Research on the Dilemma of Low Carbon Economic Development in China

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Abstract: Under the global climate change characterized by warming, low-carbon economy represents the trend and direction of future economic development. In the global perspective, China's low-carbon economic development still faces some deep-seated contradictions and problems. We use data as the support to analyze the relationship between low-carbon economic development and economic development level, energy structure, energy-saving and clean technology, carbon emission rights trading to focus on the current difficulties in the process of low-carbon economic development in China. Finally, we put forward some policy suggestions on the choice of low-carbon economic development path.

Introduction

In the Paris Climate Agreement, our government promised to reach the peak carbon emissions around 2030, and the carbon emissions per unit GDP decreased by 60%-65% compared with 2005. Therefore, it is of far-reaching significance to study the current plight of China's low-carbon economic development to improve China's international competitiveness.

Academia have made a thorough discussion on the dilemma of low-carbon economic development from various aspects. It first put forward the concept of a low-carbon economy, believing that a low-carbon economy is an economic development model with low carbon energy consumption, low environmental burden and high output efficiency [1]. Ma and TEM (2006) concluded that technological progress has different impacts on energy consumption intensity of different industries. Technological advances in the chemical industry have led to the most significant reduction in energy consumption intensity[2]. Shenxing Mo (2012) proposed that the energy structure of coal as the first energy material in China is unreasonable. In order to develop a low-carbon economy, it is urgent to adjust and optimize the energy structure[3]. Haiyan Long et al. (2018) pointed out that China's carbon trading market mechanism is not sound enough, and the government's regulatory capacity and strength are still insufficient[4]. Generally speaking, academia have deeply studied the dilemma of low-carbon development, but there are still some deficiencies in the current research. On the issue of low-carbon development dilemma, there are many studies on single dilemma factors, such as irrational energy structure. Existing studies are not comprehensive enough to consider the comprehensiveness and complexity of factors affecting low-carbon economic development. In view of this, this paper focuses on the dilemma of low-carbon economic development in China from the relation of low-carbon development and economic development level, energy structure, energy-saving and clean technology, carbon emissions trading. Finally, we
put forward some policy suggestions on the choice of low-carbon economic development path.

**Low-carbon Economic Development and Economic Growth**

Since the reform and opening up, China's gross domestic product (GDP) has grown rapidly, becoming the second largest economy in the world, and its economic construction has made remarkable achievements. It can be seen that China's economic scale and total economic output continue to expand. However, with the rapid economic development, the total carbon emissions and per capita emissions are also rising.

We use the data of China from 1990 to 2017. We use GDP to represent the level of economic growth. Carbon dioxide emissions are calculated by multiplying the end consumption of three main energy substances, coal, oil, and natural gas, and the carbon emission coefficients of the three substances. The calculation results are shown in the Fig.1: Economic growth has a sustained driving effect on the growth of total carbon emissions. The impact of economic development on total carbon emissions at different stages is heterogeneous. From 1990 to 1999, the gross domestic product (GDP) grew rapidly and the total carbon emissions continued to grow. But at this time, the gross domestic product (GDP) was at a relatively low level. As the total energy consumption was relatively small, the total carbon emissions were not high, but the growth rate was fast. From 2000 to 2010, China's GDP reached 10,08.01 billion yuan in 2000, breaking through 100 billion yuan for the first time. The domestic economy has developed rapidly. Especially during the period of “the Eleventh Five-Year Plan (2006-2010)”, China has promoted the process of economic globalization and built a well-off society in an all-round way. At the same time, the total amount of carbon emissions has increased dramatically. From 2011 to 2017, the total GDP has risen to a new height, and the total carbon emissions are at a higher level, but the growth rate of carbon emissions has obviously tended to be flat. This shows that “the 12th Five-Year Plan” calls for promoting the transformation of economic development mode policies play a certain role. In view of the above analysis, while economic growth brings about the development of social material civilization, it also brings about the environmental problems such as increasing carbon emissions.

![Figure 1: Carbon emission and economic development level](image)

Fig.1: Carbon emission and economic development level

**Low-carbon Economic Development and Energy Structure**

The existing energy consumption structure dominated by coal restricts the promotion of
low-carbon economy. We can see from Table 1 that since 2010-2017, China's main energy sources are still raw coal, crude oil and natural gas. Among them, primary energy production and consumption in China are mainly raw coal, accounting for more than 60%. However, the production and consumption of coal and other fuels will result in a large amount of carbon emissions. More than half of China's coal is used for power generation, and about 78% of the installed power is coal-fueled thermal power units. Since 2009, our government has begun to optimize the organizational structure of energy industry and encourage the development and utilization of clean energy. In general, despite the increasing share of clean energy, coal still accounts for more than 60% of energy consumption. The pressure of reducing total carbon emissions is still severe.

