

HOW ENDOWMENT INFLUENCES ENERGY CONSUMPTION MIX: AN INTERNATIONAL COMPARISON

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Overview

For a long time, sufficient energy supply has been considered as a prerequisite for economic, cultural and social development in complex societies (White, 1943 [1]; Cottrell, 1955 [2]; Tainter, 1990 [3]). The resource endowments of different countries have different effects on their energy consumption. For example, countries with rich fossil energy reserves are generally less likely to use low-carbon energy such as nuclear energy and modern renewable energy (Burke, 2013) [4]; Countries with high coal or natural gas use are often countries with high per capita coal or natural gas, while countries with high biomass and hydropower usage are often countries with high per capita forest and freshwater resources (Csereklyei Z. et al. 2017) [5]. From historical and world perspective, what historical relationship does the two have? How to concretely describe this historical relationship? This is the key issue that this article will solve. Therefore, this article takes three fossil energy sources of primary energy as the research object, then selects the data of 55 representative countries in the world from 1990 to 2016, and studies the relationship between the endowment structure of energy resources in each country and the consumption structure.

Methods

The study starts from two aspects:

1. Qualitative analysis: Firstly, according to the different energy endowments structure of domestic energy sources, the K-means clustering method is used to classify countries by means of SPSS software; further, the relationship between various types of endowment structure and energy consumption structure has been analyzed descriptively.
2. Quantitative analysis: In order to study the relationship between endowment structure and consumption structure, this paper regards the former as an explanatory variable, the latter as an explanatory variable, and introduces economic level and industrial structure as control variables, thus establishing the following forms of multiple linear regression. model.

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In the formula: 错误!未找到引用源。 is identification numbers of the 4 clusters of countries. Each variable uses the average of all countries in each cluster. 错误!未找到引用源。 is the time series of the average proportion of oil consumption, reflecting the energy consumption structure. 错误!未找到引用源。 is the time series of the average proportion of oil resources and reflects the resource endowment structure. 错误!未找到引用源。 is the time series of per capita GDP and reflects the economic level. 错误!未找到引用源。 is the time series of the average value-added ratio of the first and second industries, reflecting the industrial structure.

On the basis of collecting corresponding panel data, this paper uses Eviews software to test the stability of time series, the cointegration relationship between variables, test the model setting form. This article uses OLS method to estimate parameters, evaluate the effect of the model, and test the significance of the parameter estimation results. At last, the historical relationships between various types of energy endowments and consumption structures are summarized.

Results

1. This paper uses K-means clustering to obtain four clusters of countries with different endowments of energy resources. Among them, the first, second and fourth cluster are the countries with large oil, natural gas, and coal

resource endowment ratios, and the corresponding average reserves accounted for 65%, 76%, and 96% respectively; The third cluster has quite similar ratios of three energy resources endowments, with the proportion of coal, natural gas, and oil accounting for a sequential decline.

2. The results of qualitative analysis show that: 1) Cluster 1 and 3 countries tend to consume oil most, while cluster 2 countries tend to consume natural gas most. Cluster 4 countries have the largest share of coal consumption. 2) Despite the different endowment structure, all clusters show a decline in the proportion of oil consumption, an increase in the share of natural gas consumption, and a gradual change in the proportion of coal.

3. The results of quantitative analysis show that: 1) The time series of all variables are co-integrated with the same order, and there is a co-integration relationship among the variables. The model form can be set as a variable coefficient model with fixed-effect. 2) The measurement coefficient is 0.9924, and the adjusted measurement coefficient is 0.9912, which shows that the model has a good fitting effect. 错误!未找到引用源。 = 800.5594 (错误!未找到引用源。 = 0) means the relationship between the explanatory variable and the explanatory variable can be represented by a linear model. 3) As for the global mean intercept, 错误!未找到引用源。 19.9.8601 (错误!未找到引用源。 = 0). 错误!未找到引用源。 and 错误!未找到引用源。 passed the 错误!未找到引用源。 test while 错误!未找到引用源。 was significantly 0, and all the parameters of cluster 4 failed the 错误!未找到引用源。 test, indicating that the endowment structure did not significantly affect the energy consumption structure of cluster 1 and 4. All the parameters of cluster 2 passed the 错误!未找到引用源。 test, 错误!未找到引用源。 and 错误!未找到引用源。 passed 错误!未找到引用源。 test while 错误!未找到引用源。 is significantly 0, indicating that the endowment structure significantly affects the energy consumption structures of clusters 2 and 3.

Conclusions

The article draws two conclusions: 1) Countries with different energy resource endowments have different energy system evolution characteristics. Countries with relatively rich endowments of energy resources tend to use more of this energy, which makes it the largest share of domestic energy consumption. 2) Due to different resource endowments in different countries, the endowment structure of domestic energy resources has different effects on consumption structure. Although the endowment structure has not significantly affected the energy consumption structure of countries with oil or coal endowment advantages, it has significantly affected the energy consumption structure of countries with natural gas endowment advantages or equivalent endowments.

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