

Research on Manufacturing Supply Chain Restructuring Strategies under the Dual Circulation Pattern

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Abstract. Amid shifting global economic and political landscapes and lingering impacts of the pandemic, domestic and international manufacturing supply chains face a series of challenges, including rising tariffs, technological barriers, fluctuating costs, and inadequate information disclosure. Many cross-border transactions have been forced to close, while cash flow operations for some small and medium-sized supply chain enterprises have been constrained, even pushing them toward bankruptcy. To mitigate risks, China proposed the “dual circulation” development concept in May 2020, which will undoubtedly bring about a series of transformations. Whether and how to restructure supply chains has become a matter worthy of discussion. Through data surveys and case analyses, this paper reveals that current supply chains exhibit significant vulnerabilities. They demonstrate poor resilience against risks in terms of security, stability, flexibility, and efficiency, making them ill-equipped to withstand the current turbulence in the global economy. To address this issue, this paper will propose solutions based on a “why-what-how” logic. These solutions focus on enhancing supply chain resilience, technological innovation and practical application, upgrading domestic market demand, and aligning industrial policy direction, all aimed at achieving the goal of supply chain restructuring.

Keywords: Dual Circulation, Manufacturing, Supply Chain Restructuring, Industrial Chain Security.

1. Introduction

Over the past decade, heightened geopolitical tensions, frequent regional conflicts, and the ongoing repercussions of the pandemic have reshaped the global economic landscape. These developments have fueled regional instability and increased long-distance costs. As supply chains shift from 'efficiency-first' to 'security-first', globalization is no longer the top priority for entrepreneurs, challenging traditional models.

Against this backdrop, the Chinese government has proposed a new development paradigm centered on a domestic-driven cycle, with domestic and international cycles reinforcing each other—the “dual circulation” concept—leveraging its vast domestic market and commitment to high-quality development. Domestically, China must abandon its previous extensive development models because low-quality growth and growth driven solely by numerical indicators are unsustainable. Externally, China seeks cooperation with politically aligned nations, as seen with initiatives like the

Belt and Road Initiative and trade with the Association of Southeast Asian Nations (ASEAN). Data indicate that China's imports and exports with Belt and Road countries grew by 23.6%, exceeding the overall growth rate by 2.2 percentage points. Additionally, the volume of China-ASEAN trade has been steadily increasing, reaching US\$798.4 billion in the first ten months of 2022, a year-on-year increase of 13.8% [1].

However, this does not mean the outlook is entirely optimistic. As of August 2025, China's foreign trade continued to maintain a surplus, with the trade surplus reaching 70.6 billion yuan. This marks the eighth consecutive year of growth in this figure. Undeniably, the trade surplus has generated substantial wealth for China, alleviating economic pressures to some extent. Yet an excessively large surplus implies greater reliance on external demand and external market conditions. Consequently, political shifts can constrain both imports and exports, compelling China to reassess its trade structure—giving rise to the “dual circulation” strategy.

Under these circumstances, supply chains are undoubtedly the first to be impacted. Since traditional supply chain models are no longer viable, innovation and structural reorganization are essential. To achieve this, this paper will analyze the challenges facing supply chains from the dimensions of policy regulations, supply chain management, and technology utilization, and propose targeted solutions.

2. Literature review

China's academic community generally views the “dual circulation” strategy as a proactive response to external risks, emphasizing the unleashing of domestic consumption markets and the construction of a more resilient and controllable domestic industrial chain system driven by domestic demand [2,3]. A substantial body of literature concentrates on identifying and assessing risks to “industrial chain security,” particularly analyzing technological barriers in high-tech sectors (such as semiconductors and artificial intelligence) and critical foundational materials. Primary solutions revolve around technological innovation, self-reliance and self-strengthening, chain supplementation and reinforcement, and cultivating “chain-leading” enterprises, all aimed at achieving autonomous control over industrial chains [4, 5].

Overall, domestic research exhibits a strong policy orientation, emphasizing top-level design and macro-level pathway planning, providing rich theoretical support for understanding national strategic intent. However, empirical studies at the micro level on how enterprises specifically respond to and adapt to this restructuring process remain insufficient.

