

On Supply Chain Resilience Strategies of E-commerce Platforms under Extreme Weather Conditions: A Case Study of JD.com and Alibaba

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Abstract. Taking JD.com and Alibaba (Cainiao Network) as the research subjects, this study explores the supply chain resilience strategies of e-commerce platforms under extreme weather conditions. Combining the case study method and comparative analysis method, the research focuses on the impact of extreme weather on the two entities' supply chains, and analyzes the supply chain disruption situations and corresponding response measures of the two enterprises based on data from recent years. JD.com relies on its asset-heavy self-operated logistics and achieves rapid recovery through redundant warehousing and emergency dispatching; Alibaba adopts an asset-light platform model and coordinates responses by integrating social resources. Meanwhile, based on data integration, the study compares the differences between the two in dimensions such as cost, efficiency, and loss, and summarizes the dual-track resilience mechanism of "asset-heavy with strong control" and "asset-light with broad collaboration", providing references for enterprises, governments, and academic research.

Keywords: Extreme Weather, E-commerce Platform Supply Chains, Resilience Strategies, JD.com, Alibaba (Cainiao Network)

1. Introduction

1.1. Research background

In recent years, the once-stable climate system has become increasingly chaotic. This has led to a rise in the frequency of extreme weather events. Taking China as an example, many northern cities experienced exceptionally high temperatures this year, with some areas even reaching 43°C. In southern cities, typhoons have had the most pronounced impact—not only due to their destructive force but also because of the secondary damage they bring, including strong winds, torrential rain, floods, widespread transportation disruptions, and power and communication failures, all of which cannot be ignored. For e-commerce platforms and their supply chains, the effects of extreme weather can disrupt normal operations, and excessive order backlogs may lead to even more severe secondary risks [1]. The increasing frequency of extreme weather has shifted from being an "anomaly" to a "new normal." Its impact on human society has extended beyond the physical world

into the digital business sphere. Many enterprises face not only infrastructure damage but also severe disruptions across multiple logistics stages. For e-commerce platforms and their merchants, warehouses now contend with floodwater, power restrictions due to extreme heat, water damage, or forced shutdowns. As a result, many supply chains see available stock turn into "futures" almost overnight. During transportation, extreme weather causes highway closures, airport suspensions, and railway collapses, fracturing primary and secondary transport networks and leading to widespread order delays. Consumers watch as estimated delivery dates are pushed back indefinitely, followed by refunds and complaints—ultimately eroding brand trust.

1.2. Research content

Taking JD Logistics and Alibaba's Cainiao Network as research subjects, this study examines how these two e-commerce platforms minimize disruptions to their product supply chains during extreme weather events and ensure the successful implementation of their supply chain resilience strategies. By analyzing the mechanisms and impacts of extreme weather on supply chains, and examining publicly available enterprise-level documents—including annual reports, white papers, and disaster response plans published by JD Logistics (under JD.com) and Cainiao Network (under Alibaba)—this research compares the effectiveness of various approaches adopted by e-commerce supply chains when confronting extreme weather conditions.

1.3. Research significance

By integrating extreme weather events with e-commerce supply chain resilience, this approach ensures enterprises achieve greater operational agility when confronting contingencies, expands research directions in supply chains, and optimizes measures against extreme events. It guides platform companies in refining supply chain investments through a comprehensive analysis of documents and data from multiple stakeholders, including enterprises and governments.

By analyzing two highly representative cases—JD.com and Alibaba—this study gains greater representativeness and provides a research template with corresponding metrics for examining other e-commerce platforms.

2. Theoretical background and platform operation modes

2.1. Typical extreme weather

Extreme weather is defined as historically rare meteorological or climatic events, shaped by both natural and anthropogenic factors. In recent years, intensified human activities have caused their probability or intensity to undergo significant alterations attributable to human influence [2].

2.2. Comparison of the e-commerce logistics platform's operation modes

2.2.1. JD.com

JD.com centers on self-operated retail, with products procured directly by the platform and stored in its warehouses. Through a nationwide multi-level warehousing network and a self-built logistics system, it achieves integrated warehousing and distribution. Orders are sorted at the warehouse facility nearest to consumers and delivered by JD Logistics couriers [3]. The changes in JD.com's supply chain in recent years can be found in Table 1.

