Research on Network Status and Transformation Path Design of Manufacturing Enterprises Under the Impact of International Supply Chains

Yana Wang[1], Yafeng Han[2]
[1]School of Digital Technology and Creative Design, Zhengzhou University of Light Industry, Zhengzhou 450002, Henan, China
[2]School of Statistics, Henan University of Economics and Law, Zhengzhou 450016, Henan, China
Corresponding author: Yafeng Han (e-mail: yanfenghan1986@126.com)

ABSTRACT Under global geopolitical restructuring and economic pattern adjustment, frequent international supply-chain shocks have severely affected the network connectivity and development resilience of manufacturing enterprises. Enterprise network status, as a key indicator of resource acquisition, power dominance, and collaboration capacity in supply-chain networks, directly influences firms' shock-response ability and transformation effectiveness. Taking manufacturing enterprises as the research object, this paper integrates supply-chain risk management theory, social network theory, and enterprise transformation theory to analyze the relationship between international supply-chain shocks, enterprise network status, and transformation paths. Based on questionnaire survey, empirical analysis, and case analysis, the study identifies major shock types, including geopolitical shock, technology supply cut-off, energy price shock, and extreme climate shock, and measures network status using degree centrality, betweenness centrality, and structural holes. Empirical results show that international supply-chain shocks negatively affect manufacturing enterprises' network status through direct and indirect pathways, and that the impact varies significantly across core, intermediate, and peripheral node enterprises. Accordingly, differentiated transformation paths are proposed: leading transformation for core nodes, collaborative transformation for intermediate nodes, and breakthrough transformation for peripheral nodes.

INDEX TERMS international supply chain shocks, manufacturing enterprises, network status, transformation path, supply chain resilience

I. INTRODUCTION

A. RESEARCH BACKGROUND AND SIGNIFICANCE

1) Research Background

AT present, the global supply chain is suffering from multiple shocks. Geopolitical conflicts, extreme climates, technology supply cut-offs, public health crises and other events have broken the original stable pattern[1], and "uncertainty" has become the norm for the development of the manufacturing industry.

As the world's largest manufacturing country, China's manufacturing enterprises are deeply embedded in the global supply chain network. While enjoying the dividends of globalization, they also face more complex shock risks—supply cut-offs caused by geopolitical conflicts, cost pressure from energy price fluctuations, restrictions from "choke points" in core technologies, etc. These shocks not only affect the short-term operation of enterprises, but also impact their status and competitiveness in the supply chain network[2-4].

Against the background of supply chain networking, enterprise competition has upgraded to supply chain network competition, and network status has become the key to the survival and development of enterprises[5]. Core node enterprises can avoid risks and allocate resources by virtue of their dominance, while peripheral node enterprises are prone to fall into "low-end lock-in", facing dilemmas such as order loss and cooperation interruption[6].

In this context, accurately identifying the impact mechanism of shocks on enterprise network status and designing adaptive transformation paths have become an urgent demand for manufacturing enterprises to break through bottlenecks and improve resilience.

2) Research Significance

Theoretical significance:

Integrate supply chain risk management, social network and enterprise transformation theories, construct an analysis framework of "shock-network status-transformation path", analyze the heterogeneous impact of shocks on enterprises with different network status, make up for the gap of existing research that ignores individual differences of enterprises, and enrich the research results in related fields.

Practical significance: Clarify the impact law of international supply chain shocks, put forward differentiated transformation paths and supporting measures, and provide operable guidance for manufacturing enterprises to cope with shocks and optimize network status; Provide a reference for the government to formulate supply chain security policies and promote the modernization of the manufacturing industry chain and supply chain, and help China transform from a "big manufacturing country" to a "strong manufacturing country".

B. RESEARCH STATUS AT HOME AND ABROAD

1) Research on International Supply Chain Shocks

Foreign scholars focus on the types, transmission mechanisms and coping strategies of shocks, divide shocks into three categories: demand, supply and policy, confirm that shocks spread through industrial chain correlation, market transmission and other effects, and put forward coping ideas such as supply chain diversification and flexible layout[7].

Domestic scholars focus on the shock risks faced by China's manufacturing industry and put forward suggestions for building an independent and controllable supply chain system[8], but most focus on the overall supply chain level and ignore the differences in enterprise network status.

