

Analysis of the Impact of Structuralized Industrial Upgrading and Industry Chain Resilience

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Abstract: This paper integrates several theoretical perspectives, such as economics, sociology, environmental science, organizational ecology, global value chain theory and complexity theory, to explore in depth the interrelationship between structured industrial upgrading and the resilience of the industrial chain. From the economic dimension, industrial upgrading not only promotes the development of the industry chain to a higher level, but also improves the resilience of the whole industry chain by reducing the dependence on limited resources through the introduction of new technologies and the enhancement of efficiency. The consideration of the social dimension emphasizes the importance of paying attention to social responsibility and social participation in the upgrading process, which helps establish a stronger social foundation and improves the resilience of the whole industrial chain. The environmental dimension perspective reveals the positive impact of the environmental friendliness of industrial chain upgrading on resilience, which enhances the overall stability of the industrial chain by reducing environmental shocks. Organizational ecology theory, on the other hand, highlights the roles and interactions at the organizational level, and factors such as organizational evolution, adaptation, and resource allocation have far-reaching impacts on the resilience of the industry chain. The global value chain theory provides a global perspective, emphasizing the importance of division of labor synergy and diversification in each link of the chain. Finally, complexity theory profoundly analyzes the complex mechanism of industry chain evolution from the perspectives of self-organizing behavior, path dependence, and nonlinear effects, enabling a better understanding of the dynamic evolution process of the industry chain. The synthesis of these theoretical perspectives provides a comprehensive understanding of the relationship between industrial structuralization and upgrading and industry chain resilience, and provides theoretical support for the development of more comprehensive and targeted policies and strategies in the future. In practice, an in-depth analysis of how various factors interact will help promote the sustainable development and adaptive upgrading of the industrial chain.

Keywords: Industrial structuralization and upgrading, Chain resilience, Theoretical perspectives.

1. Introduction

Industrial structuralization and upgrading refers to the process of positive changes and upgrading of industrial sectors in an economic system in terms of technology, organization and product structure in order to adapt to new economic and social requirements. Such upgrading is usually accompanied by the emergence of high-technology industries, changes in production methods and adjustments in market structures. There are various motives for industrial structuralization and upgrading. First, technological innovation. The emergence and application of new technologies promote the upgrading of production methods and product structures and improve the competitiveness of industries. Secondly, the influence of globalization. Changes in the international market and the trend of globalization push enterprises to adjust their industrial structure to better adapt to the international competitive environment. In addition, the features of industrial structuralization and upgrading include technological updating, production efficiency improvement, industry chain reintegration and changes in market structure. This process is usually accompanied by an upward movement of the industrial value chain, thus increasing the added value of the entire industrial system.

Industry chain resilience refers to the ability of an industry chain to quickly adjust, adapt and resume normal operation in the face of external shocks, uncertainties and changes. This resilience is manifested in the ability of the industrial chain to rapidly adjust production and supply processes and reduce systemic risks in the face of various pressures and challenges,

so as to ensure the stable operation of the industrial chain. The characteristics of industry chain resilience include flexibility, adaptability, rapid response and resilience. An industry chain with high resilience is able to adjust its production plan and supply chain layout in time to quickly adapt to market demand and changes, and at the same time, it can quickly resume normal operation after facing shocks. The resilience of the industry chain covers all aspects of the chain, including suppliers, manufacturers, distributors and retailers. A highly resilient industry chain requires the establishment of a synergistic mechanism in each link to jointly cope with external uncertainties and avoid the collapse of the whole industry chain due to the problems of one link. Key factors affecting chain resilience include the application of information technology, supply chain transparency, inventory management, the strength of partnership, diversified sources of supply, and effective crisis management strategies. Together, these factors determine the resilience and recovery capacity of an industrial chain in the face of external shocks (Zhou et al., 2017).