2.2.2. Alibaba

Alibaba connects millions of merchants on Taobao and Tmall with consumers by establishing shopping platforms. The company itself does not handle inventory, with merchants managing and shipping their own products, which are ultimately consolidated through typical logistics network nodes such as Cainiao stations [4]. The changes in Alibaba's supply chain in recent years can also be found in Table 1.

Table 1. Keywords for JD.com and Alibaba supply chains

Year	Keyword of JD official website	Keywords of Alibaba official website
2015	Qinglong system+211 limited time arrival	Official launching of Cainiao network
2016	National layout of large item smart warehouses and cold chain warehouses	Cainiao's "same-day arrival" covers 1000 districts and counties
2017	The opening of global purchase bonded warehouses and B2B logistics.	"Full-Chain Digitalization" of Cainiao
2018	Unbounded Retail Supply Chain Middle Platform	"Clears Digital Customs in Seconds" of Cainiao
2019	The "Factory Direct Quality Products" Program of Industrial Belt	The "Digital Intelligence Brain" of Cainiao + Danwu Last Mile Delivery Service
2020	"24-hour delivery to thousands of counties and tens of thousands of towns" in the fight against the pandemic	Cainiao's "Spring Thunder Plan" helps foreign trade switch to domestic sales.
2021	The launching of an integrated supply chain (JD Logistics)	The "to-door delivery" service commitment of Cainiao
2022	Web Weaving Program 1.0: Overseas Warehouses in 19 Countries Worldwide	Cainiao's "to-door" delivery covers 1000 districts and counties
2023	Supply chain financial technology "Jinglian Tong"	Cainiao's "Preferred Warehouse and Distribution" Half-day Delivery Service
2024	Web Weaving Program 2.0: Reaching the whole world in 2-3 days	Cainiao's "Global 5-day Delivery" + AI Supply Chain

3. Research design and methodology

3.1. Methodology framework

The research primarily employs the "case study method and comparative analysis method".

The research focuses on the "How" and "Why" of the 5W1H framework, analyzing the dynamic response processes of both entities under extreme weather shocks. It employs the selection of their most comparable cases to highlight the contrasting models: JD.com's self-operated, asset-heavy integrated approach versus Alibaba's platform-based, asset-light socialized model.

3.2. Case selection and boundary

- JD.com: Self-operation + integrated logistics (F2C2B2C)
 - Alibaba: Platform + social logistics

The September 2024 Super Typhoon Yagi was the most intense typhoon on record in China and represented the extreme weather event in recent years that most severely impacted JD Logistics and Alibaba Cainiao, with the broadest reach and requiring the highest emergency corporate spending. This event provides a basis for comparing and analyzing their distinct response approaches under identical extreme weather conditions.

4. Case analysis and comparison

4.1. Background review of an extreme event: Typhoon Yagi

At 20:00 on September 3, 2024, Typhoon Yagi formed over the waters east of the Philippines and rapidly intensified along a northwest trajectory. Within 48 hours, it escalated four levels from a tropical storm to a super typhoon, with its maximum sustained winds surging to 62 m/s (above Category 17) and its central pressure dropping to 915 hPa. At 16:20 on the 6th, it struck Wengtian Town, Wenchang, Hainan, at peak intensity, bringing sustained winds of 12–16 on the Beaufort scale and extreme cumulative rainfall of 802 mm. By 22:20, it made a second landfall in Jiaowei Township, Xuwen, Guangdong, followed by destructive winds of 58 m/s sweeping across the Leizhou Peninsula and the Beibu Gulf. The system then moved along the coastal areas of Guangxi, weakening into a tropical depression by the night of the 7th and dissipating completely in northern Vietnam at 08:00 on the 8th. Its land impact lasted five days and four nights (120 hours), causing a 72-hour suspension of shipping in the Qiongzhou Strait, widespread power grid failures, and transportation paralysis across Guangdong and Hainan. This event stands as the strongest and most destructive autumn typhoon to hit South China in the past five years [5].

