

Systematic Exploration of the Green Transformation Path of Liaoning's Industrial Structure Driven by Cross-Border E-Commerce

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Abstract. Driven by globalization and digitalization, cross-border e-commerce has become an important force to promote the optimization and upgrading of economic structure. Taking Liaoning as an example, this paper explores how to promote the transformation of industrial structure to a green and sustainable direction through the development of cross-border e-commerce. This paper analyzes the current situation of Liaoning's industrial structure, points out the existing problems and challenges, and puts forward a green transformation strategy based on cross-border e-commerce.

Keywords: Cross-border e-commerce, liaoning, industrial structure, green transition.

1. Introduction

In the current context of globalization and digitalization, cross-border e-commerce, as an emerging form of trade, is gradually becoming a key force driving the optimization of local economic structure and green transformation. Liaoning Province, as an old industrial base in Northeast China, is faced with structural challenges such as low resource utilization efficiency, serious environmental pollution and single industrial structure, and urgently needs to explore green transformation paths to achieve sustainable economic and environmental development. The purpose of this paper is to explore how cross-border e-commerce can promote the transformation of the industrial structure of Liaoning Province to a green, low-carbon and circular economic system, construct a systematic research framework, and put forward practical practical strategies.

2. Theoretical Basis and Framework Construction

2.1. The intrinsic Link Between Cross-Border E-Commerce and Green Transformation

(1) Information transparency and market expansion: Through big data analysis, cross-border e-commerce platforms provide global market information for green products and services, promote the international circulation and recognition of green products, and broaden the market boundaries of green industries.

(2) Supply chain optimization and efficiency improvement: Cross-border e-commerce reduces resource consumption and environmental impact in the logistics process by optimizing supply chain management, improves the overall efficiency of the supply chain, and provides technical support for green transformation.

(3) Technological innovation and international exchanges: Cross-border e-commerce platforms promote international exchanges and cooperation in green technologies, accelerate the R&D and application of green technologies, and provide innovative impetus for green transformation.

2.2. Green Transition Theory

(1) Circular economy theory: Circular economy emphasizes the efficient use and recycling of resources, and cross-border e-commerce can promote the circular circulation of green products and promote the transformation of industrial structure to a circular economy model.

(2) Green technology innovation theory: Green technology innovation is the key to achieving green transformation, and cross-border e-commerce platforms accelerate the innovation and diffusion of green technologies through international exchanges and cooperation.

(3) Sustainable development theory: Green transformation driven by cross-border e-commerce is the path to achieve harmonious development of economy, society and environment, which is in line with the goal of sustainable development.

3. Opportunities and Challenges Faced by the Industrial Structure of Liaoning Province

Liaoning Province, as an important part of the old industrial base in Northeast China, has distinctive heavy industry characteristics in its industrial structure. Since the founding of the People's Republic of China, Liaoning Province has rapidly developed into an important heavy industry base for steel, coal, machinery, and petrochemical industries in China by virtue of its rich mineral resources and geographical advantages. However, with the adjustment of the global economic structure and the increase of environmental pressure, the industrial structure of Liaoning Province is facing an urgent need for transformation and upgrading.

3.1. Opportunities

(1) In-depth support of national policies: The strategy of revitalizing the old industrial base in Northeast China at the national level has provided unprecedented policy support for Liaoning Province, including financial subsidies, tax incentives, financial support and project approval, etc., and these policy dividends have provided a solid guarantee for the adjustment and upgrading of the industrial structure of Liaoning Province.

(2) High-end transformation of traditional industries: In the face of global industrial transformation, traditional industries in Liaoning Province, such as steel, petrochemical and equipment manufacturing, are accelerating the transformation to high-end, intelligent and green, which is not only in line with the global industrial development trend, but also provides a historical opportunity for the optimization of Liaoning's industrial structure.

(3) The rapid development of emerging industries: The vigorous development of emerging industries such as new energy, new materials, information technology, and biomedicine in Liaoning Province has not only become a new driving force for economic growth, but also enhanced the strategic position of Liaoning Province in the global industrial chain, laying the foundation for the diversification and modernization of the economic structure.

(4) Deepening of regional cooperation and opening up: As the geographical center of Northeast Asia, Liaoning Province has increasingly close economic ties with neighboring countries such as Russia, North Korea and Korea, and as a key node of the "Belt and Road" initiative, its potential for foreign trade and economic cooperation has been further tapped, providing a broad space for the diversification and internationalization of industrial structure.

(5) Implementation of innovation-driven development strategy: Liaoning Province has built a solid platform for innovation-driven development by relying on high-tech industrial development zones such as Dalian and Shenyang, as well as many scientific research institutions and colleges and universities, and scientific and technological innovation is becoming the core driving force for promoting industrial structure upgrading and high-quality economic development.

3.2. Challenges

(1) The complexity and arduousness of the transformation of traditional industries: Although national policies and market demand have promoted the transformation of traditional industries in Liaoning Province, the problems of overcapacity, environmental pollution and resource depletion faced by coal, steel and other industries still need systematic solutions, and the road to transformation is full of challenges.

