# Networks in Transition: Adaptive Cycles, Organizational Traps, and the Mechanisms of Supply Chain Resilience

by

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Abstract

The inability of organizations to adapt to disruptive change represents one of the most consequential challenges in supply chain management. Motivated by the widespread failure of supply chains during the COVID-19 pandemic, this dissertation examines why organizations become entrapped in maladaptive configurations and explores the structural, behavioral, and communicative mechanisms that either enable or prevent adaptive response across three interconnected studies.

Chapter 1 examines oscillatory reconfiguration in healthcare procurement, investigating how U.S. hospitals cycle in and out of Group Purchasing Organization (GPO) memberships in response to shifting structural conditions. Drawing on the Structure-Conduct-Performance paradigm and Dynamic Capabilities Theory, the study finds that hospitals engage in adaptive procurement cycling reflecting strategic responses to environmental pressures, with implications for operational resilience and supply chain disruption exposure.

Chapter 2 develops a conceptual theory of how organizational learning processes produce and resolve adaptive cycle traps. Grounding the analysis in the socio-ecological adaptive cycle framework, the study identifies four traps — dissolution, rigidity, poverty, and vagabond — and theorizes that each corresponds to a distinct learning failure mode. Qualitative interview data from supply chain managers provides empirical grounding for the propositions.

Chapter 3 reports a 2 × 3 between-subjects experiment with 685 supply chain professionals examining whether supervisor-delivered organizational nudges shape

managers' long-term collaborative intent during disruption. Results demonstrate that adaptability-oriented supervisor communication produces significantly greater collaborative intent than agility-oriented communication, that agility orientation actively suppresses long-term collaborative thinking, and that nudge type drives behavioral contagion across supply chain boundaries.

Across the three studies, this dissertation advances understanding of adaptive failure as a multilevel phenomenon rooted in structural procurement behavior, organizational learning dynamics, and everyday supervisor communication — offering theoretical and practical contributions for supply chain resilience in an era of persistent disruption.

## Artificial Intelligence (AI) Use Disclosure Statement

In the preparation of this dissertation, Artificial Intelligence (AI) tools were used in the following way. Claude, an AI assistant developed by Anthropic, was used to assist with statistical coding and data analysis support during the preparation of the empirical chapters. Specifically, the AI tool was used to help write and debug Stata code for the quantitative analyses reported in Chapters 1 and 3. All analytical decisions, interpretations, and conclusions are the sole responsibility of the author and were reviewed and approved by the advisory committee.

## Digital Accessibility Disclosure

In preparing this dissertation, the author followed Auburn University's guidance for creating digitally accessible electronic theses and dissertations. Structural heading styles, descriptive alternative text for figures, accessible table formatting, a logical reading order, and a defined document language were applied so that the document can be read and navigated with assistive technologies. To the best of the author's knowledge, this document conforms to the standards described in the Auburn University Libraries' Guide on Digital Accessibility for Theses and Dissertations and meets the WCAG 2.1 Level AA expectations referenced in Auburn's electronic thesis and dissertation requirements.

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Auburn gave me far more than a degree. It gave me my family. I met my wife here, and it was here that we welcomed our son into the world. Those two facts alone would be

enough to make Auburn a place I carry with me always — but Auburn gave me something beyond even that: a version of myself I did not know was possible. The person who will leave Auburn is unrecognizable to the person who arrived, and the distance between those two people is the measure of what this place has done for me. It is with a heavy heart that I prepare to leave. Auburn has been home in the fullest sense of that word — a place where I was challenged, where I grew, where I built a life. Leaving is not easy. But a piece of Auburn will always be with me in the work I do, the way I think, and the family I am taking with me into whatever comes next.

War Eagle.

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## INTRODUCTION

In early 2020, supply chains that had been optimized over decades for efficiency and cost minimization encountered conditions they were not built to survive. The COVID-19 pandemic did not simply disrupt supply networks — it exposed a structural vulnerability that had been quietly accumulating for years: the tendency of organizations to become so deeply committed to a particular operational logic that they lose the capacity to respond adaptively when that logic fails. Personal protective equipment sat unavailable while hospitals desperately needed it. Semiconductor shortages cascaded across industries for years after the initial shock. Logistics networks fractured at exactly the moments when resilience was most urgently required. The pandemic did not create these vulnerabilities. It revealed them.

This dissertation is motivated by a single animating question: why do networks fail to adapt? Not why they fail under extreme conditions — that is well understood — but why the adaptive response that disruption demands so often fails to materialize even when organizations have the theoretical capability to respond. The answer, this dissertation argues, lies not in capability gaps but in the orientations, learning processes, and communication architectures through which organizations form their interpretations of what the environment requires before any disruption arrives. Traps — the specific configurations of organizational commitment that constrain adaptive response — are not sudden failures. They are the accumulated product of decisions that appeared rational at every step, producing a path dependence so complete that the organization finds itself unable to respond adaptively when the environment changes.

This dissertation addresses that gap through three interconnected empirical and theoretical studies that examine trap formation and adaptive response at different levels of analysis. Together they tell a multilevel story about why organizations fail to adapt — and what structural, behavioral, and communicative conditions either enable or prevent escape from the adaptive traps that disruption exposes.

Chapter 1 examines adaptive behavior at the organizational-structural level through a longitudinal study of how U.S. hospitals cycle in and out of Group Purchasing Organization (GPO) memberships in response to shifting procurement conditions. Using panel data spanning nearly a decade and methods from dynamic panel econometrics, the study examines the structural conditions that drive oscillatory reconfiguration in procurement relationships and the implications of those cycles for operational resilience and supply chain disruption exposure.

Chapter 2 examines adaptive failure at the organizational-theoretical level through a conceptual and qualitative study of how learning processes produce and resolve the four adaptive cycle traps. Drawing on the socio-ecological adaptive cycle framework and organizational learning theory, the study develops a theoretical argument that each trap corresponds to a distinct learning failure mode. Qualitative interview data from supply chain managers provides empirical grounding for the theoretical propositions.

Chapter 3 examines adaptive orientation at the individual-managerial level through a between-subjects experiment with 685 supply chain professionals. The study tests whether the type and frequency of supervisor communication shapes the managerial orientation that determines how supply chain managers respond when disruption demands adaptation. The results demonstrate that adaptability-oriented supervisor

nudges produce significantly greater long-term collaborative intent than agility-oriented nudges, that agility orientation actively suppresses adaptability orientation, and that nudge type drives behavioral contagion across supply chain boundaries.

Chapter 4 synthesizes findings across all three studies, develops the overarching theoretical contribution, identifies practical implications, and outlines a research agenda for understanding adaptive failure as a multilevel phenomenon in supply chain management.