Industrial structuralization and upgrading and industry chain resilience are important themes that have received much attention in today's world economic research, as they involve key economic and managerial issues in the modern economic system and are crucial to the sustainable development and adaptability of enterprises, governments and society as a whole. First, industrial structuralization and upgrading refers to the transition from traditional industries to higher value-added and technology-intensive industries, which is usually accompanied by technological innovation, optimization of the

production process and adjustment of the market structure. Such upgrading is not only related to the competitiveness of enterprises, but also directly affects the overall economic competitiveness of countries and regions. With the deepening of globalization, the upgrading of industrial structure has become one of the core contents of national economic policies. Understanding the motives, impacts and mechanisms of industrial structuralization and upgrading helps governments and enterprises to better plan their strategies and promote sustainable economic growth. Second, industry chain resilience refers to the ability of the industry chain to maintain stable operation in the face of external shocks. With the continuous expansion and complexity of the global supply chain, industry chain resilience has increasingly become a key factor for enterprises and national economies. The occurrence of global crises, trade wars, natural disasters and other events can often quickly produce a chain reaction on the industrial chain. Therefore, understanding the influencing factors and mechanisms of industrial chain resilience is of great practical significance for enterprises to better manage risks and respond to crises, as well as for countries to formulate supply chain security policies. Industrial structuralization and upgrading are directly related to the economic competitiveness of a country or region. High-tech and innovative industries introduced in the process of upgrading can improve the productivity and added value of products of enterprises, thus enhancing the overall competitiveness. For a globalized economy, it is crucial to maintain competitiveness, so industrial structural upgrading has become a common goal pursued by governments and enterprises. Industrial chain resilience is one of the key factors for enterprises and countries to adapt to the globalized economic environment. The complexity of global supply chains makes enterprises more vulnerable to external shocks, such as trade frictions, geopolitical tensions and infectious disease outbreaks. Improving chain resilience can help reduce the impact of these risks on firms and the economic system and guarantee the continuity of production and services.

2. Theoretical Perspective Analysis

2.1. Institutional theory

Institutional theory provides an important theoretical framework for analyzing the influence mechanism of industrial structuring and upgrading and industry chain resilience. Institutional theory emphasizes the influence of institutions on economic and industrial development, including the interaction between government policies, regulations and organizations. Under this theoretical framework, the relationship between industrial structural change and resilient development is explored in depth. First, industrial structuralization and upgrading, as a systematic change, has a mechanism that is directly influenced by the governmental system, the regulatory system and the market system. The government's industrial policies and regulations play a guiding role in the direction and speed of industrial upgrading. For example, the introduction of innovation incentives and technical support policies by the government can promote enterprises to carry out R&D and technological innovation, thus promoting industrial structural upgrading. In addition, the change of market system in the process of industrial structuralization and upgrading is also an important factor, and the market's acceptance of new technology and new products, market competition mechanism, etc. will have

an impact on industrial structural upgrading. Secondly, institutional theory emphasizes the shaping of the resilience of the industrial chain by inter-organizational interactions. The resilience of the industrial chain depends on the degree of synergy and collaboration among organizations throughout the chain. Institutional arrangements and rules affect information sharing, risk sharing and resource synergy among enterprises. For example, the government promotes cooperation and co-construction of the industry chain at the regulatory level, which helps build a more resilient industry chain. In addition, institutionalized cooperation mechanisms and contractual relationships also play a positive role in the rapid adjustment and recovery of the industrial chain in times of crisis. In the impact of industrial structuralization and upgrading on the resilience of the industry chain, institutional arrangements can also affect the flow of factors in the industry chain. For example, the improvement of the intellectual property rights system will affect the incentives for technological innovation, which in turn will affect the dissemination and application of technology in the industry chain. Meanwhile, the institutional arrangement of the financial system is also related to the flow of capital in the industry chain, which has a direct impact on the financial support and risk management of enterprises. In addition, institutional theory draws attention to the impact of international institutions on the structuralization and upgrading of industries and the resilience of industrial chains. Under the trend of globalization, the rules of international trade and investment will directly affect the structure and resilience of the domestic industrial chain. For example, the adjustment of rules in the international trading system will affect the import and export links in the industrial chain, while international cooperation and norms also have far-reaching impacts on the resilience of global supply chains. Under the framework of institutional theory, it is necessary to study in depth the impact of institutional differences in different countries and regions on industrial structure and industry chain resilience. Through comparative analysis, the role of institutional change on industrial upgrading and resilient development can be better understood, and more targeted policy recommendations can be provided to government policymakers and enterprises. Overall, content analysis of the influence mechanism of industrial structuring and upgrading and industry chain resilience based on institutional theory can not only provide a deep understanding of the mechanism of the role of institutions in this process, but also provide specific and feasible suggestions for policy making and enterprise strategies to promote sustainable development and adaptability of industries (Amenta & Ramsey ,2020).

