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INVESTIGATING THE CHALLENGES AND STRATEGIES IN MANAGING THE MANUFACTURING INDUSTRY TRADE IN CHINA

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Abstract

China's manufacturing sector continues to be a critical component of its global trade competitiveness; however, it is confronted with a variety of challenges, including the transition to high-quality development, geopolitical uncertainty, supply chain disruptions, and environmental regulations. These issues are frequently examined in isolation in existing studies, which restricts a comprehensive comprehension of manufacturing trade management. This study adheres to the PRISMA 2020 guidelines and conducts a systematic literature review of peer-reviewed empirical articles published between 2021 and 2026 and indexed in the Scopus database. The results pinpoint critical obstacles, such as technological dependence, structural constraints, and environmental–financial trade-offs in export models. In response, firms and policymakers have implemented integrated strategies, including resilience-focused governance, digital transformation, service-oriented manufacturing, and green finance. The research suggests a thematic framework that connects the performance of manufacturing trade with sustainability, innovation, structural resilience, and institutional support. The findings underscore China's strategic transition to sustainable and high-value manufacturing trade in the face of escalating global constraints.

Keywords: Manufacturing trade; Green finance; Trade management strategies; Industrial resilience; China

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1 Introduction

The manufacturing sector has historically been the foundation of China's economic expansion and its incorporation into international trade. China, as the preeminent manufacturing nation globally, has always depended on cost efficiency (Zhang et al., 2020), extensive output, and export-driven expansion in its industrial trade (Wang & Wei, 2010). In recent years, this paradigm has faced significant challenges due to substantial structural changes in the global trading environment. Escalating environmental laws, post-pandemic supply chain disruptions, increasing geopolitical tensions, and heightened demands for

sustainable production have fundamentally transformed the operational conditions of manufacturing commerce (Kapoor et al., 2024; Kishawy et al., 2018; Zhang et al., 2025). Simultaneously, China's national development plan has transitioned from rapid expansion to high-quality (Wang et al., 2022), innovation-driven (Xiaobo & Dong, 2023), and ecologically sustainable development (Gu et al., 2020). This transformation positions industrial trade management at a pivotal crossroads, necessitating that companies and policymakers reconcile economic competitiveness with sustainability, resilience, and technical autonomy. Consequently, overseeing trade in the manufacturing sector in China has evolved into a complex, multifaceted challenge that transcends conventional trade policy and necessitates cohesive strategic approaches.

Notwithstanding the strategic significance of manufacturing trade to China's economy, current studies typically analyse its issues and policies in a disjointed fashion. Previous studies frequently concentrate exclusively on individual aspects, such as environmental regulation (Du & Li, 2020), green finance (Pasupuleti et al., 2025), supply chain resilience (Konstantinou et al., 2021), or digital transformation, lacks a holistic synthesis of the interactions among these components within the overarching trade management framework. Thus, an exhaustive understanding of the principal issues facing China's manufacturing trade and the strategic measures utilised to tackle them is still absent. This fragmentation hinders scholars and policymakers from seeing broad trends, assessing the efficacy of various solutions, and formulating cohesive policy responses. Consequently, a systematic and comprehensive evaluation of recent empirical evidence is essential to consolidate existing information and elucidate how China addresses the growing issues in the manufacturing industry trade.

This study aims to thoroughly analyse the challenges and strategic responses associated with managing trade in the manufacturing sector in China. It specifically seeks to identify the principal problems that impede manufacturing trade performance, including environmental regulations, supply chain vulnerabilities, technical reliance, and structural limits. Moreover, the study concurrently examines the measures employed by enterprises and policymakers to tackle these difficulties, including green finance instruments, industrial restructuring, digital transformation, and resilience-oriented governance. This research aims to create a theme framework that elucidates the interaction between difficulties and strategies in current industrial trade management in China, based on empirical evidence from recent studies. This comprehensive method enhances comprehension of contemporary trends and strategic avenues for maintaining competitiveness and sustainability in China's manufacturing trade.