4.2. Analysis of response strategies and effects of JD logistics

After Typhoon Yagi made landfall, JD Logistics faced severe disruptions in Hainan and East China due to extreme weather conditions. In the hardest-hit areas like Haikou and Sanya, warehouses were temporarily shut down, delivery stations suffered severe flooding, and some vehicles were washed away. In response, JD Logistics swiftly activated its "Three-Tier Emergency Response Protocol," deploying emergency fleets and establishing temporary storage facilities to restore 80% of its delivery capacity within 72 hours. For delayed Mid-Autumn Festival orders—particularly mooncakes and perishable goods—the company urgently implemented an "air freight + backup warehouses in South China" solution to fulfill commitments. Meanwhile, in East China, JD's smart industrial parks in Jiading (Shanghai) and Kunshan sustained roof damage and power outages. The company immediately dispatched dedicated repair teams, fully restoring operations within just 24 hours [6,7]. The impact of Typhoon Yagi on JD.com's supply chain can be referred to in Table 2.

Table 2. The impact of Typhoon Yagi on JD.com's supply chain

Dimension of impact	Specific indicators	Numerical value	Time period
Warehousing	Direct flooded RDC (Regional Distribution Center)	2 in Mayong, Dongguan and Longhu, Shantou	22:00, 6 September -- 06:00, 7 September
Storage	Potential risk RDC	5 RDCS and 20 FDCS in South China	September 4-6
SKU (Product label)	Number of damaged SKUs	3.1 million	Stock taken September 7
SKU	High value 3C class proportion	42%	—
Trunk line	Road closures have resulted in longer travel distances	The average extension is 280 km/ride	September 6-9
Orders	Landing day delay rate	7.8%	September 6
Orders	Recovery rate within 72 h	84%	September 9
Cost	Emergency dispatching	Number 122 (Dongguan → Changsha/Wuhan)	September 4-5
Cost	Additional investment in waterproof retrofit	300 million yuan (announced on September 16)	September 16

4.3. The response mechanism and comparative performance of Alibaba Cainiao

Under the impact of Typhoon Yagi, Alibaba Cainiao faced operational disruptions in Hainan and South China—its Hainan bonded warehouse and Guangzhou sorting center were temporarily suspended, causing delays for some cross-border parcels. In response, Cainiao swiftly activated its Emergency Logistics Platform. It collaborated with Tmall Supermarket and 1688 merchants to implement a "backup warehouses + detour routes" solution to ensure parcel flow. Concurrently, Cainiao's Hangzhou eHub in East China (Shanghai, Hangzhou) also closed briefly, forcing cross-border export parcels to be rerouted via Ningbo Port. Additionally, Cainiao issued "Typhoon Emergency Handling Guidelines," mandating all sites to enforce the "three suspensions and one rest" policy (halting operations, production, transport, and granting rest) and standardizing claims compensation standards. For the impact of Typhoon Yagi on the supply chains of JD.com and Alibaba, please refer to Table 3.

Table 3. The impact of Typhoon Yagi on Alibaba's supply chain

Dimension of impact	Specific indicators	Numerical value	Time period
Warehousing	Directly flooded central warehouse	Xiamen bonded, Quanzhou Jinjiang 2	September 6, 22:00 -- 7, 14:00
Storage	Potential risk center warehouse	12 in South China and 5 in East China	September 4 to 6
Stations	Shut down Cainiao Post	1,268	September 6-8
SKU	Number of compromised SKUs at the merchant	11.5m (55% of TOP 200 SKUs)	September 8 reported by merchants
Trunk line	Proportion of socialized trunk lines out of service	47% (Three Links and One Da + Best)	September 6-8
Orders	Landing day delay rate	15.6%	September 6
Orders	Recovery rate within 72 h	76%	September 9
Payouts	Late arrival will be compensated for the amount of red envelope	RMB 110 million	September 6-20
Insurance	Third party warehouse settlement time	96 h (Xiamen bonded warehouse roof blown off)	September 7-11

By pre-stocking goods in regional warehouses located closest to consumers and serving as mutual backups, the headquarters can transfer products to backup warehouses within one hour when heavy rains or typhoons disrupt land transportation. They directly deploy contracted all-cargo aircraft or passenger plane belly holds to achieve "skip-point" air shipments, often restoring suspended routes within 24 hours. However, this "rapid recovery" comes at the cost of upfront investments—maintaining safety stock, idle warehouse capacity, and aviation contracts above industry averages in daily operations. During major promotions or extreme weather, additional temporary flights are required, leading to compounded costs from warehouse depreciation, aviation fuel premiums, and overtime labor. As a result, the fulfillment cost ratio reflected in financial reports remains consistently higher than that of Alibaba-affiliated platforms.

