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Alternative paths to supply chain resilience: a contextualised processual analysis of SMEs and large enterprises facing external shocks and geopolitical tensions

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ABSTRACT

Supply chain resilience (SCR) is a critical yet bespoke capability. It depends on contextual factors and organizational practices. Grounded in structural contingency theory, this study examines how SMEs and large enterprises respond to supply chain disruptions, focusing on differences and similarities in their resilience mechanisms. Using an inductive, processual qualitative approach, we conducted 22 in-depth interviews in 15 Qatari firms nationwide, across diverse industries, complemented by a focus group, observations, and secondary sources. Findings show that SMEs and large firms follow different response paths to disruptions triggered by external shocks and geopolitical tensions. While both adopt shared strategies to strengthen resilience, differences in structure and capabilities drive divergence. We also identify distinctive processes that help firms manage cascading effects from multiple disruptions. Situated in Qatar's unique geopolitical context, the study informs tailoring SCR strategies by firm size and emphasizes adopting processual, context-sensitive approaches in an increasingly volatile global environment.

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Supply chain risk; disruption; resilience; SMEs and large enterprises; processual approach


Introduction

In a world of constant supply chain (SC) disruptions and unprecedented risks and challenges (Gölgeci et al. 2023), supply chain resilience (SCR) has become a prominent concept to better understand why some firms' SCs fail while others succeed (Gölgeci et al. 2023; Ivanov and Dolgui 2021; Seif et al. 2026; Wieland et al. 2023; Wieland and Durach 2021). The ever-changing business environment and a plethora of SC risks put profound pressure on SCs (Duensing, Schleper, and Busse 2023). In particular, ongoing geopolitical tensions, epitomised by events like the China-US trade war, the Russia-Ukraine conflict, and BRICS de-dollarisation initiatives, have ushered in a new era characterised by tariff escalations, trade restrictions, and diplomatic strains (Roscoe et al. 2022; Witt et al. 2023). These geopolitical upheavals, such as the hefty tariffs the US placed on specific Chinese exports like electric vehicles, semiconductors, and solar panels in May 2024, have reverberated across global SCs, instigating disruptions that cascade through sourcing, manufacturing, transportation, and market demand (Roscoe et al. 2022). Consequently, firms increasingly adopt measures

for achieving SCR amid external shocks and geopolitical tensions (Bednarski et al. 2025; Gemechu et al. 2016). Within the production planning & control (PPC) domain, this resilience imperative is enacted through adjustments to production planning, scheduling, and control systems, such as reconfiguring capacity plans, inventory buffers, and sourcing policies, to cope with geopolitical shocks and pandemic-induced ripple effects (Ali, Nagalingam, and Gurd 2017; Ivanov and Dolgui 2021).

However, recent research highlights that SCR is not a universal, immutable capability but hinges strongly on different contexts and contextual practices (Cohen et al. 2022; Dube et al. 2022; Wieland et al. 2023). As each geopolitical tension is unique, SCs involve different resilience requirements and entail different ways to achieve SCR (Cohen et al. 2022; Dube et al. 2022). Despite growing evidence pointing to different ways and routes to achieving SCR (Cohen et al. 2022; Pettit, Croxton, and Fiksel 2013; Wieland et al. 2023), most mainstream research on SCR overlooks the macro contextual factors and internal organisational dynamics that can instigate differences in SCR practices and strategies (Cohen et al. 2022). Specifically, the role of firm size in the variation

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among practices adopted across different organisations to achieve SCR amid geopolitical tensions is overlooked or treated as a peripheral factor (e.g., Tukamuhabwa et al. 2015)¹. An in-depth explorative analysis of the role of firm size in adopting different or similar practices that underpin SCR vis-à-vis geopolitical tensions is largely missing. Studying the differences between large and small firms concerning SCR is important, as they often have distinct characteristics, resources, and challenges that can significantly impact their ability to withstand geopolitical tensions and disruptions and recover from them.

Likewise, current research relies heavily on cause-and-effect models and does not adequately consider the processes through which SCR emerges (Hughes et al. 2023; Seif et al. 2026). As businesses grapple with the complexities of external shocks and geopolitical uncertainties, unravelling the processes that underlie their ability to absorb shocks, maintain functionality, and efficiently restore operations becomes paramount. Finally, most research examining SCR overlooks smaller, highly import-dependent economies that face concentrated geopolitical and logistical exposure, such as the Arab states of the Persian Gulf and other small open economies. In these settings, SC managers cannot simply apply generic “best practice” recipes: they must decide, under tight resource and time constraints, whether to invest in inventory buffers, supplier diversification, analytics, or workforce capabilities, and whether these choices should differ between SMEs and large firms exposed to the same shocks. Existing contingency studies rarely outline what SCR should entail for a mid-sized manufacturer in such contexts, nor how it is built over time, rather than measured at a single point. These challenges and the gaps identified in SCR research underscore the need for further research on the various processes that shape and contextualise SCR amid a new wave of geopolitical tensions and the polycrisis (Whiting and Parker 2023) the world has been experiencing since COVID-19.

Against this background, this research aims to explore the connections between the processes and underlying mechanisms adopted in response to SC disruptions to achieve SCR and analyse the differences/similarities between small and medium-sized enterprises (SMEs) and large enterprises in achieving SCR. Our study focuses on answering the following research question: *How do SMEs and large enterprises build SCR when facing external shocks and geopolitical disruptions?* In doing so, we employ a processual² An inductive qualitative research approach, based on interviews with 22 executives from 15 firms across various industries and sizes in Qatar, complemented by a focus group with 8 participants, observations, and secondary data sources. We focus on the context of Qatar and explore the mechanisms underpinning SCR across SMEs and large enterprises.

We provide valuable insights into how businesses navigate the complexities of geopolitical tensions while strengthening their SCs against disruptions, focusing on the context of Qatar, a country that has uniquely endured a geopolitically-driven economic blockade. This presents a distinctive and relatively unexplored phenomenon, where the effects of

two different types of environmental disruptions are analysed: the 2017 Qatar Blockade, imposed by its neighbouring countries, and the COVID-19 pandemic in 2020. As such, our study offers insights into how organisations can manage the cascading effects of multiple disruptions with varying characteristics and highlights practices that underpin resilience to environmental disruptions. In keeping with the processual approach (Cloutier and Langley 2020), we identify and unravel the processes by which SMEs and large enterprises build their SCR in disruptive contexts. Additionally, we advance the literature on SCR by demonstrating how SMEs and large enterprises emphasise somewhat overlapping but also distinct strategies for enhancing SCR in response to external shocks. To this end, this research responds to calls for a fresh and more context-sensitive approach to SCR (Hughes et al. 2023; Wieland et al. 2023; Wieland and Durach 2021) and presents a fresh perspective on the study of SCR in a world that is becoming increasingly volatile and fraught with tension.

Theoretical background

Geopolitical disruptions and structural contingency theory

Geopolitical risks -stemming from political, social, or economic factors in specific regions or countries- exert profound impacts on SCs, leading to disruptions and uncertainties that threaten the stability and functionality of global trade networks (Roscoe et al. 2022; Witt et al. 2023). Scholars have highlighted the multifaceted nature of geopolitical risks, their implications for risk management practices, and their far-reaching consequences on global SC dynamics (Roscoe et al. 2022). Geopolitical tensions can lead to disruptions in transportation routes, trade embargoes, and changes in market dynamics, impacting SCs (Gemetchu et al. 2016). For instance, the China-US trade war and the Russia-Ukraine conflict have demonstrated how tariff escalations, trade restrictions, and diplomatic tensions can reverberate through global SCs, causing disruptions in sourcing, manufacturing, and market demand (Roscoe et al. 2022).

A recent study by Bednarski et al. (2025) articulates the strategies firms can undertake to mitigate geopolitical disruptions. The results of their literature review suggest that the impact of geopolitical disruptions on SCs can be alleviated by (1) redesigning SCs, including regionalisation, backshoring, and moving away from just-in-time delivery models, and (2) implementing emerging technologies, such as blockchain, 3D printing, and artificial intelligence, to enhance SC transparency and develop modular manufacturing.

Structural contingency theory (SCT) explains how firms of various sizes build resilience against geopolitical disruptions (Parast 2022; Safari et al. 2024). SCT rests on three core premises: first, there is no single best way to organise; second, organisational effectiveness depends on achieving a “fit” between a firm’s structural features and key contingencies such as environmental uncertainty, technology, and size; and third, misfit between structure and contingencies generates performance pressures that trigger structural change

(Burns and Stalker 1994; Donaldson 2001; Lawrence and Lorsch 1967). From a PPC perspective, contingency fit is reflected in the configuration of manufacturing planning and control systems, including choices about planning horizons, workload control, and the integration of digital tools for visibility and analytics (Ivanov and Dolgui 2021). In relatively stable environments, mechanistic structures characterised by high formalisation and centralised control tend to be effective, whereas in turbulent environments, more organic structures with decentralised decision-making, lateral communication, and flexible roles are better suited to cope with uncertainty (Burns and Stalker 1994; Donaldson 2001; Lawrence and Lorsch 1967).

Recent work extends this logic to SC risk and resilience, arguing that resilience capabilities must be tailored to contextual factors such as disruption profile, SC complexity, and firm size (Parast 2022; Safari et al. 2024; Sousa and Voss 2008). For instance, Parast (2022) develops a contingency perspective of organisational and SCR, showing that the value of particular capabilities (e.g., redundancy, flexibility, visibility) depends on strategic and operational contingencies, while (Safari et al. 2024) demonstrate that the incidence of risk events and choice of resilience practices differ systematically across start-ups, SMEs, and large firms. In line with this perspective, geopolitical tensions and repeated shocks (the Gulf Cooperation Council (GCC) blockade and the COVID-19 pandemic) represent critical environmental contingencies for Qatari firms in our study. Meanwhile, firm size captures key structural contingencies, including available slack, the degree of formalised risk management, and reliance on personal versus bureaucratic coordination. SCT thus provides an explanation as to how SMEs and large enterprises differ in their paths to achieving SCR. To synthesise these arguments, [Supplementary Appendix 1](#) summarises how SCT explains the distinct resilience behaviours of SMEs and large enterprises under disruption, based on their structural profiles and resource configurations.

Supply chain resilience processes and practices

SCR –“the capacity of a supply chain to persist, adapt, or transform in the face of change” (Wieland and Durach 2021, p. 316)– has recently gained importance in supply chain management (SCM) research, given the unyielding problems and challenges associated with SCs (Gölgeci et al. 2023; Wieland 2021). With the growing incidence and gravity of SC failures and the economic consequences of such disruptions (Gölgeci et al. 2023), scholars and practitioners are increasingly pressured to understand how firms develop SCR. Past research often examines SCR as a capability and desired outcome variable and typically focuses on the antecedents (and in some cases, boundary conditions) of SCR through covariance-based examinations (Ali and Gölgeci 2019; Pettit, Croxton, and Fiksel 2013; Tukamuhabwa et al. 2015). As SCs are dynamic, responsive, and fluid systems (Wieland 2021) with unique circumstances and conditions, there is a growing recognition of the need for contextualised and processual understanding of the enablers of and underlying forces behind SCR (Cohen

et al. 2022; Wieland et al. 2023). Recent contributions have begun to move beyond static lists of generic capabilities and examine how specific configurations of resources and practices give rise to SCR under different conditions. For example, Jiang, Feng, and Huang (2024) employ fuzzy-set qualitative comparative analysis (fsQCA) to demonstrate that multiple equifinal combinations of SC integration and big data analytics capabilities can yield high proactive and reactive SCR, underscoring that no single antecedent is necessary on its own. Similarly, Nikookar, Gligor, and Russo (2024) identify several “recipes” of managerial and organisational capabilities that support SCR to both high- and low-impact disruptions, arguing that the way capabilities are combined often matters more than their individual presence. PPC research has similarly emphasised that resilience is not only a matter of network design but of how PPC processes are continually adapted under disruption, for example, through smart PPC systems, digital SC twins, and analytics-enabled risk management (Ali, Nagalingam, and Gurd 2017; Ivanov and Dolgui 2021; Seif et al. 2026). These configurational studies mark an important departure from simple cause–and–effect models but remain largely cross-sectional and typically treat firm size and geopolitical context as background controls rather than as generative contingencies that shape which SCR pathways are feasible.

Work on governance and institutional context likewise highlights that SCR strategies are deeply shaped by environmental conditions. Freitas et al. (2024), for instance, demonstrate how firms exposed to SC piracy in Brazil gradually develop “risk resilience” by integrating transactional governance (e.g., tracking technologies) with relational governance and social capital in an environment characterised by weak regulative institutions and mistrust. Yet this emerging stream focuses predominantly on large manufacturers in major emerging economies, leaving smaller and more import-dependent states, as well as size-based differences within such economies, largely unexplored. Our study extends these debates by examining how SMEs and large enterprises in a small Gulf state configure SCR processes under overlapping geopolitical and pandemic shocks, thereby treating both firm size and national context as central contingencies rather than peripheral descriptors.

