Impact of Green Policies on Industrial Upgrading

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Abstract: As the global community shifts towards sustainable development, there is a growing interest in the development of a green economy. Countries are striving to balance economic growth and environmental protection and have introduced relevant green policies, which have led to profound changes in the manufacturing sector. China, the second biggest economy in the world, has issues with its conventional industrial model, which is unable to keep up with the demands of fast economic expansion. These issues include an excessive reliance on resources and an excessive number of low-value businesses. The effect of China's green policies on industry upgrading will be the main topic of this essay. Firstly, the theoretical basis of industrial upgrading is summarized, and then the existing green policies in China and the current situation of industrial upgrading in China are analyzed. Additionally, a relevant study is conducted on how green policies affect industrial upgrading. Combining the theoretical foundation of industrial upgrading and the reality of green policies, this paper draws a diagram to illustrate the impact of major green policies on industrial upgrading.

1 INTRODUCTION

After the Industrial Revolution, technological advances caused a change in production methods—the use of large quantities of chemical fuels brought about industrial pollution. Environmental problems are becoming more and more prominent and natural disasters are occurring frequently.

A green economy is an economic system that sustainably promotes economic growth while minimizing negative impacts on the environment. It places a strong emphasis on the use of environmentally friendly technology in production operations, the effective use of resources, and the reduction of pollutants and emissions. The core concept of a green economy is to achieve economic prosperity while protecting ecosystems and providing sustainable development for current and future generations.

The global shift towards sustainable development has led to an increased focus on green economic development. As countries strive to balance economic growth with environmental protection, the manufacturing sector is undergoing significant changes. China's previous industrial model, which was unable to fulfill the demands of rapid economic expansion, has suffered from an overstock of poor value-added sectors and an overreliance on resources. Simultaneously, the level of competition in the global market is increasing, making industrial upgrading an essential strategy to boost the nation's overall competitiveness and secure a more competitive place in the global value chain. In the face of increasingly serious environmental problems, including climate change and resource depletion, the old industrial model is also unable to meet the needs of sustainable development. Conversely, industrial modernization and transformation will successfully advance production techniques and technological advancements. Achieve the goal of raising the added value of the industrial chain by simultaneously adjusting the industrial structure and the distribution of production factors, moving away from the economic development model driven by labor accumulation and resource consumption and toward one driven by technology.

Relevant studies show that green policies have an obvious promotion effect on industrial transformation and upgrading. This paper will start with the research of industrial upgrading and transformation, explore the mode of industrial upgrading and transformation based on the existing theoretical foundation, and gradually dismantle it. At the same time, combined with the current situation of industrial upgrading in

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China, it will summarize the existing major green policies in China and analyze the key factors of different green policies on industrial upgrading and transformation. This study intends to further evaluate and identify the critical elements of green policies on industrial transformation and upgrading, as well as to gain a thorough understanding of the relationship between green policies and upgrading. It also provides policy recommendations for effectively promoting industrial transformation and upgrading, thereby promoting sustainable economic development.

2 RESEARCH ON INDUSTRIAL UPGRADING

2.1 Overview of the Theoretical Foundations of Industrial Upgrading

China's original concept of "industrial upgrading" was originally referred to as "industrial restructuring". Therefore, in China, the research on "industrial upgrading" mainly originated after the reform and opening-up. These studies mainly focus on the development of industrial structure and how economic liberalization has affected it (Chen et al 2004). Poon provides a micro-level definition of industrial upgrading, using business economic behavior as the primary research focus. The process through which businesses go from the bottom to the top of the value chain and consistently raise the added value of the goods they create is known as "industrial upgrading" (Cheng 2009). The industrial upgrading discussed in this paper refers to the process of making the whole industrial chain develop in the direction of higher value-added, higher technological content, and higher innovation capacity by adjusting and upgrading the industrial structure, technological level, and management level of the economic system in a country or region. Industrial upgrading involves changes in several areas, including but not limited to technological upgrading, industrial restructuring, improvement of innovation capacity, human resource cultivation, market expansion, environmental friendliness, and sustainable development.

The theoretical foundations of industrial upgrading cover a wide range of fields. Firstly, the theory of industrial value chain upgrading suggests that industrial upgrading can be done in four ways: technological upgrading, product upgrading, functional upgrading, and upgrading between value chains (Poon 2004). Among these, the restructuring of the industrial structure is primarily referred to as inter-value chain upgrading (Poon 2004). Of them, the modification of the industrial structure is the primary definition of inter-value chain upgrading. Secondly, David argued that different countries have different labor productivity gaps for different products. Countries or regions should focus on their relative advantages of the industry, through specialized production and trade, goods with comparative advantages to export, and goods with comparative disadvantages to import. Thus achieving the effect of improving labor productivity to maximize the trade welfare of each country (John and Hubert 2020) This is the famous theory of comparative advantage. According to the theory of comparative advantage, industrial upgrading can be achieved by constantly searching for new competitive advantages, focusing on the development of leading technologies or local characteristic industries, maximizing geographical advantages according to local conditions, and maintaining the leading edge. Thirdly, Technical Innovation Theory was first put forward by Joseph A. Schumpeter's Theory of Economic Development. Joseph A. Schumpeter presented that innovation is defined as the realization of a new combination of production factors and conditions that have never been realized before and their introduction into the production system, i.e., the establishment of a new production function (David 2010).

