

How China's Soybean Industry Chain Restructures and Enhances its Tenacity against the Background of the Global Food Security Crisis

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Abstract

This study analyzes the connotations of industrial security theory and trade theory in the context of international food security, summarizing the resilience patterns of the soybean industry both domestically and internationally. By constructing the theoretical framework and analyzing trends, the topic addresses the challenges posed by the global food security crisis, providing a paradigm for China's soybean industry chain restructuring and resilience enhancement to maintain soybean industrial security.

Keywords

soybean, industry chain, new trade mode, resilience rebuild, industrial security

1. Introduction

Under the current situation of food security, the urgency of rebuilding resilience in China's soybean industry chain has become even more prominent. Systematic research can provide solutions for protecting national food and industrial security. The study aims to clarify which links in the industrial chain are the most vulnerable. This can help identify key priorities for restructuring and explore how to enhance industrial chain resilience to ensure security. By systematically analyzing the causes of weakness in each part of China's soybean industry chain, the study creatively builds an innovative theoretical framework for resilience enhancement. This framework connects factors to fill gaps in related research. The study aims to lay a solid theoretical foundation for addressing the global food security crisis and safeguarding the security of China's soybean industry. It also seeks to provide practical solutions. The research sorts out the advantages and disadvantages of each step in the industry chain and identifies specific features using the SWOT Analysis Method. At the same time, it analyzes market development trends, sorts out the industrial chain framework, provides action guidelines for industrial entities, and proposes Chinese solutions for global food security governance based on the above analysis.

2. Literature review

2.1 The current situation of international food supply in the background of traditional trade theory and industrial security theory

2.1.1 Theoretical analysis

Traditional trade theory research based on classical economics widely assumes that grain can circulate freely, relying on comparative advantage, and idealizes the market as a perfectly competitive one without economies of scale. This idealization of the scene can hardly suit the complex pattern of the current soybean market. From an industrial security theory view, existing researches mainly focus on the dimension of industrial control and regards the maximum trade that is implemented by various countries through leveraging their comparative advantages in grain trade as an ideal state. As the global landscape evolves, soybeans-which are seen as a key food crop and strategic commodity-can once be swept into a secure track when they are framed as an “existential threat”. When a country comes to a state that defines import dependence as a matter of survival, future changes in soybean-import patterns will become difficult to predict. These issues have led to a mismatch between the existing structure and capabilities of the soybean industry chain. Relied on the theoretical analysis, from the perspective of safety-oriented logic, soybeans’ security attribute makes it particularly vital to accelerate the process of reconstructing the domestic soybean industry chain and building its resilience.

2.1.2 Factors affecting global food supply

As the cornerstone of safeguarding national security and economic and social development, food safety is facing a worsening trend of global food trade protectionism, which leading numerous countries to introduce to introduce export restrictions on agricultural products. As of April 22,2024,16 countries have imposed 22 bans on grain exports, and another 8 countries have implemented 15 export restrictions. Take soybeans-one of the major cash crops-as an example, although in recent years China has expanded the planting areas to plant, soybean remains its main import in more than 80% due to poor sources. China, as the world’s biggest soybean importer, spends 30 billion US dollars on soybean imports annually. Even price fluctuations can cause high instability in the expectations of the downstream system of China's soybean industry. Supply comes from effective demand, with food prices fluctuating sharply amid the current global food crisis. Food prices have fluctuated significantly, pushing China to accelerate the integration of its food industry chain.

2.2 Vulnerability of China's Soybean Industry System

2.2.1 External Dependency

In terms of external shocks and external dependence, the main challenges include supply pressure, yield instability, the fragility of world market coordination, and the increase in international dependence. The supply pressure is mainly reflected in the increase in demand due to population growth and consumption upgrade. While yield instability is impacted by climate on agricultural production, vulnerability and dependence are even more exposed to external shocks (Xiao et al., 2025). Only by accelerating the optimization of the supply chain can a solid foundation be laid for the future of the industry. Existing studies have a gap in insufficient deconstruction of industrial fluctuations, which have not analyzed the internal mechanism of dependence and built up an industrial system that is resilient and safe.

