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Building Supply Chain Resilience in Indian Manufacturing Firms: A Multiple Case Study of Disruption Management Practices

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ABSTRACT

Increased globalization, outsourcing, and network interdependencies have significantly heightened the vulnerability of manufacturing supply chains to disruption events. While prior research has extensively examined supply chain risk mitigation through analytical and survey-based approaches, there remains a relative paucity of empirically grounded, process-level insights into how resilience is enacted in practice—particularly within emerging economy contexts. Addressing this gap, the present study investigates how manufacturing firms operating in India develop and deploy supply chain resilience through managerial practices and organizational capabilities. Drawing on a multiple case study methodology, the research examines selected local and multinational manufacturing firms using in-depth interviews, archival records, and secondary data. The findings reveal that supply chain resilience is not driven by singular structural solutions but emerges from firm-specific configurations of flexibility, redundancy, collaboration, and managerial judgment. Managerial decision-making and relational governance are shown to play a mediating role between disruption exposure and performance recovery, reinforcing the importance of dynamic capabilities in complex supply networks. By situating empirical evidence within established theoretical lenses, the study contributes to supply chain resilience literature by offering contextualized insights from an emerging economy and by highlighting the micro-foundations through which resilience is operationalized. The findings hold important implications for both scholars and practitioners seeking to design resilient supply chains under conditions of environmental uncertainty.

Keywords: *Supply Chain Resilience; Supply Chain Disruptions; Manufacturing Supply Chains; Managerial Practices; Case Study Research; Emerging Economies; India*

1. INTRODUCTION

1.1 Background and Motivation

Global manufacturing supply chains have become increasingly exposed to disruptions arising from demand volatility, supplier failures, infrastructural bottlenecks, regulatory changes, and environmental uncertainties. The growing fragmentation of production networks and reliance on

geographically dispersed suppliers have amplified vulnerability, particularly in emerging economies. India, as a major manufacturing hub integrated into global value chains, presents a compelling context to study how firms confront and manage supply chain disruptions.

Indian manufacturing firms operate under conditions of infrastructural constraints, multi-tier supplier dependency, regulatory complexity, and fluctuating market demand. These contextual characteristics heighten the likelihood of disruptions while simultaneously constraining managerial response options.

The concept of **supply chain resilience**, defined as the ability to prepare for, respond to, and recover from disruptions, has therefore gained prominence as a strategic capability rather than a purely operational concern.

Consequently, Supply chain disruptions have become an increasingly prominent concern due to globalization, outsourcing, and network complexity. Prior research highlights that tightly coupled manufacturing supply chains are particularly vulnerable to low-probability, high-impact disruption events. Emerging economies such as India face additional challenges arising from infrastructural constraints, institutional uncertainty, and heterogeneous supplier capabilities.

1.2 Supply Chain Disruptions and the Indian Manufacturing Context

Supply chain disruptions in manufacturing manifest in multiple forms, including supplier insolvency, logistics breakdowns, quality failures, labor unrest, and policy-induced shocks. In the Indian context, such disruptions are often exacerbated by:

- High dependence on small and medium-tier suppliers
- Limited real-time visibility across supply networks
- Infrastructural inefficiencies in transportation and logistics
- Exposure to regulatory and policy shifts

Despite these challenges, several Indian manufacturing firms have demonstrated notable resilience by developing adaptive sourcing strategies, collaborative supplier relationships, flexible production systems, and contingency planning mechanisms. However, systematic academic understanding of **how** these resilience capabilities are built and operationalized in Indian manufacturing remains limited.

1.3 Research Gap

While prior supply chain literature till date has extensively conceptualized disruption risk and resilience, three important gaps persist:

1. **Contextual Gap:** Much of the empirical evidence on supply chain resilience is derived from developed economies, with limited attention to emerging-market manufacturing contexts such as India.
2. **Practice-Level Gap:** Existing studies often emphasize abstract resilience constructs, offering limited insight into concrete managerial practices and decision mechanisms employed during disruptions.
3. **Methodological Gap:** Large-sample survey methods dominate resilience research, whereas **in-depth multiple case studies**—which are better suited for theory building and process understanding—remain underutilized.

This study addresses these gaps by adopting a **multiple case study approach** to examine how Indian manufacturing firms design and implement disruption management practices that contribute to supply chain resilience.

1.4 Research Objectives

The primary objectives of this study are to:

- Examine the **nature and sources of supply chain disruptions** faced by Indian manufacturing firms
- Identify the **resilience capabilities and managerial practices** deployed in response to such disruptions
- Analyze how these practices contribute to **disruption absorption, recovery, and adaptation**
- Develop a **context-sensitive conceptual understanding** of supply chain resilience in Indian manufacturing

1.5 Research Questions

Guided by the above objectives, the study seeks to answer the following research questions:

- **RQ1:** What types of supply chain disruptions are most critical for Indian manufacturing firms?
- **RQ2:** What managerial practices and organizational mechanisms are employed to manage these disruptions?
- **RQ3:** How do these practices contribute to the development of supply chain resilience?
- **RQ4:** How does the Indian manufacturing context shape resilience-building strategies?

