• Article •

Brief Analysis of the Development of Flying Geese Model in China

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Abstract: The “Flying Geese Model” has a good predictability to the regional industrial transfer path, while China's vast territory better presents the resource endowment conditions of different regions, which provides the most basic conditions for the Flying Geese Model. Studying the development of Flying Geese Model in China is of certain significance to the government's industrial policy making. This paper starts from China's industrial structure, then further analyzes the development status and related reasons of Flying Geese Model in China, and finally draws a brief conclusion and inspiration.

Keywords: Flying Geese Model; Industrial Structure; Industrial Transfer

1. The Meaning of "Flying Geese Model"

"Wild-Geese-Flying Pattern", also known as "Flying Goose", was the first time that Japanese economist Akamatsu used the word "Wild-Geese-Flying Pattern" to systematically put forward this theory in an article published in 1962. Akamatsu will describe the major Asian economies after the industrial revolution, especially according to the development process of Japanese economy. The rapid development of Japanese economy after World War II is a policy development process with the influx of western capital and export orientation as the main position, which is based on the political foundation after Meiji Restoration. It can be summarized as follows: foreign capital enters-natural economy collapses-industrial economy develops by foreign capital-industrial economic system gradually completes. Subsequently, Japan became a developed economy in Asia, and switched its role with other Asian countries to invest in other underdeveloped regions in Asia. Later, Kojima Kiyoshi, a student of Akamatsu, further supplemented the Flying Geese Model. He was not limited to the process of product upgrading, but also included selective industrial upgrading brought by the endowment of production factors. Kiyoshi Kojima summed up the three theoretical cornerstones of the "Flying Geese Model": (1) selective and diversified industrial upgrading paths; (2) Export-oriented policy supported by FDI; (3) Specialized division of labor through consultation. Related industries are strongly related to comparative advantages and product life cycle characteristics. At first, Japanese related industries can only rely on imports to meet domestic demand, and then carry out independent research and development under the

guidance of investment or government to gradually replace imported products, and then continuous improvement and investment promote the local upgrading of this industry, making it gradually turn to the whole process of catching up with export sales. During this period, Japan, as the leading geese in Yan Zhen, first led the development of labor-intensive industries, and then turned to other East Asian regions in turn.

The Flying Geese Model is directly produced by the change of factor endowment, which means that with the industrial change and upgrading in this region, the structure of its production factors will also change accordingly, which will promote the further adjustment of industrial structure. From the concept of resource endowment, there are different industrial structures between large and small countries. The industries of small countries are more concentrated and the types of industries are homogeneous, while the industrial characteristics of big countries are heterogeneous because of their unique regional differences. Therefore, the pattern of small country Flying Geese Model often refers to the industrial transfer and undertaking between independent economies, while the pattern of big country Flying Geese Model shows an independence Industrial transfer and undertaking between regions within an economy. As a big country in the world, China has outstanding industrial development characteristics in its regions. Different regions have different resource endowments and different industrial development levels. On the whole, the eastern coastal areas make full use of the geographical advantages of the region and the labor force brought by the transfer of labor force in the central and western regions, and the economy of the eastern coastal areas develops rapidly, which drives the rapid economic growth of the whole country in the form of leading geese. If the industry development of Flying Geese Model is also presented in China, the path of China's industrial transfer can be well foreseen, which is of great help to the formulation of relevant policies.

So, can the "Flying Geese Model" be successfully realized in China?

2. Characteristics of China's Industrial Structure

In China, traditional sectors (such as simple agriculture, sporadic commerce and other industries with low labor efficiency and characterized by subsistence) and modern sectors (such as technologically advanced service industries and construction industries with high labor efficiency and making full use of the nature of reproduction to seek profits) coexist, showing typical dual economic characteristics. Most of the low-level labor force has created huge surplus value and promoted the development of labor-intensive industries, while the labor force is also moving towards areas where labor-intensive industries are developing rapidly. At present, because of its convenient transportation and geographical conditions and local resource endowments, the eastern coastal areas are constantly expanding the development of their labor-intensive industries. At the same time, with the support of their historical policies, FDI, and low-cost labor transferred from the central and western regions, the eastern coastal areas have gradually developed into a labor-intensive industrial pattern with the help of industrial cluster effect. For countries with dual economic characteristics, an important change in the current economic development stage is the change of labor supply and demand situation. That is to say, with the rapid