2.2.2 Risks of disconnection and chain breakage within China’s soybean industry chain

China’s soybean supply chain has its own logical system. The supply resilience of the food industry chain has been regarded as an important measure to improve the risk protection, as the new perspective in risk governance of industrial and supply chains(Wang, 2025). Developing new productive power must be implemented in specific industries and their industrial chains (Hong and Wang, 2024). Following the directive to “deploy the industrial chain, foster strategic emerging industries that are high-tech, apply scientific and technological innovation to industrial development”, the priority is to build chain resilience and combine it with guidance in order to realize the improvement of risks of “Disconnection and Chain Breakage”.

2.3 Research gap

2.3.1 The significant impact of the multiple attributes of soybeans

From the industrial security theory, food safety is the product of the extension of traditional security issues to non-traditional security issues. Its ideal state is that every country can give full play to its comparative advantages in food trade in order to achieve the effective allocation of resources and maximize collective interests. However, food-especially strategic commodities like soybeans-possesses more than commercial value; its strategic significance also defines its security worth. Current research focuses on isolating a single attribute of grain, lacking attention to its multiple attributes, and it also has multiple identities as a key economic crop and a critical strategic stock. It is widely accepted that industrial security means offering food systems a more systemic way to respond to global shocks: it not only emphasizes “independent control”, but also focuses on “resilience building”, and ultimately achieves the goal of safeguarding security in an open environment and pursuing development in a secure context. Countries in competition base their self-sufficiency in food supply and rely on it to develop the industry in order to promote the global expansion of their grain industry to enhance their own food security. Integrating the development of the grain industry with food-security protection can not only enhance industrial competitiveness and protect the safety of the economy, but also build a systematic competitive advantage in the field of food trade, steadily improve the right to formulate rules and the right to lead agendas in the international grain trade system. In the transformation of the soybean industry, measures aimed at ensuring industrial security, production autonomy, and reducing excessive reliance on international markets have been widely recognized.

2.3.2 Research on the soybean sector under emerging trade models

Current soybean studies mainly rely on the traditional models, which lose sight of the development in emerging trade models. On the one hand, the absence of fusion with new business chains makes the chain inefficient; on the other hand, a single-chain perspective under RCEP risks forfeiting fresh growth opportunities. Scholars’ recognition of traditional supply-side factors has produced an overly narrow industrial viewing angle. The characters can be seen from digital trade, related industries, and the soybean sector. More attention should be put on foreground multi-field integration. By researching the current soybean landscape from several angles, this paper ensures the safety and stabilization of the ongoing restructuring of the chain. It innovates a trade model that combines the crop’s multiple attributes within a perspective of safety, addresses the risks and challenges confronting the chain, and advances a comprehensive reconstruction of the soybean industry.

3. Methodology

3.1 Research design

3.1.1 Industrial chain analysis

The supply chain of the grain industry is not a simple linear structure; instead, it has a complex internal structure that is made up of many difficult parts. It centered on end-customer demand, integrating resources across production, storage, processing, transport, and distribution to create an effective structure. Clarifying the supply chain structure and identifying vulnerable links are essential for defining the resilience reconstruction of the supply chain. In terms of component links: The production part, centered on the three major producing areas (Northeast China, the Huang-Huai-Hai region, and the Yangtze River Basin), is directly affected by factors, for example, natural conditions, planting technologies, and policy subsidies, serving as the “source foundation” for industrial chain resilience. The processing part presents a pattern of “large scale with scattered distribution.” Among these, soybean crushing enterprises are mainly concentrated in cities which has a coastal port, with a dependence on imported soybeans as high as over 85%, making it the main cog of the industrial chain resilience. The circulation part, as the “key link” for industrial chain resilience, covers links such as storage, transportation, and trade. National soybean reserve warehouses operate in coordination with socialized storage facilities, but the efficiency of cross-regional transportation is significantly impacted by transportation costs and infrastructure layout. The consumption part, the “guiding core” for the resilience reconstruction of the industrial chain, is dominated by soybeans for feed (accounting for approximately 60%), edible soybeans (about 25%), and industrial-use soybeans (around 15%). From the perspective of resilience

building, the main problems China's industrial chain adjustment has faced are as follows: 1. Insufficient supply resilience, which leads to high impact in the international market 2. Weak resilience links, with poor linkages between production, processing, and other links. 3. Lack of emergency resilience. There is limited ability to respond to sudden extremes such as severe weather.