This study is limited to a systematic literature review of peer-reviewed empirical articles published in English from 2021 to 2026 and indexed in the Scopus database. The emphasis is on trade within the manufacturing sector in China, addressing matters of environmental governance, green finance, structural change, digitalisation, resilience, and strategic autonomy. Consequently, non-empirical studies, publications in languages other than English, and research undertaken outside the context of Chinese manufacturing are omitted. This scope guarantees methodological rigour and theme significance, but it may restrict the generalisability of the findings to other national or sectoral contexts. Notwithstanding these constraints, the study offers substantial contributions. It enhances the literature by providing a cohesive thematic synthesis of disparate research on industrial trade management. The findings offer evidence-based insights for policymakers and industry stakeholders aiming to formulate successful trade,

environmental, and industrial policies. The report strategically endorses China's overarching objective of attaining sustainable, resilient, and high-value manufacturing trade amidst escalating global limitations.

Furthermore, this study employs a thematic research framework, informed by a systematic literature review technique, that connects trade issues, management tactics, and trade outcomes. The approach defines manufacturing trade management as a dynamic process influenced by four interconnected domains: (1) sustainability and environmental governance, (2) structural and strategic resilience, (3) innovation and digitalisation, and (4) institutional and financial support mechanisms. These domains interact to affect enterprises' trade performance, export quality, and long-term competitiveness. By integrating empirical information across various dimensions, the framework offers a comprehensive perspective on how China addresses the intricate issues of manufacturing industry trade in a swiftly changing global landscape.

2 Method

A systematic literature review (SLR) methodology was employed in this study, adhering to the PRISMA 2020 guidelines to guarantee a methodologically rigorous, reproducible, and transparent review process. This review concentrates on empirical investigations that examine the strategies and obstacles associated with administering the manufacturing industry trade in China. In order to mitigate potential selection bias, a two-stage screening procedure was implemented, which included a title-abstract review and a full-text assessment, both of which were conducted by independent reviewers. The criteria for inclusion were primary studies that were peer-reviewed and published in English between 2021 and 2026. This research was conducted using quantitative, qualitative, or mixed-methods and explicitly addressed the strategies and challenges in industrial manufacturing trade. Studies that were non-empirical or did not concentrate on manufacturing trade were excluded. The Scopus database was the sole source of the data, as it contains an exhaustive collection of reputable journals. The search query was refined to include specific keywords, publication stages, document categories, and country affiliations. This study systematically applies these criteria and procedures to synthesise current and pertinent evidence, identifying the strategies, challenges, and management practices in industrial manufacturing trade, thereby establishing a solid foundation for scholarly discourse and evidence-based policy recommendations.

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strategies, challenges, and management practices in industrial manufacturing trade, thereby establishing a solid foundation for scholarly discourse and evidence-based policy recommendations.

4 Result

4.1 Result

The manufacturing industry in China is presently at a critical juncture, as it is confronted with a dual pressure: the internal need for sustainable, high-quality development and the external challenges of a fragmented global trade environment. The strategies employed by firms and policymakers have become increasingly complex as the "world's factory" transitions from a model of high-speed growth to one of high-value innovation. Of the 36 articles, 12 articles were found to offer a multifaceted viewpoint on the manner in which China is adjusting to these changes. In general, the literature identifies three primary "stressors" that affect trade: the necessity for technological self-reliance, global supply chain vulnerabilities (following pandemic-era disruptions), and stringent environmental regulations (specifically carbon and water quotas). The current state of manufacturing trade management in China is defined by the authors, methodologies and findings of the 12 articles included in the accompanying table, which summarise their core contributions.

Table 4.1 Selected Articles Based on the Focus of the Study

Authors	Title	Methods	Summary of Findings
(Chen et al., 2026)	Aircraft export modes with MRO integration: leasing vs. direct sales	Comparative economic modeling of export modes (leasing vs. sales).	Integration of Maintenance, Repair, and Overhaul (MRO) into export modes is a key strategy for high-end Chinese manufacturing to compete globally.
(Chang et al., 2026)	Dynamic synergy and heterogeneous governance of environmental and financial performance	Multi-methodological analytical framework (Panel data).	Manufacturing sectors face the highest "environmental-financial" tension, requiring heterogeneous governance rather than one-size-fits-all policy.
(Yang et al., 2026)	Green inclusive finance: a catalyst for energy transition	Two-way fixed effects & mediation effect models.	Green finance is the primary driver for upgrading industrial structures and reducing reliance on high-carbon manufacturing inputs.
(Wang et al., 2025)	Economic Structural Adjustment Promoting Sustainable Growth in Shanghai: A Two-Decade Study (2004–2023)	Time-series analysis and ARIMA/SVM forecasting.	Documents the structural move from "heavy manufacturing" to "service-oriented manufacturing" to ensure sustainable urban economic growth.
(Shi et	Does Green Finance Facilitate	Multi-period	Government subsidies for

