Research on Industrial Structure Transformation of Hefei City under Low Carbon Background

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Abstract. Under the background that global warming poses a serious threat to human normal production and life, the development model of low carbon economy is undoubtedly an effective measure to give consideration to ecological protection and economic growth. This paper takes this as the background, through the research on the industrial structure of Hefei, finds out the problems of the low carbon economic structure in Hefei, and puts forward the countermeasures and measures for the transformation of industrial structure with these problems.

1. Introduction
Since the Second Industrial Revolution, the world economy has grown rapidly, but at the same time, due to the excessive growth of fossil energy-based economic growth, it has also seriously affected the way of human life and production, such as the excessive use of large amounts of fossil energy resulting in serious environmental pollution and carbon dioxide. The "greenhouse effect" caused by excessive emissions has caused serious threats to human survival and the global environment. In order to deal with global climate change, the "low-carbon economy" has gradually become a hot topic of concern for experts and scholars from various countries. The 1992 United Nations Framework Convention on Climate Change and the 1997 Kyoto Protocol. And the 2016 Paris Agreement is an international legal text on climate change in human history, mainly by setting greenhouse gas reduction targets in various countries to limit total greenhouse gas emissions, thereby preventing humanity from being affected by global warming. Since the 18th National Congress of the CPC, "low-carbon economy" and "industrial structure transformation" have been frequently mentioned in government meetings and related documents, which also illustrates the importance China attaches to the development of a low-carbon economy. Moreover, our country at the 2009 Copenhagen climate summit commitment to carbon emissions per unit of GDP in 2020 compared to 2005 by 40% -45%.

Throughout the process of economic development point of view, such a law can generally be found that carbon emissions with the evolution of industrial structure roughly showing a reduction increased first law, and the environment Kuznets curve very similar. With the development and progress of industrialization, the optimization and upgrading of the industrial structure, the adjustment of traditional high-carbon industries and the rise of emerging industries have led to rapid declines in carbon emissions in production. Low-carbon industrial structure and economic development are inseparable conclusion is also supported by theory and research of many experts and scholars. Therefore, the development of a low-carbon economy needs to start with the industrial structure. The optimization and upgrading of the
industrial structure includes both the elimination of traditional high-carbon industries and technological innovation, and the emergence and development of emerging low-carbon industries.

2. Analysis of the Status Quo of Industrial Structure Transformation in Hefei City under the Background of Low Carbon Economy

2.1. Analysis of the Status Quo of Industrial Structure in Hefei City

The analysis of the current industrial structure of Hefei mainly includes the following contents: In 2016, the total production value of Hefei City was 627.438 billion yuan, and the output value of the primary industry was 5.018 billion yuan, accounting for 4.3% of the total output value, and the economic contribution rate was 1.03%. The growth rate of the second year was 2.2%; the GDP of the secondary industry was 103.371 billion yuan, accounting for 50.7% of the total output value, the economic contribution rate was 48.01%, and the growth rate was 8.9% compared with the previous year; The total output of the three industries was 72.735 billion yuan, accounting for 45% of the total output value. The economic contribution rate was 50.95%, which was 11.6% higher than the previous year.

![Figure 1. Two or more references. Bar chart of the proportion of the three industrial output value structures, economic contribution rate, and growth rate in Hefei in 2016](image)

Changes in the contribution rate of the three industries in Hefei in the past ten years, the contribution rate of the primary industry is the lowest, and the average value is close to 1%. The contribution rate of the secondary industry is the industry with the highest contribution rate among the three industries, but from the figure The trend of change shows that it is in a declining state; from the contribution rate of the tertiary industry in previous years, its value has been lower than that of the industry, but it still keeps rising, and its value has exceeded the secondary industry in 2016, becoming The industry that contributed the most to the economy in the three industries.

Combined with the above data analysis, it can be seen that the current economic development of Hefei City is still dominated by the secondary industry. However, regardless of the proportion of output value and industrial contribution rate, the secondary industry shows a downward trend, while the tertiary industry is opposite. The upward trend is very obvious. And from the growth rate of the three industries in Hefei, the growth rate of the tertiary industry is much higher than that of the primary and secondary industries. It can also be seen from this that the development potential of the tertiary industry is huge and will have a huge impetus to the future development of Hefei. All in all, the industrial structure of Hefei has gradually become more highly and rationalized.