International research, while not directly employing the “dual circulation” terminology, closely monitors the core phenomena underlying it—China's shifting role in global value chains and geopolitically driven supply chain restructuring. Relevant studies are typically situated within an interdisciplinary framework combining global value chain theory, international business, and geopolitics. Scholars argue that the COVID-19 pandemic and the U.S.-China trade war served as key catalysts accelerating the evolution of global supply chains from a highly globalized, low-cost “efficiency-oriented” model toward a regionalized, diversified, and resilience-focused “security-oriented” model [6, 7]. International literature focuses on analyzing strategic adjustments by multinational corporations, such as the “China Plus One” strategy, nearshoring, and friendshoring, framing these as market-driven responses to political risks and supply chain resilience. While offering a more diverse perspective and stronger microfoundations, this approach sometimes overemphasizes geopolitical competition while relatively downplaying the role of China's internal market scale and industrial system transformations in shaping the restructuring process.

While these studies propose innovative concepts with rigorous logic from an academic standpoint, their reliance on digital simulation models often renders them overly conceptual and lacking in practical feasibility. Such forward-looking ideas may prove difficult for businesses and governments to implement. To enhance feasibility, this paper will develop a systematic supply chain restructuring framework grounded in empirical data, integrating insights from authoritative scholars' ideal models.

3. Global supply chain market analysis

3.1. Regionalization

Feature One: Regionalization Trends Are Becoming More Pronounced. According to the 2023 World Trade Organization (WTO) report, the proportion of intra-regional flows in global intermediate goods trade has steadily increased in recent years. Intra-regional trade now accounts for nearly 60% of trade in Asia and 40% in North America. This indicates that production networks are accelerating the shift from globalization to regionalization. This trend stems from two primary factors:

First, escalating geopolitical rivalry. U.S. Treasury Department data shows that, since the imposition of "secondary sanctions" on Russia in 2022, cases of noncompliance review involving third-country enterprises have surged by over 200%. This has compelled multinational corporations to relocate production capacity to regions such as Southeast Asia and Mexico. Statistics from Mexico's Foreign Investment Commission show that foreign direct investment in manufacturing grew by 34% year-over-year in the first quarter of 2023. The automotive and electronics sectors accounted for over 50% of the investment, which corroborates the trend of production capacity relocation.

Second, companies are reconsidering the drawbacks of globalization. In recent years, managers have sought out international manufacturing sources—whether company-owned or external suppliers—because of reduced costs, increased revenues, and improved reliability. Manufacturers typically establish foreign factories to take advantage of tariff and trade concessions, low-cost direct labor, capital subsidies, and reduced logistics costs in foreign markets [8].

However, amid the turbulence of the international landscape, the drawbacks of globalization are gradually coming to light. Research by the International Monetary Fund (IMF) indicates that the 2008 financial crisis led to a 35% increase in global supply chain disruption rates, while the COVID-19 pandemic pushed this metric to a historic peak of 75% in 2020. Whether it's Toyota grappling with chip shortages or Apple facing production constraints in China amid a “one-phone-hard-to-find” situation, these challenges have undoubtedly prompted companies to reassess the viability of long-distance, cross-border production. McKinsey's 2022 Global Supply Chain Survey revealed that over 78% of multinational corporations are restructuring their supply chain layouts, with 'nearshoring' and “friendshoring” emerging as preferred strategies. U.S. Commerce Department data reveals that North American regional procurement rose from 45% in 2019 to 58% in 2023. A European Commission report similarly indicates that intra-EU procurement within member states increased by 12 percentage points compared to pre-pandemic levels. These figures clearly demonstrate that nations are actively building regional supply chain systems to effectively reduce reliance on distant, high-cost supply chains, thereby comprehensively enhancing supply chain resilience and security.

3.2. Technological decoupling and trade retaliation

China's relatively recent involvement in developing complex products reveals significant disparities, particularly in manufacturing levels and the significant influence of foreign enterprises. These disparities are evident not only in the intricate network of complex product research and development, but also in the supply chain system, where non-core enterprises are subordinate. The lack of initiative and substantive decision-making roles for non-core enterprises in key technology research and development exacerbates this discrepancy [9]. The United States is leveraging this situation to repatriate manufacturing operations in key sectors, preventing technology leakage with the aim of imposing technological blockades on competitors.

