Study on Influence of the use of energy on living condition

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Abstract: Based on the important influence of the use of energy on environmental pollution, the evaluation index of the use of energy and living condition is selected, and the principal component analysis is used to measure the use of energy level and living condition degree in each region. The panel data of 30 provinces in China from 2011 to 2017 were selected to build a regression model to study the relationship between the use of energy and regional environmental pollution. The results show that the influences of different variables on living condition are different, the influences of the use of energy and population factors on living condition are positive, and the influences of scientific and technological water level on living condition are negative. On this basis, some countermeasures and suggestions are put forward to optimize the the use of energy structure, expand the scale of environmental governance investment, and give play to the leading role of the government.

1.Introduction
As socialism with Chinese characteristics enters a new era, China’s economy has shifted from high-speed growth to high-quality development, and the total economic volume has ranked second in the world. At the same time, it should be clearly recognized that the continuous improvement of economic strength is often accompanied by resources. In recent years, with the unprecedented use of various energy sources, living condition has become increasingly serious[1]. Energy has become a major strategic issue affecting climate change and the global economic and political structure. The use of various energy sources have attracted widespread attention. As a developing country in an economic transition period, China needs to focus on the consistency and feasibility of energy use reduction targets at the provincial level. At present, the economic, social and environmental development of various regions in my country are quite different, and the contradiction between the living condition level of each province and the use of energy also has different characteristics[2]. Therefore, the main influencing factors of provincial energy carbon emissions are quantitatively analyzed and their effects are unified[3].

This paper takes 30 provinces in my country as the research sample, and takes 2011-2017 as the research interval. Based on the measurement of the use rate of energy and living condition, a regression model is constructed to study the relationship between the use of energy and living condition, and proposes to promote energy Recommendations for environmental sustainability.

2.Research design
2.1.Method introduction
2.1.1.Canonical correlation analysis
Canonical correlation analysis (canonical correlation analysis) is an understanding of the cross-
covariance matrix. It is a multivariate statistical analysis method that uses the correlation between comprehensive variable pairs to reflect the overall correlation between two sets of indicators. Its basic principle is: in order to grasp the correlation between the two sets of indicators in general, two representative comprehensive variables U1 and V1 are extracted from the two sets of variables (respectively the linearity of each variable in the two variable groups). Combination, using the correlation between these two comprehensive variables to reflect the overall correlation between the two sets of indicators.

2.2. Principal component analysis

Principal component analysis is also called principal component analysis. It can be traced back to the multivariate transformation analysis of non-random variables initiated by K. Pearson in 1901; in 1933, H. A. Hotelling extended it to random variables.

1. Standardize the original data
2. Calculate the correlation coefficient matrix
3. Calculate eigenvalues and eigenvectors

2.3. Cluster analysis

Cluster analysis classifies the researched individuals so that the similarity between objects of the same class is stronger than that of objects of other classes. Its purpose is to maximize the homogeneity of objects of the same class and maximize the heterogeneity of objects of different classes. The classification of samples is often called Q-type cluster analysis, and the classification of variables is often called R-type cluster analysis. Cluster analysis includes many methods, such as systematic clustering, fuzzy clustering, K-means, clustering and decomposition of ordered samples, and so on. In this paper, a systematic clustering method is used to cluster analysis of the two types of comprehensive scores of energy consumption and environmental pollution obtained by principal component analysis.

The selection of evaluation indicators is a key step in the study of energy consumption and environmental pollution\[4\]. The selected indicators need to be able to measure the level of energy consumption and environmental pollution well. Based on the principle of data availability, this paper selects coal consumption (X1), oil consumption (X2), natural gas consumption (X3), electricity consumption (X4), and urban gas penetration rate (X5) in each region, county gas penetration rate (X6) and village gas penetration rate (X7) as comprehensive evaluation indicators reflecting the level of energy consumption; select each region's sulfur dioxide emissions (Y1), nitrogen oxides emissions (Y2), smoke and dust emissions Quantity (Y3), total wastewater discharge (Y4), environmental pollution control investment (Y5) and industrial pollution control investment (Y6) are used as comprehensive evaluation indicators reflecting the degree of environmental pollution. Since Y5 and Y6 are negatively related to environmental pollution, take a negative value for positive treatment.