2.2. Innovation theory

Innovation theory provides profound insights for analyzing the relationship between structuralized industrial upgrading and chain resilience and its influence mechanism. Innovation is an important force driving industrial evolution, and its relationship with industry chain resilience plays a key role at several levels. First, innovation theory focuses on the driving role of technological innovation on industrial evolution. The structuralization and upgrading of industries are usually accompanied by the introduction of technology and driven by innovation. Technological innovations not only change products and services, but also lead to the reorganization of production methods and industrial chains. For example, the rapid development of digital technology, artificial intelligence

and biotechnology has promoted the upgrading of many traditional industries in the direction of high technology and high value-addedness. Secondly, innovation theory focuses on the innovation network and cooperative relationship in the industrial chain. Innovation is not only the behavior of a single enterprise, but also based on extensive industrial cooperation and knowledge sharing. The establishment of innovation network and strategic cooperative relationship in the industrial chain helps to promote the flow of information, cross-application of technology and improve the innovation ability of the whole industrial chain. This close synergistic relationship also provides stronger resilience for the industry chain in the face of external shocks. Then, the attention of innovation theory to market dynamics and consumer demand provides theoretical support for industrial structuralization and upgrading and industry chain resilience. With the constant change of consumer demand, the industrial chain needs to innovate continuously to adapt to the market. Through innovation, enterprises can adjust their products and services more flexibly to meet the increasingly diversified needs of consumers and enhance market competitiveness. Innovation theory also emphasizes the positive impact of an innovative culture and entrepreneurship within an organization on the resilience of the industrial chain. Enterprises with an innovative culture are more inclined to adapt to changes and quickly adjust their strategies and production processes, thereby increasing the resilience of the entire industrial chain. This internal innovation capability is the basis for the long-term stable operation of the industrial chain. In addition, the concept of "innovation ecosystem" in innovation theory also has an impact on the resilience of the industrial chain. The innovation ecosystem emphasizes the interdependence and mutual influence between different organizations and enterprises in the industry chain. A healthy innovation ecosystem helps to form common goals and visions, and promotes the whole chain to jointly cope with external challenges and improve resilience. Finally, innovation theory suggests that the impact of the policy and regulatory environment on innovation and industry chain resilience cannot be ignored. The government's support in innovation policies and regulations can encourage enterprises to carry out more active R&D and innovation activities, thus promoting the development of the whole industry chain in a more resilient direction. Overall, the content analysis based on innovation theory reveals the complex and close relationship between industrial structuralization and upgrading and industry chain resilience. Innovation, as the engine driving industrial development, influences the upgrading and resilient development of the whole industrial chain through multiple dimensions such as technology, cooperation and culture. An in-depth understanding of these influencing mechanisms can help provide more effective guidance to policymakers and enterprises to promote sustainable, innovation-driven industrial development (Greenacre et al., 2012).

2.3. Evolutionary economics

Evolutionary economics provides a unique perspective for analyzing the relationship between industrial structuralization and upgrading and industry chain resilience. Evolutionary economics emphasizes the dynamic evolutionary process of the economic system, focusing on the institutional, technological and organizational changes over time. Under this theoretical framework, it is possible to analyze in depth