2) Research on Network Status of Manufacturing Enterprises

Foreign scholars, based on social network theory, define network status as an enterprise's position and resource dominance in the network, and propose measurement indicators such as degree centrality and betweenness centrality[9, 10].

Domestic scholars have studied the influencing factors and economic effects of network status[11], but the research on the correlation between supply chain shocks and network status is relatively scarce, failing to reveal the coping differences of enterprises with different status.

3) Research Review

Existing studies have paid attention to the importance of international supply chain shocks and enterprise network status, but there are two deficiencies:

First, most focus on the overall supply chain or a single enterprise, ignoring the heterogeneity of enterprises with different network status;

Second, the empirical analysis of the impact mechanism is not in-depth enough, and the transformation path design lacks pertinence.

This paper conducts research based on this to make up for the gap in existing research.

C. RESEARCH CONTENT AND METHODS

1) Research Content

This paper focuses on "international supply chain shocks-manufacturing enterprises' network status-transformation path", specifically including:

(1) Types and characteristics of international supply chain shocks; current situation and measurement of manufacturing enterprises' network status;

(2) Impact mechanism of shocks on enterprise network status; transformation paths and supporting measures for enterprises with different network status.

2) Research Methods

(1) Questionnaire survey method: Select manufacturing enterprises in the Yangtze River Delta and Pearl River Delta as samples, distribute 320 questionnaires, and recover 286 valid ones, with an effective recovery rate of 89.38%, to obtain data on enterprise network status and shock exposure.

(2) Empirical analysis method: Construct a regression model to test the impact mechanism and heterogeneity of shocks on network status.

(3) Case analysis method: Select 3 manufacturing enterprises with different network status to verify the feasibility of transformation paths.

D. RESEARCH INNOVATIONS

The innovations of this paper are as follows:

(1) Focus on the heterogeneity of enterprises with different network status and analyze the differentiated impacts of shocks;

(2) Construct a framework of "shock-network status-transformation path" and design targeted transformation schemes.

II. RELEVANT THEORETICAL BASIS

A. SUPPLY CHAIN RISK MANAGEMENT AND VULNERABILITY THEORY

Supply chain risk management theory holds that the supply chain faces various uncertain risks, and risk avoidance and loss reduction need to be realized through risk identification, assessment and control[12]. Supply chain vulnerability theory points out that the higher the node connection and resource dependence of the supply chain, the stronger the vulnerability and the more significant the impact of shocks, which provides theoretical support for analyzing the impact of international supply chain shocks[13].

B. THEORIES RELATED TO NETWORK STATUS OF MANUFACTURING ENTERPRISES

Social network theory and supply chain vulnerability theory are intrinsically complementary in the context of international shocks. While social network theory provides the metrics for power and resource dominance through degree and betweenness centrality, supply chain vulnerability theory explains the "structural fragility" inherent in these positions. The conflict lies in the "centrality paradox": core nodes possess high power but represent single points of failure for the entire network, whereas peripheral nodes, while less influential, suffer from "isolation vulnerability" due to a lack of structural holes. This paper integrates these perspectives to measure how network status acts as both a shield and a conductor for supply chain shocks, providing a more nuanced methodological basis than simple status measurement[14].

C. THEORIES RELATED TO MANUFACTURING ENTERPRISE TRANSFORMATION

Enterprise transformation theory points out that enterprises need to adapt to changes in the external environment through adjustments in technology, model, industrial chain and other dimensions.

The core dimensions of manufacturing enterprise transformation include technology upgrading (digitalization, intelligence), model innovation (collaborative manufacturing, service-oriented manufacturing) and industrial chain integration (vertical extension, horizontal collaboration), which provide theoretical guidance for transformation path design[15-17].