# CHAPTER 1: ON OSCILLATORY RECONFIGURATION IN HEALTHCARE PROCUREMENT: A LONGITUDINAL LOOK AT HOSPITAL AND GROUP PURCHASING ORGANIZATION MEMBERSHIPS


## ABSTRACT

U.S. hospitals increasingly rely on Group Purchasing Organizations (GPOs) to manage rising procurement costs and operational complexity. Yet GPO participation is not a one-time decision. Hospitals routinely join, exit, and rejoin as conditions change. We conceptualize this pattern as oscillatory procurement reconfiguration (OPR), highlighting procurement as a dynamic, cyclical operational capability rather than a static one. Using a national panel of acute-care hospitals from 2016 to 2023, we demonstrate that procurement costs are the primary driver of these cycles. Cost increases prompt joining, declining marginal benefits spur exits, and renewed cost pressures trigger re-entry. Geographic dispersion raises the likelihood of joining and rejoining, while disability load amplifies cost-driven adjustments. We further find that GPO participation was associated with a shorter length of stay during COVID, while having a limited effect on readmission rates, indicating enhanced operational resilience and the ability to maintain patient throughput during periods of supply chain disruption.



**Keywords:** Healthcare Operations, Group Purchasing Organizations, Dynamic Capabilities


## INTRODUCTION

In 2023, U.S. healthcare spending once again drew national and international attention. This time, not because of a sudden crisis, but because for the first time since the pandemic, its growth rate (7.5%) surpassed GDP growth (6.6%). This pushes the total U.S. annual health expenditure to almost $5 trillion (Martin et al., 2025). If “U.S.

healthcare" were an independent country, it would rank fourth globally in economic might, nearly tied with the entire GDP of Germany and ahead of Japan, the United Kingdom, and France. The long-term trend is equally striking. Since the 1970s, per capita healthcare costs have risen at an average annual rate of 12%, compared with 6.2% for GDP (McGough et al., 2024). According to the OECD (2023), per capita healthcare spending in the U.S. exceeds the OECD average by nearly $9,000. With health spending far exceeding the 7.6% share of GDP beyond which societal returns begin to diminish (Wang, 2015), the U.S. healthcare system has reached crisis levels. Hospitals comprise the largest segment of these healthcare expenditures, accounting for an estimated $1.5 trillion annually (Kaiser Family Foundation, 2024).

It is no surprise, therefore, that U.S. hospitals have faced increasing pressures over the past few years to control costs (Fredenhall & Smith, 2020). Legislators, policy makers, and scholars have called on hospitals to manage labor and supply expenditures (Lee et al., 2020), incorporate technology into their offerings (Lee et al., 2025), improve process flow (Johnson et al., 2020), and reduce waste (Dreyfus et al., 2020), all with the goal of streamlining cash burn. Consequently, operations managers in U.S. hospitals continue to seek ways to create more internal efficiencies and control expenses (Fredenhall & Smith, 2020).

Procurement represents a major cost center for acute care hospitals, accounting for up to 30-40% of their operating costs (Burns & Lee, 2008; Weinstein et al., 2025). Unlike many other factors (e.g., payer mix, location, population demographics), procurement is one area where hospitals retain at least partial managerial control. Therefore, it has become one of the primary areas that hospitals target for cost

containment efforts (Opoku-Agyeman et al., 2020). In the U.S., hospital procurement often involves contracting with collective purchasing intermediaries, also known as Group Purchasing Organizations (GPOs). GPOs are third-party entities that pool member demand to negotiate lower prices through bulk purchasing. Industry estimates attribute more than $34 billion in annual savings to GPO-mediated purchasing (HSCA, 2019).

Some industry-based reports suggest that as many as 90 percent of U.S. hospitals participate in GPOs. However, the validity of this figure remains questioned, as it is largely derived from executive self-reports and samples disproportionately composed of large, integrated hospital systems (Burns & Lee, 2008; O'Brien et al., 2017). For example, according to a study by the U.S. Senate Finance Committee, many of the numbers on GPO participation lacked independent verification (US Senate Committee on Finance, 2010). Instead, empirical reviews of hospital data show that the percentage of hospitals that are actually GPO participants is approximately 60-68% (Opoku-Agyeman et al., 2020; Lin & Wang, 2025).

GPO participation in hospitals is seldom static. It has been observed that hospital-GPO engagement changes over time (Ahmadi et al., 2019). Prior research suggests that hospital-GPO relationships tend to experience a high number of entries and exits accounting for an average of 8.7% of all hospitals either entered or exited a GPO in any given year between 2010 and 2019 (Lin & Wang, 2025). In other words, many hospitals tend to cycle in and out of GPO membership, as they may be "with a GPO" for a while but choose not to renew the contract when it comes up for renewal (Burns & Lee, 2008; Schneller, 2000). We refer to this pattern as oscillatory participation and argue that it represents a consequential but underexplored feature of hospital procurement strategy.

As noted by industry analysts, the “3-year itch” often occurs when hospitals evaluate whether the administrative fees paid by vendors to the GPO (which might otherwise be reflected as direct discounts to the hospital) justify the services provided (Definitive Healthcare, 2025). Thus, there is a lack of systematic understanding regarding how the cycles of GPO participation change in response to the underlying structural conditions, and how they ultimately influence the operational outcomes of hospitals.

This motivates our research question: How do GPO participation cycles adapt to shifting structural conditions and patient mix, and how does this affect hospital operational resilience? To address this question, we utilize the Structure-Conduct-Performance (SCP) framework, which posits that an organization's conduct is shaped by the structural conditions in which it operates and, in turn, this conduct influences its performance outcomes. By applying this framework to healthcare procurement, we conceptualize hospital GPO participation as responding to three interconnected structural dimensions: (1) economic structure, represented by procurement costs that create efficiency pressures; (2) spatial structure, captured through geographic dispersion that shapes the access and complexity of coordinating suppliers (i.e., distribution networks); and (3) demand-side structure, reflected in the disability load (the percentage of disabled individuals) of the patient population, which influences hospitals’ resource requirements and the available operational slack. We argue that these structures shape hospitals’ conduct, manifested in their adaptive procurement behavior (specifically, oscillatory participation in GPOs). This conduct, in turn, influences performance in the form of operational resilience, as measured by the length of stay (LOS), particularly in the presence of system-level disruptions, such as the COVID-19 pandemic.