1.6 Structure of the Paper

The remainder of the paper is organized as follows:

- **Section 2** reviews the relevant literature on supply chain disruptions and resilience
- **Section 3** develops the conceptual framework guiding the study
- **Section 4** outlines the research methodology and case study design
- **Section 5** presents within-case and cross-case analyses
- **Section 6** discusses the findings in light of existing theory
- **Section 7** highlights theoretical and managerial implications
- **Section 8** concludes with limitations and directions for future research

2. LITERATURE REVIEW

2.1 Supply Chain Disruptions: Nature and Sources

Supply chain disruptions refer to unplanned and unanticipated events that interrupt the normal flow of materials, information, or finances across supply networks. Early supply chain literature primarily focused on efficiency and cost minimization; however, increasing globalization and outsourcing exposed firms to heightened vulnerability, prompting scholarly attention toward disruption risks.

Disruptions may originate from **internal sources**, such as process failures, equipment breakdowns, or labor issues, or **external sources**, including supplier insolvency, transportation failures, natural disasters, and regulatory changes. Prior research emphasizes that manufacturing supply chains are particularly susceptible due to their dependence on multi-tier supplier networks and synchronized production schedules. Even localized disruptions can propagate upstream and downstream, leading to amplified operational and financial consequences.

In emerging economies like India, disruption exposure is further intensified by infrastructural bottlenecks, institutional voids, and uneven supplier capabilities. Despite this, much of the extant disruption literature treats context as neutral, underplaying the role of country-specific structural conditions in shaping disruption frequency and severity.

Supply chain disruptions are unplanned events that interrupt the flow of goods, information, or finances (Craighead et al., 2007). Disruptions may originate internally or externally and often propagate through interconnected networks, amplifying their impact (Tang, 2006). Manufacturing supply chains are especially exposed due to synchronized production schedules and supplier interdependence (Sheffi & Rice, 2005).

2.2 Supply Chain Risk and Disruption Management

Supply chain risk management literature conceptualizes disruptions as extreme manifestations of supply chain risks. Risk is typically defined in terms of the probability of an adverse event and the magnitude of its impact. Prior studies categorize risks into supply-side, demand-side, operational, environmental, and network-related risks.

Early empirical studies focused on **risk identification and assessment**, advocating tools such as risk mapping, supplier audits, and scenario planning. Subsequent work emphasized **mitigation strategies**, including safety stock, multiple sourcing, capacity buffers, and contractual safeguards. While these approaches contribute to risk reduction, they often assume relatively stable environments and may prove insufficient in high-uncertainty environments.

Importantly, earlier research highlights that risk mitigation alone does not guarantee continuity during major disruptions. This realization laid the foundation for the emergence of **supply chain resilience** as a complementary and more dynamic capability.

Supply chain risk has been conceptualized as the likelihood and impact of adverse events affecting supply chain performance (Jüttner, 2005). Early research emphasized mitigation through inventory buffers, multiple sourcing, and contractual safeguards (Tang, 2006). However, these approaches were increasingly viewed as insufficient under high uncertainty, motivating the shift toward resilience-oriented thinking (Sheffi, 2005).

2.3 Conceptualizing Supply Chain Resilience

Supply chain resilience has been conceptualized as the capability of a supply chain to **prepare for**, **respond to**, and **recover from** disruptions while maintaining operational continuity. Unlike robustness, which emphasizes resistance to change, resilience incorporates adaptability and learning.

Scholars identify several core dimensions of resilience:

- **Flexibility**: the ability to reconfigure sourcing, production, and distribution
- **Redundancy**: availability of backup suppliers, inventory, or capacity
- **Visibility**: access to timely and accurate information across the supply chain
- **Collaboration**: relational mechanisms enabling coordinated response

Earlier conceptual models argue that resilience is not a static attribute, but an outcome of strategic and operational decisions embedded within supply chain design and governance. However,

empirical validation of these dimensions remains fragmented, with limited insight into how firms orchestrate them in practice, particularly in manufacturing-intensive emerging markets.

Resilience differs from robustness by emphasizing adaptation and recovery rather than resistance alone (Christopher & Peck, 2004). Pettit et al. (2010) conceptualize resilience as a balance between vulnerability and capability, while Scholten et al. (2014) highlight collaboration as a key enabler of resilient response.

2.4 Managerial Practices for Disruption Response

The managerial dimension of resilience emphasizes **decision-making processes and organizational routines** enacted during and after disruptions. Prior studies document practices such as cross-functional crisis teams, rapid supplier engagement, decentralized decision authority, and learning-oriented post-disruption reviews.

