

Analysis and Countermeasures of Coordination between Industrial Structure and Energy Consumption Structure

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Abstract

There is a very close relationship between industrial structure and energy consumption structure. From the perspective of the relationship between China's energy consumption structure and industrial structure, there is a problem of weak interaction between them. China's energy consumption mainly relies on coal resources, and the industrial structure model dominated by the secondary industry has the particularity of high energy consumption and low efficiency. How to enhance the coordination between industrial structure and energy consumption structure has gradually become a crucial research topic. Therefore, this paper starts from the research point of industrial structure and energy consumption structure and deeply analyzes the evolution process of industrial structure adjustment and energy consumption structure. Using the panel data as an important reference, we further analyze the current and period effects of the relationship between industrial structure and energy consumption structure, find problems, and draw conclusions. Meanwhile, we try to find effective strategies from different levels that can help ease the tension between the industrial structure and energy consumption structure, so as to continuously improve the coordination between China's industrial structure and energy consumption structure.

Keywords

Industrial Structure; Energy Consumption Structure; Coordination; Process Analysis; Mitigation Strategy.

1. Introduction

At present, in terms of the distribution of China's industrial structure, energy consumption is too concentrated in the industrial field, which shows that the industrial model dominated by the secondary industry relies too much on the energy consumption structure. Meanwhile, the energy consumption structure is also affected by many factors, such as industrial energy consumption's high degree, highly intensive degree, etc. When we talk about industrial structure, it is necessary to deeply discuss energy consumption structure. Both of them have an important relationship of mutual restraint and mutual dependence. The transformation of the energy structure requires fundamental optimization of the industrial structure. To truly reduce the proportion of energy consumption, it is necessary to continuously increase the proportion of clean energy and improve the efficiency of industrial energy utilization. This can promote a benign interaction between the industrial structure and energy consumption structure and transform towards a sustainable industrial structure and energy consumption structure.

2. The evolution of energy consumption structure and the process analysis of industrial structure adjustment

The adjustment of China's industrial structure and energy consumption structure has gone through a long process and formed a certain development law. Since the continuous deepening of reform and opening-up, China's energy consumption structure has shown a basic "inverted

U-shaped" form, where the consumption of coal energy continues to decline, and the consumption of petroleum energy has gone out of the development trend of first rising and then falling, while the consumption of natural gas energy, hydropower, wind energy, nuclear energy, and electric energy has shown a continuous upward trend. It can be seen from this that the energy consumption structure as a whole presents an important pattern with traditional energy as the mainstay and new energy as the supplement. With the continuous adjustment and optimization of the energy consumption structure, the industrial structure has also shown relatively distinctive characteristics during the adjustment process. Specifically, the proportion of the primary industry in the industrial structure gradually decreases; The secondary industry shows a gradual upward trend and tends to stabilize in the process of rising; The proportion of the tertiary industry in the overall industrial structure gradually increases with good growth momentum.

The impact of reform and opening-up on the energy consumption structure is significant, especially to promote the continuous development of energy resources in a diversified direction, where the energy produced by hydroelectric power generation gradually increases. Under this influence, the use of coal resources decreases. This paper divides the time nodes of the evolution process of energy consumption structure and industrial structure. First, from 1990 to 1995, although the secondary industry relied too much on coal energy for development, the proportion of it showed an upward trend. However, the proportion of coal energy use declined. Second, from 1995 to 2000, although the volume of the secondary industry and coal energy increased, their proportion in the overall structure did not increase but declined. The synergy between them is more obvious. Third, since 2000, the secondary industry and coal consumption have been more closely linked. Both the proportion of the secondary industry and the proportion of coal consumption have shown a downward trend, but the decline is relatively small. It can be seen that there is a complicated relationship that promotes each other between China's industrial structure and energy consumption structure.

3. Coordination analysis of industrial structure and energy consumption structure based on the panel data model

3.1. Current analysis of the relationship between energy consumption structure and industrial structure

Compared with other industries, industry accounts for the largest proportion of energy consumption, such as coal, oil, natural gas, etc. From the perspective of the impact of energy consumption structure on industrial structure, the factor that has the greatest influence on the level of electricity consumption and natural gas consumption is agriculture. In addition to electricity and natural gas, it is also affected by oil consumption. For transportation, construction, catering, and other industries, the level of electricity consumption has a great impact. Compared with the level of electricity consumption, the level of natural gas consumption has a smaller impact. Judging from the above-mentioned current analysis on the relationship between industrial structure and energy consumption structure, the industry is more affected by the level of consumption of coal and oil, while other industries are slightly more affected by the level of power consumption.

3.2. Analysis of the period influence of the relationship between energy consumption structure and industrial structure

In 1980, the industrial structure at that time was more susceptible to natural gas and coal consumption. As the degree of reform and opening-up continues to deepen, the industrial structure has changed, and the impact on energy consumption has also changed to varying degrees. In particular, the impact on oil consumption has gradually increased, even far higher

than that of coal. From 1980 to 1995, the influence of coal consumption began to decline. From 1995 to 2007, the impact of coal consumption on the industrial structure increased again, but later showed a downward trend. From an overall point of view, the impact of coal consumption on the industrial structure is gradually decreasing. In addition to coal, the impact of oil consumption on the industrial structure also fluctuates to varying degrees in different periods. Such fluctuations show as a state of interweaving rise and fall. Compared with 1980, the impact of oil consumption on the industrial structure from 2007 to 2020 was reduced, but it clearly exceeded the impact of coal consumption on the industrial structure. At the same time, the impact of natural gas consumption and electricity consumption on the industrial structure also showed varying degrees of fluctuations. But no matter how fluctuating, the overall trend was gradually declining.