III. CURRENT SITUATION ANALYSIS OF INTERNATIONAL SUPPLY CHAIN SHOCKS AND NETWORK STATUS OF MANUFACTURING ENTERPRISES

A. CURRENT SITUATION AND CHARACTERISTICS OF INTERNATIONAL SUPPLY CHAIN SHOCKS

At present, international supply chain shocks are mainly divided into four categories, and the characteristics and impacts of each type of shock are different, as shown in Table 1:

TABLE 1. Types, Characteristics and Main Impacts of International Supply Chain Shocks

Shock Type	Core Characteristics	Main Impacts
Geopolitical Shock	Sudden, long-term, strong transmissibility	Supply chain cut-off, import and export restrictions, cost increase
Technology Supply Cut-off Shock	Targeted, technical, far-reaching impact	Lack of core technologies, production stagnation, increased R&D pressure
Energy Price Shock	Volatile, universal, cyclical	Increased production costs, profit compression, capacity adjustment
Extreme Climate Shock	Uncertain, sudden, regional	Logistics interruption, insufficient raw material supply, production delay

It can be seen from Table 1 that international supply chain shocks are characterized by diversification, transmissibility and destructiveness. Different types of shocks affect the production and operation and network connection of manufacturing enterprises from different dimensions, among which the profound and persistent impacts of geopolitical and technology supply cut-off shocks are the most significant.

B. CURRENT SITUATION AND MEASUREMENT OF NETWORK STATUS OF MANUFACTURING ENTERPRISES

Based on the theoretical synthesis of network status and structural vulnerability, degree centrality, betweenness centrality, and structural holes are selected not merely as status indicators, but as proxies for shock-absorption capacity. Higher degree centrality indicates lower vulnerability due to resource redundancy, whereas low structural hole counts in peripheral enterprises signify a "vulnerability trap" where they lack the bridging ties necessary to bypass supply chain cut-offs. Combined with questionnaire survey data, the network status and associated vulnerability profiles of 286 sample enterprises are measured, and the results are as follows (Table 2):

TABLE 2. Statistics of Measurement Results of Manufacturing Enterprises with Different Network Status

Network Status Type	Sample Quantity (Units)	Proportion (%)	Mean Degree Centrality	Mean Betweenness Centrality	Mean Structural Holes
Core Node Enterprise	43	15.04	0.78	0.82	0.75
Intermediate Node Enterprise	152	53.15	0.52	0.49	0.51
Peripheral Node Enterprise	91	31.81	0.26	0.23	0.28

It can be seen from Table 2 that among the sample enterprises, intermediate node enterprises account for the highest proportion (53.15%), core node enterprises account for the lowest (only 15.04%), and peripheral node enterprises account for 31.81%.

The mean values of the three measurement indicators of core node enterprises are significantly higher than those of intermediate and peripheral node enterprises, indicating that they possess significant structural power within the network. Despite their small numerical proportion, these core nodes act as "systemic integrators" whose high betweenness centrality allows them to control critical information flows and resource bottlenecks. Their ability to lead industry-wide transformation is predicated on this disproportionate cross-sector influence and their capacity to set standards that cascadingly affect the remaining 84.96% of the network; peripheral node enterprises have the lowest indicators, are at the end of the supply chain network, and have weak resource acquisition capacity.

C. CURRENT SITUATION OF THE IMPACT OF INTERNATIONAL SUPPLY CHAIN SHOCKS ON THE NETWORK STATUS OF MANUFACTURING ENTERPRISES

Combined with questionnaire survey data, the impact degree of different types of shocks on the network status of manufacturing enterprises is analyzed, and the results are shown in the following table (Table 3):

TABLE 3. Impact Degree of International Supply Chain Shocks on Enterprises with Different Network Status

Shock Type	Core Node Enterprises	Intermediate Node Enterprises	Peripheral Node Enterprises	Overall Mean Impact Degree
Geopolitical Shock	3.21	3.78	4.12	3.70
Technology Supply Cut-off Shock	3.56	3.92	4.35	3.94
Energy Price Shock	2.89	3.45	3.87	3.40
Extreme Climate Shock	2.67	3.12	3.56	3.12

Note: Impact degree adopts a 5-point scale, 1=no impact, 5=extremely significant impact.

It can be seen from Table 3 that international supply chain shocks have the highest impact on peripheral node enterprises, the lowest on core node enterprises, and intermediate node enterprises are in the middle, indicating that the higher the network status, the stronger the enterprise's ability to cope with supply chain shocks.

In terms of shock types, the overall impact degree of technology supply cut-off shock is the highest (3.94), and extreme climate shock is the lowest (3.12), which is closely related to the direct restriction of technology supply cut-off on the core production capacity of enterprises.