Extant research recognises the fragility of today’s disaggregated and globalised value creation and the need to reimagine and redesign SCs with SCR in mind (Gölgeci et al. 2023). Consequently, there is a rising need to identify unique and contextualised processes involved in developing SCR. However, the contextual aspect of SCR regarding organisational size remains largely unexplored (Cohen et al. 2022; Safari et al. 2024). Therefore, understanding the processes that drive the development of SCR becomes even more complex when examining different firm sizes. For example, smaller firms often have flatter organisational structures and shorter decision-making processes, allowing them to adapt quickly to changes in demand, disruptions, or market conditions. They also tend to have fewer slack resources than larger firms (Malagueño, Gölgeci, and Fearné 2019). Additionally, larger firms may have dedicated risk

management teams and more robust risk assessment processes, whereas smaller firms often rely on informal networks and close relationships with suppliers to manage risks effectively (Malagueño, Gölgeci, and Fearne 2019; Safari et al. 2024). Understanding these SC-level differences between different firm sizes can provide valuable insights into developing effective SC strategies, improving resilience, and optimising processes for both large and small organisations. As we focus on distinct processes adopted to achieve SCR across different firm sizes, we, in this paper, distinguish two different major types of firms: 1) SMEs and 2) large enterprises.

Simultaneously, a rapidly growing body of research foregrounds digital and analytics-based strategies for SCR. Seif et al. (2026) find that analytics capability enhances SCR and, in turn, performance. However, they also show that high levels of SC integration can dampen the performance benefits of analytics, challenging the widespread assumption that more integration is always beneficial. Other work reports the opposite pattern, with analytics, collaboration, and flexibility jointly reinforcing SCR performance (Singh 2025). These mixed findings suggest that the value of analytics and integration for SCR is highly contingent upon contextual conditions and the manner in which they are enacted over time. Rather than adjudicating between “more integration is better” and “integration can backfire”, our processual lens shows how SMEs and large enterprises in Qatar sequence and combine practices such as inventory buffering, supplier diversification, quality management (QM), and information sharing under repeated geopolitical and pandemic disruptions, thereby speaking directly to the contextual, mechanism-focused gaps highlighted in these recent debates.

In addition to a little understanding of the adopted practices of SCR processes in SMEs and large enterprises, most of the studies on SCR are conducted in the context of developed countries (Pettit, Croxton, and Fiksel 2013) or large developing countries like China (Shen and Sun 2023) and India (Badhotiya et al. 2022). Firms competing in different environments face different political, social, and economic conditions. Therefore, they are often set to use different processes to remain competitive. However, little is known about the underlying mechanisms that explain how SCR emerges in the contexts in which it occurs. Thus, there is a profound need for a better understanding of the underlying processes of SCR in smaller countries.

For SMEs in particular, ‘Wasta’ (the use of social capital and personal/professional connections) can compensate for limited formal power or resources by enabling faster problem-solving, access to alternative suppliers, and quicker coordination with government agencies. For large firms, *wasta* reinforces long-term relational stability with suppliers and authorities, thereby strengthening SCR through trust, preferential access, and reduced operational bottlenecks (Al-Ma’aitah, Soltani, and Liao 2021).

Furthermore, Sullivan-Taylor and Branicki (2011) reveal that the processes through which SCR emerges differ by various organisational factors, including size. Thus, there are no general/universal management processes against SC

disruptions that just fit all. Firms will likely use different approaches to manage their SC systems and may need to develop different processes to be more responsive. However, there is a lack of in-depth knowledge concerning the processes for responding to SC disruptions and building SCR.

This study addresses four major gaps in the literature. First, geopolitical blockades hinder not only the movement of people across borders but also the exchange of goods and services among neighbouring countries. These blockades affect both businesses and SCs dealing with raw materials and finished products. Despite some reports on the impact of blockades, the extent to which SC actors can rebuild their networks remains unexamined. The second gap analyzes the combined effects of the pandemic and geopolitical blockades on SCR. The literature lacks studies on how these two factors interact, where pandemic-related demand reduction affects sectors across the economy.

Third, although recent contingency-based studies acknowledge that the effectiveness of SCR capabilities depends on strategic and structural conditions (e.g., Parast 2022; Safari et al. 2024), they typically operationalise contingencies such as firm size through cross-sectional level differences in practices and performance. In parallel, configurational studies (e.g., Jiang, Feng, and Huang 2024; Nikookar, Gligor, and Russo 2024) document multiple “recipes” for SCR but rarely investigate how these configurations are built and recombined over time, or how they differ between SMEs and large firms facing the *same* sequence of shocks. As a result, we still know little about the *processes* through which size- and context-specific SCR capabilities emerge and interact during repeated disruptions.

Many studies see SCR as static, but recognising its dynamic nature and the practices behind it is essential for building resilience. This paper fills existing gaps by establishing a theoretical framework based on surveys, interviews, and focus groups that verify and validate our findings. In light of these gaps, this study provides a theoretical foundation for researchers to build upon and enhance the SCR of SMEs and large enterprises. We analyse the impact of geopolitical uncertainty and external shocks on SCR development processes in these organisations, providing a contextualised, size-sensitive assessment of resilience building.

Methods

Research context

This study uses data from Qatari firms to focus on the GCC region. Qatar is a distinctive and intriguing context to investigate SCR, given the blockade imposed by some of the GCC countries (UAE, Bahrain, Saudi Arabia) and Egypt between 2017 and 2021 that severely disrupted Qatar’s SCs. Qatar’s airspace and territorial waters were blocked, along with Qatar’s only land crossing through Saudi Arabia. Approximately 80 percent of Qatar’s food imports originated from its Gulf neighbours, primarily Saudi Arabia, while the remaining 20 percent was shipped through the UAE ports of Dubai and Fujairah before the blockade (Torchia 2017). Qatar

has faced geopolitical vulnerabilities due to its location in a geopolitically sensitive region, surrounded by countries with diverse political and economic relationships. Although the blockade was largely resolved by 2021, its aftereffects persist to this day. Similarly, the impact of the blockade was intensified by subsequent COVID-19-related SC disruptions that were even more severe and experienced globally (Dube et al. 2022; Gölgeci et al. 2023)³.

Qatar imports a substantial portion of its goods. Any disruptions to global SCs can have cascading effects on local markets, highlighting vulnerabilities and potential strategies for enhancing SCR. In a short period, Qatar overcame the SC disruptions imposed by the blockade and the ensuing COVID-19 pandemic by using different processes. Thus, these conditions encountered by Qatari firms in recent years make Qatar an appropriate setting for examining SCR and can provide insights into how a country with distinct geopolitical, economic, and infrastructure characteristics manages the challenges of sustaining SCR.

Research approach and sampling

To capture how SCR is built over time rather than as a static property, we adopted a qualitative, inductive, and explicitly processual research design. Process research shifts attention from variance explanations based on relationships between independent and dependent variables to explanations that trace sequences of events, activities, and interactions through which outcomes emerge (Cloutier and Langley 2020; Langley 1999). Instead of asking whether particular resilience practices are associated with performance, a processual approach asks how firms come to develop and recombine such practices over time, under what contingencies, and through which generative mechanisms (Langley et al. 2013; Van de Ven and Huber 1990).

Drawing on Cloutier and Langley (2020) framework for process theoretical contributions, we conceptualise our study as aiming to uncover alternative process pathways through which SMEs and large firms build SCR under frequent external disruptions. This entails (1) focusing on events and activities (e.g., specific disruption episodes, inventory decisions, supplier switches, quality interventions) rather than only on static attributes; (2) attending to temporal ordering and trajectories from the initial GCC blockade shock through subsequent COVID-19 disruptions; and (3) examining contingent interactions among actors (owners, managers, regulators, suppliers) and structures (formal risk procedures, informal networks, QM systems) that give rise to resilience capabilities. In line with process studies of organisational change, we combined retrospective interviewing with comparative case analysis to reconstruct sequences of key events and to identify how earlier responses to the blockade shaped later reactions to the pandemic (Langley et al. 2013; Van de Ven and Huber 1990).

Methodologically, we employed the Gioia procedure to derive first-order codes, second-order themes, and aggregate dimensions; however, we organised our analysis to preserve the temporal flow across these categories. Following Cloutier and Langley (2020) call to move from descriptive category

labels to explanatory process accounts, we iteratively mapped how practices such as inventory buffering, supply-base diversification, information sharing, and QM were combined and recombined across successive disruption episodes to form coherent “resilience pathways” for SMEs and large enterprises. This design strengthens the alignment between our empirical approach and our processual theoretical ambitions by ensuring that the analysis not only identifies categories of practices but also explicates the mechanisms and temporal dynamics connecting them (Cloutier and Langley 2020; Langley 1999; Langley et al. 2013).

The primary characteristic of SMEs is that they have fewer than 500 employees (USBA 2023). Interpretive and exploratory approaches, characterised by qualitative research, are often suitable for comprehending respondents’ experiences of a phenomenon and deriving theories from these experiences (Duensing, Schleper, and Busse 2023; Hughes et al. 2023). Therefore, in line with SCM scholars who employ a qualitative approach to investigate SCs’ more intractable, behavioural, challenging, and complex issues (Duensing, Schleper, and Busse 2023; Yaroson et al. 2021), we adopted a qualitative and inductive approach.

Our sampling principles involved selecting participants who were directly exposed to both major disruptions shaping Qatar’s SC landscape: the Qatar blockade and the COVID-19 pandemic. These disruptions significantly affected core sectors, including manufacturing, logistics, and construction, which collectively represent the backbone of Qatar’s import-dependent economy. The selected firms, therefore, reflect the diversity of industries most affected by geopolitical and operational shocks. We also ensured representation from both SMEs and large enterprises to analyse their processes comparatively and uncover alternative pathways (i.e. a coherent set of processes followed to achieve SCR) to SCR. Accordingly, we purposefully selected key informants with over five years of experience in senior positions related to firms’ SCM. We further refined our search to individuals whose roles required knowledge of SCM practices, suppliers, customers, production processes, and risk and resilience management; we made sure that interviewees had prior experience dealing with disruptive SC events. A few preliminary questions were posed during the initial contact to further validate participants’ experiences with SC disruptions. The intent was to ascertain whether potential participants had direct involvement in implementing these resilience practices or managing such disruptions. Using this approach, we ensured that all participants represented their firms reliably. As in many other countries, size categorisation in Qatar generally considers both the number of employees and the firm’s annual revenue (Qatar Development Bank, 2020). Typically, according to these standards, a firm is classified as small if it has no more than 250 employees and an annual turnover of no more than QAR 100 million, while larger firms exceed these thresholds (Bank QD, 2020).

Data collection

In-depth interviews were conducted with 22 logistics and SC managers from 15 participating Qatari firms—eight large

firms and seven SMEs—to capture the perspectives of experienced SCM executives during September and November 2022. Due to COVID-19 restrictions in certain organisations, three interviews were conducted virtually, while the remaining interviews were held in person. The interviews lasted an average of 67 min, resulting in a total of 24 h and 51 min of recorded verbal data. Additionally, 94 pages of data were transcribed manually to ensure maximum accuracy and attention to detail during the in-depth interviewing process. To protect confidentiality, we anonymised the respondents. Further details about the interviewees are provided in [Table 1](#). We utilised the C1R1 to C15R22 coding system, where C represents the participant firms, R indicates the respondents, and 1 to 22 are the respondent numbers (See [Table 1](#)).

All interviews adhered to an open-ended, semi-structured protocol to enhance reliability and comparability. The interview protocol underwent a pilot test at two organisations in Qatar: one SME in the manufacturing sector and one large enterprise in logistics and distribution, aligned with the size and involvement in SCM. The SME indicated that certain technical terms related to SCR were less familiar to their team. Alternative definitions were added to ensure the protocol was more accessible to participants with varying levels of familiarity with SCM jargon. These clarifications, reflecting recommendations from the pilot run, enhanced the clarity, flow, and relevance of the interview protocol. The first section (Section A) of our semi-structured protocol includes a cover letter and demographic questions regarding the firms and respondents. These questions encompass their primary business area, firm size, annual revenue, and SC complexity, among other aspects. Section B follows with questions about the various types of SC disruptions faced by participant firms, the measures they implement to address and manage these disruptions, and the processes involved in mitigating SC disruptions and building SCR.

