

Research on the Relationship between Industrial Restructuring and Economic Growth from a Low-Carbon Perspective: Overview and Prospects

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Abstract: In this study, a comprehensive examination of pertinent literature concerning the determinants and metrics of industrial structural adaptation has enabled us to distill the intricate interplay between industrial structural adjustment and economic growth. At present, the primary findings have coalesced around a deeper understanding of the intricate interplay between these two factors, shedding light on the pivotal direction and determinants of industrial structural adaptation amidst the ever-evolving landscape of economic development. The present study focuses on the relationship between the low-carbon perspective and identifies that low-carbon factors primarily influence the relationship between industrial restructuring and economic growth in five key aspects. This paper focuses on exploring the relationship between industrial restructuring and economic growth under a low-carbon perspective, revealing that low-carbon factors predominantly influence their interaction in five key dimensions. Lastly, this study provides a forward-looking analysis on how to effectively conduct industrial restructuring for achieving sustainable low-carbon economic development in the future, aiming to stimulate further research in related fields.

Keywords: Industrial restructuring, The industrial structure and economic growth, The industrial structure and low-carbon emissions, Decarbonization, Influencing factors.

1. Introduction

In this context, industrial restructuring has emerged as a pivotal instrument. From a sustainability perspective, industrial restructuring can propel the economic transformation and upgrading towards a low-carbon, environmentally friendly, and green direction, thereby contributing to the achievement of carbon neutrality objectives. Consequently, in the present phase, adjusting the industrial structure, reducing energy consumption intensity, and curbing greenhouse gas emissions offer promising prospects for mitigating the extent of climate warming, thus contributing to global climate change mitigation efforts while promoting environmentally sound, healthy, and sustainable economic development. Therefore, to optimize industrial restructuring, align it with low-carbon emission requirements, and foster economic growth, an exploration of the relationship between industrial structural adjustments and economic growth from a low-carbon perspective has become imperative.

2. Research on the Influencing Factors of Industrial Structural Adjustments and Industrial Structure Measurement

Structure refers to the types of industries within an economic system and their proportions and relationships to each other. Industrial structural adjustment refers to the guidance and promotion of economic structural transformation towards high technology, high value-added, low energy consumption, and low pollution through relevant policies and market mechanisms. Studying the influencing factors of industrial structural adjustment can assist us in gaining a deeper understanding of the nature and

characteristics of such adjustments, thereby providing a basis for the formulation of more rational and effective policies.

Certain scholars have primarily conducted theoretical categorization and analysis of the influencing factors of industrial structural adjustment in the relevant literature, for instance, He [1] identified in their analysis of factors influencing industrial structural adjustment that technological innovation is a central influencing factor, with other factors including natural resources, capital scale, and demand structure. In his research, Li [2] summarized the patterns of economic industrial structural adjustment and identified five influencing factors, concluding with recommendations on how to carry out industrial structural adjustments. Ma et al [3] conducted a review of the literature across eight aspects including industrial structural adjustment, optimization, upgrading, and transformation, and pointed out the next research focus based on the identified gaps in the literature. Zhu [4] contributed to the theoretical development of industrial structural adjustment by examining its relationship with economic growth and summarizing the categorization of influencing factors by other scholars, thereby establishing a coherent framework for industrial structure, which holds theoretical significance for its advancement. In their study, Gu et al [5] conducted an analysis of the impact of industrial structural adjustment through four factors: technology, demand, labor, and international trade. They also provided recommendations for each of these factors with the aim of achieving industrial optimization and upgrading in China.

Another group of scholars reached conclusions regarding the influencing factors of industrial structural adjustment through empirical analysis by constructing models. For example, Ning [6] conducted an analysis of the influencing factors of industrial structural adjustment in China from both the supply and demand perspectives, utilizing long-term and short-term models. From the supply side, she identified that

productivity improvement and an increased capital-labor ratio not only have a positive short-term impact on industrial structural adjustment but also exert a positive long-term influence through productivity enhancement. On the demand side, consumption demand plays a driving role in both the short and long terms, while investment demand is effective only in the short term. In her research, Han [7] employed input-output theory and the logarithmic decomposition method to construct a novel model for analyzing the factors and their respective impact levels on industrial structural adjustment. This analysis led to the identification of patterns in industrial structural adjustment and provided policy recommendations for its optimization. In her study, Liu [8] identified the key factor influencing industrial structural adjustment as technological innovation based on an analysis of the characteristics of such adjustment. She further proposed corresponding policy measures for industrial structural optimization and upgrading using the Analytic Hierarchy Process (AHP).

The specific measures for industrial structural adjustment, as proposed by Gan Chunhui, involve the rationalization and advancement of industrial structures. Through a detailed assessment of industrial structures, it is possible to gain insights into the industrial development of a country or region, including characteristics of its industrial types, growth rates, and economic vitality, among other aspects. Through a literature review, it was observed that some scholars have conducted organization and summarization of literature related to industrial structure measurement. For instance, Zhao [9] summarized and organized the measurement methods and indicators related to industrial structural adjustment, identifying the three primary measurement methods commonly employed. Subsequently, a comparative analysis was conducted, and improvement suggestions were proposed.