al., 2025)	the Upgrading of Green Export Quality? Evidence from China's Green Loan Interest Subsidies Policy	Difference-in-Differences (DID).	green loans directly correlate with a higher "Green Export Complexity Index" for Chinese firms.
(Wan et al., 2025)	Empowering LLMs for domain-centric Q&A in smart manufacturing	Hybrid retrieval-augmented generation (RAG) framework.	Digitalization strategy: Using AI to manage complex manufacturing domain knowledge improves operational efficiency and risk management.
(Lin et al., 2025)	Research on the optimization of operational strategies for supply chain members under two carbon trading pathways in the context of carbon emission trade	Supply chain optimization modeling.	Proves that carbon trading path selection is a critical "risk management" variable for manufacturers facing tightening emission regulations.
(Yang et al., 2025)	A Three-Dimensional Evaluation Method for the Metabolic Interaction System of Industrial CO2 and Water Pollution	State-efficiency-driving force framework.	Identifies that "driving forces" (policy/tech) are more critical than "state" (resource availability) in industrial sustainability.
(Abro et al., 2024)	Obligation to Opportunity: Exploring the Symbiosis of Corporate Social Responsibility, Green Innovation, and Organizational Agility in the Quest for Environmental Performance	Partial Least Squares Structural Equation Modeling (PLS-SEM).	Organizational agility acts as a mediator that allows manufacturing firms to pivot quickly in response to trade and environmental regulations.
(Lin et al., 2024)	Looking Back Deeper, Recovering up Better: Resilience-Oriented Contrarian Thinking about COVID-19 Economic Impact	Qualitative resilience analysis.	Suggests that "contrarian thinking" (investing during downturns) is a valid management strategy for long-term supply chain resilience.
(Zhou et al., 2024)	Synergizing carbon trading and water management for urban sustainability: A city-level multi-objective planning framework	Multi-objective planning framework.	Highlights the necessity of "Policy Reforms" that address multiple environmental constraints simultaneously to avoid trade bottlenecks.
(Bi & Zhang, 2024)	Exploring the Path of Autonomous Development: the Development Dilemma and Coping Strategies of Sub-Saharan Africa in the Post-	Policy review and dilemma analysis.	Argues for "Autonomous Development" as a strategy to mitigate risks associated with over-dependence on Western supply chain technologies.

Based on the thematic analysis, the following table summarizes the key variables addressed by the articles:

Table 4.2 Grouping of Challenges and Strategies

General Theme	Key Challenges (The Problems)	Management Strategies (The Solutions)	Supporting Articles
Green Finance & Institutional Support	Funding gaps for green transition; high cost of "Green Upgrading"; financial-environmental trade-offs.	Green loan interest subsidies; inclusive finance catalysts; heterogeneous governance.	Yang (2026); Shi (2025); Chang (2026)
Operational Sustainability	Carbon emission trade bottlenecks; water-carbon metabolic imbalances; supply chain resource constraints.	Multi-objective planning; carbon trading pathway optimization; integrated resource management.	Lin (2025); Zhou (2024); Xu (2025); Wu (2024)
Structural & Strategic Resilience	Low-value export modes; post-pandemic logistics disruption; dependence on external technologies.	MRO integration; leasing export modes; structural adjustment to service-manufacturing; contrarian thinking.	Wang (2025); Chen (2026); Han (2024); Bi & Zhang (2024)
Innovation & Digitalization	Managing industrial big data; lack of internal firm flexibility; knowledge management complexity.	LLM/AI integration; Organizational Agility; CSR-driven innovation.	Li (2025); Abro (2024)

4.2 Discussion

4.2.1 Overcoming Trade Barriers through Green Financial Policy

The findings underscore that China's manufacturing trade is currently experiencing a paradigm shift, in which environmental regulations (namely, carbon quotas) function as non-tariff trade barriers. Shi et al. (2025) and Yang et al. (2026) both illustrate that the primary strategy is "Institutional Support." The financial risk for exporters is mitigated by the Chinese government through the use of green loan interest subsidies. This implies that the challenge of "Environmental-Financial Tension" (Chang et al., 2026) for high-polluting industries is not solely addressed through regulation, but rather by establishing a financial ecosystem that incentivises green export quality.