2.2. Analysis on the Status Quo of Low Carbon Economy Development in Hefei City

2.2.1. Analysis of carbon emissions in Hefei City. Looking at the status quo of economic development in all countries of the world, it is known that the development of a low-carbon economy is in line with
the current world trend and is also in line with China's economic policy. Therefore, the development of low-carbon economy in Hefei City is the general trend. This paper analyses the development status of low-carbon economy in Hefei City mainly through three indicators: total energy consumption, carbon emissions and carbon output rate.

From the Hefei City Statistical Yearbook, the total energy consumption data of Hefei City, and converted it into carbon emissions, compiled into Figure 2, from the figure can be seen, the total change in total carbon emissions in Hefei City in the past decade It is not very obvious. From 2009 to 2013, the total carbon emissions kept rising, but its growth rate gradually slowed down. From 2013 to now, the total carbon emissions in Hefei City is declining. From the perspective of total carbon emissions of various industries, the primary industry has the lowest carbon emissions and basically no change; the secondary industry has the largest carbon emissions, almost twice as much as the secondary industry, but in recent years, the carbon emissions of the secondary industry have been The trend of decline is changing; the carbon emissions of the tertiary industry are in the middle position among the three industries, that is, lower than the secondary industry but higher than the primary industry, and its changes over the years have shown an increasing trend, but its upward trend is not obvious. In general, whether it is from the change of total carbon emissions in Hefei City or the change trend of carbon emissions in three industries, it is generally decreasing, but this part of the analysis can not judge the development of low-carbon economy in Hefei City. It is also judged by further analysis.

![Figure 2. Line chart of total carbon emissions and carbon emissions of the three industries in Hefei from 2009 to 2016.](image)

2.2.2. Analysis of carbon output level in Hefei. The carbon output level generally measures the technical level of low-carbon development in a region or an industry or the energy utilization efficiency of an industrial structure. In this paper, the carbon output rate indicator is used to measure the carbon output level of Hefei City. Carbon production rate refers to the increase in GDP per unit of carbon emissions, which is inversely related to carbon intensity. In this paper, using the data provided by the Hefei City Statistical Yearbook, the carbon output rate of the three industries from 2009 to 2016 was calculated and the following table was obtained. As can be seen from the data in the table below, in the past years, the highest level of carbon output in the three industries was the primary industry, and the lowest in the carbon output was the secondary industry; in addition, the carbon output levels of the three industries generally showed an upward trend. That is to say, the energy efficiency or technical level of various industries is constantly improving.
Table 1. Changes in the carbon output rate of the three industries from 2009 to 2016.

| Year | Primary industry carbon output rate (100 million yuan / 10,000 tons) | Secondary industry carbon output rate (100 million yuan / 10,000 tons) | Tertiary industry carbon output rate (100 million yuan / 10,000 tons) |
|------|---------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| 2009 | 6.184                                                               | 1.862                                                               | 3.325                                                               |
| 2010 | 7.867                                                               | 2.116                                                               | 3.713                                                               |
| 2011 | 5.055                                                               | 2.098                                                               | 3.844                                                               |
| 2012 | 5.129                                                               | 2.438                                                               | 3.640                                                               |
| 2013 | 4.648                                                               | 2.640                                                               | 3.685                                                               |
| 2014 | 8.004                                                               | 3.554                                                               | 4.456                                                               |
| 2015 | 7.613                                                               | 3.692                                                               | 4.896                                                               |
| 2016 | 7.202                                                               | 4.119                                                               | 5.192                                                               |

3. Organization of the Text Model establishment and empirical analysis

3.1. Model establishment

In order to fully reflect the impact of Hefei’s industrial structure on carbon emissions and the extent of its impact on the three industries, determine whether the current industrial structure of Hefei is in line with the low-carbon economic background and point out that there are problems, using multiple linear regression models in metrology. In the analysis, the total annual carbon emissions of Hefei City are interpreted as variables, and the three industrial output values are used as explanatory variables. Establish a time series linear regression model as follows.

\[
\ln Y = a \ln X_1 + b \ln X_2 + c \ln X_3 + u
\]  

\( Y \) represents the carbon emissions per unit of GDP, \( X_1, X_2, \) and \( X_3 \) represent the proportion of the output value of the primary industry (%), the proportion of the output value of the secondary industry (%) and the proportion of the output value of the tertiary industry (%), and \( u \) is the intercept term, indicating the industry. Factors other than structural factors, such as technology, population, etc. Control variables and add several cities to make panels.