For China, in high-end markets: strategic sectors such as semiconductors and industrial software are facing targeted blockades, with a clear trend toward technological decoupling. Adjustments to international rules and strengthened export controls have significantly increased the difficulty of acquiring critical technologies, while the scope of technological blockades extends to upstream areas like core equipment.

Meanwhile, research by Ivent and Fritz reveals that several nations have introduced targeted policies to reduce reliance on imports from a single country—typically China. These measures include redirecting investment through tariff/border barrier adjustments, offering local production subsidies, and implementing foreign direct investment policies such as foreign ownership restrictions or outright bans. For instance, in June 2020, Japan's Minister of Economy highlighted the country's over-dependence on China and emphasized the need to build more resilient and diversified supply chains by broadening sources and increasing domestic production [10].

3.3. Loss of market share in the low-to-mid-range segment

The situation in the mid-to-low-end market is equally grim. On June 23, 2016, Donald Trump was elected president of the United States. He ran on the slogan “Make America Great Again” and encouraged businesses to bring production back to the U.S. Shortly after his election, President Trump instigated a trade war with China by imposing tariffs on key commodities. These tariffs caused many companies to move production out of China — not to the U.S., as President Trump had hoped, but rather to nearby countries such as Vietnam, Malaysia, and Singapore [11].

On the other hand, countries like Vietnam and India are competing with China for foreign direct investment (FDI) by leveraging their labor advantages. According to the United Nations Conference on Trade and Development (UNCTAD)'s World Investment Report 2023, Vietnam's FDI inflows have grown steadily in recent years, reaching nearly \$18 billion in 2022. Simultaneously, during 2022-2023, India's government launched the Production-Linked Incentive (PLI) scheme to attract global manufacturers in key sectors—including electronics, automobiles, and pharmaceuticals—to shift their supply chains to India. Some nations view China as a competitor, adopting trade protectionist measures that restrict the development of China's supply chain system, hinder exports of China's competitive products, and disrupt the production and operations of global enterprises.

3.4. The proposal of the dual circulation concept

In 2020, there was widespread speculation in policy circles and the popular press that the pandemic experience would eventually lead to the "renationalization" of supply chains [12]. At two political meetings in April and May, General Secretary Xi Jinping respectively proposed and emphasized the dual circulation development concept. Ultimately, at the meeting of the Political Bureau of the CPC

Central Committee held on July 30, 2020, the strategy of “accelerating the formation of a new development paradigm featuring domestic circulation as the mainstay and domestic and international dual circulation reinforcing each other” was established as a major medium-to-long-term strategic deployment and incorporated into official documents. This marked its formal adoption as the core strategy guiding China's economic development.

4. Supply chain restructuring methods

4.1. Strengthen the resilience of local supply chains

The uncertainty in the international landscape makes safeguarding the security and stability of domestic supply chains critically important. According to the World Economic Forum's 2023 Global Risks Report, geo-economic fragmentation ranks among the most severe short-term risks globally, with over 75% of economists identifying the risk of global supply chain disruption. Supply chain resilience can be assessed in terms of four aspects: preparation for a disruptive event; response to an event; recovery from the event; and growth/competitive advantage after the event. SCRES strategies or capabilities should aim to maximise these aspects in a timely and cost-effective manner [13].

4.1.1. Enhancing resilience from the technical perspective

In the high-end chip sector, China's imports of integrated circuits reached a staggering 2.77 trillion yuan in 2022, with import dependency remaining persistently high. Against this backdrop, strengthening independent R&D and innovation in critical industries and core technologies to reduce excessive reliance on foreign technologies and products has become an imperative choice for enhancing supply chain resilience.

To this end, Phase III of the National Integrated Circuit Industry Investment Fund (the “Big Fund”) has been registered with a capital of RMB 344 billion, prioritizing breakthroughs in semiconductor equipment, materials, and core processes.

These assets can be deployed for R&D in several critical technological domains:

One is establishing blockchain infrastructure. Blockchain offers numerous advantages, including decentralization, immutability, and anonymity. Its applications span cryptocurrency, financial services, risk management, the Internet of Things (IoT), and public/social services, enabling secure information sharing [14]. Supply chain enterprises can develop IoT sensors and RFID tags to track goods' location and status.