development of labor-intensive industries, the labor force is gradually transferred to modern departments. In order to expand their market share and scale, the simplest and direct way for enterprises in labor-intensive industries is to recruit more workers. In this case, the effects of technological progress and industrial upgrading on economic growth are far less than those brought by capital and labor input. Export ratio and investment can stimulate economic growth more than residents' consumption demand, that is, the proportion of C in Y is weaker than that in other countries and regions, that is to say, the government and enterprises account for a high proportion in the national economic pattern, followed by residents' allocation. However, the surplus labor force is exhausted in the process of transfer, which leads to an increase in labor costs. In recent years, the phenomenon of "labor shortage" has begun to appear not only in the coastal areas but also in the inland areas of the central and western regions. Especially in the post-epidemic era, more and more laborers have returned and chose to return to their hometown instead of staying in cities to work, which has a trend of reaching Lewis turning point, resulting in the cost of production factors changing the structure of the original inherent endowment of production factors. Therefore, in the long-term fluctuation of the external environment, in order to seek long-term growth in economic development, industries must be relatively adjusted to adapt to the current structure of production factors.

At the same time, with the fiscal decentralization system formed in 1994, the competition between regions is more intense, and economically backward areas urgently seek a way to change the local economic output effect of industrial upgrading. Therefore, the adjustment of industrial structure brought by regional differences is also quite different, and different economic development strengths also lead to different degrees of government interference, resulting in a certain path dependence outcome, narrowing or even distorting the original space of industrial structure, while the results of industrial selection in different places may not match the optimal situation of local factor endowments. However, with the intensification of government intervention, in order to seek investment from enterprises to lower the price of local resources, for example, many local governments directly adopt the means of lowering land prices to attract high-tech companies to settle in in order to complete their achievements, speed up industrial transformation and upgrading, and give a beautiful result to the test paper of economic output. However, this policy of over-tilting towards enterprises makes the dependence between the government and enterprises continuously strengthen, and even in serious cases, it will help enterprises move towards monopoly position, which will have a certain negative impact on related industries in the local and even the whole country. Moreover, the wrong prices of production factors will lead enterprises to make wrong judgments on the market, reduce the vitality of R&D and innovation of enterprises, and delay the speed of industrial upgrading, transformation and adjustment.

The consequences of fiscal decentralization are not all wild goose-like industrial transfer mode, but the possible result is leapfrog-like industrial development which is contrary to it. According to the inference of Flying Geese Model, the industries among big countries are transferred and undertaken between regions, and the industrial development of leading geese regions is in the form of life cycle,

and their own industries are upgraded in this process. However, in the process of China's industrial upgrading, there has been a leapfrog-like special industrial structure due to different systems. The Pearl River Delta started with simple labor-intensive industries for processing with supplied materials, but the resource endowment structure in this region changed but upgraded slowly, so that the higher industrial structure was directly formed in the later Yangtze River Delta region, which started with high-tech industries such as information technology or skilled labor-intensive industries. While this region is still developing, the third round, that is, the industrial structure with higher capital intensity mainly based on equipment industry, also starts from the third type of regions, such as the regions represented by old industrial bases such as Northeast China. In economically developed areas, it has achieved huge economic effects due to its factor endowment advantages, so local government officials may have decisions that are unwilling to jump out of the comfort zone and carry out industrial transformation; However, in the process of undertaking the industries in the developed regions, the latter regions need to start from the low end, but they lack the advantages of production factor endowment brought by the leading geese, and do not necessarily have all the infrastructure construction conditions needed for production, so they can't compete with them. In addition, with the tide of high-tech innovation under the global tide, the economically weak regions directly seek a leap-forward industrial upgrading mode to drive the local economic scale growth.

3. Development of "Flying Geese Model" in China

For the development of Flying Geese Model, to investigate whether the industries in developed areas have shifted to areas with relatively low development level, the classic indicators are measured by the change of dominant comparative advantage and market share. As far as dominant comparative advantage is concerned, in the Flying Geese Model, the number of factor endowment industries increases from the leading regions to other regions in the industrial changes between regions. As shown in the figure, since about 2004, the number of dominant comparative advantage industries in the eastern developed regions has generally declined, while the number of comparative advantage industries in the central and western regions has started to rise. However, the total number of industries in a country will not change greatly in a short time. Therefore, it can be inferred that most of the advantageous industries reduced in the developed eastern regions are gradually transferred to the central and western regions.