Building on this foundation, we employ Dynamic Capabilities Theory (DCT) to explain how hospitals enact these adaptations (Teece et al., 1997). DCT emphasizes an organization's ability to sense environmental changes, seize opportunities, and reconfigure resources to sustain performance. We extend this logic by introducing the notion of oscillatory reconfiguration, where adaptation occurs not as a linear progression but as recurring cycles of capability activation, deactivation, and reactivation, mirroring hospitals' entry, exit, and re-entry into GPO affiliations. We test this using a panel of U.S. acute care hospitals from 2016 to 2023.

Our research, positioned at the intersection of Operations and Supply Chain Management (OSCM), health services policy, and interorganizational governance, contributes to the literature in three ways. First, we reframe hospital procurement as a dynamic, cyclical process rather than a static (i.e., one-time) cost-control decision. By examining hospitals' join-exit-rejoin patterns with GPOs, we demonstrate that procurement adaptation follows oscillatory rather than linear trajectories, an idea that has been alluded to in the literature (e.g., Lin & Wang, 2025) but has been heretofore rarely examined in detail. Second, we demonstrate that these participation cycles are systematically shaped by structural shifts in procurement costs, geographic dispersion, and disability load, and that such adaptive conduct facilitates hospitals' operational performance, reflected in faster normalization of LOS following a supply chain shock. Finally, we introduce the concept of oscillatory reconfiguration (a capability pattern characterized by the repeated activation, deactivation, and reactivation of routines to maintain alignment with fluctuating structural conditions) into DCT. Our findings inform operations managers on designing procurement governance in the face of volatility by

showing when pooled sourcing should be treated as a reversible operational lever, and help scholars reframe procurement governance as a reversible operational design choice, rather than a fixed structural commitment.

## CONCEPTUAL BACKGROUND

Hospitals tend to operate under tight resource limits, which makes them especially sensitive to supply disruptions. If procurement practices do not adjust quickly enough, even small breaks in supply can have a big impact on how smoothly operations run (Ambulkar et al., 2015; Singh et al., 2018). Hence, procurement has become more of a priority for U.S. hospitals, especially as they deal with rising costs and increasingly complex supply networks. Over time, many hospitals have started to see GPOs not just as vendors but as part of a broader strategy for staying operationally stable (Zepeda et al., 2016; Rosales et al., 2023). GPOs provide a platform that enables hospitals to leverage their collective buying power while reducing transaction costs through a single vendor screening process, negotiated contracts, and shared purchasing intelligence (Lin & Wang, 2025; Yang et al., 2025). GPO affiliation corresponds with theories of buyer power (e.g., Porter's Theory) and purchasing portfolio optimization (Kraljic, 1983) since intermediaries (i.e., the GPO) may be able to create a networked procurement system that allows hospitals with similar purchasing patterns to coordinate their purchasing routines.

However, the benefits of GPOs in hospital procurement remain contested (Hu et al., 2012). For example, Shockley et al. (2023) argue that GPO purchasing may lead to standardized ordering processes, impose unrealistic minimum order quantities, and promote order batching, all of which are indicators of suboptimal OSCM performance.

Governance issues can also create challenges with GPO coordination (Lin & Wang, 2025). Suppliers typically compensate GPOs with an administrative levy based on a percentage of their sales, typically up to 3%, which helps to fund GPO operations. This fee may also lead to contract bias towards higher-cost suppliers and decrease trust between hospitals and GPOs (Hu & Schwarz, 2011; Hu et al., 2012; Schneller et al., 2023). Studies have suggested that fixed-fee pricing arrangements for many GPOs undermine the value they provide, dissuade innovative suppliers from participating, and limit the total value offered to hospitals (e.g., Nyaga et al., 2015; Hu & Schwartz, 2011).

One point that stands out in recent research is the idea that coordination between hospitals and GPOs isn't fixed. It tends to shift over time, depending on a mix of internal and external pressures (Dean et al., 2024). Most hospitals revisit their GPO affiliations every few years, typically every three to five years, as this lines up with the usual contract renewal timelines (Burns, 2014). These reviews often lead to changes in participation, especially when cost structures, demand patterns, or supply chain issues begin to shift (In et al., 2019). In larger health systems, this reassessment can happen even more often. These organizations typically possess more leverage and tend to evaluate which sourcing categories should remain under GPO contracts versus those managed internally (Burns & Briggs, 2020). Recent findings also show that hospitals frequently cycle in and out of GPO arrangements, sometimes returning to ones they previously left (Lin & Wang, 2025). This pattern suggests a process of continuous reevaluation rather than a one-time decision.

This ongoing reevaluation extends beyond contract logistics to directly shape hospitals' access to medications. For example, Dean et al. (2024) found that hospitals'

access to biosimilar drugs (i.e., medications with similar clinical efficacy at lower costs) depends on whether their GPO portfolios include such products. By disengaging from a GPO, hospitals can access cost-saving alternatives that were previously inaccessible (e.g., Hu and Schwarz, 2012; Shockley et al., 2023; Nyaga et al., 2015). Thus, GPO participation serves as a mechanism of structural coordination and re-coordination (Saha et al., 2019). This insight underpins our view of oscillatory reconfiguration, where hospitals shift their procurement strategies over time to align with evolving cost, spatial, and demand pressures.

## THEORY AND HYPOTHESES

We ground our theoretical development in two complementary perspectives: the Structure-Conduct-Performance (SCP) paradigm and Dynamic Capabilities Theory (DCT). SCP paradigm provides an economic logic explaining how structural conditions such as market, cost, and environmental characteristics shape firm conduct, which in turn determines performance outcomes (Porter, 1981). In the case of hospitals that experience varying degrees of procurement costs, geographic dispersion, and disability load, SCP provides a unifying framework for understanding hospitals' oscillatory procurement conduct of joining, leaving, and rejoining GPOs. Building on this macro foundation, DCT describes a micro-level perspective on how hospitals sense, seize, and reconfigure routines for procurement that navigate constantly evolving structural pressures.

### Structure-Conduct-Performance Paradigm

The SCP model originated in industrial economics, but has since been developed in the field of Strategic Management (Porter, 1981; Scherer & Ross, 1990; Ralston et al., 2015). At its core, SCP posits that structural conditions shape firm conduct, which in turn determines performance outcomes. Applying this framework to healthcare procurement allows us to view hospitals' oscillatory participation in GPOs as a conduct shaped by evolving structural conditions, with implications for performance outcomes such as LOS.