Another is creating virtual supply chain models to simulate various emergency scenarios. Data from the China Federation of Logistics & Purchasing indicates that over 40% of large manufacturing enterprises have begun deploying digital supply chain risk management platforms. For example, Huawei established a global supply chain continuity management mechanism enabling rapid resource allocation and substitution during emergencies like natural disasters or geopolitical conflicts, ensuring uninterrupted business operations.

4.1.2. Build diversified strategies to strengthen risk-resilience

Building a diversification strategy is a key means of enhancing resilience, addressing various unexpected challenges by reducing dependence on a single node. Once a company adopts diversification, it cannot focus solely on its business unit strategy, that is, how to create sustainable competitive advantages in its chosen markets, but must engage in diversification-related activities when facing greater competitive pressure [15].

Frist is supplier diversification. Companies intentionally engage multiple suppliers to procure identical materials or services. The core objective is to reduce dependence on a single supplier or geographic region, thereby lowering supply disruption risks and strengthening procurement bargaining power.

According to Deloitte's 2023 Global Supply Chain Resilience Report, 72% of surveyed executives reported experiencing severe supply chain disruptions in the past year. These disruptions caused revenue declines for 45% of companies and significantly increased operating costs for 38%. While diversification may raise procurement costs by 5%-15% (McKinsey analysis), losses from a single major disruption can far exceed this. For instance, a large technology company lost over \$300 million in revenue due to a fire at a single supplier's factory.

The best way to prevent reliance on a single supplier is to source from multiple suppliers. Core enterprises can allocate orders proportionally among two or more suppliers, designating primary and secondary suppliers. The primary supplier handles approximately 50% of orders, while each secondary supplier handles around 20%. This approach avoids dependence on a single supplier, enables rapid switching if one supplier encounters issues, and introduces appropriate competition to drive suppliers to improve service and quality.

Second is diversification of production bases. Transportation costs represent a critical component of supply chain expenses, often escalating due to excessive distances between production sites and warehouses. To reduce these costs, managers typically favor establishing new production bases or warehouses rather than optimizing existing routes.

This approach offers two primary benefits: increased warehouse capacity or production output, and reduced supply chain risk. For example, after shifting production from Asia to Mexico (nearshoring), U.S. companies can utilize truck transport into the U.S., shortening the traditional 60-90 day sea freight + inventory cycle to just days. This dramatically enhances responsiveness and resilience.

And last is diversifying logistics routes. Companies pre-plan and certify multiple ports, shipping lanes, transport modes (sea, air, rail, road), and logistics providers for goods transportation. This ensures swift switching to backup routes when primary routes are disrupted by congestion, blockades, weather, or strikes, maintaining continuity and flexibility in logistics channels.

4.1.3. Building a flexible supply chain system

In recent years, supply chain flexibility has emerged as a hot topic of research among enterprises and academia both domestically and internationally. For instance, Srinivasan and Swink define supply chain flexibility for small and medium-sized enterprises as “the ability of supply chain managers to rapidly and effectively alter their internal organizational structures to adapt to changing market demands and supply conditions.” The development of supply chain flexibility stems from enterprises adopting a supply chain orientation, where businesses no longer operate in isolation but form networked alliances with other stakeholders. In uncertain environments, supply chain flexibility has become a driving force for enterprises to develop new competitive advantages. Such enterprises can better leverage factors like regulations, technology, and customer preferences to improve operational processes and innovate products [16].

Practical Approach: Enterprises can introduce advanced technologies and management models such as the Industrial Internet, smart manufacturing, and lean production to drive the intelligent transformation of production equipment. This enables rapid adjustments to production processes and product portfolios. For instance, Haier Group leverages the COSMOPlat industrial internet platform to achieve mass customization, reducing order response cycles by over 50%. In the apparel sector,

Sunway International employs flexible manufacturing systems to switch styles and initiate batch production within 72 hours based on market orders, substantially lowering inventory pressure while significantly enhancing supply chain responsiveness and customer satisfaction.

4.2. Cultivating high-quality local suppliers

This is a systematic undertaking that requires the coordinated efforts of both the “visible hand” and the “invisible hand.”