Innovation usually covers innovations in production methods, products, and raw materials. It also leads to the creation of new markets and new forms of organization. The theory emphasizes the close relationship between industrial upgrading and technological progress and innovation, which are the driving forces for the evolution and modernization of the industrial framework. Fourthly, Wernerfelt stated that “A firm's resources at a given time could be defined as those(tangible and intangible) assets which are tied semi-permanently to the firm. Examples of resources are brand names, in-house knowledge of technology, employment of skilled personnel, trade contacts, machinery, efficient procedures, capital, etc (Xiong 2019). Resource-based theory focuses on the resources and capabilities of an enterprise and believes that an enterprise's competitive advantage comes from its unique and not easily imitated resources. Applying resource-based theory to industrial upgrading involves the rational allocation and development of enterprise resources to promote industrial development to a higher level.

2.2 The Theoretical Analytical Framework of Industrial Upgrading

Referring to the theory of technological innovation, this paper first divides industrial upgrading into two parts: product technology as well as other resources. Among the product part, this paper is divided into two parts: centralized production of products and research and development of new products. Based on the theory of comparative advantage, the company should concentrate on the production of products with comparative advantage, while the theory of technological innovation also emphasizes that new products and technologies should be developed or new technologies should be cited so that technological upgrades can promote the enhancement of the added value of the industrial chain to achieve the purpose of industrial upgrading. Meanwhile, the resource-based theory emphasizes that enterprise resources with strategic advantages should be integrated and synergized, including raw materials and semi-finished products, enterprise culture, human resources, brand value, and so on. It can also be categorized into internal resources and external resources through the way of acquisition. First of all, enterprises should identify and evaluate the existing resources of the enterprise, including human resources, capital, brand value, and so on. Through an in-depth understanding of the internal and external resource status of the enterprise, it provides basic data for the strategy formulation of industrial upgrading. Conduct core competence analysis to determine the competitive advantages of the enterprise in specific fields. Encourage resource integration and synergy between different departments. By improving the mobility of internal resources, enterprises are prompted to better respond to the needs of industrial upgrading. At the same time, enterprises should not only make good use of internal resources but also flexibly acquire external resources. Advanced resources of other enterprises can be acquired through cooperation, mergers and acquisitions, and technology introduction. Invest in the development of key resources, and selectively invest in the development of key resources according to the strategic direction of industrial upgrading. This may include investments in cultivating talents, enhancing brand image, etc. Cultivate the dynamic capabilities of enterprises so that they can flexibly adjust their resource allocation to adapt to the dynamic changes of industrial upgrading.

2.3 Current Status of Industrial Upgrading

As shown in Fig 1, since the reform and opening up, China's national economy has made rapid progress. The country attaches great importance to industrial upgrading and has implemented a series of reform strategies. In terms of industrial structure, by analyzing the GDP growth rate, the GDP growth rate from 2019 to 2023 is 5.95/2.24/8.45/3.00/8.45 percent respectively. The contribution of the secondary and tertiary industries to the GDP growth rate is significantly higher than that of the primary industry, and the tertiary industry continues to be higher than the secondary industry. From the analysis of the data, China's service industry has been developing rapidly, and the proportion of the service industry in GDP has gradually increased, becoming one of the pillars of China's economy. In particular, high-end service areas, such as finance, information technology, culture, and creativity, have flourished and promoted industrial upgrading.

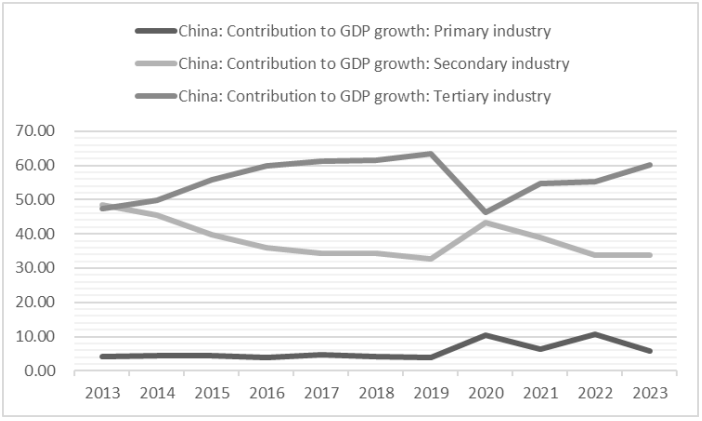

Figure 1: Industrial contribution to China's GDP growth (percentage) (Picture credit: Original).