Figure1: Changes in the Number of Dominant Comparative Advantage Industries in Eastern Regions and in the Number of Dominant Comparative Advantage Industries in Central Regions

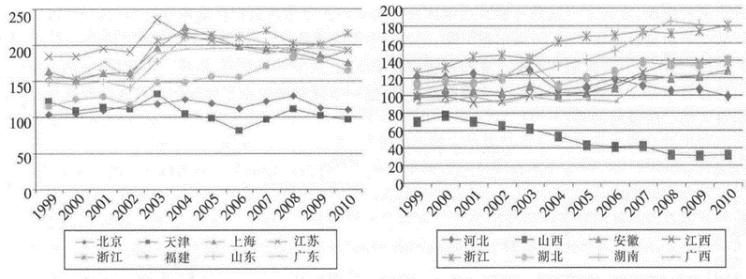
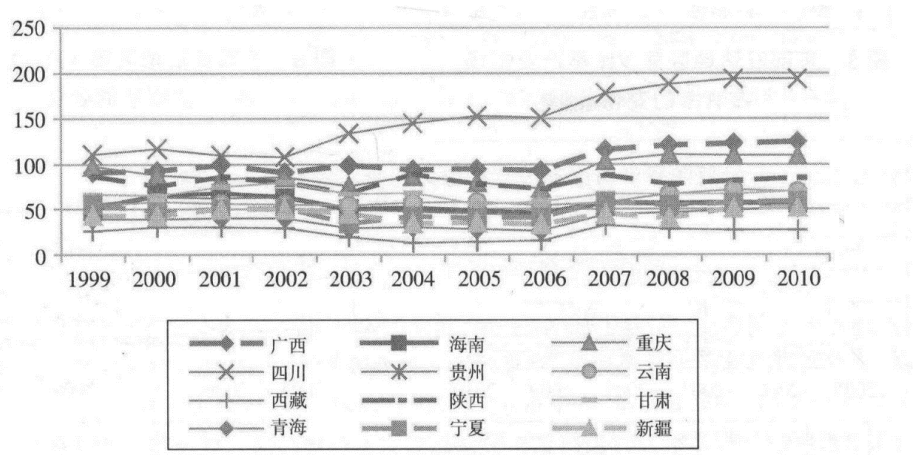


Figure2: The Change of the Number of Regional Comparative Advantage Industries in Western China



In the past time, the industry as a whole is forming the trend of Flying Geese Model, but if the industry is classified, is it still the same result? In this regard, domestic scholars often use industrial agglomeration degree as an index to compare. If the industry presents the trend of Flying Geese Model, the agglomeration effect of the industry in the leading geese area should gradually weaken with time, and the index of agglomeration degree is not significant, even negative results. Only from 1998 to 2008, for labor-intensive industries, most of its concentration index in the eastern developed regions are not significant, that is, the concentration in this region is gradually weakening with time. In the process of rapid economic development in the eastern coastal areas, its factor costs are also increasing with the economic prosperity, so labor-intensive industries began to shift to the central and western regions with lower labor costs. However, it is worth mentioning that in the early stage of industrial development, the factor cost effect is not the main factor affecting industrial agglomeration, but when the industrial agglomeration reaches a certain level, the impact of the rising factor cost on it gradually becomes prominent, which becomes a trend that hinders the further centralization of the industry and induces it to transfer to backward areas to form a Flying Geese Model. At the same time, regional protectionist policies, government intervention and foreign direct investment also interfere and hinder the development of this industry to a certain extent.

The Flying Geese Model is directly influenced by changes in factor endowment. In other words, the trend of the Flying Geese Model varies depending on the types of comparative advantages present in different regions. This model represents the process of industrial upgrading as one advantage transitions into another.

However, it is important to note that different industries within this model prioritize distinct infrastructure requirements. This aspect sets it apart from the traditional Flying Geese Model which typically involves stable industrial transformation.

The transition from one advantage to another within the Flying Geese Model signifies a shift towards more advanced and sophisticated industries. As regions develop and upgrade their industries, they may encounter various challenges specific to their comparative advantages.

For instance, a region with an initial advantage in low-cost labor-intensive manufacturing may face difficulties when transitioning to high-tech industries due to inadequate technological infrastructure or skilled workforce. On the other hand, a region with abundant natural resources might struggle with environmental sustainability issues during its transformation towards knowledge-based sectors.

To successfully navigate these challenges and achieve sustainable development within the Flying Geese Model framework, policymakers need to consider tailored strategies for each industry's unique requirements. This could involve investing in research and development capabilities, fostering innovation ecosystems, improving education systems to enhance human capital formation or implementing policies that promote sustainable resource management practices.