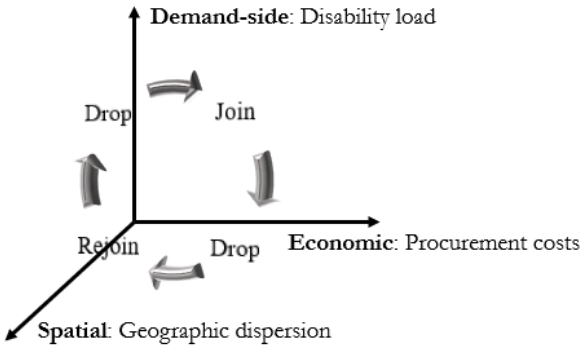
In this study, we identify three interrelated structures of the hospital operating environment: economic conditions, spatial configuration, and demand-side complexity. The economic dimension, represented by procurement costs, captures both the efficiency pressures imposed on suppliers and the broader structural and behavioral factors that influence purchasing decisions (Burns & Lee, 2008; Abdulsalam & Schneller, 2019; Hu & Schwarz, 2011). The spatial dimension, measured by geographic dispersion of hospitals, reflects how location and market configuration influence procurement logistics and coordination (Lorentz et al., 2012; Rossetti et al., 2023; Walker et al., 2021). Finally, the demand-side dimension (disability load) documents how hospitals serving patients with varied and complex disabilities face greater operational challenges due to the need to manage a wider range of care requirements (Krahn et al., 2015; Ding et al., 2024). Together, these factors represent the structural conditions under which hospitals make their procurement and coordination decisions.

While all three dimensions characterize hospitals' broader operating environments, we conceptualize disability load as a moderator rather than a direct structural driver. Unlike economic and spatial conditions that directly influence procurement decisions, disability load reflects internal demand complexity that shapes

how hospitals absorb and respond to economic and spatial pressures. Higher disability rates heighten operational rigidity and resource strains, reducing the flexibility required to adjust procurement arrangements when structural conditions shift. Consequently, disability load strengthens the effects of economic and spatial structures by making hospitals more sensitive to cost pressures and coordination challenges.

Within the SCP framework, hospitals' oscillatory participation in GPOs, manifested through join, drop, and rejoin cycles, represents conduct, enacted to manage procurement under evolving structural conditions. Through cyclical engagement and disengagement, hospitals reposition themselves within the procurement landscape, balancing autonomy, coordination, and efficiency. Figure 1 illustrates this conduct visually.

**Figure 1. SCP Framework Illustrating Oscillatory GPO Participation**




Finally, performance within the SCP paradigm aligns with the outcomes resulting from these adaptive procurement behaviors. In our context, performance is reflected in operational resilience, which is the hospital's ability to maintain efficiency and continuity of care, measured by shorter LOS during periods of supply and operational disruption. This completes the causal chain central to SCP: structural variation (economic, spatial,

demand complexity) shapes conduct (oscillatory GPO participation), which, in turn, influences performance (resilience). Figure 2 provides an overview of our theoretical model.

While the SCP paradigm clarifies why hospitals adjust their procurement behavior in response to structural pressures, it is less explicit about how these adjustments are made. To unpack the micro-level mechanisms through which hospitals sense shifts in structure and reconfigure their procurement arrangements, we draw on DCT. In this way, DCT operationalizes the "conduct" stage of SCP by explaining the internal capability processes that produce observable procurement transitions such as joining, dropping, and rejoining GPOs.

**Figure 2. Theoretical Model Linking Structural Conditions, GPO Conduct, & Performance**

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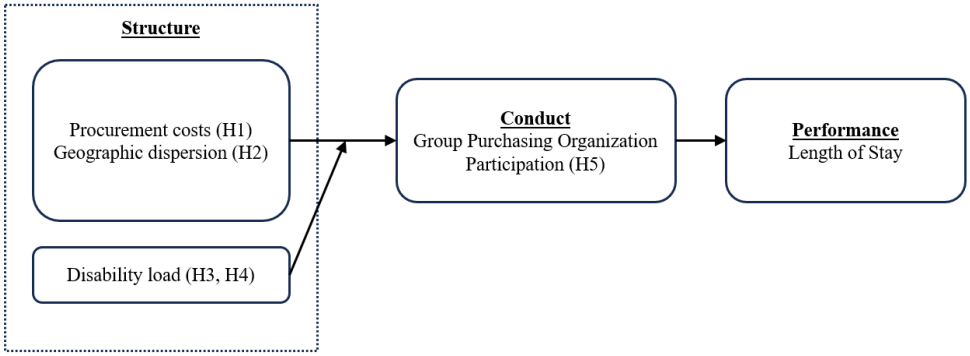



## Dynamic Capabilities Theory and Oscillatory Reconfiguration

DCT provides a framework for understanding how hospitals can adapt over time to evolving operating conditions. DCT builds on Penrose's (2009) resource-based view,

placing greater emphasis on how organizations respond to changing environments rather than on optimizing static bundles of resources. According to Teece (2007), the adaptive capacity of organizations comprises three main activities: sensing environmental changes, seizing opportunities by mobilizing resources, and reconfiguring existing routines and structures to respond to those opportunities. In aggregate, these activities enable organizations to balance the exploitation of existing capabilities with the exploration of new operational modes. Recently, dynamic capabilities have been increasingly referenced in both operations and supply chain management literature to explain how organizations respond to environmental turbulence (Ambulkar et al., 2015; Polater, 2021), with Singh et al. (2018) noting its importance in the contexts requiring rapid reconfiguration.

Earlier work in operations management has used DCT to explore how manufacturing plants, supply chains, and service systems reconfigure their routines in response to disruptions (Wilden et al., 2013; Brandon-Jones et al., 2014). Most of this research stream treated reconfiguration as unidirectional. The assumption tends to be that capabilities get refined or upgraded over time, but not reversed or brought back into use after being set aside. In some industries, organizations reconfiguring their operations follows a more back-and-forth rhythm, rather than a linear path. Airlines, for example, may leave an alliance and then rejoin it at a later point in time. Similarly, they might temporarily cancel a route and bring it back when demand shifts (Gudmundsson & Rhoades, 2001). Automobile manufacturing firms move in and out of platform-sharing partnerships depending on market conditions (Takeishi, 2002). Global manufacturers also switch between offshoring and reshoring as they try to manage cost pressures while keeping

their supply chains resilient (Gray et al., 2013). Additionally, firms alternate between centralized and decentralized structures to adjust to shifting needs for control versus flexibility (Nickerson & Zenger, 2002). These kinds of examples suggest that reconfiguration does not always follow a straight path. Sometimes, organizations step away from a prior setup and return to it later when the environment changes representing an oscillatory pattern.