The current status of China's industrial upgrading shows notable features: technological upgrading and innovation-driven, with China increasing its investment in technological innovation and promoting the upgrading of its traditional manufacturing industries to high-technology and high-value-added industries. Efforts have been made to develop cutting-edge fields such as artificial intelligence, new energy vehicles, and biotechnology to upgrade industrial technology. It has made remarkable achievements in technological innovation, especially a series of important breakthroughs in artificial intelligence, 5G technology, biotechnology, and other fields, which have promoted industrial upgrading.

At the same time, there are also problems in China's industrial upgrading, such as the industrial structure still relying on the traditional manufacturing industry, the technological innovation system is not perfect, the innovation ability of enterprises, and the autonomy of core technologies need to be improved, the regional imbalance of industrial upgrading, the mismatch between talent supply and industrial demand, and the mismatch between talent supply and demand of emerging industries.

3 IMPACT OF GREEN POLICIES ON INDUSTRIAL UPGRADING

3.1 Scope and Classification of Green Policies

Xinmiao assumed that a green industrial policy ought to be a workable policy that prioritizes the advancement of environmentally friendly technological innovation and the strengthening of the market system. In the end, it should realize the all-encompassing green development of the economy and society by encouraging the upgrading and green transformation of industries (Wernerfelt 2019). Green policy as defined in this paper refers to government policies that promote environmental protection, sustainable development, and a low-carbon economy through legislation, administrative measures, and market instruments.

This paper categorizes China's existing green policies into six categories. The first category is environmental laws and regulations, in which China has enacted and enforced an array of rules and legislation about the environment to regulate the environmental behavior of enterprises and citizens, and to ensure the rational use of resources and environmental sustainability. These include the Water Pollution Prevention and Control Law. The second category is clean energy policy, which refers to promoting a larger proportion of clean energy in the energy mix by limiting the use of energy sources that are damaging to the environment and fostering the development and use of renewable energy sources. This includes the renewable energy law and the energy conservation and emission reduction policy. The third category is market subsidies and incentives. Gao et al. point out that a key factor that enables industrial upgrading to be promoted is the expansion and upgrading of consumption on the demand side. They argue that industrial upgrading will be promoted with the expansion and upgrading of the consumption scale (Hu 2022). Echoing this view, Jiang Xuan's study found that there is an imbalance between supply and demand in China. He emphasized that expanding domestic consumer demand should be the core focus of industrial policy (Gao et al 2015). These include green industry tax credits for businesses, green technology R&D credits, and subsidies for new energy vehicles, including for consumers. The fourth category is carbon emission and climate change policies, which speak about regulating and cutting greenhouse gas emissions as well as addressing climate change by enacting carbon emission quotas and fostering a market for carbon trading. These include carbon pricing mechanisms. The fifth category is green education and green training policies. Green policies increase investment in talent training in the field of environmental protection and promote universities and scientific research institutions to strengthen green science and technology research. This includes training programs for green industry talents and public education for the public. The sixth category is green finance, which refers to a financial model in the financial system that promotes the realization of green transformation of the economy by directing capital flows to environmental protection and sustainable development. China actively promotes green finance through the formulation of policies and the introduction of relevant financial instruments to encourage green investment and support environmental protection projects to promote sustainable economic development.

3.2 Investigations into How Green Policies Affect Industrial Upgrading

Referring to the study of the industrial upgrading mechanism in 2.2, this paper divides industrial

upgrading into parts such as product technology, other resources, market structure, and factor allocation, as shown in Fig 2. Among them, market structure and factor allocation in turn interact with the upgrading of product technology and other resources. Together with the categorization and organization of green policies, this paper constructs the following diagram of the influence mechanism of the main effective green policies on industrial upgrading. In this paper, the author believes that the green policies that have a major part in promoting the development and upgrading of green industries can be categorized into four categories: research and development support, green education and training, subsidies and incentives, and green finance. First, research and development support contributes significantly to the advancement and upgrading of green industries. Firstly, research and development support is used to promote the upgrading of product technology and the continuous innovation and progress of green technology. Secondly, Green education and training for professional practitioners focuses on professional practitioners, aiming to promote the upgrading of human resources and cultivate more professionals in the green field. The fourth Green finance provides financial support to improve the industrial chain of businesses, thus also positively affecting changes in the distribution of industrial factors. These five types of policies synergize with each other and jointly promote the comprehensive development and continuous upgrading of the green industry.