the mechanism of industrial structural change and resilience development and better understand the evolutionary logic behind it. First of all, evolutionary economics focuses on the non-equilibrium nature of industrial structural evolution. Industrial structuralization and upgrading is not a one-time, linear process, but a non-equilibrium evolution at different points in time and in different environments. Evolutionary economics emphasizes that the development path of the industrial chain depends on past history and experience and is not only subject to current market demand. Therefore, the evolutionary direction of the industry chain's future resilience can be better predicted and understood through an in-depth understanding of the evolutionary path of the industrial structure in the past. Second, evolutionary economics emphasizes the importance of technological change to economic evolution. In the structuralization and upgrading of industries, technological innovation and change are the main forces driving the evolution. The introduction and application of new technologies, such as information technology and artificial intelligence, have far-reaching effects on the reorganization and optimization of industrial chains. Through the perspective of evolutionary economics, it is possible to study in depth how technological change affects the shape and resilience of the industrial chain. Then, evolutionary economics focuses on the evolution of organizations and institutions. In the industrial chain, the evolution of enterprise organization and institutional arrangement is crucial to the formation of resilience. As the industrial structure changes, firms may undergo organizational restructuring and adopt more flexible and adaptive organizational forms. In addition, the adjustment of institutional arrangements also affects the resilience of firms and the whole industrial chain. Through a deeper understanding of the evolutionary process of organizations and institutions, the mechanism of the formation of industry chain resilience can be revealed. Evolutionary economics also emphasizes the concepts of path dependence and historical dependence. Path dependence refers to the fact that past experiences and choices have a profound influence on current and future decisions. In the evolution of industry chain resilience, past upgrading and adjustment experiences play an important role in the formation of future resilience. Historical dependence, on the other hand, emphasizes the continuity of events and decisions in the economic system. By analyzing the historical trajectory, the evolutionary path of industry chain resilience formation can be better understood. Finally, evolutionary economics provides a cross-temporal perspective for analyzing the mechanism of industrial structuralization and upgrading and industry chain resilience. By examining the historical trajectory of evolution and possible future paths, the formation and development mechanism of industrial chain resilience can be understood more comprehensively and systematically. Overall, the content analysis based on evolutionary economics reveals the deep-seated relationship between the evolution of industrial structure and industry chain resilience. Understanding the perspective of evolutionary economics helps to better predict and guide the evolution of the industrial chain, provide more targeted guidance to policymakers and enterprises, and promote the sustainable development and adaptability of industries (Nelson et al., 2018).

2.4. Global value chain theory

The global value chain theory provides a unique

perspective for analyzing the relationship between structured industrial upgrading and industry chain resilience. The theory emphasizes the division of labor and cooperation in production and value creation on a global scale, as well as the interdependence of each link in the supply chain. Under this theoretical framework, the global evolution of the industrial chain can be analyzed in depth and its impact mechanism on resilience can be explored. First, global value chain theory focuses on the division of labor and synergy of each link in the industry chain. The structuralization and upgrading of industries may involve the technological upgrading of certain links in the supply chain, the improvement of production efficiency, or the development of new market opportunities. Through the perspective of global value chain, it is possible to better understand the roles and positions of different countries and regions in the industry chain, as well as their interdependence in the global context. Secondly, global value chain theory emphasizes how the international division of labor in the industry chain affects resilience. In a globalized economic system, different links of the industrial chain may be distributed in different countries, and the interdependence brought about by this division of labor is an important factor affecting resilience. The construction of global value chains makes the resilience of a country or region's industrial chain not only affected by its own internal links, but also by the international environment. This also means that factors and risks on a global scale need to be considered when considering resilience. Then, global value chain theory focuses on the transparency and flexibility of supply chains. With the continuous evolution of the industrial chain, transparent supply chain information and flexible supply chain layout are crucial for improving the resilience of the chain. Transparent supply chain information enables enterprises to respond more quickly to market changes and external shocks, while flexible supply chain layout reduces risks and increases resilience. In addition, global value chain theory provides a broader perspective, highlighting how market opportunities and challenges on a global scale affect chain resilience. For industrial structuralization and upgrading, being able to better grasp the demands and trends of the global market can help enterprises adjust their industrial structure more rapidly and improve the resilience of the whole industrial chain. Finally, the global value chain theory's focus on the international trading system enables an in-depth understanding of the impact of trade policies, trade wars and other factors on the resilience of the industry chain. The construction and operation of the global industrial chain is directly affected by trade policies, which may have a positive or negative impact on the resilience of the chain. The theoretical analysis of global value chains enables a better understanding of the industry chain evolution mechanism in the international environment. Overall, the theory of global value chains provides a multi-level and multi-dimensional framework that enables a more comprehensive understanding of the relationship between structuralized industrial upgrading and industry chain resilience. Through this theoretical perspective, the dynamic evolution of the industrial chain on a global scale can be better grasped, providing strong support for the formulation of more targeted policies and strategies to promote the sustainable development and adaptability of industries (Benito et al., 2019).