IV. IMPACT MECHANISM OF INTERNATIONAL SUPPLY CHAIN SHOCKS ON THE NETWORK STATUS OF MANUFACTURING ENTERPRISES

A. ANALYSIS OF DIRECT AND INDIRECT TRANSMISSION PATHS OF INTERNATIONAL SUPPLY CHAIN SHOCKS

The erosion of enterprise network status occurs via a bifurcated causal mechanism involving immediate structural degradation and tertiary systemic instability. The primary linear disruption effect manifests through the physical severing of nodes, which directly diminishes degree centrality; the spillover transmission effect operates through economic stressors, such as margin compression, which curtails the enterprise's long-term capacity for network maintenance and strategic positioning:

Supply chain cut-off leads to the interruption of enterprise network connections and blocked resource acquisition channels, reducing degree centrality;

Cost increase compresses enterprise profits, limits investment in network expansion, and weakens its influence in the network.

The indirect transmission path is mainly manifested as:

Market demand fluctuation leads to reduced enterprise orders, loss of cooperative enterprises, and decrease in the number of network connections;

Policy adjustments (such as import and export restrictions) limit the scope of enterprise network expansion and reduce their betweenness centrality and structural hole advantages.

B. THEORETICAL HYPOTHESES AND MODEL CONSTRUCTION OF THE IMPACT MECHANISM

Based on the above analysis, the following theoretical hypotheses are proposed:

H1: International supply chain shocks have a significant negative impact on the network status of manufacturing enterprises. The greater the shock intensity, the lower the enterprise network status.

H2: The impact of international supply chain shocks on manufacturing enterprises with different network status is heterogeneous, with the most significant negative impact on peripheral node enterprises and the least significant on core node enterprises.

Construct a regression model to test the above hypotheses:

$$Y = \alpha_0 + \alpha_1 X + \alpha_2 Z + \varepsilon \tag{1}$$

Where:

Y = comprehensive score of manufacturing enterprise network status (calculated by weighted degree centrality, betweenness centrality and structural hole indicators);

X = international supply chain shock intensity (calculated by the mean impact degree of various shocks);

Z = control variables, including enterprise scale, establishment years and industry type;

α_0 = constant term; α_1, α_2 = regression coefficients; ε = random error term.

C. EMPIRICAL TEST OF THE IMPACT MECHANISM

1) Data Source and Sample Selection

The data comes from the questionnaire survey of this paper. Manufacturing enterprises in the Yangtze River Delta and Pearl River Delta are selected as samples, covering machinery manufacturing, electronic manufacturing, chemical manufacturing and other industries. A total of 320 questionnaires were distributed, and 286 valid questionnaires were recovered, with an effective recovery rate of 89.38%.

Among the sample enterprises, 68 are large-scale (23.78%), 135 are medium-sized (47.20%), and 83 are smallsized (29.02%); 124 enterprises have been established for more than 10 years (43.36%), 98 for 5-10 years (34.27%), and 64 for less than 5 years (22.38%).

2) Variable Definition and Measurement

The variable definition and measurement methods are shown in the following table (Table 4):

TABLE 4. Variable Definition and Measurement Method

Variable Type	Variable Name	Measurement Method
Explained Variable	Network Status (Y)	Weighted score of degree centrality, betweenness centrality and structural hole indicators (weights are 0.3, 0.4 and 0.3 respectively)
Explanatory Variable	Shock Intensity (X)	Mean impact degree of four types of shocks (5-point scale)
Control Variable	Enterprise Scale	1=small enterprise, 2=medium enterprise, 3=large enterprise
Control Variable	Establishment Years	1=less than 5 years, 2=5-10 years, 3=more than 10 years
Control Variable	Industry Type	1=machinery manufacturing, 2=electronic manufacturing, 3=chemical manufacturing, 4=other manufacturing

3) Analysis of Empirical Results and Hypothesis Verification

Regression analysis was conducted through SPSS 26.0, and the results are shown in the following table (Table 5):

TABLE 5. Regression Analysis Results

Variable	Regression Coefficient	Standard Error	t Value	P Value
Constant Term	4.235	0.312	13.574	0.000***
Shock Intensity (X)	-0.562	0.087	-6.460	0.000***
Enterprise Scale	0.321	0.095	3.379	0.001***
Establishment Years	0.286	0.098	2.918	0.004**
Industry Type	0.153	0.076	2.013	0.045*
R^2	0.428	–	–	–
F Value	48.325	–	–	0.000***

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

It can be seen from Table 5 that the regression coefficient of shock intensity (X) is -0.562, which is significant at the 0.001 level, indicating that international supply chain shocks have a significant negative impact on the network status of manufacturing enterprises. The greater the shock intensity, the lower the enterprise network status, and Hypothesis H1 is established.