Additionally, we conducted a 90-min focus group in January 2024 with eight participants to deepen insights into the focal phenomenon and enrich our data. Eight senior SC managers from SMEs and large enterprises in Qatar's manufacturing, logistics services, and construction sectors were purposively selected to offer diverse perspectives on SCR and reflect key parts of the national economy. The focus group complemented the in-depth exploration of each participant's experiences and narratives obtained through interviews. Focus groups promote interaction and the exchange of ideas among multiple participants simultaneously (Hsuan, Jovanovic, and Clemente 2021). The session also allowed us to cross-verify and triangulate interview data from late 2022, enriching our insights and enhancing the validity of our findings. Discussions were organised around key themes and preliminary interview findings, following a structured agenda that highlighted SC disruption experiences, resilience practices, and differences between SMEs and large enterprises. This setup provided participants with an opportunity to respond directly to the interview findings, confirming, challenging, or expanding upon them. The focus group followed an interview protocol similar to the individual interviews, with minor adjustments to probe and clarify emerging

findings. Participants in the focus group are coded as FGR1 to FGR8. Details of the interview protocol are presented in [Supplementary Appendix 2](#), and a summary of the participants is provided in [Table 1](#).

While interviews provided primary data, complementary data were sought through direct observations and secondary sources from each participating firm to enhance the contextual detail and validity. These observations took place in various settings, such as offices, factories, and meetings. Researchers conducted site visits to firms to directly observe SCR practices related to inventory management, contingency measures, and logistics arrangements for each firm, supported by detailed notes. Firms also provided internal documents, including annual reports, press releases, and operational records, which outlined their respective SCR strategies, the nature of the disruptions, and specific performance metrics related to them. These secondary data sources offered quantitative context to the qualitative insights obtained from the interviews, enabling systematic cross-referencing and verification. Observational data and company documents were integrated into the coding process, allowing researchers to identify recurring themes in SCR across data types. This triangulated approach ensures that the findings are not solely based on interviews; instead, they draw from actual practices and documented strategies, adding depth to the study. [Supplementary Appendix 3](#) extensively covers the collection of secondary data for various firms, featuring a range of archival materials such as annual reports, press releases, firm websites, social media content, industry reports, brochures, and catalogs. This comprehensive secondary data compilation enhances research methodology by addressing gaps in primary data collection and improving the understanding of industry dynamics and firm strategies. In each firm, specific documents were selected based on their relevance for a comprehensive understanding of SCR practices. For instance, annual reports and industry reports offered insights into high-level SCR strategies, while press releases and social media posts frequently documented the firm's responses to recent disruptions, providing a real-time perspective on the resilience measures undertaken. Consequently, researchers examined this data alongside interview and focus group findings to uncover any new insights or contexts that may not have been realised while collecting primary data.

Data analysis

We adopted the Gioia method (Gioia, Corley, and Hamilton 2013) along with open, axial, and selective coding (Corbin and Strauss 1990) to sub-themes and themes and developed a theory on SCR processes from our data. SCM research increasingly adopts the Gioia method in qualitative inquiries (Duensing, Schleper, and Busse 2023). By holding to a set of preset guidelines, this method sets the groundwork for a rigorous and systematic analysis of qualitative data (Gioia, Corley, and Hamilton 2013). Consistent with the Gioia method, our approach involved simultaneous data collection and data analysis phases, in which we discovered and

Table 1. Summary of participating organisations and interviewees.

Interviewee Code	Industry	Firm age	Job title	Interviewee's work domain	Interviewee's years of experience	Firm size (number of employees)	Interview duration in minutes
C1R1	Chemical	55	Senior Manager	Sales and Marketing	>10	Large (300)	45
C1R2	Chemical	55	General Manager	Procurement	6–10	Large (300)	55
C2R3	Chemical	23	General Manager	Sales and Marketing	6–10	SME (60)	94
C3R4	Construction	5	Senior Manager	Logistics & SCM	>10	Large (320)	50
C3R5	Construction	5	Logistics Manager	Logistics & SCM	6–10	Large (320)	35
C3R6	Construction	5	Senior Officer	Logistics & SCM	5	Large (320)	18
C4R7	Construction	16	Senior Manager	Logistics & SCM	>10	Large (400)	105
C5R8	Construction	20	General Manager	Logistics & SCM	>10	SME (50)	85
C6R9	Construction	4	General Manager	Sales and Logistics	>10	SME (210)	55
C6R10	Construction	4	Project Manager	Sales and Logistics	6–10	SME (210)	45
C6R11	Construction	4	Procurement Manager	Sales and Logistics	5	SME (210)	18
C7R12	Food	23	General Manager	Sales and Logistics	>10	SME (7)	76
C8R13	Manufacturing	51	Supply Chain Manager	Logistics & SCM	>10	Large (1100)	45
C8R14	Manufacturing	51	Strategic Sourcing Manager	Logistics & SCM	>10	Large (1100)	45
C8R15	Manufacturing	51	Procurement Group Manager	Logistics & SCM	>10	Large (1100)	45
C9R16	Manufacturing	46	Supply Chain Manager	Logistics & SCM	>10	Large (260)	87
C10R17	Construction	100	Supply Chain Manager	Logistics & SCM	>10	Large (660)	123
C11R18	Trading	72	Procurement Manager	Sourcing and SCM	>10	Large (2500)	84
C12R19	Manufacturing	53	Project Manager	Sales and Logistics	6–10	SME (70)	112
C13R20	Manufacturing	12	Procurement and Admin Officer	Sourcing and SCM	6–10	SME (42)	111
C14R21	Service	17	General Manager	Sales and Marketing	>10	SME (95)	68
C15R22	Manufacturing	12	Procurement Manager	Sourcing and SCM	>10	SME (100)	90
FG1	Manufacturing	50	Supply Chain Officer	Logistics & SCM	>10	Large (662)	90
FG2	Service (logistics)	12	Business Dev. Supervisor	Logistics & SCM	>10	Large (457)	90
FG3	Service (logistics)	35	Logistics Officer	Logistics & SCM	>10	SME (250)	90
FG4	Manufacturing	22	Logistics Manager	Logistics & SCM	>10	Large (6000)	90
FG5	Manufacturing	8	CEO	Operations	>20	SME (10)	90
FG6	Manufacturing	2	Director (operations)	Operations	>10	SME (50)	90
FG7	Service	18	Operations Manager	Operations	>10	Large (1200)	90
FG8	Service (food catering)	4	CEO	Business Management	>20	SME (75)	90

demarcated emerging concepts based on interview statements (Gioia, Corley, and Hamilton 2013). As such, we carefully followed the respondents' raw data and explored and compared ideas across all respondents.

We conducted an iterative process of (re)reading and (re)coding the interview data line by line. After spending approximately 30 h on 10 interviews, we developed a preliminary coding scheme that we used to code the remaining 12 interviews separately. The main author independently coded a subsample of the data, followed by double-checking and calibration by others. Coders then compared, discussed, and refined coding choices to ensure alignment. Key segments of data were double-coded by multiple researchers to assess consistency; results were then reviewed, and percentage

agreement was calculated. Themes were finally reviewed by the team for validation and consensus, ensuring the themes accurately represented the data. Following our coding and initial analysis, we identified recurring patterns across our interview transcripts related to respondents' experiences with SC disruptions and SCR processes (Gioia, Corley, and Hamilton 2013). This method allowed us to connect our research question with empirical data and analysis.

We entered the complete sample into MAXQDA once we finalised the coding scheme. MAXQDA was used to manage and analyse all interview transcripts, organising codes and themes hierarchically from first-order codes to second-order themes and aggregate dimensions. Its visualisation tools helped us map relationships between themes, identify

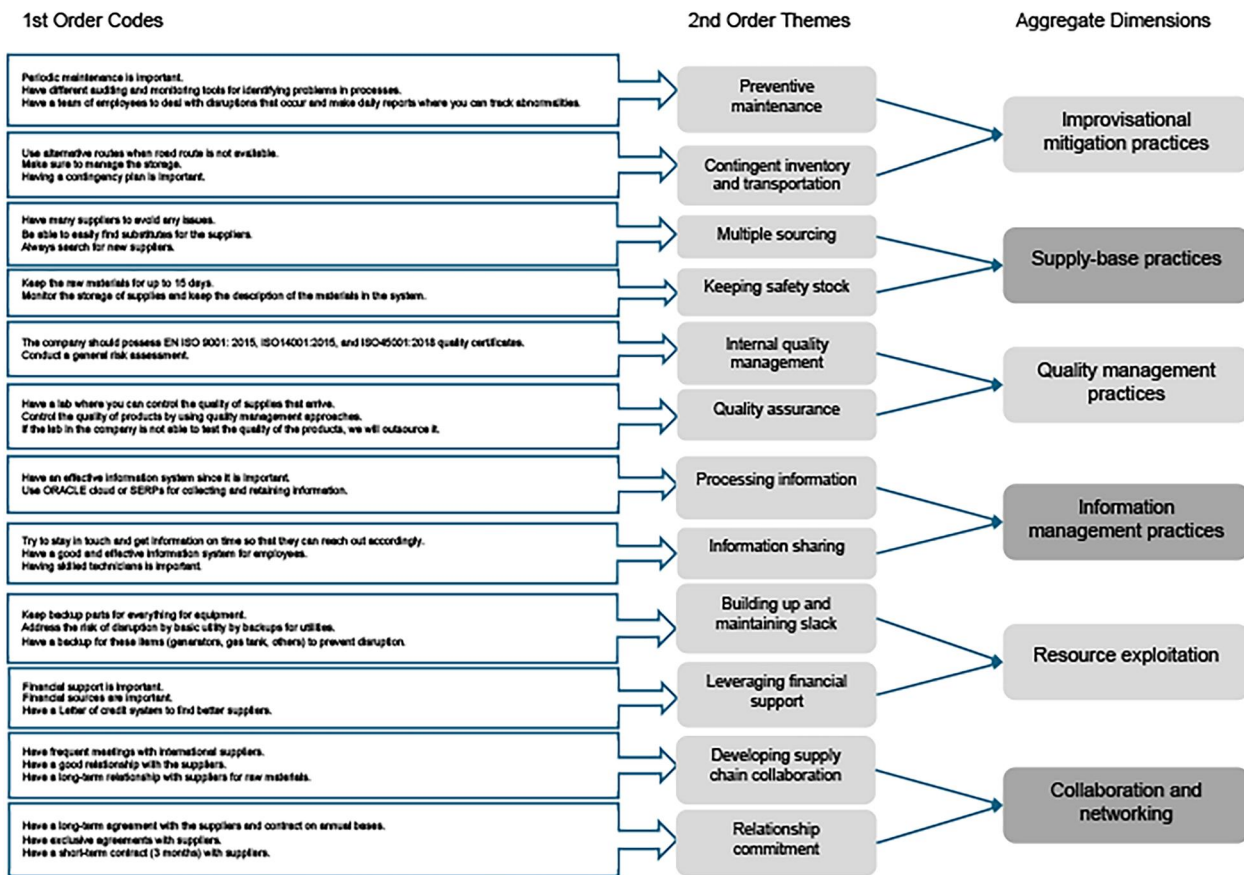


Figure 1. Overview of data structure for SMEs.

Note: Darker-colored aggregate dimensions are shared with large enterprises' aggregate dimensions.

patterns, and construct a coherent narrative. The query functions enabled us to focus on specific codes or themes to refine our interpretations and strengthen the robustness of our findings. Through iterative coding and recoding in MAXQDA, we refined our theoretical framework and validated emerging themes, cross-referencing data and codes in tables to confirm the robustness of both first- and second-order themes.

We coded the data through multiple cycles. Figures 1 and 2 illustrate the data structure and order, beginning with specific first-order codes used by informants and progressing to more abstract second-order themes and aggregate dimensions. After several iterations, we identified twelve second-order themes for both SMEs and large enterprises that captured the constituent activities of the distinct processes underlying SCR for these organisations (Supplementary Appendix 4). We also constructed historical reconstructions of each activity by placing aggregate dimensions over time. Thanks to the focus group study and archival secondary data, we were able to produce more detailed case descriptions and narratives. During our regular meetings, we shared the results of our ongoing data analysis with each other. When no new codes or insights emerged from the continuous data collection and analysis, we concluded that theoretical saturation had been achieved. Finally, we reviewed the entire data set again to seek evidence supporting and refuting the theoretical framework (Miles and Huberman 1994).

Thus, we established the data structure depicted in Figures 1 and 2, after several iterations of refinement and revision.