4.2.2 Resilience through Structural Adjustment and Service-Integration

The transition to "MRO (Maintenance, Repair, and Overhaul) Integration" in high-end exports such as aircraft is a highly significant discovery in the structural theme (Chen et al., 2026). This resolves the issue of poor profit margins in conventional manufacturing. By transitioning from "direct sales" to "leasing and service integration," Chinese companies are forging more durable trade relationships. This is consistent

with the long-term structural changes that have been observed in Shanghai (Wang et al., 2025), where the strategy is to decouple development from heavy industrial production and transition to service-oriented manufacturing.

4.2.3 Digitalization as a Risk Management Tool

The challenge of "Information Complexity" and "Supply Chain Disruption" is being increasingly addressed through digital strategies. Li et al. (2025) underscore the significance of Large Language Models (LLMs) in the management of manufacturing domain knowledge. This suggests that digitalisation is no longer solely concerned with automation on the factory floor; it is a management strategy that is designed to guarantee "Organisational Agility" (Abro et al., 2024). In the event of abrupt trade policy changes or logistics bottlenecks, firms that are digitally agile can pivot more rapidly.

4.2.4 Achieving Autonomous Development

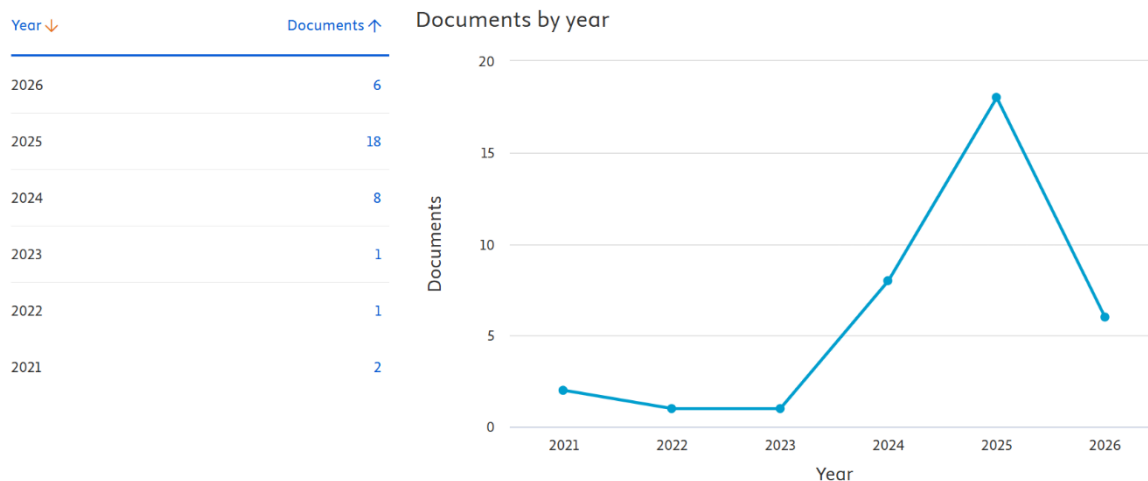


Figure 4.2 Trend of Publication

Lastly, the "Development Dilemma" identified by Bi & Zhang (2024) underscores a critical challenge: the excessive reliance on external technological supply chains. The discussion implies that "Autonomous Development" is the most effective defensive strategy. China's objective is to establish a "closed-loop" industrial system that is less susceptible to global geopolitical and logistical disruptions by integrating internal innovation, water management (Wu et al., 2024), and carbon trading.

The publication trend is indicative of a current and expanding scholarly interest in the strategies and obstacles of China's manufacturing trade, as evidenced by the 12 articles.

