

Analysis of the Current Status and Strategic Recommendations for Supply Chain Development in the Post-epidemic Era

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Abstract. At the beginning of 2020, the COVID-19 pandemic quickly swept the world, bringing a huge impact on the world economy, and all industries faced unprecedented challenges. As a key link connecting domestic production and consumption, China's supply chain has undergone profound changes in this pandemic. Based on the background of the post-epidemic era, this article analyzes the supply chain logistics in detail on the basis of explaining the current development status of China's supply chain and the new changes it faces, and discusses the current supply chain financial innovation and resilience building. In combination with China's actual situation and social development needs, this article focuses on countermeasures and suggestions for the changes and challenges in the post-epidemic era, in order to provide a reference for the sustainable and healthy development of China's supply chain. The study found that in the macro context of increasing uncertainty factors and increasing downward pressure on the economy, accelerating intelligent and digital transformation and promoting transportation structure reform are of great significance to alleviating development risks.

Keywords: Post-epidemic era; supply chain; logistics industry.

1. Introduction

As the epidemic progresses, the logistics industry has ushered in new opportunities in the post-epidemic era. The popularity of online shopping has promoted the rapid development of e-commerce logistics, and the application of cold chain logistics in fresh food e-commerce and other fields has also become increasingly widespread [1]. At the same time, through diversified business models, logistics companies are also constantly improving their hard power and enhancing their market competitiveness. Direct-operated logistics companies with strong hard power, such as Deppon, SF Express, and JD Logistics, have demonstrated strong market operation capabilities. Through various business models such as "supply chain + finance", digital operations, BC warehouse, and crowd sourcing [2], they continue to enrich their business forms and enhance the comprehensive strength of enterprises. This provides valuable experience and inspiration for the further development of the logistics industry. In addition, in the post-epidemic era, the logistics industry also needs to strengthen supply chain collaboration and service capabilities. Achieving close cooperation with upstream customers, building a full-industry supply chain, and increasing user reach will become the key to the future development of the logistics industry.

In 2020, due to the impact of the COVID-19 epidemic, domestic industrial production stagnated. According to data from the China Federation of Logistics and Purchasing [3], the total logistics volume during this period decreased by 11.8% year-on-year, and the logistics prosperity index dropped to 26.2. With the coordinated promotion of epidemic prevention and control and economic development, my country's macroeconomic and logistics operations have gradually returned to normal. By June, the total domestic social logistics volume had returned to the same level as the same period in 2019. From January to November 2020, China's total social logistics volume totaled 266.2 trillion yuan, a year-on-year increase of 3.0%. Logistics demand continued to recover, market vitality was further enhanced, and business revenue growth accelerated. Overall, the domestic logistics industry was generally stable and improving.

From the data from 2020 to 2022 [4], the volatility of the growth rate of total social logistics volume has increased significantly, with an annual growth rate of 3-9%. There is a high correlation between the total social logistics volume and GDP changes, and the growth rate continues to lead the GDP level in the same period. The continued and stable growth of logistics demand is an important basis for promoting the connection between supply and demand of the national economic industrial chain and the circulation of physical goods. At the 7th Annual Conference of the Freight Logistics Industry, He Liming, President of the China Federation of Logistics and Purchasing, said that the average annual prosperity index of China's logistics industry in 2023 was 51.8%, 3.2 percentage points higher than in 2022. China's logistics market has achieved recovery and growth. Specifically, the express delivery business volume reached 132 billion pieces, ranking first in the world for ten consecutive years. The railway completed the shipment of 3.91 billion tons of goods, setting a new historical high. The civil aviation cargo and mail transportation volume was 7.35 million tons, basically restored to the 2019 level.

As China's economic development enters a new normal, the logistics industry, as an important service industry, will face a shift from pursuing scale and speed growth to pursuing quality and efficiency improvement. The requirements of optimizing the stock and promoting the quality and efficiency of the industry have made informatization, intelligentization, platformization, integration, and automation an inevitable trend in the development of the modern logistics industry. This study systematically reviews relevant literature to construct a theoretical framework and research hypotheses, analyzes the new challenges facing China's supply chain in the post-epidemic era, identifies and evaluates China's supply chain innovation practices, explores the potential impact of these innovations on cost reduction and efficiency improvement in the logistics industry in the supply chain, and puts forward policy recommendations to promote the research goal of sustainable development of China's supply chain.