3.1.2 Case analysis of Dabeinong company

Since 2018, Dabeinong Group has successively established subsidiaries in Argentina and Brazil, building an industrial chain from planting to sales. By successfully achieving vertical integration of “planting – processing – sales”, the company has markedly alleviated China’s reliance on imported soybeans, reduced transaction costs, and strengthened control over the entire value chain. Only when China holds the initiative in the industrial chain in its own can it pursue power in geopolitical relations. Nowadays, China is promoting the “Belt and Road” Initiative to break through the geographical constraints of traditional coastal trade, in order to build broader land-sea linkage channels and gain advantages in the trade market.

3.2 Data sources

National Bureau of Statistics of China, China Grain Yearbook, China Agricultural Yearbook.

3.3 Analytical methods

3.3.1 SWOT analysis method

The research analyzes the problems and directions on how to reconstruct the resilience of China’s soybean industry chain using the SWOT analysis method.

Based on Strengths (S), it is significant to focus on the internal support of the industry chain and develop block advantages to strengthen resilience and address shortcomings. Some regions play a role in the quality of domestic soybeans, the advantages of the transportation chain, and policy support (such as grain-growing subsidies and the National Soybean Revitalization Plan).

The Weaknesses (W) shift the lens to the industry chain. At the origin, the domestic soybean supply is insufficient, quality control is uneven, processing technology is behindhand, and the circulation end is overly dependent on hard conditions. Combine data analysis and industry reports to quantify the impact of weaknesses on the reconstruction of the industry chain resilience.

The Opportunities (O) talks that harness favorable external conditions to shape the structure of the industry chain, such as market demand, government support, and international cooperation. Analyze the role of these opportunities in compensating for supply chain shortcomings to maximize their advantages.

The Threats (T) attentively monitor external risks, including natural risks, trade risks, and substitution risks. Use existing strengths to offset the yield fluctuations caused by risks. Specifically, small and medium-sized processing enterprises should avoid homogeneous competition with large enterprises, and all-chain enterprises should share policy information and market channels.

Based on the SWOT findings, four strategic matrices-SO (Strengths-Opportunities), WO (Weaknesses-Opportunities), ST (Strengths-Threats), and WT (Weaknesses-Threats)-are constructed to provide great guidance for individual firms and to rebuild the resilience of China’s soybean industrial chain.

3.3.2 Trend analysis

Dynamic analysis tracks the soybean industry chain, conducts long-term monitoring and short-term analysis of key indicators, and converts the resilience dimension into a visual variable indicator. Summarizing and analyzing the data can determine the impact of domestic policy changes and reforms on fluctuations in the industry chain. In terms of data selection, indicators that can measure changes are chosen, including soybean supply resilience indicators (such as domestic self-sufficiency rate of soybeans, import dependence), soybean transportation resilience indicators (raw material inventory turnover rate, transportation efficiency), and soybean emergency resilience indicators (raw material supply guarantee rate, turnover rate, risk assessment system) (Ma and Kang, 2025). The final purpose is to cover dynamic changes from a full-chain perspective of the industry chain, measure and identify the long-term evolution trends, and identify fluctuation characteristics

of the indicators in real time in chronological order, and provide corresponding solutions to address the existing problems in the soybean industry chain.