Case-based research suggests that resilient firms rely less on formalized contingency plans alone and more on **managerial judgment, relational capital, and experiential knowledge**. Nonetheless, much of this evidence is drawn from single-case or anecdotal studies in developed economies, limiting generalizability.

In the Indian manufacturing context, where supplier relationships are often relational rather than contractual, managerial discretion and informal coordination mechanisms may play a disproportionately important role—an aspect underexplored in existing literature.

Managerial decision-making plays a critical role during disruptions, particularly under conditions where formal systems are inadequate (Bode et al., 2011). Informal coordination, relational governance, and experiential learning have been identified as important response mechanisms (Wieland & Wallenburg, 2013).

2.5 Empirical Studies on Supply Chain Resilience

Empirical research on supply chain resilience that has been conducted in the recent past is characterized by three dominant approaches:

1. **Survey-based studies** examining relationships between resilience constructs and performance
2. **Analytical and simulation models** evaluating disruption scenarios
3. **Limited case studies**, primarily exploratory in nature

While survey studies provide breadth, they often abstract away from contextual and processual richness. Analytical models, though rigorous, rely on simplifying assumptions that may not reflect real-world manufacturing complexity. Consequently, scholars have repeatedly called for **multiple case studies** to deepen understanding of resilience-building mechanisms in context-specific settings.

Empirical research till date, has relied largely on surveys and analytical models (Ponomarov & Holcomb, 2009; Brandon-Jones et al., 2014). Scholars repeatedly call for in-depth case studies to uncover process-level insights into resilience development (Barratt et al., 2011).

Table 1: Classification of Supply Chain Disruptions and Managerial Response Strategies

Disruption Category	Typical Sources	Common Managerial Responses
Supply-side disruptions	Supplier failure, quality issues	Multiple sourcing, supplier development
Demand-side disruptions	Forecast errors, market volatility	Flexible production, postponement
Operational disruptions	Equipment breakdowns, labor issues	Preventive maintenance, cross-training
Logistics disruptions	Transportation delays, infrastructure failure	Alternate routes, logistics partnerships
Environmental/regulatory disruptions	Natural disasters, policy changes	Contingency planning, adaptive sourcing

2.6 Synthesis and Research Gap

The literature establishes that supply chain disruptions are inevitable, and that resilience is a critical capability for manufacturing firms. However, three unresolved issues remain evident:

- Limited **contextualization** of resilience within emerging economy manufacturing
- Insufficient **process-level understanding** of how managerial practices shape resilience
- Over-reliance on **survey and modeling approaches**, with few rigorous multiple case studies

Addressing these gaps requires an in-depth, case-based examination of real firms operating under real constraints—precisely the focus of the present study.

3. CONCEPTUAL FRAMEWORK AND THEORETICAL FOUNDATIONS

3.1 Theoretical Foundations of Supply Chain Resilience

The concept of supply chain resilience draws upon multiple theoretical perspectives, reflecting its inherently multidisciplinary nature. So far, three theoretical lenses dominated resilience-oriented supply chain research.

First, the **resource-based view (RBV)** conceptualizes resilience as an outcome of firm-specific resources and capabilities that are valuable, rare, and difficult to imitate. From this perspective, capabilities such as flexible sourcing arrangements, relational capital with suppliers, and information-processing competence enable firms to absorb and recover from disruptions more effectively than competitors. The **resource-based view** suggests that resilience emerges from firm-specific capabilities that are valuable and difficult to imitate (Barney, 1991).

Second, **systems theory** views supply chains as complex adaptive systems characterized by interdependence, non-linearity, and feedback loops. Disruptions in one node may cascade across the system, implying that resilience emerges not solely from individual firm actions but from coordinated responses across the network. **Systems theory** highlights supply chains as complex adaptive systems prone to cascading failures (Choi et al., 2001).

Third, **contingency theory** emphasizes the fit between organizational practices and environmental conditions. Applied to supply chains, this lens suggests that resilience strategies must be context-specific, shaped by factors such as industry characteristics, supply network structure, and institutional environment—making the Indian manufacturing context particularly salient. **Contingency theory** emphasizes alignment between practices and environmental uncertainty (Donaldson, 2001).

Together, these perspectives suggest that supply chain resilience is neither accidental nor uniform; rather, it is **intentionally developed through managerial choices embedded within specific structural and contextual constraints**.

3.2 Key Constructs Underpinning the Framework

Drawing on prior literature, the present study conceptualizes supply chain resilience as a **processual capability** consisting of three interrelated phases:

i. **Disruption Exposure:** Refers to the type, frequency, and severity of supply chain disruptions faced by manufacturing firms. Exposure is shaped by supplier dependency, logistics infrastructure, and regulatory environment.
ii. **Managerial Disruption Management Practices:** Represents the set of organizational mechanisms and decision routines activated in response to disruptions. These practices operate at strategic, tactical, and operational levels.
iii. **Resilience Outcomes:** Captures the ability of the supply chain to absorb shocks, recover performance, and adapt structures or processes to reduce future vulnerability.