2. Analysis

2.1. Policy

In the post-epidemic era, the Chinese government has introduced a series of policies and plans to promote the recovery and long-term development of the transportation industry. For example, the "14th Five-Year Plan" for the development of a modern comprehensive transportation system issued by the State Council has added a new key task to "focus on the deep-seated contradictions that restrict high-quality development and strengthen the construction of modern governance capabilities". The guarantee measures have shifted from the construction of organizations, technology, talents, and other aspects to the emphasis on system, the institutional mechanism construction. On the one hand, under the impact of the epidemic, long-standing deficiencies in China's transportation industry have gradually emerged, such as low market concentration, high transportation costs, and weak systematic and comprehensive logistics. On the other hand, affected by the epidemic, the Chinese government has deepened its understanding of the high-quality development of the logistics industry, focusing on the construction of system capabilities to solve the contradictions that restrict development, and has made key adjustments.

2.2. Market

The epidemic has accelerated the industry clearance and integration of the domestic logistics industry, and has profoundly changed people's travel and logistics needs. According to data from the National Bureau of Statistics [5], online consumption growth data has reached a new high. In 2023, China's online retail sales will reach 15.43 trillion yuan, a year-on-year increase of 11%. In the first half of 2024, China's online retail sales reached 7099.1 billion yuan, a year-on-year increase of 9.8%. The epidemic has promoted the development of various logistics sub-sectors such as cold chain logistics, pharmaceutical logistics, fresh logistics, rural logistics, community terminal distribution, and waste logistics. At the same time, it has also promoted the popularization of new models such as

"unmanned delivery". The logistics industry needs to adapt to these changes and innovate service models. For example, develop full-chain, intelligent, one-stop travel service technology, build a logistics inter modal transportation system, accelerate the research and, development and application of smart logistics technology equipment, and build a multi modal transport network.

2.3. Technological

Technological innovation is a key factor in promoting the development of the transportation industry. China's transportation industry has improved transportation efficiency and service quality through technological innovation, such as the application of technologies such as big data, artificial intelligence, and the Internet of Things. The recent mainstream development of China's logistics industry is the accelerated implementation of intelligent technologies such as AI and digital twins, which has promoted a new round of cost reduction and efficiency improvement exploration and model innovation in the supply chain logistics industry. Low-code and application Platform as a Service technology enable technology service providers to improve customer service and precipitate general capabilities in a platform model. The application of these technologies not only improves the intelligence level of the transportation industry but also provides new solutions to cope with the challenges brought by the epidemic.

2.4. Environmental

The outbreak of the epidemic has made countries realize the importance of environmentally friendly policies such as sustainable development. In the future development of China's transportation industry, it should emphasize the concept of green development and promote low-carbon development, such as increasing the proportion of railway freight volume, optimizing the structure of freight transportation, and promoting clean energy vehicles. JD.com, SF Express, and other leading players in the domestic logistics industry have incorporated ESG evaluation standards into their corporate development plans, and are promoting the ESG system to become part of the industry standard, improving the sustainability of the development of the logistics industry and reducing the impact on the environment, to achieve progress in the industry in terms of environment, society, and governance.

3. Specific

3.1. Development of Air Logistics

In the post-epidemic era, the strategic value of China's air logistics industry has been highlighted, especially its importance in the global supply chain. With the continued growth of China's economy, the continuous expansion of domestic and foreign trade, and the growth of e-commerce, the air logistics industry will face more development opportunities and challenges in its development. Sun Wensheng, deputy director of the General Department of the Civil Aviation Administration of China, introduced at a regular press conference on January 8 this year that at the beginning of 2023, China's air logistics market will increase rapidly, with a total cargo and mail transportation volume of 7.354 million tons, a year-on-year increase of 21%, showing strong market vitality. The application of innovative technologies such as the Internet of Things, big data, cloud computing and artificial intelligence will help promote the transformation of the air logistics industry to more intelligent and automated operations, improve the efficiency of cargo handling and reduce transportation delays.

At the same time, industry management policies have also timely adapted to market changes and actively promoted the opening and competition of the air cargo market. Relevant departments have issued a series of action outlines and development plans to help expand the air logistics market, and the air logistics infrastructure system has been initially formed. The Civil Aviation Administration of China issued the "Guiding Opinions of the Civil Aviation Administration on Promoting the Development of the Aviation Logistics Industry" [6], stating that by 2025, several aviation logistics enterprises with strong international competitiveness will be formed, multi modal aviation transport

will operate smoothly, and a modern aviation logistics service system will be established basically. In addition, the Chinese government has emphasized the importance of aviation logistics in the "Belt and Road" initiative, and it is expected that more funds and resources will be invested in the construction and upgrading of aviation logistics infrastructure to enhance the service quality and efficiency of the industry. The opening of these policies has had a positive impact on the aviation logistics industry and promoted the rapid development of the industry.