For governments, financial policy support can be provided: for instance, offering low-interest loans, tax incentives, and procurement preferences to local SMEs to encourage technological upgrades and equipment modernization. Second is market cultivation: fostering national-level advanced manufacturing clusters (such as Hefei's integrated circuits, Shenzhen's new display technologies, and Suzhou's biopharmaceuticals) to promote knowledge spillovers, specialized division of labor, and industrial chain collaboration through geographic concentration, thereby reducing suppliers' overall costs. Additionally, governments can establish public technical service platforms—such as pilot production bases and common technology R&D platforms—to lower innovation costs and technical barriers for small and medium-sized suppliers.

From a societal perspective, cultivating and attracting high-level talent is crucial for driving industrial innovation and sustainable development. According to National Bureau of Statistics data, China's full-time equivalent R&D personnel reached 6.356 million person-years in 2022, a 9.0% increase from the previous year, indicating continued expansion in talent scale. However, in high-end technology fields and advanced manufacturing segments, there remains a shortage of high-level, multidisciplinary talent. The self-cultivation system for talent in key core technology areas is still imperfect, and there exists a certain mismatch between the talent structure and the demands of industrial upgrading.

This necessitates the “invisible hand” of the market to attract interests. Large enterprises such as Huawei and BYD can open up their demand markets, using profits to attract investors' attention, thereby directing social resources and talent resources toward these high-demand areas.

4.3. Case study

As a pioneer in supply chain restructuring, CATL undoubtedly faces immense pressure and challenges. For instance: severe price volatility. The explosive growth of the new energy vehicle industry has triggered a surge in raw material demand, leading to periodic price spikes and crashes (such as the rollercoaster ride of lithium carbonate prices in recent years), severely eroding battery manufacturers' profits. Secondly, as a midstream manufacturer, key resources are controlled by upstream suppliers. Without command over critical resources, CATL's capacity expansion and order fulfillment become constrained by upstream mining companies, forcing it into a passive role in price acceptance.

Facing these challenges, CATL has transcended the role of a mere “purchaser” and proactively extended its reach to the very top of the supply chain, executing a strategic restructuring through “vertical integration.”

The first step involved domestic investments. CATL participated in the development of domestic resources like the Yichun lithium mine and Sichuan Snowflake Mine through joint ventures and equity stakes. China's vast population and abundant territory provide immense market potential and mineral resources. Even if political factors disrupt some multinational supply chains, domestic resources can provide a degree of foundational production capacity assurance. This strengthens

CATL's supply chain resilience, making it less susceptible to international instability. This approach aligns perfectly with the “internal circulation” development philosophy.

When confronting technical barriers and order issues stemming from a lack of cost awareness, CATL chose to participate directly in mining as a solution. Hands-on involvement provides clearer insight into actual cost structures, bolsters bargaining power with external suppliers, and deepens understanding of upstream resource markets. By engaging in mining and smelting operations, CATL can internalize profit margins traditionally captured by upstream mining companies, thereby boosting overall profitability.

Second is overseas resource deployment (external cycle): Unstable international economic conditions prompted CATL to shift some investments domestically, but this does not mean it abandoned overseas markets. To ensure security, CATL pursued global diversified investments: establishing an integrated project in Indonesia covering everything from laterite nickel mining to battery material production; investing in cobalt mining projects in the Democratic Republic of the Congo; and acquiring stakes in lithium mining enterprises across Australia, the Americas, and beyond. This has established a diversified resource supply network spanning Asia, Africa, and the Americas. These investments undoubtedly provide CATL with abundant supply sources, eliminating concerns over supply disruptions caused by political instability, policy changes, or natural disasters in any single region.

CATL's supply chain restructuring fundamentally shifts its role from a passive purchaser to an active resource manager, no longer reliant on any single node in traditional supply chains. Through vertical integration and global diversification, it internalizes the supply chain's “vulnerability points,” achieving a win-win outcome for security interests, economic benefits, and strategic advantages.

5. Conclusion

Even with successful corporate precedents, restructuring manufacturing supply chains remains a significant challenge for many enterprises. However, driven by mounting economic pressures and the policy orientation toward a dual-circulation strategy, supply chain restructuring has shifted from being “desirable” to becoming “inevitable”.