This process view aligns with pre-existing resilience literature that emphasizes preparation, response, and recovery rather than static resistance.

3.3 Managerial Practices as the Central Linking Mechanism

A central premise of this study is that **managerial practices mediate** the relationship between disruption exposure and resilience outcomes. Prior research indicates that disruptions alone do not determine performance consequences; rather, it is how managers interpret, prioritize, and respond to disruptions that shapes resilience.

Key categories of managerial practices identified in the literature include:

- **Sourcing and Supply Network Practices:** Multiple sourcing, supplier development programs, and relational governance mechanisms.
- **Operational Flexibility Practices:** Flexible production scheduling, cross-trained workforce, and modular process design.
- **Information and Visibility Practices:** Use of real-time data, cross-functional information sharing, and coordination routines.
- **Relational and Collaborative Practices:** Trust-based supplier relationships, joint problem-solving, and informal coordination.

These practices are particularly relevant in Indian manufacturing supply chains, where relational ties and managerial discretion often substitute for formal contracts and advanced digital infrastructure. Managerial practices thus act as **micro-foundations** enabling resilience outcomes (Teece et al., 1997; Wieland & Wallenburg, 2013).

3.4 Proposed Conceptual Framework

Based on the above synthesis, this study proposes a conceptual framework that links **supply chain disruptions**, **managerial disruption management practices**, and **supply chain resilience outcomes**, while explicitly recognizing the role of the Indian manufacturing context.

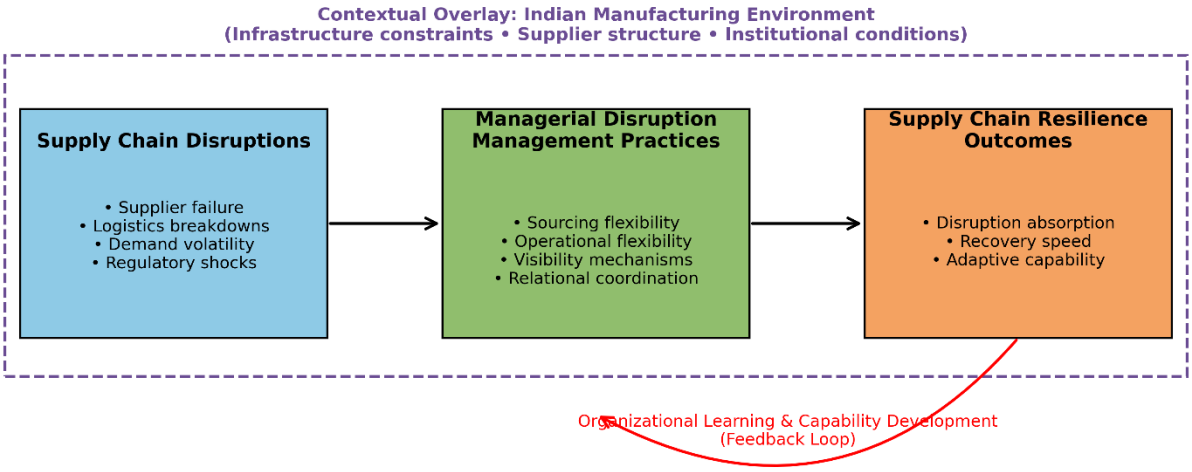

Figure 1: Conceptual Framework Linking Supply Chain Disruptions, Managerial Practices, and Resilience Outcomes

3.5 Theoretical Propositions Guiding the Case Analysis

Consistent with case study research aimed at theory building, the study advances a set of **theoretically informed propositions** rather than testable hypotheses:

- **Proposition 1:** Higher exposure to supply chain disruptions prompts the development of diversified and flexible managerial response practices in Indian manufacturing firms.
- **Proposition 2:** Managerial practices emphasizing flexibility, visibility, and collaboration enhance the ability of manufacturing supply chains to absorb and recover from disruptions.
- **Proposition 3:** The effectiveness of disruption management practices is contingent upon contextual characteristics of the Indian manufacturing environment.

These propositions guide data collection, within-case analysis, and cross-case comparison in subsequent sections.

3.6 Linkage to Research Methodology

The conceptual framework necessitates a **multiple case study methodology** capable of capturing dynamic processes, managerial decision-making, and contextual nuances. Accordingly, the next

section details the research design, case selection logic, data sources, and analytical procedures employed in this study.

4. RESEARCH METHODOLOGY

4.1 Research Design

This study adopts a **multiple case study research design** to examine how Indian manufacturing firms manage supply chain disruptions and build resilience capabilities. A case study approach is particularly suitable for this research as it enables in-depth exploration of complex, context-dependent phenomena and facilitates theory building through rich empirical evidence.