(2) Uncertainty in the cultivation of emerging industries: Although the emerging industries in Liaoning Province have shown a strong growth trend, there are still uncertainties in technological innovation, market development, talent attraction, etc., and how to accelerate the cultivation and growth of emerging industries to ensure their sustainable and healthy development is an important topic at present.

(3) Limitations of single economic structure and anti-risk ability: Liaoning Province's economy has long been overly dependent on heavy industry, resulting in a single economic structure and weak anti-risk ability, and its economic stability and sustainability are tested in the face of global economic fluctuations.

(4) Lack of Brain Drain and Innovation Vitality: The lack of economic transformation and employment opportunities has led to the severe challenge of the loss of talents, especially high-skilled and young talents, which poses a major constraint to the upgrading of industrial structure and the improvement of innovation vitality.

(5) The dual pressure of resource and environmental constraints: As a resource-based economy, Liaoning Province seeks a balance between resource depletion and environmental protection, and faces the dual challenges of resource utilization efficiency and environmental protection, and it has become an urgent need to achieve green and sustainable development.

The transformation of the industrial structure in Liaoning Province is a complex and long-term process, which requires the joint efforts of the government, enterprises and all sectors of society to gradually realize the optimization and upgrading of the industrial structure through policy guidance, market mechanism and scientific and technological innovation, so as to lay a solid foundation for the sustainable development of Liaoning Province.

4. Analysis of the Mechanism of Cross-Border E-Commerce Driving Green Transformation

The mechanism of cross-border e-commerce to drive green transformation is a complex and multi-dimensional process, which involves multiple aspects such as technological innovation, market demand, and policy guidance. Here's an in-depth look at this mechanism:

4.1. Technological Innovation Leads the Green Transformation

Digital and intelligent technology: Cross-border e-commerce is supported by the Internet platform and uses advanced technologies such as big data, cloud computing, and artificial intelligence to realize the online, digitization and intelligence of trade activities. These technologies not only improve the efficiency of trade, but also promote the intelligent transformation of the production process, reducing resource consumption and environmental pollution.

Green logistics technology: With the rapid development of cross-border e-commerce, the logistics industry is also constantly exploring the path of green transformation. The application of technologies such as new energy logistics vehicles, intelligent dispatching systems, and green packaging materials has effectively reduced carbon emissions and waste generation in the process of logistics and transportation, and promoted the sustainable development of the logistics industry.

4.2. Market Demand Drives Green Transformation

Consumers' green preference: With the increasing awareness of environmental protection, more and more consumers tend to choose green and environmentally friendly products and services. Cross-border e-commerce platforms have met consumers' demand for green products and promoted the formation and development of the green consumer market by providing green product information and carrying out green marketing activities.

Green standards in the international market: Many countries and regions have set strict environmental protection standards and green barriers for imported products. In order to enter these markets, cross-border e-commerce enterprises must comply with relevant standards and strengthen

the research and development and certification of product environmental performance, thus promoting the green transformation of enterprises.

4.3. Policy Guidance to Promote Green Transformation

Government policy support: Governments around the world have introduced a series of policies and measures to support the development of cross-border e-commerce and green industries. These policies include tax incentives, capital subsidies, technological innovation support, etc., which provide a strong guarantee for the green transformation of cross-border e-commerce enterprises.

International cooperation and exchanges: In the context of globalization, governments and international organizations have strengthened cooperation and exchanges in the fields of cross-border e-commerce and green transformation. Through the sharing of experience, the development of common standards, and the promotion of technological innovation, the establishment and improvement of the global green trading system have been promoted.

5. Design of Green Transformation Path in Liaoning Province

Facing complex and ever-changing challenges, if Liaoning Province wants to achieve a smooth transformation of its industrial structure, it must take decisive and powerful measures, addressing both the symptoms and the root causes, and focusing on both the present and the long term. Now, the following targeted transformation path suggestions are put forward:

5.1. Accelerate the Green Transformation of Traditional Industries and Promote the Cluster Development of Emerging Industries

Strategy: On the one hand, existing industrial enterprises should be encouraged and supported to adopt advanced energy-saving and environmental protection technologies and equipment to reduce energy consumption and pollutant emissions per unit of output value. On the other hand, focus on strategic emerging industries such as integrated circuits, biomedicine, new materials, and new energy vehicles. Through a combination of fiscal and tax incentives, land support, and financial services, attract high-quality enterprises and major projects to take root and form industrial clusters with complete upstream and downstream supporting facilities.

Expected effect: This measure can not only reduce the pressure on the environment but also drive employment and consumption and promote the economic structure to move in a diversified direction.

5.2. Strengthen the Driving Force of Scientific and Technological Innovation and Enhance the Supply Capacity of Independent and Controllable Technologies

Strategy: Increase investment in scientific research, especially in basic research and applied technology research and development. Build a number of national or provincial-level key laboratories, engineering research centers and other innovation platforms to attract top scientists and engineers to join. Establish and improve the evaluation, trading, and transformation mechanism of scientific and technological achievements to shorten the distance from the laboratory to the market.