Some scholars, through quantitative analysis, have quantified the rationalization and sophistication levels of industrial structures either by utilizing existing models or constructing new regression models. Furthermore, many of these studies incorporate total factor productivity (TFP) into their indicators. Yang et al [10], in their research, took an ecological perspective and developed a new model for industrial structural rationalization, sophistication, and ecological improvement. The aim was to provide a foundation for enhancing urban economy, ecology, and industrial structure. Liu et al [11], in their research, conducted empirical analysis by employing a measurement method involving the product of industry composition and labor productivity on nearly 20 years of data from various regions in Guangdong. This analysis yielded insights into the trends of industrial structural transformation across different regions in Guangdong. In their study, Lu et al [12] adopted a perspective based on the "Four Modernizations" and employed a non-parametric geometric approach. They introduced total factor productivity into the indicators to calculate the regional level of industrial structural optimization. Subsequently, they explored the mechanisms of industrial structural optimization from the perspective of "industrial agglomeration". In his study, Xu [13] assessed the level of industrial structural upgrading by constructing a novel model, which involved assigning varying weights to the income contributions of the three major industries and then summing them up. Gong et al [14] analyzed the limitations of existing models for measuring industrial structural sophistication. They then considered the

service-oriented characteristics of industrial structure to make improvements to existing models, studied its properties, and validated the feasibility of the model using data spanning nearly 70 years in China. Han et al [15] built a new measurement index based on the framework of industrial structural rationalization and sophistication, with a focus on quality aspects. In her study, Sheng [16] analyzed data from the Yangtze River Economic Belt using the Moore Structural Change Index to measure the level of industrial structural rationalization and sophistication. She then summarized the trends in industrial structural changes.

3. Research on the Relationship Between Industrial Structural Adjustment and Economic Growth

Foreign scholars have predominantly focused their research on the relationship between industrial structural adjustment and economic growth, with an emphasis on the role of economic growth in shaping industrial structure. For instance, Denison [17], Maddison [18], and Chenery [19] utilized industry development and economic growth data to demonstrate the positive impact of industrial structural upgrading on economic growth.

Domestic scholars have primarily concentrated their research efforts in this area on two aspects. On one hand, they have employed theoretical and comparative research methods to study the direction of industrial structural adjustment and the factors influencing it under the dynamic trends of economic development. For example, Yu [20] pointed out in her research that the relationship between the direction of national economic growth and industrial structural adjustment is closely intertwined. She conducted an analysis of the current state of industrial structure in China, identified shortcomings, and proposed adjustment strategies to better contribute to economic development.

On the other hand, empirical analysis methods, primarily involving econometric modeling, have been extensively employed to conduct in-depth research on the relationship between industrial structural adjustment and economic growth. For instance, in her research, Ma [21] conducted cointegration analysis on the data and introduced an error correction model. She confirmed that the second and third industries have a more significant impact on economic growth compared to the first industry. Chen [22] discovered, by introducing a mediation effect model, that the service-oriented industrial structure has a negative impact on economic growth through its influence on the growth rate of labor productivity.

4. Research on the Relationship Between Industrial Structure and Economic Growth from A Low-carbon Perspective

In the context of low-carbon economy becoming a global focus, industrial structural adjustment has become crucial. The current research aims to explore how low-carbon industrial structural adjustment affects economic growth and how to seek a balance between environmental sustainability and economic development to the maximum extent. Low-carbon factors play a significant role in the relationship between industrial structure and economic growth in the following aspects.

Firstly, focus on the interplay between the environment and the economy. Research on the connection between low-carbon industrial structural adjustment and economic growth typically begins by examining the interaction between the environment and the economy. It places particular emphasis on how environmental issues such as resource scarcity, climate change, and ecosystem degradation affect economic growth. Additionally, it addresses the long-term adverse effects of high-carbon industries and the potential benefits of low-carbon industries.

Secondly, focus on technology innovation and industrial structure. The primary emphasis is on how technology innovation drives the emergence of low-carbon industries and promotes industrial structural adjustment. Research in this area highlights the impact of developments in areas such as clean technology, renewable energy, and green production methods on industrial structure and how these technologies facilitate economic growth.

Thirdly, policy intervention and economic growth. Government policies play a vital role in low-carbon industrial structural adjustment. The main focus of research is how governments use incentives for green investments, the formulation of environmental regulations, and the provision of financial support, among other measures, to guide the adjustment of industrial structure in order to achieve economic growth and reduce carbon emissions.

Fourthly, employment and social impacts. From a low-carbon perspective, industrial structural adjustment not only has far-reaching implications for economic growth but also has a wide-ranging impact on employment and society. Research focuses on issues such as the growth of green employment, the transformation of worker skills, and social inequality to assess the societal effects of low-carbon industrial structural adjustment.

Fifthly, international competition and the global value chain. International competition plays a significant role in the global economy and has also become an important research area. Research in this regard primarily analyzes the comparative advantages of different countries and regions in low-carbon industrial structural adjustment and examines how their positions in the global supply chain impact economic growth and environmental sustainability.

5. Research Outlook

China is currently implementing a series of measures, including energy transition, industrial upgrading, and carbon emission reduction, with the aim of reducing carbon dioxide emissions. Additionally, China is actively participating in the construction of global cooperation mechanisms for low-carbon and energy-efficient emission reduction. The effectiveness of these initiatives will directly impact whether China's future economy can achieve green, healthy, and sustainable development. Therefore, research on the relationship between industrial structure adjustment and economic growth from a low-carbon perspective holds significant potential and carries substantial importance and impact. Future research can explore several areas, including green finance and investment, technological innovation and green competitiveness, global supply chains and international cooperation, social impacts and sustainable development, regional disparities and tailored policies, among others. These studies aim to better understand how to strike a balance between economic prosperity and environmental sustainability, while encouraging active participation from

various stakeholders to collectively promote the development of a low-carbon economy.

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