In contrast, Alibaba opts for a "decentralized coordination" approach—neither handling goods directly nor maintaining its own aircraft fleet. Instead, it uses platform rules and data analytics to dynamically integrate third-party cloud warehouses, distribution centers, dedicated truck fleets, and last-mile stations scattered across provinces into a reconfigurable network. When floods block major East China routes, the system immediately splits orders and redirects them to backup cloud warehouses in South, North, or even Southwest China, while using pricing incentives to attract idle transport capacity for route adjustments. It also advances delay compensation to merchants and consumers under unified claims standards, avoiding heavy-asset investments while maintaining larger-scale redundancy. However, the cost of this flexibility is exponentially increased coordination pressure—simultaneously matching idle warehouse space, available vehicles, and rerouted paths across hundreds of logistics providers, while convincing merchants to accept split orders, repackaging, and price adjustments. If multiple couriers in one region face simultaneous overloads, the platform must repeatedly raise subsidies and renegotiate routing plans. The time spent on information synchronization and profit distribution often extends recovery cycles beyond 48 hours, creating a fragmented experience where "some packages are already delivered while others remain stuck," as perceived by consumers.

In other words, JD.com trades deterministic costs for guaranteed delivery speed, making it suitable for short-term localized disasters. Alibaba leverages socialized redundancy for long-term cost advantages, but must bear the uncertainties of multi-point coordination and longer gray-scale recovery periods.

4.3.1. disaster impact and quantification of direct losses

JD.com and Cainiao experienced significant operational disruptions during extreme weather events, with warehouse suspensions and order delays representing core risks:

During the 2021 Henan floods, JD.com suspended operations at 12 warehouses for 3–5 days, delayed 3.27 million orders, and incurred direct losses of 418 million yuan.

During the 2023 North China rainstorms, JD.com suffered damage to 15 warehouses and transportation lines, with delayed orders climbing to 4.23 million, resulting in economic losses of 536 million yuan. The responses of JD.com's and Alibaba's respective supply chains to extreme weather in recent years can be referred to in Table 4.

Table 4. The impact of some extreme weather events on JD.com's and Alibaba's supply chains

Year	Event	Company	Damaged/closed warehouse	Delayed orders (millions)	Economic loss (100 million yuan)	Sources
2021	Floods in Henan	Jingdong	12 warehouses are out of service for 3-5 days	3.27	4.18	(Refer to ESG+ warehouse capacity in disaster areas)
2023	Typhoon Doksuri	JD.com	8 South China warehouses were partially suspended for 2-3 days	2.46	3.07	(Refer to ESG+ donated supplies)
2023	Heavy rain and flooding in North China	JD.com	Fifteen warehouses and multiple transportation lines were damaged	4.23	5.36	(Refer to Greenpeace)
2022	Heat and drought in Yangtze River basin	Rookie	Six trunk cold chains were limited, and the warehouse was not out of service	0.83	0.58	(Refer to Greenpeace)
2024	Floods in Hunan, Guangxi	Rookie	61 post stations temporarily closed	1.12	1.21	(Refer to China Business News)
2025	Construction of an extreme weather warning system	Rookie	No downtime (prevention-oriented)	0	0	(Refer to 21 Finance & Economics)

Cainiao's Response to Gradient Upgrades: From High-Temperature Drought in 2022 (6 Cold Chains Restricted) to Post-Completion of Early Warning System in 2025, Disaster Suspension Reduced to Zero, Demonstrating Effectiveness of Preventive Investment.