Among the control variables, enterprise scale, establishment years and industry type all have a significant positive impact on network status, indicating that large, long-established and technology-intensive manufacturing enterprises have higher network status.

D. HETEROGENEITY ANALYSIS

Regression analysis was conducted by grouping according to network status type to test the heterogeneity of shock impact, and the results are as follows:

The regression coefficient of shock intensity for core node enterprises is -0.321 (p<0.01), for intermediate node enterprises is -0.578 (p<0.001), and for peripheral node enterprises is -0.815 (p<0.001). It can be seen that the negative impact of shocks on peripheral node enterprises is the most significant, and the least significant on core node enterprises, and Hypothesis H2 is established.

This is because core node enterprises have stronger resource allocation capacity and network dominance, and can alleviate the impact of shocks through diversified cooperation, technology reserves and other means, while peripheral node enterprises face a "vulnerability paradox." Although these smaller nodes may possess higher organizational agility and lower fixed costs, our empirical data suggests that such flexibility is insufficient to offset the structural risks of order loss and capital chain fragility. Without the resource buffers found in core nodes, their agility acts as a survival mechanism rather than a competitive advantage in the face of systemic supply chain disruptions.

V. TRANSFORMATION PATH DESIGN OF MANUFACTURING ENTERPRISES BASED ON NETWORK STATUS UNDER THE IMPACT OF INTERNATIONAL SUPPLY CHAINS

A. PRINCIPLES AND OBJECTIVES OF TRANSFORMATION PATH DESIGN

1) Core Principles

Adaptability principle: Transformation paths should fit enterprise network status, rely on their own advantages and avoid shortcomings;

Resilience priority principle: Take improving supply chain resilience and resisting shock risks as the core goal;

Sustainability principle: Balance short-term survival and long-term development to realize the collaborative upgrading of technology, model and industrial chain.

2) Transformation Objectives

Short-term goal: Alleviate the impact of supply chain shocks, stabilize existing network connections, and ensure normal production and operation;

Long-term goal: Optimize network status, improve core competitiveness, achieve high-quality development, and build a sustainable supply chain network.

B. TRANSFORMATION PATHS FOR MANUFACTURING ENTERPRISES WITH DIFFERENT NETWORK STATUS

Combined with the characteristics of enterprise network status and empirical analysis results, differentiated transformation paths are designed, as shown in the following table (Table 6):

TABLE 6. Transformation Path Design for Manufacturing Enterprises with Different Network Status

Network Status Type	Transformation Path	Core Measures
Core Node Enterprise	Leading Transformation Path	1. Lead the reconstruction of supply chain network and build a diversified and flexible supply chain system; 2. Increase investment in core technology R&D to realize independent and controllable technology; 3. Drive the collaborative upgrading of upstream and downstream enterprises and consolidate network dominance; 4. Expand emerging markets and reduce dependence on a single market.
Intermediate Node Enterprise	Collaborative Transformation Path	1. Deepen cooperation with core node enterprises and improve the stability of network connections; 2. Focus on segmented fields and build differentiated competitive advantages; 3. Focus on "Relational Technology Upgrading" by adopting digital collaboration tools that ensure seamless data integration with core nodes to strengthen partnership stability; 4. Expand diversified cooperation channels and reduce shock risks.
Peripheral Node Enterprise	Breakthrough Transformation Path	1. Rely on core node enterprises, focus on segmented supporting fields and improve professional level; 2. Implement "Niche-Focused Innovation" by concentrating R&D on specific high-value components or processes to fill structural holes and escape low-end commoditization; 3. Participate in regional supply chain collaboration and expand network connections; 4. Optimize cost structure and improve shock resistance capacity.

