsu, Zhejiang, Fujian and Shandong. The central region includes Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan and Chongqing; Western regions include Inner Mongolia, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang. Considering China mineral resources development and utilization and the environmental pollution has the regional characteristics, further to the eastern, central and western three regional mineral resources development and utilization of the environmental impact investigation respectively, to reveal the impact of regional differences.

Table 1. Estimation results of the environmental impact by mineral resources development and utilization in different areas

| Item   | Eastern region | Central region | Western region |
|--------|----------------|----------------|----------------|
|        | Stochastic effect model | Fixed effect model | Fixed effect model | Fixed effect model | Stochastic effect model |
| lemma  | 0.260*** (0.058) | 0.137** (0.059) | 0.32*** (0.096) | 0.293* (0.100) | 0.133* (0.036) | 0.261*** (0.146) |
| inn    | 0.132** (0.191) | 0.432** (0.201) | 0.214*** (0.116) | 0.198*** (0.133) | 0.028** (0.133) | 0.224*** (0.109) |
| Lind   | 0.681*** (0.197) | 0.430** (0.062) | 0.387* (0.019) |
| lentic | -0.410** (0.057) | -0.039* (0.024) | -0.017*** (0.022) |
| logo   | -0.314** (0.306) | -0.021** (0.025) | 0.027** (0.038) |
| F      | 19.334 16.716 27.823 25.428 9.753 7.664 |
| P      | 0.000 0.000 0.000 0.000 0.000 0.000 |
| DW     | 0.479 0.569 0.402 0.338 0.917 0.444 |
The data show that in the eastern, central and western regions, the coefficient of the metal minerals on environmental pollution is 0.260, 0.320 and 0.133. The effect coefficient of energy minerals on environmental pollution is 0.200, 0.455 and 0.814. The effect coefficient of non-metallic minerals on environmental pollution is 0.132, 0.274 and 0.028. From the perspective of regional comparison, the development and utilization of various mineral resources in China and western regions are most obvious to the environment. In the central region, the development and utilization of metals, energy and non-metallic minerals has increased by one unit, and environmental pollution has increased by 0.320, 0.455 and 0.214 units; In the western region, the development and utilization of metals, energy and non-metallic minerals will increase by one unit, and the environmental pollution index will increase by 0.133, 0.814 and 0.048. From the comparison of mineral resource types, energy and mineral resources have the most prominent role in the environment, and the role of metal mineral and non-metallic mineral exploitation and utilization on the environment is in turn.

The analysis results show that the industrial structure, technological progress and governmental management factors all have different roles in the exploitation and utilization of mineral resources. In the three regions, although the industrial structure has a positive effect on environmental pollution, this role has been prominent in the central and western regions and relatively weak in the eastern region. This shows that the mineral resources are relatively abundant in the central and western regions, and the industrial development is more dependent on the mineral resources.

The results to a certain extent reflects the parts of the Midwest mineral resources development and utilization of bonus in pursuit of resources and insufficient investment in environmental protection, environmental governance of government failure, transformation of the pattern of economic development needs to be reality.

5. Conclusion
Using panel data model, this paper inspect the Chinese mineral resources development and utilization of the environmental impact of the overall effect and the regional difference, from the industrial structure, technological progress and the government management dimension expansion theory and empirical analysis, reveals the internal mechanism of mineral resources development and utilization of the environmental impact. The main conclusions are as follows:

The development and utilization of mineral resources has a strong lag effect on the natural environment, and the environmental pollution in the early stage plays an obvious role in the environmental impact of the current period. The development and utilization activities of different kinds of mineral resources have different impacts on the environment. In the process of developing and utilizing mineral resources, industrial structure, technological progress and government management have played an obvious role. Environment in different regions can be found in the comparison of the factors influencing the formation of eastern China in the development and utilization of mineral resources, industrial structure, technological progress and three factors in the role of the government management than the central and western regions. Therefore, to improve China's mineral resources exploitation and utilization of environmental impact must adjust measures to local conditions, conducive to local advantages of resources saving, since the mutual aid to establish suitable for ecological civilization needs the resources and environment of technical and economic innovation system.

References
[1] Stephen E K. Mineral Resources, Economics and the Environment[M]. USA: Lehigh Press, 1994.
[2] Kang S. Pair Wise Aggregated Hierarchical Analysis of Ratio-scale Preferences[J]. Decision Sciences, 1994, 25: 607-624.
[3] Linlin G E, Hsingchung C, Chris R. Monitoring Land Surface Subsidence Using Radar Interferometry: The Challenges[R]. Working Paper, 2006.
[4] Sergei S, Pastarus J. Environmental Impact Assessment for Estoning Oil Shale Mining Systems [R]. Jordan: International Oil Shale Conference, 2006.
[5] Lei Genqiang, Cai Xiang. The Distortion of Primary Income Distribution, Urban-biased Fiscal Expenditure Policy and Urban-Rural Inequality [J]. The Journal of Quantitative & Technical Economics, 2012, (3): 8