The challenges of restructuring are both tangible and multifaceted. Setting aside the possibility that such changes might expose corruption among influential officials, potentially stifling supply chain restructuring in its infancy, objectively speaking, it carries numerous unknown risks, including substantial upfront investments and complex corporate relationship restructuring. Currently, supply chain restructuring is primarily undertaken by large enterprises. Whether extending upstream to control resources like CATL or building flexible digital ecosystems like SHEIN, such efforts demand substantial capital, technological accumulation, and strategic boldness, all daunting for small and medium-sized enterprises. Moreover, under the “dual circulation” framework, achieving balanced allocation of resources between domestic and international markets demands extensive market research and strategic planning. Consequently, many companies remain in a wait-and-see mode regarding supply chain restructuring.

Unfortunately, supply chain restructuring is no longer an optional “best solution” choice but an imperative “mandatory question” for corporate survival and long-term development. Successful restructuring isn't merely about finding alternative suppliers or relocating production capacity. It requires profound reflection on one's position within the industrial chain and a systematic upgrade tailored to the company's specific circumstances. This includes, but isn't limited to: extending into both ends of the “smile curve” through technological innovation; enhancing end-to-end visibility

and agility via digital transformation; and forming synergistic innovation through ecosystem alliances.

References

- [1] Hu, J. (2023). Characteristics, Issues, and Optimization Pathways of China's State-Owned Capital Layout under the "Dual Circulation" Strategy. *Journal of Shenzhen University (Humanities and Social Sciences Edition)*, 40(1), 71-82.
- [2] Liu, H. (2020). The "dual circulation" development pattern. *Qiushi Journal*.
- [3] Huang, Q. (2021). The new development pattern: A grand strategy for China in a changing world. *China Economist*, 16(1), 2-19.
- [4] Jia, G. (2020). The "dual circulation" strategy: A new pattern of development for China. *Beijing Review*.
- [5] Sheng, B. (2022). The security of industrial and supply chains: Challenges and countermeasures. *Social Sciences in China*, 43(1), 5-23.
- [6] Gereffi, G. (2020). What does the COVID-19 pandemic teach us about global value chains? The case of medical supplies. *Journal of International Business Policy*, 3(3), 287-301.
- [7] Evenett, S.J. (2022). The West's new economic policy: How to respond? In *The 33rd Global Trade Alert Report*.
- [8] Meixell, M.J. and Gargeya, V.B. (2005) Global supply chain design: A literature review and critique. *Transportation Research Part E: Logistics and Transportation Review*, 41(6), 531-550.
- [9] Qi, N. and Zhang, A. (2024) Technological cooperation relationships among supply chain enterprises under the perspective of technological blockade: A tripartite evolutionary game model. *Journal of Cleaner Production*, 447, 141240.
- [10] Baldwin, R. and Freeman, R. (2022) Risks and global supply chains: What we know and what we need to know. *Annual Review of Economics*, 14(1), 153-180.
- [11] Bednarski, L., Roscoe, S., Blome, C. and Schleper, M. C. (2023) Geopolitical disruptions in global supply chains: a state-of-the-art literature review. *Production Planning & Control*, 36(4), 536-562.
- [12] Bonadio, B., Huo, Z., Levchenko, A. A. and Pandalai, N.N. (2021) Global supply chains in the pandemic. *Journal of international economics*, 133, 103534.
- [13] Tukamuhabwa, B.R., Stevenson, M., Busby, J. and Zorzini, M. (2015) Supply chain resilience: definition, review and theoretical foundations for further study. *International journal of production research*, 53(18), 5592-5623.
- [14] Zheng, Z. and Huaimin W. (2018) "Blockchain challenges and opportunities: A survey." *International journal of web and grid services* 14, no. 4: 352-375.
- [15] Narasimhan, R. and Kim, S.W. (2002) Effect of supply chain integration on the relationship between diversification and performance: evidence from Japanese and Korean firms. *Journal of operations management*, 20(3), 303-323.
- [16] Dong, H. and Tingting, M. (2022) Supply Chain Integration, Flexibility, Agility, and Operational Performance in a VUCA Environment. *Sustainable Development*, 12, 836.