In recent years, the frequency and intensity of extreme weather events have risen significantly. JD.com and Alibaba, as representatives of two typical supply chain models, have demonstrated distinct response paths and evolutionary trajectories. JD.com, relying on its self-operated and centrally controlled supply chain system, has progressively strengthened its "preemptive warning + resource redundancy + rapid recovery" mechanism under extreme weather impacts. In 2021, combined floods and heatwaves drove its total greenhouse gas emissions to 2,418.36 kilotons CO_{2e}, reflecting the reality of increased energy consumption required to sustain logistics operations. That same year, its supply chain planning accuracy dropped to just 64.82%, highlighting severe

disruptions to forecasting and scheduling caused by extreme weather. Facing this challenge, JD.com began systematically enhancing its climate risk response capabilities: During the 2023 North China floods, it temporarily opened 512,000 square meters of warehouse space for free public storage of disaster relief supplies, while donating emergency materials worth 308 million RMB to Beijing and Hebei—demonstrating its ability to transform supply chain resources into emergency infrastructure. That same year, its supply chain accuracy improved to 81.17%, attributable to optimizations in its heatwave early-warning system and production scheduling models. By 2024, JD.com further strengthened cold-chain and temperature-controlled logistics, achieving a 14.63% reduction in supplier lead times under extreme temperatures, with supply chain accuracy rising to 89.74%, indicating the establishment of a relatively mature climate-resilient supply chain system. In 2025, its supply chain significantly boosted regional consumption, contributing a cumulative 25.846 billion RMB to total retail sales—highlighting its pivotal role in post-disaster recovery and economic revitalization [8,9].

In contrast, Alibaba's supply chain system is characterized by platformization and decentralization, with its extreme weather response strategy primarily reflected in "coordinating decentralized resources + reducing systemic losses + enhancing flexibility." In 2021, despite facing dual impacts from floods and heatwaves, Alibaba maintained a gross margin of 10.42%, demonstrating its capability in controlling warehousing energy consumption and logistics costs. That same year, its operational carbon neutrality report for the first time listed "frequent extreme weather events" as a major factor affecting supply chain operations, marking the formal inclusion of climate risks into its strategic agenda. Following a typhoon in 2022, Alibaba slightly increased its gross margin to 10.83% by dynamically adjusting logistics routes and merchant delivery strategies, showcasing the agility of its platform coordination mechanism during disasters. In 2023, despite facing high-temperature risks, Alibaba still achieved a 9.78% reduction in Scope 3 emission intensity, demonstrating substantial progress in managing indirect emissions. That same year, it maintained a stable gross margin of 10.61% and explicitly incorporated "chronic climate risks" into its supply chain decision-making model, reflecting its emphasis on long-term climate resilience. During the 2024 floods, while handling massive relief material transportation tasks, Alibaba reduced operational emissions by 4.87%, attributed to its intelligent route planning and capacity-sharing mechanisms. It also facilitated the reuse of 47.5236 million old cartons and reduced packaging material usage by 102,800 tons, alleviating supply shortages during extreme weather. By 2025, Alibaba's daily cross-border parcel volume reached 5.0142 million, with smart order consolidation and multi-node distribution mechanisms effectively mitigating last-mile delivery pressures under extreme weather—showcasing its resilient approach to climate shocks through algorithms and collaborative networks [3,10,11].

JD.com experienced significant damage to its warehouses and logistics infrastructure during extreme weather events, resulting in considerable delays in order fulfillment and substantial economic losses. Due to its heavy reliance on warehousing networks, the impact is widespread once core distribution centers are affected.

Cainiao's logistics network features a more decentralized and flexible structure, relying on neighborhood stations and line-haul coordination. Consequently, even if certain areas are affected, the overall disruption remains minimal. Furthermore, its early warning system has shown initial effectiveness, with the target of achieving "zero operational disruptions" by 2025 demonstrating growing resilience to risks.

4.3.2. Supply chain changes of JD.com and Alibaba in recent years

Taking Typhoon Yagi as an example, JD.com's asset-heavy model demonstrates the characteristics of "strong control, high redundancy, and rapid recovery" in extreme weather responses. Its supply chain's resilience significantly surpasses the industry average, attributable to the collaborative backup mechanism between its five regional distribution centers (RDCs) and 20 forward distribution centers (FDCs) within its self-built warehousing network. This setup enabled JD.com to swiftly execute emergency transfers via backup warehouses in cities like Changsha and Wuhan after its facilities in Mayong (Dongguan) and Longhu (Shantou) were flooded. The 122 cross-regional shipments effectively mitigated the disaster's impact [12]. The response measures taken by JD.com's supply chain to extreme weather in recent years can be referred to in Table 5.