In the healthcare industry, GPO membership provides a particularly notable manifestation of such oscillatory reconfiguration, as some hospitals tend to enter and exit GPO contracts on a regular basis (c.f., In et al., 2019; Burns & Briggs, 2020; Lin & Wang, 2025). To that extent, we extend DCT by introducing the concept of Oscillatory Procurement Reconfiguration (OPR), defined as the periodic activation and deactivation of third-party negotiation portfolios in response to shifts in procurement costs and supplier-access constraints. Unlike prior research that views supply/procurement realignment as a linear path (i.e., one where there is no “going back”), OPR views it as an oscillatory process, characterized by episodic waves of engagement and disengagement. This is also consistent with prior research in healthcare, which, while not specifically looking at entry/exit with GPOs, does, however, identify that even within “static” relationships between hospitals and GPOs, there is constant renegotiation and reconstruction of relationships aiming for sustainable performance (Bhakoo et al., 2012).

**Procurement Costs and OPR (the Economic Dimension of SCP)**

Consistent with the SCP paradigm, increases in procurement costs constitute an economic structural force that alters hospitals’ procurement conduct. GPO contract portfolios represent a collective procurement mode that reduces supplier screening

frictions, transaction costs, and information asymmetries (c.f., Hu et al., 2012; Hu & Schwarz, 2011), making it especially valuable under cost pressures. Previous studies have also shown that hospitals are more likely to use GPO contracts in times of financial stress (Burns, 2014; Burns & Briggs, 2020), reinforcing the belief that one of the primary motivations for joining is to reduce costs.

From a DCT perspective, in hospitals that are not part of a GPO, the increase in procurement costs leads to a sensing phase, where they become aware of their increased risk exposure. This subsequently leads to a seizing phase, where hospitals partner with GPOs to realize economies of scale and coordination benefits (Teece, 2007). On the other hand, in the hospitals that are a part of a GPO, when procurement costs decline, hospitals may feel less exposed to risk and feel that they can also take advantage of more efficient internal processes by moving purchasing in-house (c.f., Lin & Wang, 2025). Lower cost pressures, therefore, may create incentives to reconfigure procurement routines away from collective modes (Brandon-Jones et al., 2014). Therefore, lowered procurement costs may allow hospitals to more easily feel that they can leave their GPO membership. Indeed, empirical research suggests that when hospitals perceive that they no longer have a cost advantage from being part of a GPO, or when they have an internal capability that can generate a greater value, they will exit GPO contracts (In et al., 2019). Finally, dynamic capability processes also allow organizations to reactivate prior routines when conditions change, enabling oscillatory rather than linear reconfiguration (Wilden et al., 2013; Gudmundsson & Rhoades, 2001). When procurement costs rise again following a prior exit, hospitals may therefore redeploy previously used GPO-based procurement arrangements, consistent with OPR and the logic of reversible reconfiguration observed

in alliances and interorganizational collaborations (Takeishi, 2002; Bhakoo et al., 2012). Thus, renewed cost pressures are likely to increase the likelihood that hospitals rejoin a GPO after having exited. These expectations motivate the following hypotheses.

*H1a: As procurement costs increase, the likelihood that a hospital joins a GPO increases.*

*H1b: As procurement costs decrease, the likelihood that a hospital exits a GPO increases.*

*H1c: Among hospitals that previously exited a GPO, increases in procurement costs increase the likelihood of re-joining a GPO.*

**Geographic Dispersion and OPR (the Spatial Dimension of SCP)**

Geographic dispersion refers to the extent to which facilities are spatially distributed across a region. This metric captures the distance between facilities and the density of surrounding healthcare infrastructure (Kafouros et al., 2018; Lorentz et al., 2012). Prior OSCM research demonstrates that geographic structure is a fundamental determinant of operational performance in healthcare (e.g., Patidar et al., 2023). Greater dispersion increases supply chain costs (Lorentz et al., 2012), raises inventory requirements and replenishment cycle times (Bode & Wagner, 2015; Rossetti et al., 2023), and amplifies exposure to disruptions (Vogel & Miller, 1995). From an SCP perspective, geographic dispersion constitutes a persistent structural constraint that shapes hospitals' feasible procurement strategies (Scherer & Ross, 1990; Lorentz et al., 2012).

In dispersed settings, independent sourcing is more costly and less reliable due to elevated coordination costs and greater exposure to localized supply disruptions,

increasing dependence on mechanisms that pool demand and stabilize supplier access (Craighead et al., 2007; Handfield & McCormack, 2007). Because of these coordination and logistics challenges, hospitals with more geographically dispersed operations face stronger incentives to rely on collective procurement mechanisms. GPOs serve precisely this function by aggregating purchasing volume, broadening supplier access, and reducing exposure to localized supply disruptions (Hu & Schwarz, 2011; Burns & Lee, 2008). As a result, geographic dispersion may increase the likelihood that hospitals join a GPO. Conversely, a reduction in geographic dispersion should increase the likelihood that hospitals exit GPO participation. As dispersion decreases and hospitals become clustered, they may sense reduced vulnerability and seize opportunities to pursue independent procurement strategies. This increased autonomy lowers the perceived value of maintaining GPO membership as internal efficiencies outweigh the benefits of pooled purchasing (Chen et al., 2013).

DCT emphasizes that organizations retain and redeploy previously developed routines when environmental or operational conditions shift (Zollo & Winter, 2002). Hospitals that have previously participated in GPOs and exited, therefore, may possess relational ties and contractual knowledge that can be reactivated when independent sourcing becomes untenable. Prior research on interorganizational relationships similarly documents reversible patterns of engagement, wherein firms exit and later re-enter collaborative arrangements as environmental conditions evolve (Gulati & Gargiulo, 1999; Ozcan & Eisenhardt, 2009). This leads to the belief that geographically dispersed hospitals that exit GPO partnerships are then likely to re-enter, resulting in oscillatory participation rather than permanent disengagement.

In summary, geographic dispersion is expected to increase the likelihood that hospitals join GPOs, increase the likelihood that they exit them when geographic dispersion decreases, and increase the likelihood that they subsequently rejoin following a prior exit. These expectations motivate the second set of hypotheses, which, taken together, imply that hospital-GPO associations are stable in hospitals with relatively high geographic dispersion.

*H2a: As geographic dispersion increases, the likelihood that a hospital joins a GPO increases.*

*H2b: As geographic dispersion decreases, the likelihood that a hospital exits a GPO increases.*

*H2c: Among hospitals that previously exited a GPO, increases in geographic dispersion increase the likelihood of re-joining a GPO.*

**Disability Load and OPR (the Demand-side Dimension of SCP)**

Hospitals that provide care for a larger share of patients with disabilities tend to deal with complex demands, both clinically and operationally, than hospitals with general populations. Treating individuals with disabilities, on average, costs about 2.6 times more than treating those without (Khavjou et al., 2020). That difference does not just arise from treating complicated health conditions, but also results from a heavier reliance on specialized supply items that are often expensive, sensitive to quality standards, and not always easy to forecast. Such unpredictability results in a complex procurement system resulting in hospitals having to maintain higher inventories which makes them vulnerable to price swings and restocking delays (Barros et al., 2021). From a dynamic capabilities standpoint (Eisenhardt & Martin, 2017), these hospitals need to build up their ability to

create governance systems that help stabilize supply availability, even under market uncertainty. Taken together, disability load is likely to influence the relationship between structural pressures (procurement costs and geographic dispersion) and GPO participation.