Expected effect: By gathering innovation resources and breaking through key core technologies, not only can domestic gaps be filled, but also a batch of products and services with independent intellectual property rights can be generated, enhancing the resilience of the industrial chain and seizing the future competitive high ground.

5.3. Build a Talent Highland and Optimize the Allocation of Human Resources

Strategy: First, formulate more attractive talent introduction policies, such as housing subsidies, preferential treatment for children's schooling, and entrepreneurship funding, so that all kinds of professional talents are willing to come, stay, and be useful. Second, strengthen cooperation with well-known domestic and foreign universities and research institutes to jointly build talent training bases and customize the cultivation of urgently needed highly skilled talents. Third, improve the

lifelong education system and encourage on-the-job personnel to participate in continuing education to improve their own qualities and employment competitiveness.

Expected effect: Through multi-level and all-round talent team construction, the problem of mismatched supply and demand of talents can be fundamentally solved, injecting a steady stream of intellectual support for the high-quality economic development of Liaoning Province.

5.4. Deepen the Reform of the Fiscal and Tax System and Enhance Fiscal Sustainability

Strategy: First, straighten out the fiscal relationship between the central and local governments, appropriately increase general transfer payments, and ease the local revenue and expenditure gap. Second, implement budget performance management, actuarially calculate the benefit ratio of each fiscal expenditure, and avoid waste and redundant construction. Third, broaden the channels of financial resources, such as moderately raising the tax rates of resource tax, property tax, etc., increase non-tax revenue, and at the same time encourage private capital and social forces to participate in the construction of public utilities.

Expected effect: By optimizing the fiscal structure and improving the management level, the local fiscal tight situation can be effectively alleviated and stable financial guarantees can be provided for various people's livelihood projects and industrial upgrading projects.

5.5. Expand the Degree of Opening Up and Improve the Level of International Operation

Strategy: First, actively integrate into international economic cooperation frameworks such as the "Belt and Road Initiative" and RCEP, give play to the advantages of transportation nodes such as ports, railways, and aviation, and build an open channel network facing Northeast Asia and even the world. Second, encourage enterprises in the province to go global, participate in activities such as overseas resource development, capacity cooperation, and service outsourcing to obtain more international market shares. Third, learn from international prevailing rules, improve the soft investment environment, protect the legitimate rights and interests of foreign-funded enterprises, and attract more multinational companies to settle in Liaoning.

Expected effect: By deeply embedding in the world economic system, two markets and two resources can be fully utilized, enhancing the resilience and anti-risk ability of Liaoning's economy. At the same time, it is also conducive to absorbing foreign advanced concepts and technologies and promoting industrial upgrading to speed up and increase efficiency.

5.6. Implement Differentiated Development Strategies to Help Resource-Based Cities Be Reborn

Strategy: According to the resource endowments, industrial characteristics, and historical and cultural conditions of different cities, formulate personalized transformation paths respectively. For example, Fushun can develop circular economy and tourism and cultural industries, while Benxi can focus on the biomedical and health industries. At the same time, the central and local governments should give certain policy supports such as fiscal inclination, land replacement, and debt restructuring to help resource-based cities smoothly tide over difficulties and reshape their economic foundations.

Expected effect: Through classified policy implementation and targeted assistance, the comparative advantages of various places can be activated to the greatest extent, forming a good pattern of multiple complementarity and competing development, and avoiding the pain and turmoil caused by a "one-size-fits-all" transformation.

5.7. Deepen Institutional and Mechanism Reforms and Create A First-Class Business Environment

Strategy: First, continuously promote the reform of "decentralization, regulation, and service", simplify work processes, compress approval time, and reduce institutional transaction costs. Second, strengthen the construction of a law-based government, protect the rights and interests of all types of market entities equally according to law, and severely crack down on monopoly behaviors and unfair

competition. Third, improve the credit system, establish and improve the incentive and disciplinary mechanism for keeping promises and breaking promises, and establish the value orientation of honest operation.

Expected effect: By creating an open, transparent, fair, just, efficient and convenient market environment, the enthusiasm and creativity of micro-subjects can be greatly stimulated, attracting more domestic and foreign-funded enterprises to take root in Liaoning and sharing development dividends.

6. Conclusions and Future Prospects

Cross-border e-commerce has opened up a new path for the green transformation of Liaoning Province, which not only provides innovative ideas for solving the problem of upgrading the traditional industrial structure, but also provides the possibility to achieve a win-win situation of high-quality economic development and ecological environmental protection. Through in-depth research and practical exploration, Liaoning Province is expected to realize the strategic transformation from an "industrial town" to a "green economy strong province", and provide a demonstration and guidance for the green transformation of Northeast China and even the whole country. In the future, Liaoning Province should continue to deepen the integration of cross-border e-commerce and green transformation, strengthen policy guidance, promote technological innovation, optimize industrial structure, and enhance green competitiveness, in order to seize opportunities in the global economic and environmental changes and achieve the long-term goal of sustainable development.

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