Table 1: proportion of total energy production and consumption in China from 2010 to 2017

<table>
<thead>
<tr>
<th>year</th>
<th>Proportion of energy production (%)</th>
<th>Proportion of energy consumption (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw coal</td>
<td>Crude oil</td>
</tr>
<tr>
<td>2010</td>
<td>76.2</td>
<td>9.3</td>
</tr>
<tr>
<td>2011</td>
<td>77.8</td>
<td>8.5</td>
</tr>
<tr>
<td>2012</td>
<td>76.2</td>
<td>8.5</td>
</tr>
<tr>
<td>2013</td>
<td>75.4</td>
<td>8.4</td>
</tr>
<tr>
<td>2014</td>
<td>73.6</td>
<td>8.4</td>
</tr>
<tr>
<td>2015</td>
<td>72.2</td>
<td>8.5</td>
</tr>
<tr>
<td>2016</td>
<td>69.8</td>
<td>8.2</td>
</tr>
<tr>
<td>2017</td>
<td>69.6</td>
<td>7.6</td>
</tr>
</tbody>
</table>

Low Carbon Development and Low Carbon Technology

At present, China has made great progress in the innovation and development of low-carbon technology. For example, in 2009, Huaneng "Green Coal Power" Tianjin IGCC demonstration power station was put into operation, which indicates that China's "Green Coal Power" plan not only has independent intellectual property rights, but also represents the world's leading level of clean coal technology. But we should also recognize that there are still some shortcomings in the development of low-carbon technology innovation. Firstly, the cost of low-carbon technology innovation is still high. Enterprises need to invest more manpower, material and financial resources for low-carbon technology research and development. High cost will reduce the initiative of enterprises to technological innovation. It will result in some small and medium-sized enterprises not fully invested in the research and development of low-carbon technology. In addition, the research and development cycle of low-carbon technology is long and benefits are uncertain. The research and development of low-carbon technology is more based on theoretical research or experimental simulation, lacking practical experience. Therefore, the risk of technology innovation is relatively high, which can not guarantee that enterprises' investment in technological innovation can create value. Besides, China still lacks a complete and effective policy support system. In the process of low-carbon technology innovation, there is no clear legal and policy support.

Low Carbon Development and Carbon Emission Trading

The efficient market mechanism of carbon emission trading promotes the development of low-carbon economy by making the carbon emission rights allocated reasonably [5]. China began to build a carbon emission trading market in 2008. In October 2011, the National Development and Reform Commission approved the pilot projects of carbon emission trading in Beijing, Tianjin,
Shanghai, Chongqing, Hubei, Guangdong and Shenzhen. After seven years of exploration and practice, the domestic carbon emission market has made great progress. But there are many problems still need to be solved. Primarily, the carbon trading market mechanism is still perfect. In the process of carbon emission trading, information asymmetry still exists, which results in unreasonable allocation of resources and affects the low efficiency of emissions trading. In addition, enterprises and the public do not attach much importance to it. Enterprises and the public are the main body of carbon emissions trading. They have not fully adapted to the carbon emissions trading market. What is more, the government's supervision still needs to be strengthened. Data collected by the government are not comprehensive enough and cannot quite ensure the accuracy of it.

Conclusions

In view of the above analysis, China's low-carbon economic development still faces severe difficulties. China still needs to further improve and innovate the low-carbon development path. Firstly, we should change the mode of economic growth. we must fully consider the global carbon emission control and the international and domestic background of China's own tight ecological environment constraints. Secondly, we should optimize our energy consumption structure and actively develop and utilize green energy. Specifically, we should actively promote and develop clean power sources, such as nuclear power, wind power, photovoltaic, biomass power generation, to reduce the proportion of thermal power and further reduce carbon emissions. Thirdly, the government should actively introduces advanced technologies for energy conservation and encourage enterprises to carry out technological innovation and development. In addition, it is urgent to further improve China's carbon emissions trading market mechanism. Fair and perfect carbon trading market mechanism not only creates a good market for enterprises to carry out environmental technology innovation, but also is an important basis for the development of low-carbon economy.

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References