Multiple case studies, as opposed to a single-case design, enhance analytical generalization by enabling **cross-case comparison** and pattern matching. The design follows a **replication logic**, wherein each case serves as a distinct empirical experiment that either confirms or extends emerging theoretical insights derived from the conceptual framework.

A **multiple case study design** is appropriate for theory building and process understanding (Yin, 2014; Eisenhardt, 1989). Replication logic enhances analytical generalizability (Eisenhardt & Graebner, 2007). Data triangulation and pattern matching strengthen validity and reliability (Miles & Huberman, 1994).

4.2 Case Selection Criteria

Cases were selected using **theoretical sampling**, guided by the objective of maximizing learning rather than statistical representativeness. The following criteria informed case selection:

i. **Manufacturing Intensity:** Firms with complex, multi-tier supply chains and significant dependence on external suppliers.
ii. **Exposure to Supply Chain Disruptions:** Firms that have experienced notable supply, logistics, or operational disruptions over the past decade.
iii. **Operational Presence in India:** Firms with substantial manufacturing and sourcing activities within India.
iv. **Data Accessibility:** Availability of reliable archival data and access to knowledgeable informants at managerial levels.

Applying these criteria ensures that the selected cases are information-rich and appropriate for examining resilience-building practices in the Indian manufacturing context.

4.3 Case Sample

The final sample consists of **three large manufacturing firms** operating in India, representing the automotive and heavy manufacturing sectors. These industries are particularly suitable due to their high supplier dependency, just-in-time production practices, and exposure to demand and supply-side volatility.

Table 2. Profile of Case Firms and Supply Chain Characteristics

Case Firm	Industry Segment	Supply Chain Complexity	Primary Disruption Exposure
Case A	Automotive manufacturing	High (multi-tier suppliers)	Supplier failure, logistics delays
Case B	Automotive & farm equipment	High (domestic & global sourcing)	Demand volatility, capacity constraints
Case C	Commercial vehicles	Moderate to high	Regulatory changes, infrastructure bottlenecks

Note: Firm names are anonymized at this stage to preserve confidentiality and analytical neutrality; they will be disclosed where appropriate in later sections.

4.4 Data Sources

To ensure data triangulation and analytical rigor, multiple sources of evidence were utilized:

- **Semi-structured interviews:** Conducted with supply chain managers, procurement heads, operations managers, and logistics coordinators.
- **Archival and documentary data:** Including annual reports, sustainability reports, internal presentations, and industry reports.
- **Operational and secondary data:** Where accessible, data on inventory levels, supplier lead times, delivery performance, and disruption recovery timelines were examined.

Using multiple data sources reduces single-informant bias and strengthens construct validity.

4.5 Data Collection Procedure

Data collection followed a structured yet flexible protocol. An interview guide was developed based on the conceptual framework and theoretical propositions, focusing on:

- Nature and frequency of supply chain disruptions

- Managerial responses and decision-making processes
- Short-term and long-term impacts on supply chain performance
- Learning mechanisms and post-disruption adaptations

Interviews were recorded, transcribed, and verified for accuracy. Documentary evidence was systematically catalogued and linked to interview data to facilitate triangulation.

4.6 Data Analysis

Data analysis was conducted in three stages:

i. **Within-Case Analysis:** Each case was analyzed independently to identify disruption events, response strategies, and resilience outcomes.
ii. **Cross-Case Analysis:** Patterns were compared across cases to identify similarities and differences in managerial practices and resilience development.
iii. **Theory Matching:** Empirical patterns were matched against the theoretical propositions and conceptual framework to refine and extend existing theory.

This iterative approach allowed continuous movement between data and theory, strengthening analytical depth.

4.7 Research Rigor and Trustworthiness

To enhance methodological rigor, the study employed established qualitative research criteria:

- **Construct Validity:** Multiple sources of evidence and chain-of-evidence documentation
- **Internal Validity:** Pattern matching and explanation building
- **External Validity:** Replication logic across cases
- **Reliability:** Use of a standardized case study protocol and database

These measures collectively enhance the credibility and trustworthiness of the findings.

4.8 Ethical Considerations

Ethical safeguards were observed throughout the research process. Participation was voluntary, informed consent was obtained, and confidentiality of respondents and sensitive firm information was strictly maintained.

5. CASE ANALYSIS AND FINDINGS

5.1 Within-Case Analysis

The within-case analysis examines each firm independently to understand the nature of disruptions faced, managerial responses enacted, and resilience outcomes achieved. This approach preserves contextual richness and allows process tracing within each case.

5.1.1 Case A: Automotive Manufacturing Firm

Disruption Profile

Case A operates a highly synchronized automotive supply chain with strong reliance on tier-1 and tier-2 suppliers. Major disruptions reported include supplier insolvency, logistics delays caused by infrastructure bottlenecks, and quality failures at upstream supplier facilities.