We also adopted several measures to ensure the trustworthiness of our findings and data quality. In particular, we focused on ensuring credibility, transferability, dependability, and confirmability across the research strategy, sampling, data collection, and data analysis stages (Lincoln and Guba 1985). We first ensured that the sample included multiple industries, followed multiple criteria detailed above to arrive at the final sample, and followed a specific protocol to support transferability and dependability. We then ensured that the sample was inclusive and purposeful, allowing for a detailed description of the focal phenomena to enhance credibility, transferability, dependability, and confirmability. Furthermore, when collecting data, we relied on multiple sources of information through triangulation, sought multiple respondents for each participant firm, and followed a consistent interview protocol that included considerable data collection on focal firms' backgrounds and contexts to support credibility, transferability, dependability, and confirmability.

Finally, we triangulated our primary data with secondary sources. Our approach to analysing these materials involved several key steps to ensure thorough integration with the primary data. We systematically compared patterns and trends identified in the primary data with those emerging from secondary sources. This process validated the recurring themes and insights derived from the interviews.

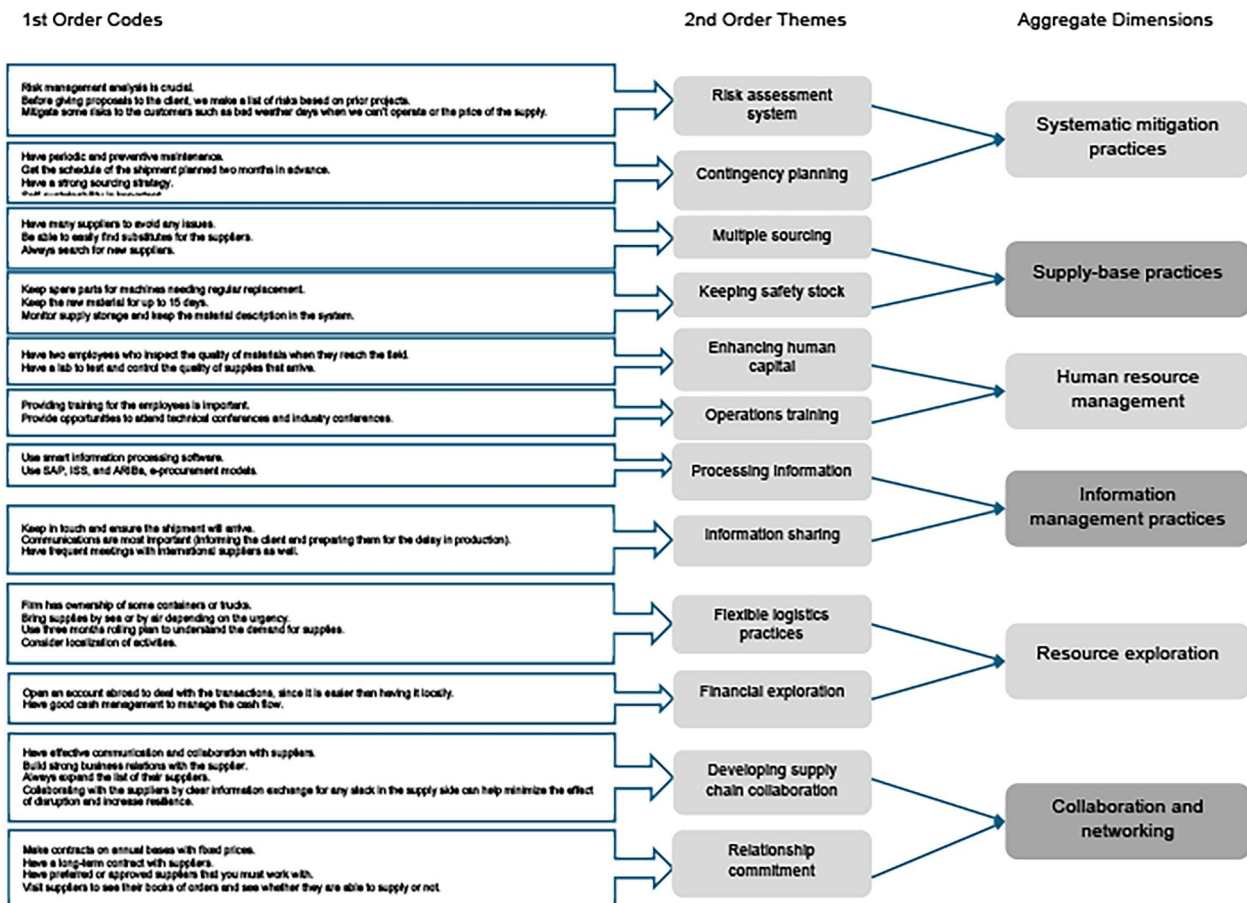


Figure 2. Overview of data structure for large enterprises.
 Note: Darker-colored aggregate dimensions are shared with SMEs' aggregate dimensions.

Observations and interviewees' claims were compared with information found in secondary sources. For instance, managers of large enterprises have invested in advanced information systems, especially ERP systems, to enhance SC visibility and mitigate risks. Reports from these firms indicate that implementing an ERP incurs costs but offers benefits, such as improved communication and operations during crises. This process was crucial for assessing the credibility of primary data and identifying discrepancies or corroborative evidence to strengthen the findings. Secondary data provided additional context and insights not directly addressed during the interviews or focus groups. By integrating information from annual reports, social media, and industry reports, we gained a deeper understanding of each firm's market position and strategic initiatives, enriching our analysis of firm-specific strategies. This comprehensive compilation of secondary data ensured a well-rounded approach to our research, addressing potential gaps left by primary data collection and providing a more complete picture of the industry dynamics and individual firm strategies.

Findings

Rather than presenting isolated categories of resilience practices, our findings trace the processes through which Qatari firms configured and reconfigured their SCs across successive disruption episodes. We compare SMEs and large enterprises

to identify distinct but partially convergent resilience pathways that unfold over time⁴. These pathways illuminate how firm size, structural features, and prior experience with the blockade jointly shape the mechanisms through which SCR develops during the COVID-19 crisis.

Processes for building supply chain resilience

Improvisational mitigation practices

Our study shows that SMEs enhance SCR by integrating planned mitigation with improvisational tactics. It indicates that SMEs employ preventive maintenance, contingent inventory, and transportation as systematic mitigation practices to improve supply-based operations. SMEs regard preventive maintenance as a vital element of effective facility management. It ensures their equipment operates efficiently, promotes employee safety, and prevents significant and costly operational failures and repairs.

Contingent inventory and transportation have been identified as key components of improvisational mitigation practices for SMEs, especially during the pandemic and periods of trade restrictions. Contingent inventory enabled SMEs to cope with sudden fluctuations in demand and storage management. By implementing an action plan for inventory, SMEs could accommodate late supply arrivals, which were frequent during the blockade and pandemic. SMEs often faced situations requiring them to store extra supplies or raw

materials due to uncertainty about the exact arrival of shipments. C6R11 also highlighted that contingent transportation played a crucial role in various emergency scenarios that arose during this time:

“During the COVID-19 pandemic, we had to ship our supplies more than once via air transportation, when it was possible, since the sea route was slow, and shipments were late. Our clients did not want to wait, and they were ready to cover the difference in the shipping cost. On another occasion during the blockade (trade restrictions with neighboring countries), there was a lack of trucks in the country, and we couldn’t distribute our products. Later on, we decided to purchase our trucks instead of outsourcing them.”

Supply base practices: multiple sourcing and inventory buffers

Another major theme among SMEs is building resilience through supply base flexibility. Based on the insights of SCM professionals who participated in the interviews, multiple sourcing as a supply base practice was identified as the second most important process for enhancing SCR. According to the informants, multiple sourcing reduced their SMEs’ reliance on a single supplier and provided additional flexibility to navigate unexpected disruptions that could impact capacity. Furthermore, as they noted, suppliers are often motivated to improve their prices and services due to the competitive landscape. C13R20 shared their experience with multiple sourcing and how it strengthened their firm’s resilience:

“We always have more suppliers to prevent SC failure. At the same time, this gives us more negotiation power with suppliers. If they offer us better conditions, we will sign an exclusive agreement with them, and they will be the main suppliers. We check the conditions on the market and always search for new suppliers.”

Similarly, FGR4 noted that diversifying suppliers helped SMEs navigate the blockade when their primary foreign suppliers became inaccessible:

“We had major suppliers in the neighboring countries, but once we had a sudden blockage, we were like a stunned fish. We had to airlift some of the materials for quick supply, but then we also worked through our suppliers in three countries to source them.”

In addition to multi-sourcing, SMEs maintain safety stocks as an inventory buffer for resilience. Keeping safety stock helped them build a cushion when the products they ordered required longer than expected to arrive at their warehouse. Several firms kept a minimum stock of critical materials (e.g., two months’ supply) on hand to cushion against late shipments or demand surges. Also, safety stock in response to the blockade and ensuing pandemic made them more resilient to unexpected demand surges. C5R8 stated:

“We have a minimum stock level of two months for the supply of materials in case the shipment is late. We need to keep the product inventory for at least two months. This can be shipped in case of unexpected demand. The company has a 3,500 m² absolute dry area, and 248 different raw materials in stock.”

Inventory buffers act as shock absorbers during disruptions, enabling SMEs to maintain production and meet

customer needs amid inbound supply delays. These practices of multi-sourcing and inventory redundancy reflect resilience tactics of supply diversification and stockpiling (Pettit, Croxton, and Fiksel 2013), adapted by SMEs to fit their resource levels.

Quality management (QM) practices

Given their limited slack resources, SMEs place a strong emphasis on QM practices to mitigate risk at the source. All SMEs emphasised the importance of conducting a general risk assessment. The difference lies only in their approaches to risk assessment. Some SMEs employed internal risk assessment measures, while others favoured using QM standard certificates as a crucial QM practice that ensured minimal quality standards, ultimately reducing risk over time by providing a global consensus on managing certain risks. Certificates like the ISO series allow SMEs to enhance their resource procurement, streamline operations, and improve risk management. Additionally, SMEs utilise various software programs tailored to their specific work domains. C13R20 shared:

“As a part of QM standards, we use ISO for risk assessment. The company possesses EN ISO 9001: 2015, ISO14001:2015, and ISO31000:2018 quality certificates and EN61537, NEMA VE-1, and NEMA FG-1 standardization documents. We have had the certificates since the early beginning of the company.”

What also helped SMEs become more resilient were the quality assurance measures as another QM practice. SMEs used various QM approaches, such as testing the quality of raw materials, testing the quality of final products, receiving quality certification from suppliers, and adhering to industry standards. Given that SMEs have limited resources (Malagueño, Gölgeci, and Fearné 2019), most respondents reported that they outsourced their laboratory testing for supply quality. Furthermore, they often did not visit suppliers to ensure that quality standards were met; instead, they relied on remote monitoring. C15R22 informs us about their quality assurance approach:

“We control the quality of products by using QM approaches. Also, we don’t have a lab where we test the quality of the products. We sometimes send it to a lab called ‘xxxxxxx’ in Qatar. Our oil comes with a certificate, so there is no risk that food is contaminated.”

Proactive QM—via standardised certifications, risk audits, and outsourced checks—forms a cornerstone of SMEs’ resilience strategy. This highlights QM as a key resilience enabler, supporting the idea that process standardisation strengthens SCR in smaller organisations.

Information management and sharing practices

SMEs also foster resilience through effective information management and sharing practices. SMEs in the study highlighted information processing as a critical element of their information and information management practices, dedicating resources to enhance their management information systems (MIS). The MIS and information technology (IT) they adopted allowed them to process and utilise information effectively, boosting their SCR. These IT systems provided

tools for collecting and analysing data. The most commonly used IT solutions among SMEs include ORACLE, SAP, and Focus Softnet as ERP platforms for product tracking, financing, distribution, sourcing, importing, and inventory management.

Additionally, the study highlights the importance of information sharing as another crucial practice among SMEs. C5R8 pointed out that information-sharing mechanisms within the firm facilitate faster collaboration and provide a competitive advantage:

“Sharing information helps us stay in touch and get the information timely. Firms that share information can foresee and respond to disruptive events better. We try to maintain an open customer-supplier relationship and inform them in case of late shipments and other issues. This was especially helpful during the pandemic since we were not able to meet in person.”

Another key element of the information management process is sharing knowledge within a firm. SMEs interviewed in the study reported holding regular knowledge-sharing sessions for their employees, which were both technical and general in nature. Employees were encouraged to stay up-to-date on the latest industry trends and obtain the necessary information to enhance their work processes. SMEs compensate for their smaller size with rich information and effective communication. They enhance their ability to respond quickly to disruptions by leveraging IT data management and fostering knowledge sharing. This shows resilience involves not just resources but also information capabilities and social capital.