4 RELEVANT POLICY RECOMMENDATIONS

To achieve greening in society and the economy, outdated development routes must be changed, new ways forward created, and risks distributed equally among government and enterprises. Effective responsibility and implementation mechanisms should be established through forward-looking judgment (Lütkenhorst and Altenburg 2014).

Based on the analysis of 2.2 on the current situation of China's industrial upgrading, China industrial upgrading still exists the problems of industrial structure relying on the traditional manufacturing industry, the innovation system is not perfect enough, the environmental protection pressure and resource consumption problems, as well as the regional imbalance of industrial upgrading and the imbalance of talent supply. In this regard, this paper gives the following green policy suggestions for industrial upgrading:

The first is to promote innovation and technological upgrading: formulate innovation incentive policies, including tax incentives and financial support, to stimulate businesses to invest more in research and development, as well as to support technological innovation and the emergence of new sectors; establish green innovation funds to support environmental protection science and technology enterprises, and to promote the application of green technology in the manufacturing industry; the second is to strengthen the environmental protection supervision and standard system: strengthen environmental protection supervision, and to increase the enforcement of environmental protection standards for traditional manufacturing industries, and to promote the adoption of cleaner technologies by enterprises. The second is to strengthen the environmental protection regulation and standardization system: strengthening environmental protection regulation, increasing the enforcement of environmental protection standards for traditional manufacturing industries, promoting the adoption of cleaner production technologies by enterprises; and formulating and updating green industry standards to guide enterprises to shift to more environmentally friendly and sustainable production methods. The third is to promote a low-carbon and circular economy: formulate carbon pricing policies to guide enterprises to reduce carbon emissions and prompt industrial upgrading in a low-carbon direction; support the development of circular economy industries and encourage the resourceful use of waste, to reduce reliance on limited resources. The fourth is to promote regional industrial upgrading and balanced development: formulate differentiated industrial policies to promote industrial upgrading with differentiated characteristics based on the industrial foundation and advantages of different regions; and provide financial and tax incentives to guide the flow of funds to weaker industrial upgrading regions, to promote balanced regional development.

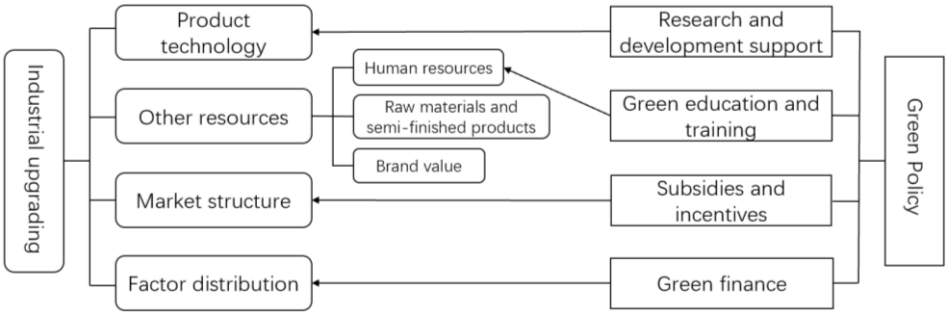

Figure 2: Illustrative map of the impact of green policies on industrial upgrading (Picture credit: Original).

The fifth is to focus on talent training and introduction: strengthening the training system for green industry-related talents, as well as raising the bar for environmental preservation and green technology among practitioners; promoting talent introduction policies to attract Superior skills in environmental science and technology and management talents, and prompting enterprises to carry out more in-depth innovations and improvements in the area of safeguarding the environment.

5 CONCLUSION

This study divides industrial upgrading into four ways of upgrading: Product technology, Other resources, Market structure, and Factor distribution, where Other resources are divided into three ways of upgrading: Human resources, semi-finished goods, raw resources, and brand value. Simultaneously, China's existing green policies are summarized, mainly divided into four forms: research and development support, green education and training, subsidies and incentives, and green finance.

Combined with the current situation of China's industrial upgrading, the analysis names the key factors in the impact of green policies on industrial upgrading, specifically the Research and development support Policy for Product technology, the Green education and training Policy for Human resources, and the Green education and training Policy for Market structure. The results of this study provide five policy recommendations for green policies, namely, promoting innovation and technological upgrading, strengthening the environmental regulation and standardization system, enhancing environmental protection, and strengthening the environmental management system and standardization system. The findings of this study provide five policy recommendations for green policies, namely, promoting innovation and technological upgrading, strengthening environmental regulation and standardization systems, promoting low-carbon and circular economy, promoting regional industrial upgrading and balanced development, and focusing on talent training and introduction. This study identifies important components in the influence of green policies on industrial upgrading, drawing on prior research on the subject's effects in China, which helps readers to understand how green policies affect industrial upgrading, but to quantify how much the impact has been, subsequent studies can be further quantitatively analyzed on this basis.

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