While following the principles of the Flying Geese Model can lead to industrial upgrading and economic growth for regions worldwide; understanding and addressing industry-specific infrastructure needs are crucial for successful transformations across diverse sectors. Generally speaking, areas dominated by low-tech and low-connectivity industries face significant challenges in transforming their comparative advantage. These regions often lack the necessary infrastructure and technological capabilities to compete effectively in the global market. As a result, they are more prone to experiencing difficulties during the transformation process.

In order to overcome these obstacles, these areas require substantial capacity building efforts. This entails investing in new technologies, improving connectivity through enhanced transportation networks and digital infrastructure, and fostering innovation within local industries. By doing so, these regions can embark on a path of leap-forward industrial upgrading.

One example that exemplifies this need for leapfrog industrial upgrading is Northeast China. Historically known for its heavy reliance on traditional industries such as coal mining and manufacturing, this region has recognized the importance of embracing advanced technologies and diversifying its economic base.

To achieve this transformation, Northeast China has implemented various strategies aimed at promoting innovation-driven development. It has established research institutes and technology parks to foster collaboration between academia and industry. Additionally, it has provided incentives for businesses to invest in high-tech sectors such as biotechnology, renewable energy, and information technology.

Furthermore, Northeast China has prioritized improving connectivity both domestically and internationally. The construction of high-speed rail networks linking major cities within the region has facilitated efficient transportation of goods and people. Moreover, initiatives like the Belt and Road Initiative have opened up opportunities for trade with neighboring countries.

The success of Northeast China's leapfrog industrial upgrading can be attributed to its commitment towards capacity building efforts across various sectors. By leveraging its existing resources while simultaneously embracing new technologies and enhancing connectivity, this region is gradually shedding its dependence on low-tech industries. Why does the industrial development of Northeast region appear leapfrog type upgrade.

Although the supply of labor force in China is no longer unlimited, it only reflects that the new labor force is gradually slowing down. In particular, due to historical reasons, China also has a large number of low-end labor force with low educational level. Therefore, to a certain extent, to maintain labor-intensive industries and continue to play its role in economic growth and employment absorption is an important aspect to promote China to maintain a good growth trend at the middle-income stage.

Expanding on this point, it is crucial for China's economy to find ways to effectively utilize its existing labor force while simultaneously investing in education and skill development programs. By doing so, not only can the country address the issue of low educational levels among its workforce but also enhance their productivity and competitiveness.

Furthermore, as China transitions towards becoming a more innovation-driven economy, there is a need for skilled workers who possess advanced technical knowledge and expertise. This shift requires investments in research and development (R&D) activities as well as fostering an environment conducive to entrepreneurship and creativity. Additionally, promoting inclusive growth should be prioritized by ensuring equal access to quality education across all regions of the country. This will help bridge the gap between urban and rural areas by providing opportunities for individuals from disadvantaged backgrounds. Moreover, efforts should be made towards creating favorable conditions for attracting foreign direct investment (FDI) into sectors that require higher-skilled workers. This can be achieved through implementing policies that encourage technology transfer collaborations between domestic firms and multinational corporations.

However, as the economic development of coastal areas reaches a certain stage and approaches the Lewis turning point, it becomes evident that the cost of factors such as wages and labor starts to increase rapidly. This phenomenon poses challenges for industries in these regions, particularly those that heavily rely on labor-intensive production processes. On the other hand, when we consider the central and western regions of a country, we observe relatively backward economic and manufacturing development compared to their coastal counterparts. However, this situation also presents an opportunity for these regions due to their lower costs of production factors such as labor.

Given these circumstances, there is potential for the central and western regions to undertake labor-intensive industries from the eastern coastal areas. By leveraging their comparative advantage in terms of lower production costs, they can attract investments from companies seeking more affordable manufacturing options. This dynamic creates an environment conducive to realizing what is known as the "flying goose model" within a country's manufacturing industry. In this model, industries gradually

shift from one region (the leader) with higher costs towards other regions (the followers) with lower costs but similar capabilities.

The formation of this model not only promotes balanced regional development but also facilitates knowledge transfer and technological upgrading across different parts of a country. As labor-intensive industries migrate inland or towards less developed areas, it allows for job creation and income redistribution while fostering industrial diversification. It is important to note that implementing this model requires strategic planning by policymakers at both national and regional levels. Efforts should be made to improve infrastructure connectivity between coastal areas and inland regions while providing necessary support in terms of education and training programs aimed at enhancing human capital in underdeveloped areas.