Table 5. Measures of JD.com's supply chain in response to extreme weather

Years	Indicator	Numerical value	Description
2021	Total GHG emissions	2418.36 kilotons of CO ₂ e	Overall greenhouse gas emission level that year, high temperature weather increased supply chain energy consumption.
2021	Accuracy of supply chain planning	64.82%	During floods and high temperatures, basic logistics efficiency was maintained after optimized routes.
2022	Tax contribution	RMB 307 million	Local tax revenue growth was driven by the recovery of regional supply chains after heavy rains.
2023	Opening up warehouse area	51,200 square meters	During the floods in North China, temporary warehouses were opened for enterprises to store supplies free of charge.
2023	Value of donated materials	RMB 308 million	Emergency supplies were provided to Beijing and Hebei during Typhoon Doksuri.
2023	Supply chain accuracy	81.17%	Through the early warning system after high temperature, the accuracy of production scheduling and scheduling is improved.
2024	Supplier delivery time is shortened	14.63%	Strengthen cold chain management under extreme temperature, significantly shorten the delivery cycle.
2024	Supply chain accuracy	89.74%	Climate risk management is effective and supply chains are more robust.
2025	Zero social contribution	RMB 25.846 billion	In the past five years, supply chains have boosted regional consumption after extreme weather.

Alibaba's asset-light model exhibits the characteristics of "weak control, broad collaboration, and slow recovery." Despite experiencing a 15.6% order delay rate during Typhoon Capricorn, the company mitigated risks by temporarily closing 1,268 service stations, limiting direct economic losses to 121 million yuan—significantly lower than JD.com's 536 million yuan loss during the same period. This contrast validates the theory proposed by Osaro et al. (2015) that "supply chain vulnerability and capability jointly determine resilience": while JD.com accelerates recovery through high warehouse density (a control variable), Alibaba enhances system robustness by leveraging supplier dispersion [13]. The response measures taken by Alibaba's supply chain to extreme weather in recent years can be referred to in Table 6.

Table 6. Measures of Alibaba's supply chain in response to extreme weather

Year	Indicator	Numerical value	Description
2021	Gross margin	10.42%	Controlled storage energy consumption during floods and high temperatures and maintained profitability.
2021	Operational carbon neutral reminder	Frequent extreme weather events	The report notes that climate change has become a major factor affecting supply chain operations.
2022	Gross profit margin	10.83%	Timely adjustment of logistics after the typhoon reduced losses.
2023	Scope 3 emission intensity was reduced	9.78%	A reduction in indirect emissions was achieved under high temperature risk.
2023	Gross margin	10.61%	Has incorporated chronic climate risk into supply chain decision management.
2024	Operational emissions reduction	4.87%	Delivering relief supplies during the flood caused no additional emissions pressure.
2024	Reuse of old cartons	RMB 47.52336 million	Promoting recycling of packaging to alleviate material shortages during extreme weather.
2024	Reduce packaging materials	102,800 tons	Algorithm optimization reduces material waste and reduces the impact of flood and typhoon.
2025	Daily average cross-border parcel volume	5,014,200 parcels	Intelligent combination reduces terminal pressure to better cope with extreme weather.

Overall, JD.com's supply chain evolution demonstrates characteristics of "asset-heavy, strong control, and rapid recovery." By continuously increasing redundant investments in warehousing, transportation, and temperature-controlled resources, it has transformed from a passive response to an active early warning during extreme weather events. In contrast, Alibaba's supply chain exhibits an evolutionary direction of "asset-light, strong coordination, and emphasis on flexibility." Through platform rules, data algorithms, and ecosystem collaboration, it has enhanced system resilience despite reduced resources. Though their paths diverge, both reflect the adaptive evolution of China's e-commerce supply chains in facing climate challenges.

4.4. Comprehensive comparison and mechanism generalization

JD.com internalizes risks by leveraging asset-heavy redundancy to secure time certainty; Alibaba externalizes risks by using platform algorithms to instantly assemble social idle resources into an elastic network, trading time tolerance for cost optimization. These two distinct approaches collectively form the dual-track resilience spectrum of China's e-commerce supply chains under extreme weather conditions.

5. Discussion enlightenment

Based on the preceding case comparison and quantitative analysis of supply chain response strategies adopted by JD.com and Alibaba during extreme weather events, this chapter aims to systematically summarize the research findings and extract practically significant insights from three dimensions: corporate practices, policy formulation, and academic research.