Managerial Response Practices

The firm responded to disruptions by strengthening supplier development initiatives, introducing dual sourcing for critical components, and creating cross-functional crisis response teams. Informal coordination mechanisms played a crucial role, particularly during supplier failures where rapid managerial intervention substituted for contractual enforcement.

Resilience Outcomes

These practices enabled Case A to reduce disruption recovery time and stabilize production schedules. Over time, the firm institutionalized learning mechanisms, leading to improved preparedness for future disruptions.

5.1.2 Case B: Automotive and Farm Equipment Manufacturer

Disruption Profile

Case B faced pronounced demand-side volatility due to cyclical market fluctuations and seasonal demand patterns. Supply-side disruptions were less frequent but had significant downstream impact when they occurred.

Managerial Response Practices

The firm emphasized operational flexibility through modular production systems and cross-trained labor. Scenario planning and rolling forecasts were adopted to manage demand uncertainty.

Supplier relationships were characterized by long-term engagement and information sharing rather than transactional contracting.

Resilience Outcomes

Case B demonstrated high absorptive capacity, enabling it to continue operations during moderate disruptions with minimal performance degradation. Adaptation was evident in revised production planning routines and improved coordination with key suppliers.

5.1.3 Case C: Commercial Vehicle Manufacturer

Disruption Profile

Case C experienced disruptions primarily from regulatory changes, transportation delays, and infrastructural inadequacies. These disruptions were largely exogenous and difficult to predict.

Managerial Response Practices

Management relied heavily on contingency inventory buffers and alternate logistics routes. Decision authority was decentralized, allowing plant-level managers to respond swiftly to localized disruptions.

Resilience Outcomes

While redundancy-based strategies increased cost, they significantly enhanced recovery speed. Post-disruption reviews led to the reconfiguration of supplier locations and logistics partnerships, strengthening long-term resilience.

5.2 Cross-Case Analysis

The cross-case analysis identifies common patterns and contrasts across the three cases, enabling analytical generalization beyond individual firm contexts.

Table 3. Cross-Case Comparison of Disruptions, Managerial Practices, and Resilience Outcomes

Dimension	Case A	Case B	Case C
Dominant disruption type	Supply-side failures	Demand volatility	Regulatory & logistics
Key managerial practices	Dual sourcing, supplier development	Operational flexibility, forecasting	Redundancy, decentralization
Primary resilience mechanism	Collaboration & flexibility	Absorptive capacity	Recovery speed
Learning orientation	Moderate	High	Moderate
Cost–resilience trade-off	Balanced	Low additional cost	High redundancy cost

5.3 Pattern Identification and Theoretical Insights

Three robust patterns emerge from the analysis:

i. **No Single Resilience Pathway:** Resilience was achieved through different combinations of practices across cases, reinforcing the contingency-based nature of resilience strategies.
ii. **Centrality of Managerial Judgment:** Across all cases, managerial discretion and informal coordination were critical during disruption episodes, often outperforming formalized plans.
iii. **Learning as a Resilience Multiplier:** Firms that systematically reflected on disruption experiences demonstrated superior adaptive capability over time.

These patterns align strongly with the conceptual framework and support the proposed theoretical propositions.

5.4 Refinement of Theoretical Propositions

Based on empirical evidence, the propositions outlined in Section 3 are refined as follows:

- **Refined Proposition 1:** Disruption exposure leads to heterogeneous resilience strategies shaped by firm-specific capabilities and contextual constraints.

- **Refined Proposition 2:** Managerial practices emphasizing flexibility and collaboration contribute more to resilience than redundancy alone, except under high environmental uncertainty.
- **Refined Proposition 3:** Contextual factors in Indian manufacturing amplify the importance of informal coordination and decentralized decision-making.

5.5 Summary of Findings

The case analysis demonstrates that supply chain resilience in Indian manufacturing firms is not the result of standardized best practices but emerges from **context-sensitive managerial action**. The findings provide strong empirical grounding for advancing resilience theory beyond abstract constructs toward practice-oriented understanding.

The findings corroborate prior work suggesting that resilience is achieved through different configurations of flexibility, redundancy, and collaboration (Tang, 2006; Pettit et al., 2010). The central role of managerial judgment aligns with earlier disruption response studies (Bode et al., 2011).

6. DISCUSSION

6.1 Reinterpreting Supply Chain Resilience through an Emerging Economy Lens

The findings of this study reinforce the view that supply chain resilience is a **context-dependent, managerial capability**, rather than a universally standardized set of practices. While prior literature conceptualizes resilience in terms of flexibility, redundancy, and visibility, the case evidence demonstrates that **how these dimensions are enacted** varies significantly under emerging economy conditions.