Overall, by embracing the flying goose model within a country's manufacturing industry – specifically focusing on labor-intensive sectors – it is possible to foster inclusive growth across different regions while maximizing each area's unique strengths in contributing to overall economic prosperity.

4. Limitations and Challenges in China of "Flying Geese Model"

The difficulty of transforming the middle and high-end manufacturing industry in China is a complex challenge that requires careful consideration. While China has made significant progress in establishing its position within the global value chain, transitioning from low-end to high-end manufacturing is not an easy task. To successfully achieve this transformation, China needs to focus on enhancing its technological innovation and research and development (R&D) capabilities. This entails investing more resources into cutting-edge technologies, such as artificial intelligence, robotics, and advanced materials. By fostering a culture of innovation and encouraging collaboration between academia, industry, and government sectors, China can accelerate its progress towards becoming a leader in high-end manufacturing.

Furthermore, developing a higher quality workforce with specialized skills is crucial for the success of the middle and high-end manufacturing industries. Investing in vocational training programs that equip workers with relevant technical knowledge will help bridge any skill gaps that may exist. Additionally, promoting lifelong learning initiatives can ensure that employees stay up-to-date with emerging technologies and industry trends. Effective management practices are also essential for driving the transformation of the manufacturing sector. Encouraging companies to adopt modern management techniques such as lean production systems or agile methodologies can improve efficiency and productivity levels. Moreover, nurturing a business environment that supports entrepreneurship and fosters creativity will enable companies to adapt quickly to changing market demands. In order to overcome these challenges effectively, it is imperative for China to increase investment in scientific research institutions as well as provide financial support for startups focused on technological advancements. Collaborating with international partners through joint ventures or technology transfer agreements can also facilitate knowledge exchange and promote mutual growth opportunities. In a word, while there are obstacles ahead in transforming the middle and high-end manufacturing industry in

China, by prioritizing technological innovation efforts alongside talent development initiatives while fostering effective management practices; China has great potential to succeed in this endeavor.

Transformation of growth drivers. The transformation of China's growth drivers is a crucial step towards sustainable and balanced economic development. As the country moves away from traditional investment-driven growth, it is embracing innovation-driven and consumption-driven models. Innovation has become a key focus for China as it aims to enhance its global competitiveness. The government has been actively promoting technological advancements through various initiatives such as the "Made in China 2025" plan, which emphasizes the development of high-tech industries like artificial intelligence, robotics, and biotechnology. By investing in research and development, China seeks to foster homegrown innovation that can drive economic growth. Moreover, shifting towards a consumption-driven economy entails stimulating domestic demand by empowering Chinese consumers. This involves improving income distribution, enhancing social welfare programs, and encouraging entrepreneurship to create more job opportunities. By boosting consumer confidence and purchasing power, China aims to reduce its reliance on external demand while simultaneously creating a robust domestic market. To support this transition process effectively, intellectual property protection plays a vital role. Strengthening IP rights enforcement not only encourages innovation but also attracts foreign investors who seek assurance that their inventions will be safeguarded against infringement. By providing adequate legal frameworks and implementing stricter regulations against IP violations, China can foster an environment conducive to technological advancement. Overall, the transformation of growth drivers in China signifies a shift towards sustainable economic development driven by technology innovation and domestic consumption. Through these efforts aimed at fostering creativity within its borders while protecting intellectual property rights both domestically and internationally, China is positioning itself as an innovative powerhouse with strong potential for long-term prosperity.

Changes in the international trade environment have become increasingly prominent in recent years. With the rise of protectionist measures adopted by various countries, such as tariffs and trade barriers, the global industrial chain and the flying geese model are encountering unprecedented challenges. These changes have not only disrupted established trading patterns but also posed significant risks to economic growth and stability. In response to these uncertainties, China must adapt its strategies and seek new opportunities for cooperation. One approach is to diversify its export markets by exploring emerging economies with high growth potential. By expanding trade relations with these countries, China can reduce its reliance on traditional markets and mitigate the impact of protectionist measures. Furthermore, it is crucial for China to enhance its competitiveness in key industries through technological innovation and upgrading. By investing more resources into research and development, China can develop cutting-edge technologies that will enable it to stay ahead in global competition. This will not only help counteract any negative effects caused by protectionism but also position China as a leader in future industries. Additionally, strengthening regional economic integration is another viable strategy for coping with changes in the international trade environment. Initiatives like the Belt and

Road Initiative provide platforms for enhanced connectivity among participating countries, fostering greater trade flows and investment opportunities. Through increased collaboration within regions, China can create a more resilient network that withstands external shocks while promoting mutual benefits among nations involved. In conclusion, navigating through uncertainties brought about by changes in the international trade environment requires proactive measures from China. By diversifying export markets, enhancing competitiveness through innovation, and promoting regional economic integration, China can effectively address challenges while seeking new avenues for cooperation globally.