3.2. Development of Marine Logistics

Marine logistics occupies a pivotal position in China's economy. According to the "2022 China Marine Economic Statistical Bulletin" [7], the annual added value reached 752.8 billion yuan, an increase of 6.0% over the previous year. With the adjustment and upgrading of the industrial structure, the marine transportation industry has maintained rapid growth. According to data from the Ministry of Natural Resources and the Ministry of Transport of China [8], the added value of the marine transportation industry in 2023 will be 762.3 billion yuan, an increase of 8.5% over the previous year, and the cargo throughput of coastal ports will be nearly 11 billion tons. As one of the most important modes of transportation for global trade, ocean transportation has a strategic position not only in the huge volume of cargo transportation, but also in its role in promoting national economic development. Especially during the epidemic, the ocean logistics industry has demonstrated its unique resilience and importance, providing strong support for the stability of the global supply chain.

In the post-epidemic era, the challenges faced by the ocean logistics industry mainly include global economic uncertainty, increasingly stringent environmental protection regulations, and the pressure of digital transformation. To meet these challenges, China's ocean industry has adopted a series of strategies. First, by improving the operating efficiency of ships and ports, reducing costs and improving competitiveness. Secondly, increase investment in the research and development of green energy and environmental protection technologies to meet the environmental protection requirements of the International Maritime Organization (IMO). In addition, strengthen cooperation with international partners to jointly respond to global challenges, such as strengthening cooperation with countries along the Belt and Road Initiative.

In terms of digital transformation, China's ocean logistics industry is actively exploring the application of new technologies to improve the industry's intelligence level. Yang Huaxiong, deputy director of the Water Transport Bureau of the Ministry of Transport, said that China has made significant progress in smart shipping, and the construction scale of automated container terminals has ranked among the top in the world. At the same time, the pace of digital and intelligent transformation of inland waterway operation monitoring, cascade lock joint dispatching, etc. has accelerated, and the block chain-based shipping service network has continued to expand. In terms of green development, China's marine logistics industry is committed to achieving sustainable development goals. This includes promoting the use of clean energy, such as liquefied natural gas (LNG), electric and hydrogen-fueled ships, and implementing ship energy efficiency management plans to reduce greenhouse gas emissions.

3.3. Development of other Modes of Transportation

In the post-epidemic era, China's road transport industry is facing major adjustments and transformations. According to the Statistical Bulletin on the Development of the Transportation Industry in 2023 [9], the annual commercial freight volume was 40.337 billion tons, an increase of 8.7% over the previous year, and the cargo turnover volume was 739.5 billion ton-kilometers, an increase of 6.9%. This shows that road transport still plays an outstanding role in the freight sector. To adapt to new market demands, the road transport industry is moving towards a more efficient, environmentally friendly and intelligent direction. For example, by optimizing route planning, increasing vehicle loading rates, and adopting new energy vehicles, costs can reduce, and efficiency can be improved. At the same time, with the booming development of e-commerce, the road transport

industry is also strengthening cooperation with express delivery and logistics companies to provide more flexible and personalized logistics services.

As an important part of China's logistics and transportation, railway transportation has also shown new development trends in the post-epidemic era. According to the National Railway Administration, on October 2, 2023, the Jakarta-Bandung High-speed Railway, the first high-speed railway in Indonesia and Southeast Asia, was officially put into use. This is the first time that China's high-speed railway has landed overseas with a full system, full elements, and full industrial chain. In China, railway transportation optimizes resource allocation and improves transportation efficiency by deepening cooperation with other modes of transportation. For example, the opening of the China-Laos Railway has not only changed the transportation pattern of Laos, but also promoted the production and export of goods, attracted many tourists to visit, and driven the Lao economy to a new level. In addition, railway transportation is also actively exploring inter modal services with other modes of transportation such as ports and roads. Improve overall logistics efficiency and reduce transportation costs through multi modal transport. Resource optimization of railway transportation is also reflected in the upgrading and transformation of freight infrastructure, such as improving the loading and unloading efficiency of railway freight stations and increasing railway dedicated lines to meet the growing demand for freight.