3.2. Data Sources

The data selected in this paper mainly comes from the Hefei Statistical Yearbook, which includes the gross national product from 1997-2016, the output value of the first, second and third industries, and the total energy consumption of Hefei from 2005-2016. Since the total energy consumption of Hefei City has been converted into unit coal, the carbon emission of this paper is the carbon emission required by the carbon emission coefficient calculation model announced by the National Development and Reform Commission Energy Research Institute, and the carbon emission coefficient is 0.7476.

3.3. Empirical analysis

Using EViews software, the logarithm of \( Y, X_1, X_2, \) and \( X_3 \) are respectively taken, and the data of \( \ln Y, \ln X_1, \ln X_2, \) and \( \ln X_3 \) are generated respectively. The model parameters are estimated by OLS method, and the model estimation result is:

\[
\ln Y = 0.6975 \ln X_1 + 3.2454 \ln X_2 - 0.7171 \ln X_3 + 204.9334 \\
t = (1.0291) \quad (0.8895) \quad (-1.8375) \quad (1.1298) \\
R^2 = 0.9201 \quad \bar{R} = 0.8902 \quad F = 30.7419
\]

The estimation results show that \( R^2 = 0.9201, R^2 = 0.9201, \) the coefficient of determination is very high, indicating that the model fits the sample well; the F test is significant, indicating that the regression equation is significant, that is, the industrial structure has carbon emissions. There is a significant impact; and all parameters passed the t test. The estimated value of the coefficient is
explained as follows: The estimated value of the first industry coefficient is 0.6975, that is, there is a positive correlation between the output value of the primary industry and the carbon emission. If the other variables are constant, if the output value of the primary industry increases by 1%, the carbon emission increased by an average of 0.6975%; the estimated value of the second industry coefficient was 3.2454, that is, the output value of the secondary industry was also positively correlated with the carbon emission. If the other variables were constant, if the output value of the secondary industry increased by 1%, carbon emissions increased by an average of 3.2454%; the third industry coefficient was estimated to be -0.7171, that is, the tertiary industry output value and carbon emissions are negatively correlated, and if other variables are unchanged, if the tertiary industry output value For every 1% increase, carbon emissions decreased by an average of 0.7171%. It can be seen that in the development of low-carbon economy in Hefei, the second industry is the most influential to the development of low-carbon economy, which is mainly related to the high energy consumption and high emissions in the production process of the secondary industry; Conducive to a low carbon economy model.

4. Conclusion
As the capital city of Anhui Province, Hefei City has important economic development status for the whole of Anhui Province. Especially in the context of the development of low-carbon economy today, Hefei City should protect the ecological environment while stimulating economic growth. Providing experience in promoting the development of low-carbon economy in surrounding cities, and finally promoting the development of low-carbon economy throughout Anhui Province. In order to better promote the development of low-carbon economy in Hefei City, this paper proposes specific policies and measures to promote the industrial structure optimization and transformation of Hefei City from three aspects: government, society and enterprises. First, the government should actively play a guiding role, adjust and optimize government functions, improve market mechanisms, and establish policies and regulations related to low-carbon economy. Second, vigorously develop independent innovation capabilities, promote the transformation and upgrading of traditional industries with low carbon, and accelerate technological innovation to lead emerging industries. Development; in the end, we must strengthen the propaganda of low-carbon economic development concepts and achieve the goal of a low-carbon society.

The main content of this paper is to construct an econometric model of the relationship between industrial structure and carbon emissions in Hefei through a series of specific data. The measurement analysis and statistical analysis are used as tools, and the current industrial structure of Hefei has a low carbon economy. Have a general understanding. Through the above analysis, the final conclusion of this paper is that in order to accelerate the development of low-carbon economy in Hefei, the upgrading of its industrial structure cannot be delayed.

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