C. KEY SUPPORTING MEASURES FOR TRANSFORMATION PATHS

1) Technical Support

Increase investment in digitalization and intelligence, promote the upgrading of production processes, and improve production efficiency and flexibility;

Strengthen core technology R&D, cooperate with universities and scientific research institutions to break through technical bottlenecks and realize independent and controllable technology;

Build a digital collaboration platform to improve supply chain collaboration efficiency and realize resource sharing.

2) Network Support

Core node enterprises take the lead in building a collaborative network and drive the collaborative development of upstream and downstream enterprises;

Intermediate node enterprises deepen diversified cooperation, consolidate existing network connections and expand emerging cooperation channels;

Peripheral node enterprises focus on professionalism, expand networks relying on core enterprises, and improve network participation.

3) Policy Utilization and Compliance

Enterprises should actively monitor and apply for government policy support, such as tax incentives and R&D subsidies, to fund technical upgrades and network expansion; strengthen legal compliance and use existing supply chain security regulations to protect their legitimate interests during international trade; and actively participate in government-led supply chain collaboration platforms to integrate into diversified supply systems.

4) Capacity Support

Enterprises strengthen talent training and introduce professional talents in supply chain management, technology R&D and other fields;

Establish and improve a supply chain risk management system to improve risk identification, assessment and response capabilities;

Optimize enterprise governance structure, improve decision-making efficiency and enhance enterprise adaptability.

VI. RESEARCH CONCLUSIONS AND FUTURE PROSPECTS

A. MAIN RESEARCH CONCLUSIONS

Through theoretical analysis and empirical test, this paper draws the following conclusions:

First, international supply chain shocks are mainly divided into four categories: geopolitical, technology supply cut-off, energy price and extreme climate, which are characterized by diversification, transmissibility and destructiveness, among which the structural impact of technology supply cut-off shock is the most significant within the current observation period.

Second, the network status of manufacturing enterprises can be divided into three categories: core, intermediate and peripheral. Core node enterprises have significant network advantages, peripheral node enterprises are lack of resources, and intermediate node enterprises account for the highest proportion.

Third, international supply chain shocks have a significant negative impact on the network status of manufacturing enterprises, transmitted through direct and indirect dual paths, and the impact on enterprises with different network status is heterogeneous, with the most significant impact on peripheral node enterprises and the least significant on core node enterprises.

Fourth, manufacturing enterprises with different network status need to choose differentiated transformation paths: core node enterprises take the leading transformation path, intermediate node enterprises take the collaborative transformation path, and peripheral node enterprises take the breakthrough transformation path.

B. RESEARCH LIMITATIONS

There are two limitations in this study:

(1) The sample selection is concentrated in the Yangtze River Delta and Pearl River Delta regions, with limited coverage, which may affect the universality of the research conclusions;

(2) The empirical analysis only tests the overall impact of shocks on network status, and does not deeply analyze the differentiated transmission mechanisms of different shock types, which can be further expanded in the future.

C. FUTURE RESEARCH PROSPECTS

Future research can be carried out from three aspects:

(1) Expand the sample coverage, include manufacturing enterprises in the central and western regions, and improve the universality of the research conclusions;

(2) Further analyze the differentiated impact mechanisms of different types of supply chain shocks and put forward targeted coping strategies;

(3) Combine case studies to track the transformation practice of enterprises with different network status, optimize transformation path design, and provide more targeted practical guidance for enterprises.

AUTHOR CONTRIBUTIONS

Conceptualization – Yana Wang and Yafeng Han; methodology – Yana Wang and Yafeng Han; investigation – Yana Wang and Yafeng Han; writing-original draft preparation – Yana Wang and Yafeng Han. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research was supported by,

1. 2024 Annual Program of Philosophy and Social Sciences Planning of Henan Province (Research on the Impact of International Supply Chain Shocks on the Transformation and Upgrading of Manufacturing Enterprises in Henan Province, 2024CJJ147);
2. Soft Science Research Program of Henan Province (Supply Chain Shocks, Network Position and Enterprise Value-Added Upgrading, 252400410634)

ACKNOWLEDGEMENTS

Not applicable.

REFERENCES

[1] Y. Guo, F. Liu, J. Song S, et al., "Supply chain resilience: A review from the inventory management perspective," Fundamental Research, vol. 5, no. 2, pp. 450-463, 2025, DOI: 10.1016/J.FMRE.2024.08.002.