Consistent with the OPR logic developed earlier, disability load is likely to strengthen all three directional adjustments in GPO participation, albeit for distinct reasons. First, when procurement costs rise, high-disability hospitals benefit more from pooled buying power and standardized contracting, making them more likely to join a GPO (Burns & Lee, 2008). Second, the relative value of pooled buying power diminishes more sharply for disability-intensive hospitals, which gain greater flexibility to source specialized supplies outside standardized GPO contracts when procurement costs decrease. Such hospitals are disproportionately more likely to exit a GPO (Hu et al., 2012). Finally, following an exit, when purchasing becomes unsustainable due to renewed spikes in procurement costs, hospitals with higher disability loads feel the strain more acutely and therefore exhibit a stronger likelihood of rejoining to restore stability (Helfat & Peteraf, 2003; Ambulkar et al., 2015). Hence.

*H3a: The effect of procurement costs on the likelihood of joining a GPO is stronger when disability load is higher.*

*H3b: The effect of procurement costs on the likelihood of leaving a GPO is stronger when disability load is higher.*

*H3c: The effect of procurement costs on the likelihood of rejoining a GPO is stronger when disability load is higher.*

As documented in H2 and H3, geographic dispersion and disability load each introduces distinctive sources of procurement vulnerability, but when they occur together, their effects compound (Rossetti et al., 2023; Krahn et al., 2015). When both structural and demand-side vulnerabilities co-exist, hospitals face amplified uncertainty. Disruptions are harder to buffer, replenishment is harder to coordinate, and procurement cost shocks are more difficult to absorb (Okoro et al., 2018). Therefore, hospitals must more frequently reconfigure governance arrangements to sense and respond to this compounded strain.

As a result, disability load is likely to magnify the oscillatory pattern of GPO affiliation observed among geographically dispersed hospitals. When procurement costs rise, the combined burden of spatial coordination and specialized demand makes pooled buying power especially valuable, strengthening the likelihood of joining or rejoining. Conversely, when procurement costs fall, these hospitals gain more from restoring procurement autonomy to pursue customized sourcing arrangements that better fit their logistical footprints and patient needs, strengthening the likelihood of leaving. Thus, disability prevalence should amplify both the positive and negative effects of geographic dispersion on GPO oscillation. We therefore propose the following hypotheses:

*H4a: The effect of geographic dispersion on the likelihood of joining a GPO is stronger when disability load is higher.*

*H4b: The effect of geographic dispersion on the likelihood of leaving a GPO is stronger when disability load is higher.*

*H4c: The effect of geographic dispersion on the likelihood of rejoining a GPO is stronger when disability load is higher.*

**GPOs and Supply Chain Disruptions (the Performance Dimension of SCP)**

There is growing recognition that disruptions in healthcare supply chains have effects that extend beyond logistics and cost efficiency. Multiple studies have connected shortages in essential medications and medical supplies to delayed treatment, longer recovery periods, and, in some cases, increased patient risk, including mortality (Vail et al., 2017; Phuong et al., 2019; Park et al., 2025). These challenges were especially visible during the COVID-19 pandemic, when hospitals across the system faced extensive interruptions to their supply of basic pharmaceuticals and critical care equipment like ventilators. As hospitals transitioned out of the most critical stage of the pandemic, many faced renewed difficulties in reestablishing stable procurement processes. Those with longer-standing purchasing arrangements, often supported through GPO involvement, appeared to restock essential supplies more efficiently. In turn, this may have supported smoother clinical operations and helped reduce the kinds of delays and capacity strain that disrupted patient flow during the earlier phases of the crisis (Finkenstadt & Handfield, 2021; Sodhi & Tang, 2021).

From an OSCM standpoint, supply chain disruptions can increase LOS during disruptions, not only because of a greater clinical need, but also because interruptions in the availability of medications, devices, and consumables can delay routine care processes, thereby increasing patient flow cycle time. GPO participation enables hospitals to enact sensing, seizing, and reconfiguring procurement routines by providing pre-established supplier access, standardized substitution pathways, and shared procurement intelligence, which reduces coordination costs under time pressure. By shortening the duration and severity of process interruptions, GPO-affiliated hospitals can, therefore, restore throughput more quickly following system-level shocks, resulting

in a faster normalization of length of stay. Accordingly, we propose the following hypothesis:

*H5: Following COVID-19-related supply chain disruptions, the reduction in LOS will be greater for hospitals that participate in GPOs than for hospitals that do not participate in GPOs.*

## METHODOLOGY

### Data Sources

To evaluate our research hypotheses, we constructed a hospital-year panel for 2016-2023 using several national datasets. The American Hospital Association (AHA) Annual Survey serves as the starting point for our analysis, providing longitudinal information on hospital characteristics and GPO affiliations in system organizations (AHA, 2023). GPO participation cycles: join, drop, and rejoin events were coded from this dataset, allowing us to capture shifts in procurement strategy over time (Lin & Wang, 2025). We supplemented this data with Centers for Medicare and Medicaid Services (CMS) files, containing information on payer mix, coverage rates, and patient outcomes. The Bureau of Labor Statistics (BLS) provided information on disability, while the Agency for Healthcare Research and Quality (AHRQ) provided information on population health through the Area Health Resources Files (AHRF). We drew additional demographic and socioeconomic controls, including local income ratios, insurance coverage rates, and access to primary care from federal and county-level datasets.