4. Results

4.1 Measures and current situation of the reconstruction of China's soybean industry chain pattern

China has adopted a full-chain restructuring of the industry chain to respond to the challenges today. The specific measures include improving independent supply, diversifying the supply chain, and extending processing and value-added. Through industry chain analysis, this study finds that self-sufficiency ability, the leading factor in the entire industry chain layout, is the key direction of reconstruction and the foundation for solving problems. Through the "Soybean Revitalization" plan, China has expanded the domestic soybean planting area and effectively reduced the dependence on imported soybeans. In 2022, the No. 1 Central Document elevated the "soybean expansion plan" to a strategic level. In 2023, the soybean planting area reached 157 million mu, a year-on-year increase of 1.95%, the highest level since 1958. Promote the dual drive innovation and planning: enterprises are accelerating the commercialization of genetically modified soybeans. It is expected that the yield per mu of domestic genetically modified soybeans will increase by 40% by 2026, which will greatly reduce external dependence. At the same time, digital technology is used to improve agricultural production efficiency. This shows that China has made significant progress in this regard and achieved stable development.

Through SWOT analysis and industry chain trade analysis, supply chain diversification completes and connects the production chain, and it is a vital part in the reconstruction of industrial chain resilience. China has developed multiple import countries, which is based on the principle of vertical integration of the industry chain, and is committed to building a "multi-channel, multi-field" "stable main supply, multiple source supplements" import system. Compared historical data, before 2018, the United States dominated China's soybean import market, accounting for more than 50%. However, by 2023, the market pattern had a significant transformation, with Brazil rising to become the largest supplier, accounting for 65%, Argentina accounting for 15%, and the share of the United States dropping sharply to 18%. What's more, China has actively implemented a diversified import strategy, vigorously exploring the markets of emerging soybean source countries such as Russia and Canada. Take Russia, for example, in 2023, China's soybean imports from Russia increased by 40% year-on-year, with a total of 1.2 million tons, effectively dispersing geopolitical risks. These deeply reflect the changes in the global soybean system.

By analyzing the changing data in the downstream, this study has found that the extension of processing and value-added promotes the transformation of China's soybean industry pattern towards openness and diversity, effectively ensuring the irreplaceability of the production chain while reducing the industry's dependence on a single trade model.

By forming the trade loop of "importing raw grains - processing and value-added - exporting finished products", China successfully optimized the trade structure.

4.2 Integrating the multiple attributes of grain

Comparing under the new trade mode, this study finds that the location of soybean has no longer been a simple farm commodity, but also endowed with multiple attributes—"quasi-public good", "financial asset", and "strategic commodity" (Bian and Chen, 2020). In international trade, these three attributes interact, reinforcing and constraining one another.

Firstly, quasi-public good: The core attribute of soybeans lies in their role in ensuring people's livelihood and social public interests. It has irreplaceable significance. Soybean is the core source of the bulk of plant protein and cooking oil in China's diet—roughly 70 % of edible oil comes from soybean crushing, and soybean products provide about 15 % of daily plant-protein intake. The stability of its supply is directly related to meeting the basic dietary needs of the entire population. At the same time, soybean is the key part to connect multiple industrial chains. This industrial linkage means the sector requires public support to prevent market failure. This finding provides a basis for the government to support public infrastructure and offers logical

support for an institutionalized industrial chain, which can effectively avoid market failures, safeguard people's livelihoods and market stability, and promote the coordinated development of the industrial chain.

By analyzing bulk commodity trade, the financial feature of soybeans is used as a tool under the new trade mode. In cross-border supply chains, soybean is used in a financial scenario as a bulk commodity. Soybean trade has evolved into a composite commodity of “bulk commodity transactions + financial derivative operations” and has secured a position in the financial sector. By tapping into the financial attributes of soybeans, traders not only enrich the international trade models but also enhance the crop's resilience against financial-sector shocks. The strategic attribute of soybeans has been the promotion of composite cooperation by bilateral trade, technical barriers, and other means. By systematically analyzing soybeans' multiple attributes and functions, the structure of the industry chain can be more comprehensive.