Resource exploitation

Another finding is that SMEs intentionally utilise any slack resources they can generate as a buffer against disruptions. SC professionals we interviewed recognised the role of inventory leanness and slack resources as means of resource exploitation in enhancing a firm’s resilience. They used the slack resources as a cushion or pool of resources to adapt to external pressures. The most used practices were ordering and storing spare parts for their equipment to prevent production disruption. For SMEs, this was a learned behaviour. C12R19 faced a disruption in its SC caused by machine failure, which motivated them to modify their processes to better prepare for future risk events:

“We had a major machine failure five years ago, and our production process was stopped for about three months. We suffered major losses during this time. The spare part needed for the machine was unavailable locally, and we had to wait for it to be shipped from China. After this incident, we began storing spare parts to prevent any major operational disruptions. This also led to an increase in our storage cost, but we must have it in any case.”

Furthermore, some SMEs opt to secure utilities such as spare electricity generators and extra water tanks or enter into special long-term contracts with utility providers (like liquid gas). Moreover, SMEs often lack sufficient financial support locally. They typically address this issue by implementing new financial processes and relocating their accounts abroad. This financial adaptation was crucial for operations when local support was absent. SMEs utilise available slack—

inventory, capacity, or financial—to create a buffer in their SC. This strategy shows that smaller firms can strategically allocate reserves to key areas to withstand disruptions.

Collaboration and networking

The key components of collaboration and networking that SMEs predominantly utilised in SC practices were joint relationship efforts, collaborative communication, and co-created knowledge. By integrating SC collaboration practices into their SCs, SMEs could facilitate joint planning, develop synergies among partners, and promote real-time information exchange. C2R3 emphasised that transparency is crucial for effective collaboration in addressing the impacts of the blockade:

“We always try to stay in touch with suppliers. When something is wrong from their end, we always prefer to be upfront and mention this to decide whether they should ship the supplies out at all”.

Regular visits to suppliers through joint quality checks were deemed important for most SMEs, according to C5R8:

“We sent quite a few high-quality personnel there, along with lab equipment, to determine whether the material had been harmed. We do this occasionally so that they take us seriously and don’t miss any steps in production. We don’t inform them about the visits until we are there. Until this point, we did not face any issues, except during COVID-19 when it was impossible to travel.”

Lastly, commitment in relationships was emphasised as a key facet of collaboration and networking for building SCR. Some SMEs opt for long-term contracts instead of short-term ones. As SC professionals noted, any form of commitment, even a short-term one, is preferable to no commitment at all; however, fostering long-term relationships with suppliers enhances trust. In contrast, smaller SMEs leaned towards flexible contracts that allow them to adjust to unexpected disruptions and sudden fluctuations in demand or raw material prices. C7R12 shared how their firm utilises short-term contracts to increase resilience:

“We have a short-term contract (three months) with suppliers. If we are not happy with their performance, we can always find a replacement, and we have many replacement options available in the market. We often have changes in demand, and we cannot commit to buying the same quantity (of raw material) for a long period.”

Collaboration and networking enhance SMEs’ resilience. They engage suppliers as problem-solving partners through trust-based communication, regular audits, and balanced contracts.

Large enterprises’ processes for building supply chain resilience

Systematic mitigation practices and contingency planning

In contrast to SMEs’ ad-hoc tendencies, large enterprises rely heavily on structured risk management systems and formal contingency planning to build SCR. They implement various strategies to identify and assess risks by routinely screening for potential SC threats. Due to the complexity of SCs and resource limitations, they gather data on critical steps, flows,

and SC partners to optimise SCR. Next, they utilise different analysis and risk assessment tools to discover effective solutions. Typically, large enterprises allocate audit departments to carry out these risk mitigation exercises and define effective solutions to enhance their resilience. C10R17 explained the mitigation processes that their firm employs:

“The company has a risk assessment system. Before giving proposals to the client, we need to list risks based on prior projects. Then, we assign risk scores every month, and based on them, we take the required actions. We mitigate some risks to the customers, such as bad weather days when we can't operate or the price of the supply (nickel).”

All large participant firms had distinct risk assessment systems but shared the same crucial steps: identification, assessment, mitigation, and control. Another vital practice in systematic mitigation, contingency planning, has been employed by large enterprises to gain better control over their available assets. Large enterprises emphasised that the efficient use of available resources is a key activity in contingency planning. Firms implemented preventive maintenance systems, weekly dispatching schedules, contingency management plans, and self-sustainability to enhance their resource effectiveness. C9R16 informed us about their firm's contingency planning:

*“A*** uses contingency management plans for all suppliers. We emphasized strong sourcing strategies and approaches. Also, we try to be self-sustainable as much as possible. Lastly, I would point out that we practice proactiveness and we always try to be one step ahead.”*

Likewise, FGR1 added to the importance and practice of contingency planning. These plans cover the effective use of available resources and alternative workflows to keep operations running during a crisis:

“A resilience plan means a good contingency plan. The Red Sea issue also provided us with the opportunity to look at supplies differently. Therefore, we have to look at the problems as a strike in one area, and we have to deal with it.”

Large enterprises use a protocol-driven approach to manage disruptions. By monitoring risks and creating fallback plans, they build resilience, ensuring clear procedures and resources are available for response during an external shock.

Supply base practices

According to SCM professionals who participated in the interviews, multiple sourcing as a supply base practice was the most crucial process that large enterprises employed to enhance the resilience of their SCs. By adopting multiple sourcing, these enterprises could mitigate risks by maintaining alternative or backup sources of supply. The informants noted that multiple sourcing lessened their firms' dependence on a single supplier and provided greater flexibility to handle unexpected disruptions that could jeopardise output. C9R16 shared their experience with multiple sourcing and how it strengthened their firm's resilience:

“We purchase product supplies from different suppliers in the US, Europe, India, Asia, Turkey, Saudi Arabia, United Arab Emirates, and

Qatar. We have around 50-70 different suppliers. Having alternatives for the suppliers is good. We have alternative suppliers if some of the suppliers are not able to apply due to load or financial problems.”

Additionally, large enterprises maintained safety stocks as a supply-based strategy for building SCR. There were three types of safety stocks: raw materials, spare parts for machinery, and finished products. Having safety stock available provided a buffer in case the items they ordered took longer than anticipated to arrive at their warehouse. Furthermore, in the event of sudden machine failure or unpredictable demand, they were better equipped to manage disruptions thanks to the availability of safety stock. In this context, C3R6 stated:

“To address an increase in unexpected orders, our storage always has 800 tons of additional product. Also, we stock additional raw materials. When shipment is not possible due to the unavailability of containers, firms make additional space for the storage of late shipments, which creates additional costs. My advice is to store extra products, spare parts, and store supplies by increasing the stock orders.”

In summary, both SMEs and large enterprises utilise multi-sourcing and safety stock; however, large enterprises implement these strategies more extensively and systematically. Large firms often formalise these strategies into official policies, such as requiring at least two suppliers for every critical item or maintaining a specific months-of-inventory for key products.

Human resource management (HRM) practices

Large enterprises emphasised the importance of improving HRM practices by implementing operations training and developing human capital, which can address disruptive situations more effectively. With larger organisational structures, large enterprises viewed their workforce not merely as contributors but as strategic assets for resilience. A common theme was the emphasis on employee training and skill development to ensure the organisation possesses the right competencies to manage disruptions. They offered specialised training to employees in the following areas: workplace safety, industry-specific training, and technical training. Additionally, they sent employees to technical and industry conferences as part of their training programs. C3R6 shared their experiences with operations training within their firm:

“Our firm is supportive of us taking education that can improve our work. Senior managers attend technical and industry conferences, while our firm has different training opportunities organized for the remaining employees. Most of the time, we bring someone from outside of the country to do the training, they are experts in the field.”

Large firms also invested in retaining experienced staff and experts, acknowledging that their expertise is vital during crises. C4R7:

“During the COVID-19 period, hiring new staff or experts was difficult... However, we could overcome the situation by retaining our trained staff to support the development of new practices and facilitate relations with the suppliers. Knowing the supplier's key person helped minimize the impact”.

While SMEs value their people as well, they often lack the scale to implement formal programs. In SMEs, critical

knowledge may be concentrated among a few individuals or shared informally. In larger firms, HRM formalises that knowledge and cultivates a talent pipeline prepared to manage disruption.

Information management practices

Processing information for large enterprises as part of information management practices shows few distinctions compared to SMEs. Large enterprises process information and store it in extensive databases that are maintained over time. In contrast, SMEs may lack the financial resources to do so, although they focus more on how to use the information in the short term to enhance resilience. Large enterprises also have more complex requirements for processing information. They utilise advanced data collection and processing software, which is highly valuable for them since they manage significantly more data than SMEs. Information technologies convert data into operable, useful, and valuable information, which is later used for making business decisions, as C10R17 states:

“We use different software and simulation programs. We have a whole team that is dedicated to data collection and sharing. The software helps us with different items such as purchasing, procurement, business integration, everyday activities, etc.”

Another critical aspect of information management is knowledge sharing within firms. Large enterprises regularly organised internal and external meeting sessions. They focused especially on maintaining contact with their suppliers and ensuring that shipments arrived on time. As noted by C11R18, this allowed firms to access and share information to effectively complete processes:

“We have frequent meetings with international suppliers. We always try to keep in touch with suppliers and inform the client about possible delays in production. Compiling the information is useful. We meet twice a week internally to discuss the workload that is coming in the next few days.”

Essentially, large enterprises strive for end-to-end SC visibility and communication, often facilitated by their IT systems and formal organisational processes. In contrast, SMEs often depend on personal relationships and basic tools for sharing information, while large firms implement enterprise-wide systems and scheduled communications. Both seek to achieve visibility and coordination, but larger firms can integrate it on a far grander scale.

Resource exploration and adaptation

Flexible logistics practices and financial exploration emerged as crucial elements of large enterprises' resource management, particularly when they faced the pandemic and trade restrictions. Large enterprises utilised flexible logistics resources to adapt to clients' new demands, respond to rising shipping prices, embrace new trends in outsourcing, and alleviate storage issues. As C8R14 noted, some firms that had been outsourcing transportation locally decided to invest in their own logistics because they recognised that the local logistics supply was unreliable.

“During the blockade (trade restrictions with neighboring countries), there were many issues with finding drivers and trucks to deliver the orders. It lasted for a long period. It was even easier to send products locally by ship than to find a truck. We decided to purchase our trucks instead of outsourcing them during the blockade, and we still use them.”

Furthermore, firms revealed that they do not have local financial exploration opportunities. To mitigate this, large firms opened overseas accounts and adjusted financial processes for liquidity. Although they generally have more capital, their actions show that disruptions can strain substantial resources, requiring innovative changes.

Essentially, large enterprises leveraged their scale by reconfiguring existing resources and exploring new ones as needed. They had the ability to make significant investments quickly, such as in trucks and alternative facilities, which smaller firms might find challenging. Additionally, they could better absorb the costs of these changes, viewing them as strategic investments in continuity. These findings highlight that, beyond pre-planned contingencies, resilience sometimes requires large enterprises to innovate resources on the spot as well.

Collaboration and networking

Large enterprises utilised SC collaboration practices as essential foundations for collaboration and networking to establish SCR. They emphasised the significance of long-term relationships fostered through collaborative communication and mutual knowledge exchange. C3R4 explained the importance of SC collaboration practices in achieving SCR:

“Collaboration with the customers and collaboration with the suppliers through clear information exchange for any slack in the supply side or demand side can help to minimize the effect of disruption and increase resilience.”

Incorporating SC collaboration practices enabled firms to jointly plan, create partner synergies, and encourage real-time information exchange.

Lastly, relationship commitment was another way of collaboration and networking to build SCR. Large enterprises use short-term and long-term contracts. They also had qualification programs for suppliers. Compared with SMEs, they preferred or approved suppliers with whom they worked. Suppliers were mostly assigned by their contractors. Preferred contract commitments that large enterprises used were long-term contracts due to the collaboration and trust that they had in suppliers, as C9R16 states:

“It takes us a long time to choose suppliers since we have a complex selection process. After we run the initial analysis of the supplier, we offer them a trial contract, and if they satisfy our conditions, we will make them permanent long-term suppliers. We put much effort into building relationships with suppliers and prefer working with the same people.”

Large firms leveraged human resources to strengthen networks. They assign experienced teams to manage supplier relations, host suppliers at their facilities, and attend conferences to build rapport. In summary, large enterprises develop SCR by embedding themselves in resilient networks

Table 2. Comparison of resilience-building strategies in SMEs and large enterprises.