In Indian manufacturing supply chains, infrastructural constraints, supplier heterogeneity, and institutional uncertainty fundamentally shape resilience-building pathways. Rather than relying predominantly on formalized systems or technologically intensive solutions, the case firms emphasize **managerial judgment, relational coordination, and experiential learning**. This extends pre-existing resilience literature by illustrating that resilience does not necessarily require advanced digital infrastructure but can emerge from adaptive managerial practices embedded in local contexts.

6.2 Managerial Practices as the Core Micro-Foundations of Resilience

A central insight from the cross-case analysis is the pivotal role of **managerial practices as micro-foundations of resilience**. The study demonstrates that disruptions do not automatically translate

into performance degradation; instead, it is the **interpretation and response enacted by managers** that determines resilience outcomes.

Across cases, practices such as informal coordination with suppliers, rapid cross-functional decision-making, and decentralized authority were more influential than pre-defined contingency plans. This finding supports and extends earlier conceptual arguments that resilience is a **dynamic capability**, developed through repeated exposure to disruption and iterative learning.

Importantly, the findings suggest that managerial practices act as a **mediating mechanism** between disruption exposure and resilience outcomes—an aspect often implied but insufficiently demonstrated in prior empirical research.

6.3 Flexibility versus Redundancy: Revisiting a Core Debate

Earlier literature frequently contrasts flexibility and redundancy as alternative resilience strategies, often treating redundancy as costly and inefficient. The present findings complicate this dichotomy. While flexibility-based practices (e.g., modular production, cross-trained labor) were effective in managing demand and moderate supply disruptions, redundancy-based practices (e.g., buffer inventory, alternate logistics routes) proved indispensable under conditions of high uncertainty and regulatory shocks.

This suggests that resilience should not be conceptualized as a binary choice between flexibility and redundancy, but rather as a **contextually optimized configuration** of both. In the Indian manufacturing context, where exogenous disruptions are frequent and difficult to predict, redundancy—despite its cost implications—serves as a critical resilience enabler.

6.4 Learning and Adaptation as Long-Term Resilience Drivers

A notable contribution of this study lies in its emphasis on **organizational learning** as a cumulative driver of resilience. Firms that systematically reflected on disruption events, revised routines, and institutionalized lessons exhibited superior adaptive capacity over time.

This finding advances prior resilience research by shifting attention from short-term recovery metrics toward **long-term capability development**. Resilience emerges not merely from absorbing shocks, but from **learning how to respond better to future disruptions**. Such learning-oriented practices were particularly salient in firms that treated disruptions as strategic signals rather than operational anomalies.

6.5 Implications for Supply Chain Resilience Theory

The findings offer several theoretical implications:

i. **Contextual Embeddedness of Resilience:** Resilience capabilities are shaped by institutional, infrastructural, and relational contexts, challenging universalistic models.
ii. **Managerial Agency as Central:** The study foregrounds managerial action as the primary mechanism through which resilience is enacted, complementing structural explanations.
iii. **Process-Oriented View of Resilience:** Resilience should be conceptualized as an evolving process encompassing disruption exposure, response, recovery, and learning, rather than as a static attribute.

By grounding these insights in multiple case studies, the research strengthens the empirical foundations of supply chain resilience theory and responds directly to long-standing calls for qualitative, process-oriented inquiry.

6.6 Positioning Relative to Prior Literature

Relative to existing studies till date, this research extends prior work in three important ways:

- It shifts the empirical focus from developed economies to **Indian manufacturing supply chains**
- It moves beyond survey-based correlations to **process-level explanations**
- It integrates managerial practices explicitly into resilience theorization

In doing so, the study bridges the gap between abstract resilience constructs and real-world disruption management practices.

The results extend resilience theory by empirically demonstrating managerial practices as mediating mechanisms, supporting dynamic capability arguments (Teece et al., 1997). The Indian manufacturing context further reinforces calls for contextualized resilience theorization (Christopher & Peck, 2004).

7. IMPLICATIONS

7.1 Theoretical Implications

This study offers several important implications for supply chain resilience theory.

First, the findings reinforce the argument that supply chain resilience should be conceptualized as a **dynamic, process-oriented capability** rather than a static structural attribute. By tracing how firms respond to disruptions over time, the study demonstrates that resilience evolves through iterative cycles of exposure, response, recovery, and learning. This process perspective complements and extends pre-existing resilience models that emphasize preparedness and recovery but often understate adaptation.

Second, the study advances resilience theory by explicitly identifying **managerial practices as micro-foundations** of resilience. While prior literature acknowledges the importance of flexibility, redundancy, and collaboration, the present findings reveal that these dimensions are operationalized through managerial judgment, informal coordination, and decentralized decision-making. This highlights the need for resilience theories to move beyond structural configurations and incorporate managerial agency more centrally.