4. Discussion

First, strengthen the resilience of the supply chain. The robustness of the supply chain is highly related to the development of enterprises, and the survival of enterprises has a profound impact on the development of the supply chain. In the post-epidemic era, when unstable factors increase and economic downward pressure increases, it is very important to maintain the resilience of the enterprise supply chain. For supply chain resilience, most academics use the definition of “the supply chain’s ability to prepare in advance when facing potential emergencies, its ability to respond quickly when interruptions occur, and its ability to recover quickly after interruptions [10]. In terms of advance preparation, the supply chain structure can be strategically adjusted. For example, the supplier of core materials can be adjusted from a single supplier to multiple suppliers to reduce dependence on and risk of a single supplier. The supply chain can be shortened through “nearshore outsourcing” such as domestic supplier substitution, reducing dependence on international suppliers, especially suppliers from non-friendly countries. In terms of how to respond quickly, it is necessary to improve the risk warning system and establish a data-driven warning mechanism for major shock events. It is necessary to respond quickly in combination with the state of the shock and timely activate backup plans or redundant production capacity through rescheduling and optimization technology according to the plan to reduce the adverse effects caused by the shock event.

Second, vigorously develop innovation in supply chain finance. Supply chain finance, as a financial service based on the business relationship between various links in the supply chain, is of great significance for reducing the risk of supply chain disruptions and optimizing the working capital of buyers and suppliers. Affected by the epidemic, global economic uncertainty increased, and inflation has intensified. Since the beginning of 2021, the Federal Reserve has continued to raise the benchmark interest rate and cash flow has been tight. There is a differentiation between PPI and CPI and they continue to run at a low level. The price transmission of upstream and downstream enterprises in the supply chain is out of touch, and the stability of the supply chain has been frustrated. In the context of the post-epidemic era, how to develop supply chain finance is very important for the healthy development of the supply chain. In this regard, financial institutions should promote digital transformation, use technologies such as big data, the Internet of Things, block chain, and artificial intelligence to improve the intelligence level of supply chain financial services, achieve more accurate risk control and more efficient capital circulation, and use data sources such as Internet trading platforms to analyze the business situation of enterprises, improve customer acquisition efficiency,

and reduce financial risks. For the government, supervision should be strengthened to prevent illegal goods trading, over-reliance, and other behaviors.

First, the construction of smart ports and intelligent railway stations is the key to digital transformation. The widespread application of new technologies such as mobile Internet, big data, cloud computing, and the Internet of Things in the logistics field has promoted the continuous emergence of new models and new formats of "Internet +" efficient logistics.

Second, continue to promote the reform of transportation structure. The optimization of transportation structure can reduce supply chain costs. In 2023, China's total supply chain logistics costs will account for 14.4% of GDP, while the United States and Japan will account for 9.1% and 5.7% respectively. Compared with developed countries, there is still a lot of room for reduction. Hou Hanpo, Yuan Yuan and others attributed this phenomenon to four main factors: high institutional costs and labor cost growth. Based on this study, the lack of integration of logistics elements is also worthy of attention. For enterprises, it is very important to strengthen internal information exchange, strengthen internal management, and carry out structural cost reduction and efficiency improvement. At the same time, at the government level, it is necessary to play a leading role in the innovation and reform of transportation structure, actively explore new modes of transportation such as subway-freight co-line mode, high-speed rail logistics transportation, low-altitude logistics mode, etc.; accelerate the construction of multi modal transport such as rail-water transport, and provide "door-to-door" economic and efficient services; build a logistics port network and promote information coupling to promote supply-side structural reform.

5. Conclusion

In the post-epidemic era, the trend of various parts of the supply chain transforming from traditional modes to digital modes is becoming more and more obvious. Using new technologies to achieve correct intelligent transformation can not only reduce costs and increase efficiency, but also take this as an opportunity to promote transportation structure reform and accelerate supply-side structural reform. At the same time, China's supply chain logistics industry has undergone significant changes. The government has introduced policy support to strengthen the systematic and comprehensive nature of the transportation industry. Changes in market demand have promoted service model innovation, which is reflected in the growth of online consumption. Technological innovation, especially the application of big data and artificial intelligence, has improved transportation efficiency and service quality. Environmental friendliness and sustainability have become development priorities, promoting the development of green logistics. Specifically in terms of transportation modes, both air logistics and marine logistics have shown strategic value and growth potential, while facing digital transformation and environmental protection challenges. Road and rail transport are also transforming towards high efficiency, environmental protection, and intelligence to adapt to new market demands. Overall, China's supply chain logistics industry is moving towards intelligence, greening and globalization. This article mainly highlights the analysis of the supply chain and summarizes some transformation discussions and suggestions based on experience. For example, enterprises should accelerate digital transformation and intelligent construction, while the government continues to promote transportation structure reform, strengthen supervision, and maintain supply chain resilience. By analyzing the development of China's supply chain, this article hopes to provide more help to Chinese logistics and related enterprises facing opportunities and challenges. However, since this article only analyzes the macro status of China's supply chain, the series of countermeasures and suggestions obtained may not be applicable to the development of all enterprises and countries. In subsequent research, more micro-level data and information will be collected to supplement the conclusions of this article.

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