2.5. Complexity theory

Complexity theory provides a profound and systematic perspective for analyzing the relationship between industrial structuring and upgrading and industry chain resilience. The theory holds that the economic system is a complex self-organized network composed of a large number of interacting agents (individuals, enterprises, etc.), and its evolution process is influenced by the interplay of multiple factors. Under this theoretical framework, the nonlinear and dynamic evolution characteristics of the industrial chain can be studied in depth and the complex mechanism of its resilience formation can be revealed. First, complexity theory focuses on the self-organization phenomenon in the industrial chain. The evolution of the industrial chain is jointly driven by the interaction and self-organization behavior of a large number of agents. Industrial structuring and upgrading can be regarded as a dynamic interaction among agent individuals, and this self-organizing behavior may lead to the evolution of the overall structure of the system. Complexity theory emphasizes the role of such self-organized behavior in shaping the resilience of the industrial chain, as self-organized systems are more likely to adapt to changes and cope with external shocks. Second, complexity theory emphasizes the impact of "path dependence" and "sudden" events on the chain. Path dependence indicates that past experiences and choices have a profound impact on the current and future evolution of the chain. At the same time, sudden events, such as technological breakthroughs, market fluctuations, disasters, etc., can cause nonlinear and drastic changes in the system. Through complexity theory, it is possible to better understand the formation of paths in the process of industrial chain evolution and how sudden events shape the resilience of the industrial chain. Then, complexity theory focuses on the information transfer and learning mechanism in the industrial chain. In complex self-organized systems, information transfer and learning are very important factors. The agent individuals in the industrial chain can better adapt to changes and adjust strategies through interaction and learning. In the process of industrial structuralization and upgrading, the timely transmission of information and learning among enterprises can prompt the whole industrial chain to respond more flexibly to market demand and technological innovation. In addition, complexity theory highlights the influence of network structure on system behavior. In the industrial chain, various enterprises and organizations are connected with each other through complex network structure. According to complexity theory, the characteristics of the network structure, such as the connectivity of nodes and the resilience of the network, have a profound impact on the stability and adaptability of the whole system. By analyzing the network structure in the industry chain, the overall toughness of the industry chain can be better understood. Finally, complexity theory focuses on the "boundary" and "nonlinear" effects. The evolution of the industrial chain often involves the adjustment of the system boundary and the interaction between the internal and external environment of the industrial chain. At the same time, the nonlinear effect in the industrial chain means that small changes may cause drastic changes in the system. Through complexity theory, it is possible to better understand how these nonlinear effects play a role in the structural upgrading and resilient development of the industrial chain. Overall, the content analysis based on complexity theory provides a profound and comprehensive perspective, which helps to

reveal the complex mechanism between the structural upgrading of industries and the resilience of industrial chains. By understanding the self-organizing behavior, path dependence, information transfer, network structure and nonlinear effects of the industrial chain, it can better guide the development of the industrial chain and provide more profound theoretical support for promoting sustainable development and resilience (Manson, 2001).

2.6. Sustainable development theory

The theory of sustainable development provides a useful perspective for in-depth analysis of the relationship between industrial structuralization and upgrading and the resilience of the industrial chain, emphasizing the balanced development of the economy, society and the environment. Under this theoretical framework, the sustainable development of the industrial chain and the mechanism of how it affects resilience can be explored from the economic, social and environmental dimensions. First, from the economic dimension, sustainable development theory encourages industrial structure upgrading to pursue a balance between economic growth and resource utilization. Industrial upgrading needs to avoid over-reliance on limited resources, especially environmentally sensitive resources. The theory emphasizes the development of industries in a more sustainable direction through technological innovation, green production methods and the effective use of resources. This sustainable model of economic development contributes to the resilience of the industrial chain by reducing dependence on finite resources, mitigating environmental shocks and promoting the health of the ecosystem. Second, from the social dimension, sustainable development theory emphasizes social responsibility and inclusive development. In the process of industrial structure upgrading, it is important to pay attention to factors such as social justice, labor rights and interests, and social participation to ensure the universality of the upgrading process and social stability. Social participation and sharing will help the industrial chain establish a more solid social foundation and improve the risk-resistant capacity of society. By focusing on the sustainable development of society, the industrial chain can better adapt to the needs of a pluralistic society and enhance its resilience. Then, from the environmental dimension, the theory of sustainable development emphasizes that the industrial chain should reduce the negative impact on the environment in the process of upgrading. Environmentally friendly production and supply chain management, reduction of waste and emissions, and adoption of renewable energy are all key elements of sustainable development. By taking environmental sustainability into account in industrial upgrading, industrial chains can reduce environmental risks, improve the stability of ecosystems and enhance overall resilience. In addition, the theory of sustainable development proposes life-cycle thinking, which considers the impact of resources and the environment throughout the entire process, from product design, production, use to disposal. In the industrial chain, the implementation of life cycle thinking helps to reduce resource waste, lower the environmental burden, and improve the sustainability and resilience of the industrial chain. Under the theoretical framework of sustainable development, the resilience of the industrial chain can also be realized through the establishment of diversified partnerships. The theory of sustainable development encourages enterprises to cooperate with various stakeholders,