Table 4.3 Research Trends with a More Specific Focus

Year	Number of Articles	Primary Research Focus
2024	4	Recovery & Resilience: Focus on post-pandemic recovery (COVID-19), autonomous development, and foundational firm-level agility (CSR/Innovation).
2025	5	Policy & Digital Execution: A surge in research on specific trade instruments

		like green loan subsidies, carbon trading optimization, and AI/LLM integration in factories.
2026	3	Future-Oriented Strategy: Emerging research on high-end aircraft export modes (MRO) and complex governance of environmental-financial trade-offs.

4.2.5 Summary of the Trend

In 2024, the trend transitions from reactive strategies (which addressed the aftermath of COVID-19 and supply chain disruptions) to proactive management in 2025 and 2026. The more recent articles concentrate on the development of innovative trade models, such as aircraft leasing, and sophisticated financial governance. Earlier articles (2024) address comprehensive management concepts, including "Organisational Agility." Nevertheless, the 2025 and 2026 literature incorporates highly specific technical and economic variables, including Multi-objective Planning for water-carbon management and Large Language Models (LLMs) for smart manufacturing. In addition, the years 2025 and 2026 demonstrate a focused initiative to address the "Green Export" issue. The papers increasingly emphasise how China can maintain its industrial trade volume while adhering to global environmental standards, signifying that this continues to be the foremost long-term problem for the business.

4.2.6 Implications of the Study

The results of this systematic review have substantial implications for industrial managers and policymakers. The study posits that the success of China's "Green Export" quality is significantly influenced by institutional incentives, specifically green loan interest subsidies that alleviate the high costs of industrial upgrading. This is particularly relevant for policy development. In order to prevent regulatory impediments from impeding trade volume, policymakers must transition to an integrated governance framework that simultaneously addresses carbon and water constraints. The transition from traditional product-based sales to long-term service ecosystems is necessary for firms to maintain global competitiveness, as the shift toward service-integrated manufacturing, such as the MRO and leasing models for high-value assets, implies from a managerial perspective. Additionally, the integration of AI-driven knowledge management and digital capabilities is no longer solely an efficiency gain; it is a fundamental requirement for organisational agility. Managers who employ these digital tools are better equipped to navigate supply chain disruptions and quickly adapt to changing international trade standards.

4.2.7 Future Recommendations

Future research must prioritise the intersection of evolving trade policies and emergent technologies to guarantee the manufacturing sector's ongoing competitiveness. A primary area of focus should be the long-term impact of the integration of Smart Manufacturing and Large Language Model (LLM) on the workforce, with a particular emphasis on the potential for labour displacement in traditional production roles and the shift in skill requirements. Moreover, this study underscores the efficacy of Green Finance in coastal centers such as Shanghai. However, comparative cross-regional analyses should be conducted in future empirical research to ascertain whether inland manufacturing zones necessitate distinct institutional incentives to upgrade their export quality. In addition, scholars are encouraged to conduct a more thorough examination of the "Autonomous Development" path, with the goal of identifying specific high-tech sectors in which China can achieve technological sovereignty without inciting further international trade isolation or decoupling. In conclusion, there is a distinct necessity for the creation of

quantitative models that can accurately quantify the Synergy Effect between water resource management and carbon trading, thereby providing firm managers with precise return-on-investment (ROI) metrics for integrated environmental investments.

5 Conclusion

This study indicates that the management of trade in China's manufacturing industry has become a complicated, multi-faceted process influenced by sustainability demands, structural changes, technical progress, and the need for strategic autonomy. The systematic literature analysis indicates that environmental laws, including carbon and resource limitations, have become significant non-tariff trade obstacles, necessitating enterprises and policymakers to transcend conventional cost-based competitiveness. Strategies such as green finance, institutional assistance, and diverse governance frameworks are crucial in alleviating environmental-financial trade-offs while enhancing export quality. The findings indicate that structural adjustments towards service integration and high-value manufacturing, along with resilience-oriented policies, have enhanced China's ability to endure global supply chain disruptions. Digitalization, particularly via AI- and LLM-driven systems, has become as a vital management instrument for improving corporate agility and risk management. The report underscores a strategic transition in China's industrial trade management from an efficiency-driven expansion to a strategy focused on sustainability, resilience, and innovation. This change redefines China's position in global manufacturing trade and offers significant policy and managerial lessons for attaining long-term competitiveness amid increasingly rigorous global economic and environmental constraints.

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Ethical Considerations

Not Applicable

Conflict of Interest

The Authors declare there is no conflict of interest.

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