3. Evaluation of energy consumption level and environmental pollution

3.1. Typical correlation analysis of energy consumption and environmental pollution

According to the collected energy consumption and environmental pollution data, through the typical correlation analysis of SPSS19.0 software, the typical correlation coefficient table is obtained (see Table 1).
Table 1

| Canon Cor | Wilk’s Chi-SQ | DF | Sig. |
|-----------|--------------|----|------|
| 1 0.986   | 0.002        | 142.826 | 0   |
| 2 0.851   | 0.056        | 63.418  | 0   |
| 3 0.754   | 0.203        | 35.045  | 0.02 |
| 4 0.636   | 0.472        | 16.519  | 0.169 |
| 5 0.411   | 0.793        | 5.1     | 0.531 |
| 6 0.214   | 0.954        | 1.033   | 0.597 |

It can be seen from Table 3 that a total of three pairs of canonical correlation variables have passed the 5% significance level test, and the canonical correlation coefficients obtained are $\lambda_1=0.986$, $\lambda_2=0.854$, and $\lambda_3=0.754$. The three canonical correlation coefficients are all high, indicating the canonical correlation variables are highly correlated.

3.2.2. Evaluation of environmental pollution

3.2.1. Evaluation of energy consumption level

It can be seen from Table 2 that the eigenvalue of the first principal component is 3.612, and the variance contribution rate is 51.607%; the eigenvalue of the second principal component is 1.591, and the variance contribution rate is 22.727%; the eigenvalue of the third principal component is 0.898, and the variance contribution rate was 12.828%. The cumulative contribution rate of the first three principal components reached 87.162%, which can better retain the information of the original variables, so 3 principal components were selected to replace the 7 original variables.

Table 2

| Principal component | Initial eigenvalue | Extract the sum of variance | Grand total/% |
|---------------------|-------------------|-----------------------------|--------------|
|                     | total             | Grand total/%              |              |
| 1                   | 3.612             | 51.607                     | 51.607       |
| 2                   | 1.591             | 22.727                     | 74.334       |
| 3                   | 0.898             | 12.828                     | 87.162       |
| 4                   | 0.423             | 6.041                      | 93.204       |
| 5                   | 0.274             | 3.915                      | 97.118       |
| 6                   | 0.117             | 1.671                      | 98.789       |
| 7                   | 0.085             | 1.211                      | 100          |

3.2.2. Evaluation of environmental pollution
Table 3

| index | Y1  | Y2  | Y3  | Y4  | Y5  | Y6  |
|-------|-----|-----|-----|-----|-----|-----|
| Y1    | 1   |     | 0.705 | 0.77 | 0.211 | -0.456 | -0.5 |
| Y2    | 0.705 | 1   | 0.768 | 0.699 | -0.762 | -0.754 |
| Y3    | 0.77 | 0.768 | 1   | 0.181 | -0.452 | -0.44 |
| Y4    | 0.211 | 0.699 | 0.181 | 1   | -0.561 | -0.56 |
| Y5    | -0.456 | -0.762 | -0.452 | -0.561 | 1   | 0.752 |
| Y6    | -0.5 | -0.754 | -0.44 | -0.56 | 0.752 | 1   |

It can be seen from Table 3 that more than 60% of the selected variables have an absolute value of greater than 0.3, indicating a strong linear relationship. Principal component analysis of environmental pollution was performed, and the results are shown in Table 4.