including governments, non-governmental organizations, communities, etc., to promote common sustainable development goals. Such diversified partnerships help the industry chain better cope with external shocks and improve overall resilience. Taken together, the sustainable development theory provides a comprehensive perspective that deeply analyzes the influence mechanism of industrial structure upgrading and industry chain resilience through the integration of economy, society and environment. While pursuing sustainable economic, social and environmental benefits, the industrial chain can better adapt to changes, mitigate risks and realize healthier, more resilient and sustainable development (Shi et al., 2019).

2.7. Organizational ecology

Organizational ecology theory provides a useful perspective for an in-depth study of the relationship between structuralized industrial upgrading and industry chain resilience. The theory focuses on the evolution and interaction of organizations in an ecological environment, providing a framework for understanding the evolutionary mechanism of industrial chains. Under this theoretical framework, it is possible to examine the change of the industrial chain from the organizational level and analyze its influence mechanism on the toughness. First, organizational ecology theory focuses on the evolution and adaptation of different organizations in the industrial chain. Structuralized industrial upgrading is usually accompanied by the introduction of new technologies, the emergence of new enterprises, and the elimination of old enterprises. Organizational ecology emphasizes that in this dynamic evolutionary process, inter-organizational competition, cooperation and adaptation are important factors in shaping the resilience of the industrial chain. Through in-depth study of the evolutionary paths and adaptive strategies of organizations, it is possible to better understand how the industrial chain maintains its resilience in the ever-changing environment. Second, organizational ecology theory focuses on the distribution of resources and opportunities. In the industrial chain, resource allocation and opportunity structure are crucial to the survival and development of organizations. Industrial structuring and upgrading often involves the reallocation of resources and redistribution of opportunities. Organizational ecology emphasizes that an organization's positioning in the ecosystem and the way it acquires resources and utilizes opportunities directly affects its adaptability to environmental changes. By analyzing the dynamics of resources and opportunities, it is possible to gain insight into how the resilience of the industrial chain is affected by the allocation of resources and opportunities. Third, organizational ecology theory emphasizes the importance of diversity and variety. In the industrial chain, diversity is not only reflected in products and services, but also in organizational forms and strategic choices. Diversity helps the industrial chain adapt to different market demands and cope with different external shocks, and improves the overall resilience. By analyzing the formation and evolution of diversity, it is possible to gain a deeper understanding of how the complementarities of diverse organizations contribute to the resilience of the industrial chain. In addition, organizational ecology theory focuses on key players and critical paths in the ecosystem. In the industrial chain, some organizations may play key roles, such as technology innovators, market leaders, etc., and their ability to change and adapt has an important impact on the resilience of the

whole industrial chain. By analyzing the changes and interactions of these key players, the evolutionary trajectory of the industrial chain and the formation of its resilience can be better understood. Finally, the theory of organizational ecology emphasizes the synergistic and competitive relationships in the ecosystem. In the industrial chain, the synergistic and competitive relationships between organizations have a profound impact on the stability and resilience of the whole system. Through in-depth analysis of synergistic and competitive relationships between organizations, it is possible to reveal how these relationships affect the robustness and sustainability of the industrial chain. Overall, the content analysis based on the theory of organizational ecology provides profound insights into the complex mechanisms between the structured upgrading of industries and the resilience of the industrial chain. By focusing on aspects such as organizational evolution, resource allocation, diversity, key players and synergistic competitive relationships, it is possible to understand the dynamic evolution process of the industrial chain in a more comprehensive way and provide theoretical support for promoting the resilient development of industries (Baum & Amburgey, 2017).