4.3 China enhances industrial chain resilience to build a systemic competitive advantage in the grain trade field.

The key practices and breakthrough points for China to improve the resilience of the soybean industrial chain are: Production end: from “passive dependence” to “self-sufficiency” and “self-increment” to address the hidden dangers of supply security. This production is not only a hard breakthrough in area and output, but also a dual soft improvement in quality and efficiency. In 2023, China's soybean planting area reached 154 million mu. Compared with 2020, it has an increase of 23 million mu; the output hit a record high of 20.28 million tons, with the proportion of domestic supply increasing to 18%. This breakthrough is not simply about “encroaching on the area of other crops”, but rather through the “soybean-corn strip intercropping” technology. In 2023, the commercialization rate of high-quality soybeans in China exceeded the 90% mark. Compared with ordinary soybeans, processing companies offer a purchase premium of 0.2 to 0.3 yuan per jin for high-quality soybeans. This price advantage not only effectively boosted the enthusiasm of soybean farmers for cultivation but also opened up a differentiated raw material supply channel for downstream soybean product processing enterprises, breaking the predicament of homogeneous quality dominated by imported soybeans. What's more, the supply-chain side, which is shifting from “single dependence” to “diversified layout”, the measures of cultivating new supply ways along the Belt and Road and upgrading logistics resilience effectively raised China's systemic competitive advantage. Finally, the technology end: high-value breakthroughs in processing technology and the full-scale empowerment of digital technology have become the core for industrial take-off.

To sum up, internally, enhancing industrial competitiveness and safeguarding the stable development of key sectors to protect national economic security; externally, supported by forward-looking economic and diplomatic initiatives, it builds systematic competitive advantages in the field of grain trade, steadily increases China's power to set rules and shape agendas within the global grain-trading system to inject strategic momentum into safeguarding world food security and supply-chain stability.

4.4 The general funding of the international soybean industry pattern

The international soybean industry pattern has gradually become clear. This study finds that under the forms of globalization, differences in resource endowments and geopolitical games, as well as technological innovation and trade liberalization, a multi-level situation has emerged, providing a prerequisite for the reconstruction of China's soybean supply chain. It is easy to find that to achieve the stability of the industrial chain and supply chain, it is necessary to take control of the entire process from the production end to the sales end through resource endowments, policies, and technologies to achieve food security and industrial security. Each level's core pushing factor in the development of soybean industry pattern is accelerating the change, transforming the international soybean industry from “regional self-sufficiency” to “global division of labor”, and forming a transformation from internal improvement to external layout and policy coordination: first, consolidating the industrial chain foundation with self-sufficiency capacity and industrial competitiveness, and then expanding the development space of the industry through multi-level coordination and risk dispersion and prevention, finally consolidating resilience through policy coordination and rule construction to provide important prerequisites for the reconstruction of China's soybean industrial chain and its branches. The multi-level game and evolution not only bring challenges to the reconstruction of China's soybean industrial chain, but also opportunities. Only by fully leveraging the advantages brought by the pattern changes can the stability and upgrading of the industrial chain be achieved, laying a solid foundation for food development.

5. Discussion

5.1 Interpretation and Impact of the “Weaponization” Phenomenon in the Grain Sector

The weaponization of food can be traced back to the Cold War era, when food was deliberately used as a military strike tactic (Xiao and Zhang, 2025). With the development of time, the forms and means of grain “weaponization” have continued to change. Grain has increasingly been used as a financial tool, and the weaponization of the grain sector has had a profound negative impact on global food security. On the one hand, it exacerbates the imbalance between global grain supply and demand. Trade restrictions and export bans prevent grain from circulating freely in the global market. On the other hand, the significant fluctuations of food prices bring uncertainty to global food security, increasing the procurement costs for grain-importing countries, and making it even more difficult for low-income groups to obtain adequate food supplies. It is necessary to think more systematically about how China can reconstruct its industrial chain and enhance its resilience by deeply understanding the multifaceted nature of grain. Therefore, it is necessary to enhance resilience through reconstruction to mitigate existing risks.