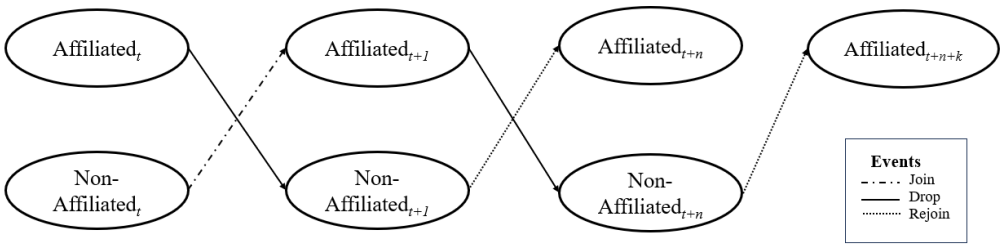
### Dependent Variables

This study employs four dependent variables. First, to test H1-H4, we model hospitals' GPO participation as a sequence of three event outcomes observed in a hospital-year panel: Join, Drop, and Rejoin. Using longitudinal AHA affiliation data, we first derive an annual indicator of whether a hospital reports membership in a GPO in a given year. From this baseline status, we then code transitions as discrete events. A hospital joins a GPO when it is observed moving from non-affiliation in year t-1 to affiliation in year t (Join is coded 1 in that given year, 0 otherwise). It drops when it moves from affiliation in year t-1 to non-affiliation in year t (Drop is coded 1 in that given year, 0 otherwise). Finally, a hospital rejoins when it re-enters affiliation in year t after a prior drop has been observed in its history (Rejoin is coded 1 in that given year, 0 otherwise). These events are mutually exclusive within a given year (a hospital cannot both join and drop in the same year), but a hospital may experience multiple events across years (e.g., join → drop → rejoin). To reduce left-censoring bias, hospitals already affiliated at the panel's first observed year are not treated as "joins"; their first observable transition is a potential drop. This event-based approach captures procurement strategy as a sequence of discrete adjustments rather than as a continuous scale, aligning with the dynamic capability perspective. Additionally, this event-based specification is preferred to duration models because our interest lies in state-contingent transitions (join, drop, rejoin) rather than time-to-exit alone. Figure 3 illustrates the phase transitions between states and the associated event coding.

Next, to test H5, we calculate LOS as the ratio of total inpatient days to total discharges in a given hospital-year, yielding the average number of inpatient days per admission. Prior healthcare OM studies employ LOS as a proxy for efficiency and quality

in care delivery (Thomas et al., 1997). Because LOS reflects a hospital's ability to deliver appropriate care to patients on time, it indicates the hospital's ability to operate without delays that may stem from operational or supply-related disruptions.

**Figure 3. Coding of Hospital Transitions in GPO Affiliation**




## Independent Variables

Procurement Costs is the first independent variable in our study. To develop this measure, we referred to reports published by the Healthcare Cost Report Information System (HCRIS), which provides annual records of the financial results of hospitals for each fiscal year (CMS, 2024). All costs relating to the procurement or usage of core hospitalized services have been included within this measure. As noted by Bradley et al. (2025), Procurement Costs are defined as those costs associated with the purchase or use of items such as general supplies, surgical/medical supplies, laboratory/radiology diagnostic services, pharmaceuticals, and administrative supplies. Procurement Costs also includes those costs associated with the purchase of oxygen and other medical gases, as well as dietary products that may be provided in the patient's diet. This broad classification has been designed to ensure that it covers both clinical (medical and surgical) supplies, as well as ancillary items which are necessary for the daily operation of the hospital (Abdulsalam & Schneller, 2019; Bradley et al., 2025).

Our second independent variable is Geographic Dispersion of hospitals (Bloom et al., 2012). To construct this measure, we identify all hospitals within a 50-mile radius of each focal hospital i in year t, using the reported latitude and longitude coordinates. The pairwise distances (dij) are calculated using the Haversine formula, which accounts for the Earth's curvature (calculation details in e-companion OA1). The dispersion of each focal hospital's local network is then defined as the standard deviation of these Haversine distances:

The above measure captures how tightly or loosely the nearby hospitals are clustered in geographic space. A higher value indicates that the hospital's local neighborhood is more spatially dispersed, while a lower value suggests greater geographic clustering within the 50-mile boundary. As old hospitals close and new ones open (by some estimates, over 115 hospitals closed in the U.S. between 2020 and 2025, and about the same number have opened in other areas), the geographic dispersion of any individual hospital vis-à-vis its 50-mile radius can vary from year to year.

Finally, to test H5, we create a binary variable, GPO Participation, coded as 1 if the hospital participates in a GPO in a given year and 0 otherwise. This specification collapses the dynamic join, drop, and rejoin events into a single indicator of current membership status, allowing us to examine whether participation itself affects hospital performance.

**Moderator Variables**

We include two moderators to test the mechanisms proposed in H3-H5. For H3 and H4, Disability Load is measured as the number of disabled people in a county divided by the number of hospitals in that county. This per-hospital disability burden reflects the

underlying demand pressure faced by local providers and captures variation in the intensity of resource needs across counties. A higher disability load indicates a demanding operating environment. Finally, COVID period indicator is included to capture the disruptions that altered hospital operations and procurement stability during the pandemic (H5). This variable takes a value 1 in COVID affected years (2020 onward) and 0 otherwise. It allows us to assess whether the relationship between GPO participation and LOS differs under conditions of operational stress.

**Control Variables**

We incorporate several control variables that could affect hospital decisions concerning the oscillatory characteristics of GPO participation and hospital performance. To begin with, we take into account the hospital's features. First, Admissions Per Bed is determined by dividing the total number of hospital admissions by the number of available beds. This ratio indicates the hospital's operating scale and utilization. Hospitals with elevated admissions per bed possess enhanced purchasing power, extensive services, and superior procurement methods compared to other hospitals and may exhibit a greater tendency for periodic oscillatory reconfiguration. Second, we incorporated Operating Margin to account for the financial stability of a hospital. It is measured as the difference between total expenses and total income from operations, divided by total operating revenue. Hospitals with greater margins may negotiate contracts independently of GPOs, whereas those facing financial limitations may be compelled to depend on GPOs. Third, System Affiliation is incorporated as a binary indicator denoting whether a hospital is part of a hospital system. System membership frequently offers centralized purchasing power that can either replace or enhance GPO agreements (Aloh et al., 2020; Gaffney &

Michelson, 2023). Finally, we incorporate two hospital capability controls: Surgical Intensity quantifies the baseline volume of surgical services, calculated as the total number of surgical procedures conducted in a year divided by the total number of adult and pediatric beds. Staffing Intensity is determined by the ratio of full-time equivalent registered nurses to adult and pediatric bed capacity, indicating clinical staffing capability. Higher values signify enhanced frontline staffing resources that may affect procurement methods.

We also control for institutional and policy factors. The Rural-Urban Commuting Area (RUCA) indicates if hospitals serve a predominantly urban or rural population. Hospitals in rural areas tend to operate in thinner supplier markets with different contracting needs than urban ones. We also include a binary measure of participation in the federal 340B drug pricing program, which gives eligible hospitals access to outpatient drugs at discounted prices. This lowers the benefit of GPO membership for purchasing decisions, thereby affecting overall GPO engagement (Danek et al., 2022).