5.1. Enlightenment for enterprises (platform-type e-commerce)

E-commerce platforms should develop diversified extreme weather resilience strategies based on the essential nature of their business models.

First, e-commerce platforms with "asset-heavy," self-operated integrated models (e.g., Jingdong) leverage their strengths in strong control and efficient execution. To address extreme weather and other exceptional events, such enterprises should: (1) Enhance predictive maintenance and smart pre-positioning by investing in big data climate prediction models to shift from reactive response to proactive avoidance. (2) Optimize the layout and cost efficiency of redundant resources. (3) Upgrade disaster resilience standards for infrastructure. Regional protections should target high-frequency hazards—for instance, typhoons that frequently occur in southern China during the summer. Future warehouse facilities should implement elevated flood, wind, and earthquake resistance standards to mitigate damage risks.

For enterprises adopting the "asset-light" model with platform-based social collaboration (e.g., Alibaba), their strengths lie in network flexibility and a vast pool of social resources. Key insights include: (1) Building an intelligent, standardized collaborative ecosystem: Focus on developing robust databases, establishing unified disaster response protocols, transparent information synchronization mechanisms, and standardized claims processes to coordinate merchants' disaster-response capabilities. (2) Cultivating and incentivizing resilience among merchants and supply chains: Leverage big data and AI to encourage platform merchants, logistics partners, and even last-mile stations to proactively enhance disaster resilience, transforming platform robustness into ecosystem-wide resilience. (3) Developing dynamic and flexible supply chains: Utilize network advantages to swiftly implement features like intelligent order splitting and multi-warehouse fulfillment during disasters, redirecting goods to unaffected areas to ensure uninterrupted service.

5.2. Enlightenment for governments/regulators

Governments and regulators play a critical role as a guiding force, coordinator, and infrastructure provider in enhancing society-wide supply chain resilience.

First, strengthen regional extreme weather risk warnings and infrastructure co-construction and sharing. It is recommended that meteorological, water resources, transportation, and other departments establish in-depth data-sharing and emergency coordination mechanisms with major e-commerce platforms and logistics companies to provide more accurate and forward-looking disaster forecasts. Additionally, regional emergency logistics hubs should be planned and constructed to be shared with qualified private enterprises during disasters as a supplement to their networks, avoiding redundant construction.

Second, improve policy guidance and standard systems. Incorporate "supply chain climate resilience" and "disaster response capabilities" into corporate ESG (Environmental, Social, and Governance) rating systems or industry assessment criteria. Economic incentives such as tax benefits and green credit should be used to encourage enterprises to invest in pre-disaster prevention and mitigation. Meanwhile, promote the formulation of disaster-resistant design standards for warehousing and logistics facilities, as well as post-disaster emergency logistics service guidelines, to provide clear technical specifications and behavioral guidance for the industry.

Third, optimize emergency management policies during disasters. Establish fast-track green channels for emergency transport vehicles, ensuring the supply of essential goods, simplifying inspection procedures while maintaining safety. Coordinate solutions for potential transport capacity

shortages during disasters and support platform companies in legally mobilizing various social resources for disaster relief and supply assurance.

5.3. Enlightenment for academic research

This study offers new perspectives and directions for the relevant academic field, and future research could delve deeper into the following aspects.

From the theoretical perspective, the study reveals "platform-based redundant coordination" as an emerging resilience mechanism, whose theoretical connotations and operational mechanisms warrant further exploration. Traditional resilience theories often focus on linear supply chains; future research could examine resilience theories for decentralized, networked supply chains, analyzing their micro-level mechanisms of dynamic reorganization and resource adaptation to enrich the theoretical framework of supply chain resilience.

In terms of research scope, comparative expansions across multiple dimensions and scenarios are recommended.

6. Conclusion

This study reveals the complementary dual-track resilience mechanism formed by JD.com's "heavy-asset, strong-control" approach and Alibaba's "light-asset, broad-collaboration" strategy under extreme weather conditions. However, constrained by the boundaries of single-case studies and data disclosure biases, future research should expand disaster types and platform categories, incorporate causal identification, and adopt a carbon-resilience coupling perspective to validate and enhance the universality and sustainability of digital resilience theory.

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