Resilience Aspect	SMEs (Small & Medium Enterprises)	Large Enterprises
Risk Mitigation Approach	<i>Blend of systematic and improvised:</i> Basic preventive maintenance programs, along with ad-hoc responses (e.g., quickly switching transport modes and emergency sourcing) to address unforeseen issues.	<i>Highly systematic:</i> Formal risk assessment systems that include regular risk scoring, along with detailed contingency plans and protocols in place for various scenarios.
Supply Base Strategies	<i>Diversified but limited scale:</i> Utilising multiple suppliers, often focused regionally, to prevent reliance on a single source; keeping manageable safety stocks of critical items to mitigate delays.	<i>Extensive diversification:</i> A broad, multi-regional supplier base, comprising dozens of suppliers, ensures redundancy. There is a significant safety stock of raw materials, components, and finished goods, all of which are managed through advanced inventory systems.
Quality/Process Focus	<i>Emphasis on quality management:</i> Dependence on quality standards and certifications (ISO series) alongside outsourced testing to maintain consistent processes and minimise risk, compensating for the impact of limited resources.	<i>Baseline Quality, Emphasis on Processes:</i> Quality control is typically standardised (often already certified); the primary focus is on ensuring process consistency through formal procedures and audits. (Quality management is essential but often considered a given.)
Human Capital Focus	<i>Informal and limited HR development:</i> On-the-job learning and internal knowledge-sharing sessions; limited formal training infrastructure because of resource constraints (staff assume multiple roles).	<i>Strong HRM and training programs:</i> Continuous employee training (safety, technical, managerial) and strategies for knowledge retention; dedicated teams for supplier relationship management and risk management roles.
Information Systems	<i>Basic MIS and communications:</i> The implementation of affordable ERPs/MIS for current operations focuses on real-time internal communication and the direct sharing of critical information among key staff and with suppliers/customers.	<i>Advanced IT and analytics:</i> Integrated, enterprise-level IT systems (ERP, SCM software) supported by dedicated analytics teams; extensive data collection, modelling, and regular information exchange meetings both internally and with supply chain partners.
Resource Buffering	<i>Leveraging minimal slack:</i> Keeping essential spare parts, backup utilities, and contingency funds readily available; maintaining flexibility to quickly reallocate limited resources (for instance, repurposing storage and utilising personal networks for funding).	<i>Resource depth and reconfiguration:</i> Possessing significant slack resources (financial reserves, surplus capacity); capacity to invest in new assets (e.g., proprietary logistics facilities) when external alternatives are unavailable; established budgets for emergency purposes.
Collaboration Style	<i>Flexible networking:</i> Relying on trust-based relationships and open communication while using shorter-term contracts to remain agile, all while fostering long-term connections when feasible and often personalising supplier relationships.	<i>Strategic partnerships:</i> Establishing long-term, often contractual relationships with key suppliers (such as preferred supplier programs and long contracts); formal collaboration frameworks that foster high supplier loyalty; and maintaining communication through established channels with regular coordination.

characterised by trust, communication, and commitment, unlike SMEs, which maintain more open collaboration.

Towards a processual model of building supply chain resilience in SMEs and large enterprises

Our findings show that both SMEs and large enterprises pursue SCR through common domains, such as mitigation planning, supply base management, quality control, information sharing, resource buffering, and collaboration. However, their emphasis and execution vary by firm size. Table 2 compares key resilience strategies in SMEs and large enterprises, highlighting their similarities and differences.

As shown in Table 2, resilience-building practices manifest differently across SMEs and large firms. Both types of organisations invest in multiple suppliers, inventory buffers. These overlapping strategies indicate that certain principles of SCR (like not putting all eggs in one basket and maintaining transparency) are universal. However, the differences lie in scale, formality, and focus.

As previously noted, the processes underpinning SCR in two types of firms follow different strategies with some overlaps. The findings clearly indicate that the foundation for addressing SC disruptions caused by geopolitical tensions and external shocks and achieving SCR is somewhat similar at its core. However, notable differences exist. For instance,

as will be explained later, HRM practices are deemed more important in large enterprises, while QM practices are prioritised in SMEs, providing an interesting perspective on the link between QM and resilience, highlighting how organisations of different sizes emphasise QM differently. This distinction stems from the operational needs of these firms—large enterprises require structured workforce management to ensure process continuity, while SMEs focus on continuous quality improvements to mitigate disruptions at an operational level. Large firms employ HRM strategies, such as workforce training, skill retention, and supplier engagement programs, to institutionalise resilience. In contrast, SMEs rely on QM to maintain supply consistency and operational efficiency despite external shocks. Additionally, we observe that while large enterprises adopt a more structured and formalised approach to enhancing resilience, SMEs tend to use a more unstructured and flexible method.

The major SC disruptions for all firms include environmental risks related to COVID-19, the socio-cultural environment, blockade-based export or import restrictions, regulatory changes, tax alterations, and economic recessions. We also identified that firms focus on either reactive or proactive measures concerning SC disruptions, particularly those stemming from blockades and COVID-19. Reactive measures are commonly used for unforeseen events, where immediate planning may be difficult or take a long time to stabilise.

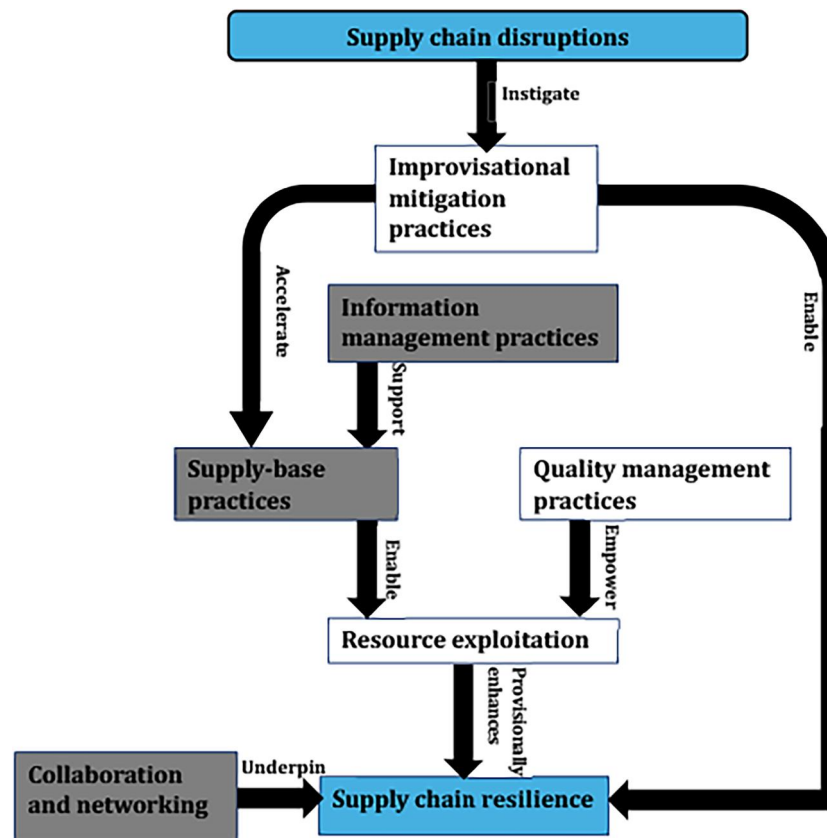


Figure 3. SMEs' processes of building supply chain resilience.
 Note: Grey-colored practices are shared with large enterprises' processes for building SCR.

Therefore, SC disruptions are addressed either through the immediate assimilation of available resources or the more proactive application of existing plans and procedures. Based on the analysis of the interview responses, we propose process frameworks among different dimensions for SMEs and large enterprises, as illustrated in Figures 3 and 4, which depict alternative paths to SCR. The interactions will be discussed next.

SMEs' processes of building supply chain resilience

In discussions with the respondents, it was noted that SMEs are especially vulnerable to SC disruptions due to their size, limited resources and capabilities, and lower levels of standardisation in SC practices. As illustrated in Figure 3 and elaborated above, they mainly encounter supply, organisational, operational, and environmental risks.

In Qatar, SMEs were more vulnerable to the global pandemic and the restrictions on exports and imports, as well as regulations, due to the blockade from June 2017 to January 2021. The demand for SME products gradually declined during this period, impacting the production system. Concurrently, delivery times for processed parts and raw materials became longer. Furthermore, the restrictions imposed by various countries to control the spread of the virus limited transportation availability, leading to modifications in transportation methods (shifting from land to sea) and increased transportation costs, as shipping capacities were constrained by a sudden surge in demand and full-load

requirements. SMEs faced challenges such as labour quarantines, port congestion, and closures. As C13R20 mentioned:

"We were doing business with our partners in the neighboring countries, but the blockade of Qatar stopped land transportation to those areas. Therefore, business there had to be stopped. At the same time, as the materials for other nearby countries had to be sent by ship, the ports became congested, which delayed our shipments. The limited number of container options required us to book full containers and pay higher prices than the smaller volumes we used to trade before. These factors increased the cost of doing business for our company."

The increase in transportation costs is also attributed to COVID-19. It is noted that the COVID-19 impact happened not long after the blockade was alleviated. C12R19 mentioned:

"There were limitations on transportation operations in the ports due to the COVID-19 situation. As all trade had to pass through the ports, the costs were increased to two to four times the cost in normal times, which was difficult for us to cope with."

The disruption related to import and export was sudden, leaving little time for adjustment. All internal parameters were functioning, yet it was challenging to determine when and how this restriction would be lifted, and how long operations would continue. This disruption prompted many SMEs to refocus their priorities on business operations.

Information gathered from the SMEs indicated that regulatory limitations were a significant risk. These limitations can include a lack of local support, slow customs clearance, and frequent changes in government policies. Although firms

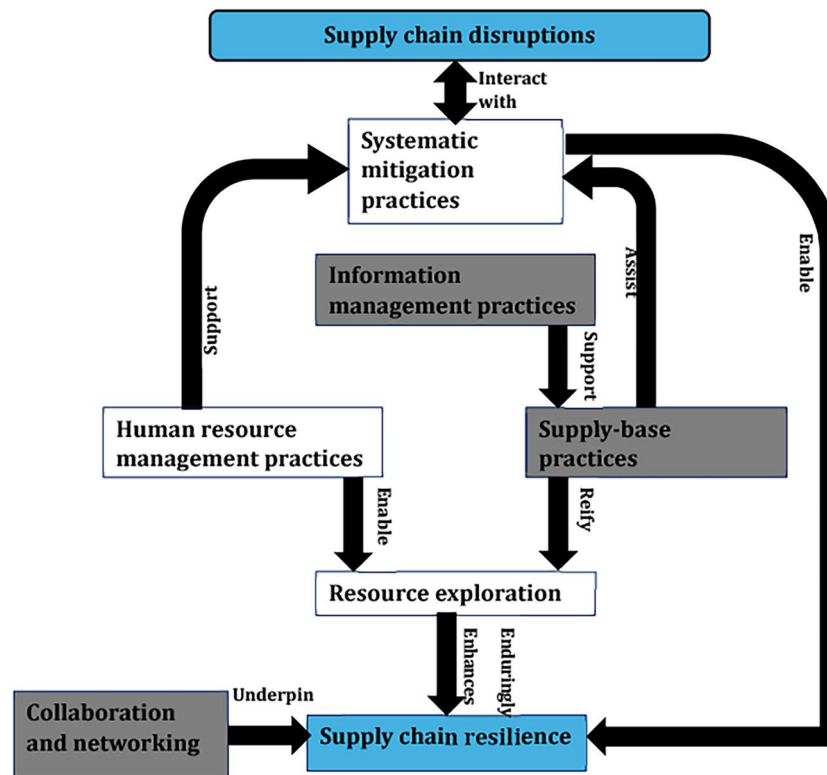


Figure 4. Large enterprises' processes of building supply chain resilience.
Note: Grey-colored practices are shared with SMEs' processes for building SCR.

attempt to access prior information to manage these disruptions, their limited financial capacity hampers their ability to address the consequences. Additionally, these restrictions were linked to transportation availability and increased processes for quarantining hazardous goods.

Environmental risks compelled SMEs to implement immediate and improvised mitigation strategies, such as slowing down production processes and using existing inventory when feasible. As C14R21 states:

"The blockade was sudden, and as soon as it was announced, the first thing for us to do was to get the data on what was in the store and what was in the transportation route, through the sea, and what had already entered the country."

Simultaneously, it prompted the examination of existing information among the SMEs, as well as with their suppliers and customers, where feasible, in search of alternative sources. C5R8 also mentioned, *"We had to continue the operations and work with the suppliers to get information on the extended suppliers for the materials."* Without such immediate action, business continuity would have posed a problem, particularly for those producing fast-moving items, such as consumables. With COVID-19, the situation changed. There were concerns that mobility and operations needed to be restricted for safety and security reasons. A limited time frame allowed for collaboration with suppliers to ensure a steady flow of materials. In any case, inventory practices constituted the initial action plan for achieving SCR. By utilising contingent inventory and transportation, SMEs could adapt supply base practices, including altering the mode of transport. Consequently, various aspects of resource management, collaboration, and networking help SMEs support SCR.