Table 4

| Principal component | Initial eigenvalue | Extract the sum of |
|---------------------|--------------------|--------------------|
|                      | total | variance | Grand total | total | variance | Grand total |
| 1                   | 3.913 | 65.214  | 65.214      | 3.913 | 65.214  | 65.214      |
| 2                   | 1.118 | 18.639  | 83.853      | 1.118 | 18.639  | 83.853      |
| 3                   | 0.454 | 7.569   | 91.422      | 0.454 | 7.569   | 91.422      |
| 4                   | 0.274 | 4.571   | 95.993      | 0.274 | 4.571   | 95.993      |
| 5                   | 0.214 | 3.572   | 99.565      | 0.214 | 3.572   | 99.565      |
| 6                   | 0.026 | 0.435   | 100         | 0.026 | 0.435   | 100         |

3.3. Comprehensive score of energy consumption and environmental pollution

Substituting standardized data into equations (3), (4), and (5) to obtain the values of F1, F2, and F3, respectively, and then substituting equation (6) to obtain W1 to obtain the energy consumption of 30 provinces in my country in 2017 Comprehensive level score and ranking situation. Substituting the standardized data into equations (7), (8), and (9) to obtain the values of F4, F5, and F6, respectively, and then substituting equation (10) to obtain W2, and obtaining the data of 30 provinces in my country in 2017 Comprehensive score and ranking of environmental pollution degree (see Table 12). In Table 12, a positive value indicates that the energy consumption or environmental pollution in the region is higher than the national average, and a negative value indicates that the energy consumption or environmental pollution is lower than the national average[5]. The higher the overall score, the higher the level of energy consumption or the degree of environmental pollution, and thus it can be intuitively seen that there are greater differences between provinces and cities.

In general, 13 provinces have energy consumption levels higher than the national average, and 13 provinces have environmental pollution higher than the national average. This indicates that energy consumption and environmental pollution are positively correlated. The higher the energy consumption level, the greater the degree of environmental pollution.

4. The impact of energy consumption on regional environmental pollution

Specifically, the impact of energy consumption on environmental pollution is positive. This is due to the unreasonable structure of energy consumption in China, the excessive use of coal, and the low energy utilization rate, resulting in serious environmental pollution; The impact is positive. This is because industrial pollution is one of the main sources of environmental pollution. As the proportion of the secondary industry's output value increases, the amount of industrial waste gas, wastewater, and solid waste will also increase, making it difficult to treat and purify, causing environmental pollution. Intensified, environmental governance is inefficient; population has a significant positive correlation...
with environmental pollution, indicating that with the increase in population, the amount of garbage generated by life needs and industrial development will also increase, which in turn leads to a deepening of environmental pollution; The impact of is negative, and the impact coefficient is very large, indicating that the improvement of science and technology can significantly improve the degree of environmental pollution. This is because science and technology can introduce clean energy technology and energy utilization technology to reduce the emission of environmental pollutants, thereby improving the efficiency of environmental governance And energy efficiency[6]. Therefore, in the future environmental pollution prevention and control, targeted suggestions can be made based on the impact variables to reduce environmental pollution and enhance sustainable energy development.

5. Conclusions and recommendations
The first is to optimize the energy consumption structure and improve energy efficiency. My country's energy consumption structure is still dominated by fossil energy, and fossil energy is characterized by high carbon content, burning produces a lot of harmful gases, and most of them are non-renewable energy sources.

The second is to increase investment in environmental governance, optimize the industrial structure, and promote green economic development. The state should give more support to expand the scale of investment in environmental pollution control funds, broaden capital flow channels, establish a long-term capital guarantee system, and provide financial support for the realization of environmental governance; increase the research and development and introduction of key technologies, and cultivate relevant technical talents. Promote the optimization and upgrading of the industrial structure, reduce the proportion of heavy industry and other high-polluting industries, develop clean industries, and establish a resource-saving and environment-friendly society.

The third is to give full play to the guiding role of the government and actively guide individuals and enterprises to make important contributions to environmental governance. All regional governments should strengthen the level of environmental governance, establish a diversified regulatory system, strictly implement various pollution indicators and emission reduction measures, and promote a green, low-carbon, and environmentally friendly lifestyle; strengthen inter-regional exchanges and cooperation, give full play to regional linkages, and work together Promote environmental pollution control. Residents should raise awareness of environmental protection and resource conservation, learn to sort waste, and reduce the generation of domestic waste. Enterprises should continue to innovate, strictly control all aspects of pollution control, and strengthen the use of new technologies for the treatment of different pollutants, so as to reduce polluting gas emissions. As a result, the government, individuals, and companies will work together to improve the quality of the ecological environment and achieve a new pattern of harmonious development between man and nature.

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