3. Conclusion

The relationship between industrial structuralization and upgrading and the resilience of the industrial chain constitutes a complex and profound picture, and multiple theoretical perspectives provide a way to comprehensively understand this relationship. This relationship not only covers economic development, but also permeates social, environmental, organizational interaction and other dimensions. In this dynamic evolutionary process, various theories provide insights that guide the understanding and promote the sustainable development and adaptive enhancement of the industrial chain. First, the consideration of the economic dimension provides insight into the positive impact of industrial structuralization and upgrading on the resilience of the industrial chain. The new technologies introduced, efficiency improved and market opportunities opened up in the upgrading process not only promote the industry chain to a higher level, but also reduce the dependence on limited resources and improve the resilience of the whole industry chain. The concept of sustainable economic development has become the engine that drives the robust development of the industry chain, and through the effective utilization of resources and balanced economic development, the industry chain is able to better adapt to external changes and shocks. Secondly, the consideration of social dimension emphasizes the importance of social responsibility and social participation in the process of upgrading the industry chain. Attention to social justice, labor rights and interests and other factors not only make the industrial chain more sustainable in the upgrading process, but also improve the overall resilience in the construction of social foundation. Social participation and sharing promote the establishment of a stronger social foundation for the industrial chain, enhance the risk-resistant ability of the society, and make the industrial chain better adapt to the needs of a diversified society. Under the perspective of the environmental dimension, the sustainable development theory provides a way to reveal the positive impact of the environmental friendliness of the industrial chain upgrade on the resilience. The introduction of environmentally friendly production and supply chain

management, the reduction of waste and emissions, and the adoption of renewable energy sources have all become key elements in improving the resilience of the industrial chain. By reducing environmental shocks, the industrial chain can enhance the stability of its ecosystem and improve overall resilience, making the chain more resilient in the face of changes in the external environment. Organizational ecology theory provides an in-depth analysis at the organizational level, revealing the roles and interactions of organizations in the evolution of the industrial chain. Factors such as organizational evolution, adaptation, resource allocation, diversity, key roles and synergistic competitive relationships directly affect the resilience of the industrial chain. The different evolutionary paths and adaptation strategies of organizations intertwine in a dynamic ecosystem, shaping the characteristics of the whole industrial chain. The existence of diversity helps the industrial chain to adapt to different market demands and external shocks, which improves the overall resilience. The theory of global value chain provides a global perspective, highlighting the importance of division of labor synergy and diversification in each link of the chain. The construction of the global value chain makes the resilience of a country or region's industry chain not only affected by its own internal links, but also directly affected by the international environment. This global interdependence increases the complexity of the industrial chain system and puts forward higher requirements for the resilience of the industrial chain. Finally, complexity theory profoundly analyzes the complex mechanism of industrial chain evolution from the perspectives of self-organizing behavior, path dependence, and nonlinear effects. This theory believes that the industrial chain is a nonlinear, dynamic system, and its self-organizing behavior and sensitivity to path dependence make the industrial chain more likely to adapt to changes and better cope with external shocks and environmental changes. The nonlinear effect of this complexity means that small changes may cause drastic changes in the system, thus improving the adaptability and resilience of the industry chain as a whole. Combining the above theoretical perspectives, it is deeply recognized that the interrelationship between industrial structuralization and upgrading and industry chain resilience is diversified and complex. This relationship is not only embodied in the economic level of development, but also covers multiple dimensions such as social, environmental and organizational interactions. Understanding the complex mechanism of this relationship helps us to promote the sustainable development and adaptive upgrading of industrial chains in a more comprehensive way. In future research and practice, we need to analyze in greater detail how various factors interact with each other in order to formulate more comprehensive and targeted policies and strategies to promote the sustainable development of the industrial chain and improve the resilience of the entire chain.

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