5.2 Policy and theoretical significance of building resilience in China’s soybean industrial chain

To strengthen the resilience of the soybean industrial chain, China has introduced a series of policies and measures in multiple areas: In the production part, it has promoted the capacity expansion project for soybeans, increased investment in agricultural infrastructure, improved producer subsidy policies, and promoted advanced planting technologies and management experiences. In the processing part, it has implemented the action plan for upgrading agricultural product processing, encouraged enterprises to increase technological research and development, guided large enterprises to develop deep processing, and optimized the industrial layout. In trade, it has had an effect on stabilizing imports, exploring new soybean source markets, promoting the diversification of import sources, participating in the formulation of international market rules, and strengthening cooperation and coordination to address risks. Actively participating in the formulation of international soybean market rules and strengthening cooperation and coordination with other countries is an important move to maintain the stable and healthy development of the soybean industry in the current specific international food security environment. By focusing on these three core issues of the industrial chain and forming a theoretical framework, it is easy to address weaknesses, optimize strengths, prevent risks, and clarify the development goals of the industrial chain, further enhancing supply resilience and providing theoretical guidance for strategies and rules.

The policies for building resilience in China’s soybean industrial chain are underpinned by solid theoretical support. The theory of industrial security emphasizes that a country’s industrial security is an important component of its economic security (Zhu and Li, 2025). As one of the important agricultural industries in China, the stable and secure development of the soybean industry is closely related to the country’s food security and economic stability. By enhancing the resilience of the soybean industrial chain, the impact of international market fluctuations and changes in trade policies on China’s soybean industry can be effectively mitigated, ensuring the sustainable development of the industry and safeguarding the country’s industrial security. The theory of resource security proposes that ensuring the stable supply of resources is the foundation of a country’s economic development. As an important agricultural product resource, the supply security of soybeans directly affects China’s food security. By increasing domestic soybean production and stabilizing import channels, it is positive to ensure the stable supply of soybeans, meeting domestic market demands and safeguarding the country’s resource security. Based on these theories, the necessity and importance of building resilience in the soybean industry can be demonstrated.

5.3 Implications for the future international grain trade system and industrial security strategy

By analyzing the Chinese pattern and areas like Brazil, some differences are found. In terms of policy orientation, the Brazilian government mainly promotes the development of the soybean industry through early industrial planning, technological research support, and development support, and final trade liberalization policies to promote the development of the industry chain. By contrast, China’s policies are more

comprehensive, with complete safeguard measures, and have unique advantages in ensuring demand and maintaining security (Kuang and Xiang, 2025). Looking at the logical structure abstracted from reality, China's soybean industry has formed an interactive feature of coordinated development through the establishment of a safety bottom line and an open and interconnected thinking mode. Totally analyze and regulate, building a national food industry security strategy is a key move to address the challenge of food being “weaponized”. The future international situation will move towards a fairer and stable direction, improve rule-making, and provide a more stable foundation for development. of industrial structures in all countries, and continuously enhance the stability and sustainability of the trade system.

6. Conclusion

Through global food security analysis, empirical research on China's soybean industry chain, and theoretical framework, this study focuses on “reconstructing the resilience of the industry chain” and finds: Under the background of the escalating global food security crisis, the three core links of China's soybean industry chain - production, processing, and trade - exhibit have significant differentiated characteristics and different formation causes and specific manifestations of vulnerability. The production end focuses on the dual logic of policy support and technological breakthroughs to consolidate the foundation and drive transformation; the processing end promotes structural upgrading; and the trade end diversifies its layout and develops a policy-technology-market synergy mechanism through element interaction. This study reveals the core logic of resilience reconstruction in the soybean industry chain to respond to the security demands of the soybean industry under the current international situation, and creatively proposes a core system for resilience reconstruction. It systematically resolves the predicament of “link coordination” and “element interaction” in the reconstruction of the soybean industry chain's resilience, transforming from passive acceptance and being constrained by others to active control and shaping of each link, injecting Chinese momentum into the global food sector.

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