Pressure of sustainable development. Under the new situation, sustainable development has become an important issue of global concern. China needs to pay more attention to environmental protection, resource conservation and green development to ensure sustainable and long-term stable economic growth.

In general, although the flying geese model has played an important role in China's development, China still faces some limitations and challenges under the new pattern. In order to achieve a higher level of industrial upgrading and economic development, China needs to strengthen technological innovation, enhance domestic demand, adapt to changes in the international trade environment, and pay attention to the requirements of sustainable development.

5. Conclusion and Lessons

Due to its vast territory and unique geographical features, China exhibits regional disparities in terms of resource endowments within its national industries. However, the process of industrial transfer, development, and upgrading cannot be simply generalized as a " Flying Geese Model ". Various factors such as regional protectionist policies, government intervention, and the escalating costs of production factors with economic development intertwine and influence China's industrial development trajectory.

In light of these complexities, it is evident that China has indeed taken place a Flying Geese Model for industrial development. However, this model is not uniformly applied across all industries but rather tailored to suit different sectors. The concept behind the Flying Geese Model involves the sequential transfer of industries from more developed regions to less developed ones over time.

Nevertheless, it should be noted that China's implementation of the Flying Geese Model has encountered significant challenges in the post-epidemic era. The disruptions caused by the global pandemic have disrupted supply chains and hindered economic activities worldwide. As a result, China's progress in implementing this model has been impeded.

Despite these obstacles faced by China's big country Flying Geese Model during this period, it remains an ongoing process that requires continuous adaptation and adjustment. The Chinese government will need to address issues related to regional disparities while promoting balanced growth across various industries. By doing so effectively, they can ensure sustainable economic development throughout the nation without compromising overall stability or exacerbating existing inequalities among regions.

China's economic development has undoubtedly been greatly influenced by the process of globalization. The opening up of international markets and the integration of global supply chains have provided immense opportunities for China to expand its industries, attract foreign investment, and boost exports. This has led to significant economic growth and improved living standards for many Chinese citizens.

However, in recent years, China has faced challenges in maintaining a smooth external environment. The Sino-US trade war initiated by the Trump administration created uncertainties and disruptions in bilateral trade relations between the two largest economies in the world. Tariffs imposed on Chinese goods affected various sectors, leading to decreased export volumes and increased production costs for some companies.

Furthermore, the unexpected Black Swan incident caused by the COVID-19 pandemic had severe consequences on China's industrial transfer and upgrading plans. Lockdown measures implemented globally disrupted supply chains, causing delays in production schedules and affecting both domestic consumption and international trade activities.

In light of these obstacles, it is crucial for China to construct a more resilient industrial development pattern that can withstand external shocks. One approach is to understand the unique characteristics and differences between different regions within China itself. Each region possesses distinct advantages such as natural resources or skilled labor forces that can be leveraged upon for targeted industrial development strategies.

Additionally, optimizing local industrial chain structures is essential to enhance efficiency and competitiveness. By identifying key areas where improvements can be made – whether it be through technological advancements or streamlining processes – local industries can become more productive while reducing costs.

Moreover, strengthening supply chain structures is equally important as it ensures a steady flow of raw materials and components necessary for manufacturing processes. Diversifying suppliers' sources geographically could mitigate risks associated with overreliance on any single country or region.

Lastly but importantly, making a determined effort towards supply-side reform will help address structural imbalances within industries themselves. This involves eliminating excess capacity while promoting innovation-driven growth models that prioritize quality over quantity.

In conclusion, despite facing challenges from both geopolitical tensions like the Sino-US trade war initiated by Trump administration as well as unforeseen events like COVID-19 pandemic's impact on global economies; constructing an adaptive industrial development pattern based on regional strengths along with optimizing local industrial chain structure will enable China to navigate through uncertain times successfully while ensuring sustainable economic growth in line with its long-term goals.

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Author Contributions

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Availability of Data and Materials

This research is solely based on references.

Conflicts of Interest

The authors declare that they have no conflicts of interest to report regarding the present study.

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