Third, the study contributes a **context-sensitive understanding of resilience** by situating resilience-building practices within the Indian manufacturing environment. The findings challenge implicit assumptions of institutional neutrality in existing models and demonstrate that infrastructural constraints, supplier heterogeneity, and regulatory uncertainty materially shape resilience strategies. This underscores the importance of contextual embeddedness in resilience theorization, particularly in emerging economies.

7.2 Managerial Implications

The findings of this study provide several actionable insights for managers responsible for designing and operating manufacturing supply chains.

Develop context-appropriate resilience strategies: Managers should avoid adopting standardized resilience "best practices" without considering local constraints. In emerging economy contexts, relational coordination and managerial flexibility may be more effective than capital-intensive technological solutions.

Balance flexibility and redundancy strategically: While flexibility-based practices help manage routine volatility, redundancy-based mechanisms remain essential for absorbing high-impact, low-probability disruptions. Managers should view redundancy not as inefficiency but as a strategic investment in continuity.

Empower decentralized decision-making during disruptions: The case evidence suggests that rapid response is facilitated when decision authority is pushed closer to the point of disruption. Establishing clear escalation protocols while preserving local autonomy enhances response speed and effectiveness.

Institutionalize learning from disruptions: Organizations that systematically analyze disruption events and embed lessons into routines develop superior adaptive capability. Managers should treat disruptions as learning opportunities rather than isolated operational failures.

7.3 Implications for Policy and Industry Stakeholders

Beyond firm-level management, the findings carry implications for policymakers and industry bodies. Infrastructure development, supplier capability enhancement programs, and regulatory stability can significantly reduce disruption exposure and enhance systemic resilience. Industry associations may play a facilitative role by promoting information sharing and collaborative risk mitigation across supply networks.

The emphasis on learning and adaptation resonates with evolutionary views of organizational capability development (March, 1991). The balance between redundancy and flexibility refines prior cost-efficiency trade-offs discussed by Tang (2006).

8. CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

8.1 Conclusion

This study set out to examine how Indian manufacturing firms manage supply chain disruptions and develop resilience capabilities. Drawing on multiple case studies, the research demonstrates that supply chain resilience is best understood as a **contextually embedded, managerial capability** that evolves through experience, learning, and adaptive response rather than through static structural arrangements alone.

The findings reveal that Indian manufacturing firms confront a diverse set of disruptions stemming from supplier dependency, infrastructural constraints, demand volatility, and regulatory uncertainty. In responding to these challenges, firms rely heavily on **managerial judgment, relational coordination, and decentralized decision-making**, often compensating for limitations in formal systems or advanced technological infrastructure. Resilience, therefore, emerges not from the mere presence of buffers or flexibility mechanisms, but from the **effective orchestration of managerial practices under constraint**.

By adopting a process-oriented, case-based approach, the study advances understanding of how resilience is enacted in practice and highlights the importance of contextual sensitivity in resilience research. The findings contribute to a more nuanced and realistic conceptualization of supply chain resilience, particularly within emerging economy manufacturing settings.

By grounding resilience theory in multiple case studies, the research responds directly to calls for qualitative depth in supply chain risk research (Ponomarov & Holcomb, 2009).

8.2 Limitations

As with all empirical research, this study is subject to certain limitations.

First, the use of a **multiple case study design** prioritizes depth over breadth. While this approach is well-suited for theory building and process understanding, the findings are not intended for statistical generalization. Instead, they offer analytical insights that may inform theory and guide further empirical testing.

Second, the study focuses on **large manufacturing firms**, which may possess greater managerial resources and organizational slack than small and medium-sized enterprises. As a result, resilience strategies observed in this study may not be directly transferable to smaller firms operating under more severe resource constraints.

Third, although multiple data sources were used, some reliance on **managerial self-reports** was unavoidable. While triangulation and cross-verification were employed to mitigate bias, retrospective accounts of disruption events may still reflect perceptual or recall limitations.

8.3 Directions for Future Research

Building on the findings and limitations of this study, several avenues for future research emerge.

First, future studies could adopt **mixed-method or longitudinal designs** to examine how resilience capabilities evolve over extended periods and across repeated disruption cycles. Such approaches would complement case-based insights with temporal rigor.

Second, comparative research across **different emerging economies or across firm sizes** could further elucidate how institutional and structural conditions shape resilience-building strategies.

Third, future work may seek to **operationalize managerial practices identified in this study** and examine their relationship with performance outcomes using large-sample empirical methods, thereby strengthening causal inference.

Finally, as digital technologies increasingly permeate supply chains, future research could investigate how **digital visibility tools interact with managerial judgment** in shaping resilience, while maintaining sensitivity to contextual constraints.

8.4 Closing Remark

Overall, this study underscores that supply chain resilience is not a universal blueprint but a **context-driven capability forged through managerial action, learning, and adaptation**. By grounding resilience theory in real-world manufacturing practice, the research contributes to more actionable and contextually relevant supply chain scholarship.

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