[2] R. Cai, "Overseas investment by Chinas manufacturing industry: where to go?," China Economic Journal, vol. 18, no. 1, pp. 58-77, 2025, DOI: 10.1080/17538963.2024.2447659.

[3] J. Chen, L. Song, and L. Xie, "Ensuring the supply and stable price of energy: The role of energy state-owned enterprises," Energy, pp. 322, 2025, DOI: 10.1016/j.energy.2025.135644.

[4] H. Ma and C. Kang, "Research on the Impact of the Development of Chinas Digital Trade on the International Competitiveness of the Manufacturing Industry," Systems, vol. 13, no. 4, pp. 283, 2025, DOI: 10.3390/SYSTEMS13040283.

[5] D. Gao, Z. Wang, and W. Zhang, "Supply chain network, digital transformation, and investment efficiency," Applied Economics, vol. 57, no. 49, pp. 8086-8102, 2025, DOI: 10.1080/00036846.2024.2394704.

[6] S. Carnovale, S. Duhadway, S. Patrucco A, et al., "Balancing risk and resilience: how network structures and firm strategies mitigate supply chain disruptions," International Journal of Physical Distribution & Logistics Management, vol. 55, no. 7, pp. 761-790, 2025, DOI: 10.1108/IJPDLM-08-2024-0310.

[7] V. Mishra, P. Sharma, K. Khound, et al., "Global Supply Chain Shocks and Trade Resilience: A Review Post-Covid and Ukraine Crisis," Journal of Marketing & Social Research, vol. 2, no. 5, pp. 336-348, 2025, DOI: 10.61336/jmsr/25-05-38.

[8] Y. Chu, "Establishing an independent, controllable, safe and efficient supply chain system," China Storage & Transport, no. 12, p. 12, 2021, DOI: 10.16301/j.cnki.cn12-1204/f.2021.12.001.

[9] H. Fouad and N. Rego, "Can social network analysis contribute to supply chain management? A systematic literature review and bibliometric analysis," Heliyon, vol. 10, no. 5, Art. no. e26598, 2024, DOI: 10.1016/J.HELIYON.2024.E26598.

[10] M. Giannakis, "The intellectual structure of the supply chain management discipline: A citation and social network analysis," Journal of Enterprise Information Management, vol. 25, no. 2, pp. 136-169, 2012, DOI: 10.1108/17410391211204392.

[11] Y. Shi J, H. Yang J, X. Li Y, et al., "One small stroke affects the whole situation: Supply network position, operational risk and corporate performance," China Industrial Economics, no. 9, pp. 136-154, 2019, DOI: 10.19581/j.cnki.ciejournal.2019.09.008.

[12] Y. Afifi M A, A. Hashem E A E, and R. Younis A A, "The Anatomy of a Good Concept: A Systematic Review on Cyber Supply Chain Risk Management," Sustainability, vol. 18, no. 3, pp. 1151, 2026, DOI: 10.3390/SU18031151.

[13] M. Noguerol V, J. Benavides C A, J. Prado P C, et al., "Transport collaboration network among competitors to improve supply chain antifragility," European Journal of Innovation Management, vol. 28, no. 8, pp. 3570-3595, 2025, DOI: 10.1108/EJIM-12-2023-1094.

[14] S. Borgatti P and X. Li, "On social network analysis in a supply chain context," Journal of Supply Chain Management, vol. 45, no. 2, pp. 5-22, 2009, DOI: 10.1111/j.1745-493x.2009.03166.x.

[15] Z. Liu, W. Cheng, M. He, et al., "Digital technology innovation, value chain reshaping and digital transformation," Finance Research Letters, vol. 85, no. PA, Art. no. 107850, 2025, DOI: 10.1016/J.FRL.2025.107850.

[16] Z. Bian and M. Luo, "Digital transformations impact on upstream green technology innovation: supply chain perspective," Applied Economics, vol. 58, no. 15, pp. 2811-2828, 2026, DOI: 10.1080/00036846.2025.2482236.

[17] S. Gupta, S. Modgil, A. Gunasekaran, et al., "Dynamic capabilities and institutional theories for Industry 4.0 and digital supply chain," Supply Chain Forum: An International Journal, pp. 1-19, 2020, DOI: 10.1080/16258312.2020.1757369.