Our data indicates that when SMEs encounter disruption, their first management step towards resilience is to assess inventory to address their system's immediate needs. Conducting inventory assessments, collections, and utilisation enables the evaluation of information and the supply base, thereby enhancing connectivity with available suppliers. Emphasising existing supply base practices is crucial for business continuity and fostering long-term relationships. In disruptive scenarios, SMEs and their suppliers also play significant roles, as suppliers may possess information that SMEs can leverage to their advantage. Likewise, some suppliers may be unresponsive during disruptions due to the constraints they face. This was evident in Qatar's case, particularly concerning regional suppliers, who faced transaction restrictions during the blockade. As C6R10 mentioned:

"Some suppliers from the blockading countries did not respond to us during the first few months of the blockade. It was probably owing to the immediate trade restrictions and not knowing if and how they should communicate with their partners in Qatar. Therefore, we had to work with those suppliers who were responsive to our queries."

Therefore, the blockade situation required immediate action to expand the supply base.

The availability and access to information also supported actions regarding the supply base. This information can help understand the impact of the quality of both incoming and outgoing materials. In cases of supply-related quality issues, new relationships must be established to integrate quality into the supply processes. The communication and relationship-building efforts of SMEs also facilitate collaboration with the supply base. Most SMEs appear to aim for long-term

relationships with their suppliers to gain insights into new developments as well as pricing, quality, quantity, and availability. When there is symmetry in information with the supplier regarding materials or parts in transactions, this information can significantly benefit the SMEs. Information symmetry also implies possible access to the supplier's stock and pipeline inventory, making resource utilisation more manageable, along with meeting the required product quality. During the pandemic, sharing information and maintaining communication with suppliers about late deliveries and shipment cancellations were among their primary activities. Thanks to previous exchange visits, SMEs may possess critical information that has proven useful for engaging with and enhancing supply base practices.

SMEs show agility in disruptions but rely on flexible supply base expansion and quick adaptations for resilience. They compensate for their lack of formal risk management by using established supplier relationships and effective informal communication. This is evident in their search for alternative supply routes and proactive collaboration with suppliers. Unlike large enterprises, SMEs maintain production stability by refining internal processes instead of enforcing standardised mitigation frameworks.

Taken together, these observations suggest an "improvisation-to-formalisation" pathway for SMEs. Initially, exposure to the blockade shock triggers rapid, largely informal sensemaking centred on immediate inventory visibility and ad-hoc supplier searches. This phase mobilises pre-existing social ties to secure critical inputs, but remains weakly structured. As disruptions repeat and become more severe, SMEs selectively stabilise the most successful improvisations into simple rules and, in some cases, into more formal QM routines. The generative mechanism here is the coupling of flexible, owner-driven decision-making with learning from disruption experience: informal experimentation generates locally workable solutions, which are then partially codified when they prove effective. This process explains why SMEs can pivot quickly and survive repeated shocks on an improvisational basis, yet often struggle to invest in more advanced and enduring resilience capabilities that require significant slack resources or sophisticated risk analytics.

Large enterprises' processes of building supply chain resilience

Due to their high production volumes and dependence on multiple suppliers and customers, management practices in large enterprises can swing from disastrous to limited. SC disruptions may trigger new opportunities for large enterprises once they adjust to the new business environment. Based on the interviews, a general framework for SCR for large enterprises has been developed, as shown in [Figure 4](#).

Like SMEs, large enterprises may experience supply disruptions due to trade restrictions, pandemic-related limitations, constraints on transportation options and routes, and increased quarantine procedures for hazardous materials. These restrictions can create challenges in procuring supplies and accessing customers alike.

Given the specific circumstances of COVID-19, there were disruptions in transportation and workforce utilisation. The restriction of labour mobility and health measures was crucial, creating a challenge for business continuity. The unavailability or limited availability of transportation raised costs and extended delivery times, thereby hindering production and logistics. C4R7 stated:

"Road transportation to the neighboring countries was not functional after the blockade, so we had to buy supplies from Turkey and Taiwan, thus increasing the cost and lead time. The transportation mode had to be changed from road to sea."

C9R16 mentioned:

"Kuwait was our main customer, accounting for 40% of our product sales, but as the land transport to Kuwait through Saudi Arabia was closed, we had to resort to ship transportation, which became more expensive."

It is noteworthy that Kuwait was not part of the blockade and had a very cordial relationship with Qatar. C10R17 mentioned:

"The changes in the maritime regulations around the blockading countries required Qatari shipments to travel through an alternative longer route, which increased the cost of transportation."

This point was corroborated by C9R16, where they "lost the Saudi market, which was more than 20% of our output".

Large enterprises also had to contend with issues of port congestion and closures. Sudden import-export restrictions necessitated a reassessment of their current policies, frameworks, and business processes. An examination of large enterprises in Qatar shows that they are experiencing longer lead times for raw material deliveries, reduced production capacity, higher shipping costs, labour quarantines, port congestion and closures, and lockdowns due to these disruptive circumstances.

Large enterprises typically had systematic mitigation plans to address risks and disruptive situations. Such plans may encompass disruptions in one country or all others along SCs. The availability of frameworks and procedures to assess available resources, evaluate the economic impact in their jurisdictions, analyse quality impact due to the disruptions, maintain a library of mitigation practices, and adapt to dynamic changes in these measures, along with effective risk management, constitutes some of the systematic mitigation practices. These practices also consider regulatory provisions to execute action plans for addressing disruptions. Systematic mitigation practices enable firms to be alerted to potential risks, thereby enhancing SCR. C4R7 stated:

"Although we did not have any measures for addressing the blockade, we have a risk management manual that deals with abrupt supply disruption and market changes. Therefore, to some extent, the manual was helpful for us in managing our operations."

The volume of supply base practices helps enterprises develop flexibility and a resilient framework, considering disruptive situations. This framework illustrates how information exchange supports the supply base practices adopted by enterprises, which in turn aids in consolidating mitigation strategies. Large enterprises excel at information management and can utilise data on supply base practices to foster

collaboration and address post-disruptive scenarios. For instance, FGR7 stated:

“Close coordination with suppliers is key to resilience, especially when working in the manufacturing sector. They provide us with resource problems originating in one country, taxes, supply restrictions, price changes, or problems with certain ports used to bring the materials.”

Business-to-business information management practices adopted by large enterprises have simplified their ability to gain support for supply base strategies. Consequently, they can identify a strong mix of suppliers for specific spending categories to lessen the impact of disruptions on operations. This information is also useful for determining whether a supplier can assist the enterprise in sourcing or accessing alternative suppliers due to blockades. As C3R5 noted:

“Once we discovered the blockade situation, we contacted our suppliers outside the blockading country to help us find alternate suppliers at the quickest possible time to minimize operations. We were lucky to have this information at hand and our communication speed. We could find new suppliers to replace supplies from the blockading country suppliers within a month.”

We also found that good supply base practices reify resource exploration from different sources. A good relationship has buyer-supplier interdependence when considering the spending item. At the same time, suppliers were willing to make some internal changes to increase production or support the customer's customer to get long-term benefits. A strong HR team is necessary for this type of collaboration and networking. As C3R6 mentioned:

“Before the COVID-19 situation, some of us attended supplier conferences and built relations, and often, we hosted some suppliers from abroad who were invited to our premises. This had strengthened both personal and professional relationships and was important to devise mechanisms to limit the impact of disruptions.”

Regarding collaboration and networking, large enterprises prefer long-term commitments with their suppliers since they underpin SCR. Large enterprises approached relationship commitment and long-term partnerships more seriously, as they required input from suppliers to enhance operational efficiencies and leverage their expertise on alternative materials. For example, C3R4 stated:

“Our customers were using a particular type of metal molding for their product, the supply of which was restricted during the blockade. We mentioned using an aluminum alloy to offer the same features and specifications. The customer asked us to show testing in a standard international lab, which we did. The customer was happy and provided a big order for our product.”

In this case, the enterprise was the supplier of the product, but it shows the impact of collaboration and networking in attaining resilience.

The availability of the right skills is also crucial for developing a systematic framework, enabling resource exploration, and facilitating communication through relationship development. Our findings reveal that large enterprises utilise HRM practices to access external knowledge, thereby enhancing their knowledge base. C4R7 noted:

“During the COVID-19 period, hiring new staff or experts was difficult as people's mobility was restricted. However, we could

overcome the situation by retaining our trained staff to support the development of new practices and facilitate relations with the suppliers. Knowing the supplier key person earlier helped to minimize the impact.”

While SMEs leverage knowledge from databases and their relationships, large enterprises focus on enhancing their workforce's ability to navigate systematic frameworks, explore resources, and build relationships with other entities in SCs. For large enterprises, a supplier's supplier and the customer's customer become critical in achieving end-to-end resilience. They typically sought to establish long-term relationships with suppliers to sustain business operations.

For large enterprises, the data point to a different, “formalisation-to-flexibilization” pathway. Before the blockade, many of these firms had already developed extensive, mechanistic risk management infrastructures that enabled systematic scanning and coordinated responses when the blockade and later COVID-19 hit. These structures provide a powerful initial response capability, but their very formalisation can slow adaptation when disruptions unfold in unexpected ways. The repeated crises, therefore, trigger a second phase in which managers loosen rigid procedures, create cross-functional task forces, broaden the supplier base, and introduce more devolved decision-making at plant or regional levels, while still anchored in overarching governance and quality frameworks. Over time, lessons from these adjustments are re-embedded into revised manuals, training, and performance indicators, so that the organisation gradually shifts from a purely bureaucratic resilience model towards a more ambidextrous one that combines structural discipline with targeted flexibility. This dynamic illustrates SCT's argument that the misfit between existing structures and new environmental contingencies generates pressures for structural adaptation (Donaldson 2001; Parast 2022) and clarifies the mechanisms through which large firms learn to accommodate geopolitical and pandemic-induced volatility without abandoning their core formal systems.

Synthesising across the cases, we therefore conceptualise two size-contingent pathways for building SCR under conditions of geopolitical turbulence. SMEs follow an improvisation-to-formalisation pathway, in which resilience emerges through experimental, relationally anchored responses that are selectively codified into simple routines. Large enterprises follow a formalisation-to-flexibilization pathway, in which pre-existing infrastructures structure the initial response, but repeated shocks prompt the introduction of more flexible, cross-functional practices. These pathways are not strictly deterministic; we observe convergence over time as some SMEs formalise more and some large firms loosen certain procedures. However, the analysis shows how firm size and associated structural features shape the sequence and mechanisms of building SCR, thereby moving beyond a merely descriptive contrast between improvisation and structure towards a processual explanation grounded in SCT.

Discussion and conclusions

In the dynamic landscape of global SCs, the intersection of geopolitical risks and SCR has emerged as a pressing concern

for businesses and policymakers alike. That said, while the importance of SCR is undeniable and undisputed, there might be many context-dependent ways to build and achieve SCR. This study examined the underlying mechanisms of SCR among SMEs and large enterprises in the context of external shocks and geopolitical tensions. Specifically, we investigated how SMEs and large enterprises address SC disruptions and achieve SCR through different routes (i.e. a set of processes adopted to achieve SCR) in the face of geopolitical tensions and unexpected challenges. Drawing on evidence from Qatar, a nation at the epicentre of a region known for geopolitical tensions, our analysis reveals differences in how SMEs and large enterprises navigate SC disruptions arising from external shocks and geopolitical tensions. More importantly, we reveal that while there are some commonalities across the routes taken to build and achieve SCR, SMEs and large enterprises follow different strategies in the pursuit of SCR.

Beyond the Qatari context, the alternative resilience pathways identified in this study can be meaningfully transferred to other small, import-dependent and geopolitically exposed economies. Prior research shows that exposure to geopolitical disruptions creates structural supply vulnerabilities for nations that rely heavily on external trade routes and concentrated supplier bases, similar to Qatar (Bednarski et al. 2025; Roscoe et al. 2022). Studies on geopolitical supply risks further emphasise that countries with limited domestic production capacity or constrained market size, such as small Gulf states, Singapore, or Taiwan, experience heightened vulnerability to external shocks (Gemechu et al. 2016; Witt et al. 2023). These contexts reflect Qatar's reliance on global networks and its sensitivity to regional and international political tensions. Accordingly, our findings extend SCT by demonstrating how firm size influences the resilience-building process. In what follows, we discuss our findings' theoretical implications, practical relevance, and future research avenues.