Based on the analysis of the period impact of the relationship between industrial structure and energy consumption structure, the influences of industrial structure and energy consumption structure are gradually declined, and the close relationship between them in the past is gradually weakened. This shows that the development of technology directly affects the relationship between industrial structure and energy consumption structure. When discussing the relationship between industrial structure and energy consumption structure, we have to consider the changes brought about by technology.

3.3. The found problems and analysis conclusions

The sector most affected by coal consumption and oil consumption is industry. Correspondingly, the industry has the greatest impact on energy consumption structure. The reason for this situation is that industry accounts for a relatively large proportion of China's total economic output. It can be seen that if the industrial structure cannot be adjusted and optimized, the energy consumption structure cannot be optimized. The adjustment of industrial structure has a decisive influence and effect on energy consumption structure. Therefore, it is necessary not only to optimize the layout of high-energy-consuming industries in the industrial sector but also to focus on reforming the industrial structure, especially increasing the development of modern service industries. This can help ensure that China's energy consumption is always in a balanced state of development, reduce the proportion of coal consumption in total consumption, and gradually build a diversified consumption structure system. Meanwhile, in addition to the industrial sector, other industries have greater demand for electricity consumption. Faced with this situation, it is necessary to increase the consumption of new types of clean energy and raise the consumption level of new types of clean energy, such as solar energy, wind energy, etc. With the increasing influence of technology on industrial development, the close connection between industrial structure and energy consumption structure has gradually weakened. The transformation of energy consumption structure needs to firmly grasp the opportunity of technological progress, make full use of advanced technology to improve the efficiency of energy utilization, and then gradually increase the level of energy consumption.

4. Countermeasures to ease the tension between energy consumption structure and industrial structure

4.1. Adjust energy structure, enhance energy and consumption saving

At present, coal still accounts for a relatively high proportion of China's energy consumption structure, and new types of renewable energy account for a relatively low proportion of the consumption structure. Compared with the basic status of energy consumption in China, coal accounts for a small proportion of the total energy consumption in developed countries. Developed countries mainly consume new clean energy, where electricity and natural gas

consumption account for a large proportion. Therefore, it is necessary to adjust the energy structure, that is, focus on the development of new clean energy, gradually increase the proportion of the tertiary industry, and gradually reduce the proportion of high-energy-consuming industries in the energy consumption structure through vigorous development of the tertiary industry. At present, some companies still have problems with high energy consumption and low output. Therefore, it is very necessary to accelerate the implementation of the transformation of high energy-consuming enterprises. Some equipment that consumes more energy needs to be eliminated, and energy-saving equipment with low energy consumption and high output should be actively introduced and applied. At the same time, we should vigorously develop advanced production technologies with broad prospects for conservation and substitution and maximize the level of energy conservation and consumption.

4.2. Strengthen the construction of energy infrastructure facilities

Energy infrastructure is an important foundation for a country's economic development. Without energy supply, it is impossible to inject sufficient impetus into economic development. Starting from the basic situation of energy consumption, the problems existing in the process of energy infrastructure construction should be improved. Through continuous improvement of the power grid, natural gas pipeline network, oil storage and transportation, and other infrastructure, the construction level of different types of energy infrastructure is comprehensively improved, and a solid material foundation is laid for the transformation and adjustment of the energy consumption structure and industrial structure.

4.3. Enhance government functions and create an environment conducive to structural transformation and upgrading

The market plays an irreplaceable role in energy consumption and industrial restructuring. However, different problems will also be exposed in the process of market regulation, such as the phenomenon of "market failure". To effectively avoid the emergence of this phenomenon, the government needs to play an important intervening role in it and continuously improve its own functional level. The government can start from the resource allocation model and actively explore information with sufficient arguments and related price policies to find a point that matches the market regulation. Based on market regulation, we should actively build a government guidance model, form a relatively complete resource allocation mechanism, strengthen the construction of an energy management system, and fully use the government's management functions.

4.4. Introduce energy price reform with a competitive mechanism

The competition mechanism is an important means to realize the transformation and substitution of energy consumption. By regulating energy prices to improve the efficiency of the use of alternative elements, it can better restrain the growth of energy demand. To integrate the competition mechanism into the energy market, we should continuously improve and optimize the energy distribution pattern and perform well on benefit coordination. This can not only greatly improve energy efficiency but also help build a long-term mechanism for coordination between energy consumption structure and industrial structure. To this end, we can use the market mechanism as the basis to continuously weaken the government's administrative control over energy prices and give full play to the government's active role in the regulation of important energy prices. In the meanwhile, on the basis of clarifying the goal and direction of China's energy price mechanism reform, we continue to promote the marketization of energy prices and improve the level of scientific management and control.

5. Conclusion

In summary, in the new era, China is still in the process of adjusting and optimizing the energy consumption structure and industrial structure. The transformation of the industrial structure cannot rely entirely on energy consumption, and it needs to start with the adjustment of the industrial structure. We should vigorously develop the tertiary industry and drive the transformation of energy consumption structure through industrial structure adjustment. At the same time of economic development, the energy consumption structure is promoted to transform to low energy consumption and low pollution, so as to promote the simultaneous realization of economic growth and environmental protection.

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