Theoretical implications

Our findings enhance SCR research by illustrating the differing responses of SMEs and large enterprises to geopolitical shocks and disruptions. Unlike prior studies viewing SCR as static (Ali and Gölgeci 2019; Tukamuhabwa et al. 2015), we highlight its dynamic nature influenced by firm size and context. We demonstrate how each group takes alternative paths to support SCR, aligning with recent literature (Cohen et al. 2022; Wieland and Durach 2021) that advocates for a processual, firm-specific, contextualised approach to SCR.

The accumulated knowledge of SCR, grounded in extant research (Ali and Gölgeci 2019; Tukamuhabwa et al. 2015; Wieland et al. 2023; Wieland and Durach 2021), follows the paradigms and realities of previous decades but is insufficient to fully appreciate SCR amid the polycrisis (Whiting and Parker 2023) the world has been experiencing since COVID-19. As such, lately, there have been calls for new approaches to understanding SCR through new angles and perspectives

(Hughes et al. 2023; Wieland et al. 2023; Wieland and Durach 2021).

In particular, geopolitical risks, characterised by unexpected macro-level events or conditions stemming from political, social, or economic factors in specific regions or countries, pose significant challenges to SCR (Gemechu et al. 2016; Roscoe et al. 2022), which are largely overlooked by the extant research examining SCR. By using the case of Qatar, our research adopts a processual approach (Cloutier and Langley 2020) to disentangle different processes through which SMEs and large enterprises build their SCR in the face of different geopolitical tensions and external shocks. Our research makes a contextually-grounded processual contribution to SCR research. It elaborates on the theory of SCR by unravelling different processes involved in building SCR across different firm sizes and different connections between these processes amid geopolitical tensions and external shocks. We demonstrate that resilience-building is not a one-size-fits-all process; rather, it depends on firm size and contextual conditions. This processual approach (Cloutier and Langley 2020) challenges the traditional covariance-based analysis of SCR. This perspective advances theoretical discussions on SCR beyond static models, advancing firm-size and context-sensitive resilience pathways and providing a more nuanced framework for future research. As such, it uniquely contributes to the literature by highlighting the contextual nuances and internal organisational dynamics influencing SCR practices, particularly contrasting the response processes between SMEs and large enterprises during geopolitical shocks, as evidenced in Qatar.

Our review of the different resilience strategies for SMEs (Figure 3) and large enterprises (Figure 4) reveals an interesting dynamic related to the linkage between QM and SCR, advancing the knowledge of this linkage, which has also been examined by Parast (2022). Although both SMEs and large enterprises prioritise QM practices, they adopt different approaches to QM implementation. In Qatar, SMEs primarily focus on quality assurance and the technical aspects of QM, following a more structured and system-wide approach, whereas large corporations emphasise HRM practices. Given that large corporations have been early adopters of QM practices, the findings present different QM implementation paths for enhancing SCR for each organisational type. We also recognise that the HR-related focus in large corporations aligns with the literature on organisational resilience, which highlights the importance of human capital as a crucial resilience booster (Blackhurst, Dunn, and Craighead 2011). Thus, the results offer two insights related to the linkage between QM and SCR. First, they suggest that implementing QM can strengthen SCR, and second, there is a distinct QM implementation route for SMEs and large corporations to improve SCR.

Our research highlights the distinct paths that SMEs and large enterprises follow in developing SCR amid geopolitical tensions and external shocks. We find that while both SMEs and large enterprises employ some shared processes in their pursuit of SCR, there are notable differences in certain

processes, and even similar processes may be applied in distinct ways and linked to different processes (see [Figures 3 and 4](#) and [Table 2](#) for further details). Specifically, our findings reveal key differences between SMEs and large enterprises in responding to geopolitically driven SC disruptions and developing SCR. SMEs are generally more reactive, relying on improvisational mitigation, whereas large enterprises adopt a proactive and systematic approach. Additionally, QM practices are crucial for SMEs in building SCR, while HRM practices are more important for large firms. SMEs prioritise resource exploitation due to significant challenges, achieving SCR provisionally, while large enterprises focus on resource exploration, benefiting from their more robust resources for sustainable SCR. Finally, large enterprises use more sophisticated and recursive methods in building SCR, characterised by enhanced feedback loops compared to SMEs. These findings corroborate recent exploratory research on SCR processes (Cohen et al. 2022; Yaroson et al. 2021), which transcends a covariance-based understanding, offering a more comprehensive view of the unique processes that facilitate the emergence and attainment of SCR. Our research also addresses calls for a more contextualised and tailored understanding of SCR, advancing the field in an under-researched context experiencing unique and unprecedented SC disruptions (i.e. blockade).

Our findings suggest that SMEs adopt more organic, improvisational resilience pathways that leverage relational ties and opportunistic supply base expansion, which aligns with their resource constraints and exposure to volatile local supply markets. In contrast, large enterprises rely on mechanistic elements such as formal risk manuals, dedicated risk teams, and structured contingency planning to secure continuity, but they also selectively introduce more flexible and cross-functional processes to cope with fast-moving geopolitical threats (Parast 2022; Safari et al. 2024; Sousa and Voss 2008; Sullivan-Taylor and Branicki 2011). In other words, SMEs depend on knowledge databases and relationships for adaptation, whereas large firms prioritise workforce capabilities. Over time, repeated disruptions prompt both types of firms to reconfigure their structures in search of renewed fit—for example, when SMEs formalise QM routines or when large firms loosen rigid procedures to expedite decisions.

Our findings extend SCT by showing that organisational size not only shapes structural choices but also produces distinct capability-building pathways for resilience. While SCT traditionally emphasises static fit between organisational structures and environmental conditions, our results demonstrate that SMEs and large firms respond to geopolitical disruptions through different patterns of capability alignment, with SMEs relying on improvisational flexibility and large enterprises on structured orchestration. This dynamic interpretation highlights that contingency is not a fixed alignment but a size-dependent, evolving process, thereby enriching SCT in the context of repeated geopolitical shocks (Parast 2022; Safari et al. 2024).

Additionally, the findings strengthen the processual understanding of SCR by uncovering temporal mechanisms

through which resilience develops. Rather than operating as isolated practices, resilience activities unfold in sequences, beginning with the detection of disruptions, followed by short-term reallocation, and culminating in structural adjustment and reinforcement. Recognising these mechanisms of progression and layering provides a clearer explanation of how resilience emerges over time, addressing calls in the literature for more temporally grounded theorising.

Practical implications

Our frameworks can provide a contingent and flexible roadmap for firms in Qatar and similar contexts, including the countries in North Africa and the Middle East, which encompass 21 countries covering over 15 million square kilometres and are home to approximately 493 million people. Our results turn familiar resilience practices into an opportunity for improving PPC in contexts experiencing geopolitical shocks. Specifically, the SME and large-enterprise routes we identify show how firms adjust planning horizons, safety stock policies, and supplier portfolios in ways that echo PPC debates on tailoring planning and control systems to volatile, resource-constrained environments. For one, the differentiation between improvisational pathways (SMEs) and structured orchestration pathways (large enterprises) provides managers with a size-sensitive toolbox to integrate resilience into operational routines. For SMEs, the results suggest that resilience is enhanced when planning systems are designed to provide real-time flexibility, such as dynamic inventory thresholds, rules that can be quickly changed for transportation modes, and short planning cycles that reflect high variability. These mechanisms demonstrate how improvisation can be integrated into basic control routines in a resource-constrained environment.

However, the implications for large enterprises reveal an additional point: resilience can be increased by embedding risk-screening checkpoints, qualification cycles for suppliers, and contingency simulations into firms' production planning and S&OP processes themselves. Our results suggest that, instead of relying strictly on multi-sourcing or safety stock, large enterprises are more likely to benefit from incorporating resilience into the planning cycle (monthly risk scoring, scenario-based load balancing, and visibility audits) and the architecture of control systems (ERP-linked disruption alerts and supplier redundancy indices).

Second, the processual analysis has its lesson that resilience does not occur in sequence per se, but is constructed over time. That is to say, firms should develop planning and control systems in a way that has resilience activities built upon each other as they are enacted: disruption detection, short-term reallocation and structural adjustment, and capability reinforcement. What this sequencing provides is a guideline for managers, a template that allows them to think about how to bake resilience into daily decision-making, rather than consider resilience as risk in isolation.

Third, the study guides firms operating in high-risk geopolitical areas. The evidence suggests that these disruptions

in these environments are cumulative, including blockade, pandemic, and new regional risks; therefore, planning systems need to be both short-term and adaptable to demand, with respect to restructuring capacity in terms of time and space. Hence, managers can leverage the alternative resilience routes identified in the study and adjust their planning horizons, inventory policies, and supplier portfolios to match the volatility profile of their geopolitical setting.

Limitations and future research avenues

We focused on conducting research within the context of the small country of Qatar. Although the sampling approach provided valuable insights into the SCR practices of SMEs and large enterprises in Qatar, it has certain limitations. The purposeful sampling method was employed to select firms that experienced significant operational disruptions due to the blockade situation and the COVID-19 pandemic, allowing for the capture of intended resilience strategies through targeted responses. However, this approach is limited in terms of generalisability because our findings pertain to firms operating within a specific geographical and geopolitical environment.

Another potential limitation of our research is that the respondents primarily discussed processes leading to SCR based on their experiences with the blockade and COVID-19. While SC disruptions and SCR are closely related, SCR does not have to be merely reactive and dependent on responding to disruptions; it can also adopt a proactive strategy, regardless of any SC disruptions it faces. Thus, our findings should be interpreted with the understanding that they may reflect a more disruption-oriented view of SCR.

Furthermore, beyond the recognised limitations, our research highlights future research opportunities. In several well-organised ways, future research can expand on our results. First, the alternative resilience paths described here need to be investigated in other geopolitically exposed or import-dependent economies, such as Singapore, Taiwan, and small Gulf and Mediterranean states, to see how contextual features define the mechanisms of processual resilience. Second, heterogeneity within firm-size categories, such as micro-SMEs, medium-sized firms, family-owned enterprises, state-owned firms, and multinational subsidiaries, allows us to identify any additional routes or sub-patterns at work here. Third, longitudinal studies would further illuminate the temporal sequence identified by our processual analysis, including how resilience routines unfold through a series of repeated disruptions. Fourthly, future research could explore (or build upon) digital planning and control tools (e.g., real-time visibility platforms, predictive analytics, AI-enabled risk scoring) and their role in informing or accelerating resilience capabilities. Finally, policies might be explored on a more policy level (for example, national inventory policies, supplier diversification schemes, or resilience incentives), and how those external structures influence business processes. Taken together, these directions broaden the theoretical and practical implications of our findings and encourage

more comparative and mechanism-oriented research on resilience.

Notes

1. While contingency-based studies show that resilience practices and performance vary with factors such as size, industry, and supply-base complexity, they typically treat firm size as a static contingency and focus on associations between “level” of practice and performance (e.g., Parast 2022; Safari et al. 2024). As a result, SC managers in SMEs and large enterprises receive little concrete guidance on which resilience levers to prioritise for their structural profile, or how these levers should evolve across repeated disruptions. In contrast, our study examines how firm size shapes the pathways through which SCR is built over time under repeated disruptions. We place size at the centre of the analysis and trace how SMEs and large firms iteratively reconfigure their processes across successive disruptions, move beyond documenting size-based differences at a single point in time, and show how size conditions the sequence and mechanisms of building SCR.
2. In this paper, a processual approach explains organizational phenomena by focusing on the dynamic unfolding of events, activities, and interactions over time, and on how their temporal sequencing and contingent interactions generate particular pathways and outcomes (Cloutier and Langley 2020). Much of the SCR literature relies on cross-sectional, covariance-based designs that estimate associations among contingencies, practices, and performance at a single point in time (Ali and Gölgeci 2019; Parast 2022; Tukamuhabwa et al. 2015). These studies are valuable for identifying practices that correlate with resilience but offer limited insight into how managers in different types of firms construct and adjust resilience in their day-to-day planning and control as disruptions unfold. As detailed below, our processual approach generates conceptual insights that unravel different paths to achieving SCR across SMEs and large enterprises. These pathways specify the temporal ordering and generative mechanisms through which SCR is achieved.
3. We use Qatar not merely as a novel backdrop, but as a revelatory context that sharpens our theoretical lens. The combination of a highly import-dependent small state, strong state intervention in key SCs, and overlapping geopolitical and pandemic shocks creates an “extreme” environment in which size-contingent resilience pathways become particularly visible. That said, the relevance of our findings and processes we unraveled is likely to extend to other politically volatile contexts.
4. As detailed below, for SMEs, resilience emerges through a sequence that progresses from rapid sensemaking and improvisation to opportunistic reconfiguration of supply and logistics, and, in some cases, to partial formalization of routines. For large enterprises, resilience is built through pre-existing formal structures, scenario-based response routines, and subsequent adjustments that introduce more flexibility into otherwise bureaucratic systems.

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