Several control variables related to the socioeconomic environment in which a hospital operates are included. Income Ratio is constructed at county-level and captures the relative economic standing of the local population. Lower income ratios indicate more economically constrained communities, which can affect hospitals' payer mix, dependence on public insurance programs, and the volume of uncompensated care. We also include the percentage of the population without health insurance. Higher uninsured populations increase uncompensated care and financial risk, which makes hospitals more reliant on the cost savings promised by GPOs (Maeda et al., 2014). Limited Food Access, defined as the proportion of the population living in food deserts or areas with restricted

food availability, is also controlled for. It indicates underlying health risks that can influence demand for hospital services. Primary care coverage, defined as the percentage of the population with a primary care provider, is another community-level factor; lower coverage usually increases reliance on hospitals for non-emergency care. Age-adjusted mortality, reported as the mortality rate per 100,000 in the population, adjusted by age, represents a statistic of community health status. Hospitals in areas with higher mortality rates may face greater complexity of care and resource constraints (Basu et al., 2019). Finally, we include year fixed effects to control for temporal factors.

Table 1 documents the descriptive statistics and correlations. All correlation coefficients fall below the widely accepted criterion of 0.70. The maximum VIF is 1.49, suggesting that multicollinearity is not a substantial issue in our research.

**Model Estimation**

As per our conceptualization of OPR, hospitals do not make a single, irreversible decision to join a GPO; instead, they may enter a GPO, remain for a period, exit, and, in some cases, re-enter after leaving. To capture this oscillatory behavior, we adopt a first-order Markov chain framework, which is well-suited for modeling participation as a sequence of transitions across distinct participation states (i.e., join, drop, re-enter) (Faddy & McClean, 1999). In this framework, the probability of entering a new state depends directly on the most recent prior state. In our setting, this means that whether a hospital joins, drops, or rejoins a GPO each year depends on its GPO status in the previous year. Formally, if Sit denotes the GPO status of hospital i at time t, the transition probability can be expressed as

where the likelihood of being in state s at time t is conditional on the immediate prior state Si,t-1.

## Table 1. Descriptive Statistics and Pairwise Correlations

| | Mean | Std. Dev. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Join | 0.69 | 0.46 | | | | | | | | | | | | | | | | |
| Drop | 0.07 | 0.25 | | | | | | | | | | | | | | | | |
| Rejoin | 0.03 | 0.16 | | | | | | | | | | | | | | | | |
| Length of stay | 9.39 | 18.38 | | | | | | | | | | | | | | | | |
| 1. Procurement costs (millions) | 19.59 | 41.48 | 1 | | | | | | | | | | | | | | | |
| 2. Geographic dispersion | 0.52 | 0.12 | -0.19* | 1 | | | | | | | | | | | | | | |
| 3. Disability load (1000s) | 1.73 | 2.73 | 0.15* | -0.49* | 1 | | | | | | | | | | | | | |
| 4. COVID | 0.58 | 0.49 | 0.06* | 0.01 | -0.02* | 1 | | | | | | | | | | | | |
| 5. Admissions per bed | 111.24 | 68.00 | -0.05* | 0.11* | -0.10* | 0.00 | 1 | | | | | | | | | | | |
| 6. Operating margin | -2.54 | 15.62 | -0.01 | -0.08* | 0.03* | -0.07* | 0.11* | 1 | | | | | | | | | | |
| 7. System affiliation | 0.72 | 0.45 | 0.10* | -0.19* | 0.13* | -0.00 | -0.02* | 0.22* | 1 | | | | | | | | | |
| 8. Surgical intensity | 9.20 | 5.75 | 0.29* | -0.23* | 0.18* | -0.11* | 0.17* | 0.20* | 0.18* | 1 | | | | | | | | |
| 9. Staffing intensity | 1.87 | 0.85 | 0.31* | -0.09* | 0.10* | 0.05* | 0.51* | 0.08* | 0.05* | 0.53* | 1 | | | | | | | |
| 10. RUCA | 3.08 | 2.88 | -0.28* | 0.47* | -0.36* | 0.02* | 0.04* | -0.19* | -0.28* | -0.48* | -0.24* | 1 | | | | | | |
| 11. 340B | 0.06 | 0.24 | 0.16* | 0.01 | -0.01 | -0.07* | 0.00 | -0.00 | 0.01 | 0.07* | 0.09* | -0.06* | 1 | | | | | |
| 12. Income ratio | 4.70 | 0.69 | 0.17* | -0.20* | 0.25* | -0.03* | -0.09* | -0.07* | 0.07* | 0.12* | 0.04* | -0.19* | 0.04* | 1 | | | | |
| 13. Uninsured | 12.68 | 6.59 | 0.09* | 0.02* | -0.45* | 0.25* | 0.12* | -0.04* | 0.00 | 0.03* | 0.14* | -0.09* | 0.00 | -0.02* | 1 | | | |
| 14. Limited food access | 6.49 | 4.48 | -0.07* | 0.23* | -0.21* | 0.03* | -0.04* | -0.01 | -0.05* | -0.09* | -0.16* | 0.13* | 0.00 | -0.06* | -0.17* | 1 | | |
| 15. Primary care | 0.001 | 0.0003 | 0.25* | -0.21* | 0.13* | -0.01 | 0.01 | 0.04* | 0.14* | 0.31* | 0.23* | -0.34* | 0.07* | 0.24* | 0.27* | -0.19* | 1 | |
| 16. Mortality | 377.29 | 102.08 | -0.14* | 0.35* | -0.28* | 0.08* | -0.06* | -0.08* | -0.09* | -0.26* | -0.28* | 0.36* | 0.01 | 0.15* | -0.26* | 0.39* | -0.40* | 1 |
| 17. GPO Participation | 0.69 | 0.46 | 0.13* | 0.00 | 0.03* | -0.07* | 0.10* | -0.00 | 0.08* | 0.06* | 0.09* | -0.09* | 0.06* | -0.06* | 0.00 | -0.03* | 0.08* | -0.09* |

We classify GPO participation (GPO Status) into four mutually exclusive states: (0) no GPO participation, (1) currently in a GPO, (2) dropped from a GPO, and (3) rejoined a GPO. Guided by this structure, we estimate three separate transition models corresponding to the movements between these states. The first model (join) estimates the probability that a hospital with no prior GPO participation (Si,t-1=0) enters a GPO in the current year. Formally,

The second model (drop) estimates the probability that a hospital currently in a GPO (Si,t-1=1) exits participation in the following year:

Finally, the third model (rejoin) estimates the probability that a hospital with prior membership, having previously exited (Si,t-1=2) re-enters a GPO in the current year:

Each of these transitions is estimated separately, with the sample restricted to the relevant state-specific risk set. By focusing on join, drop, and rejoin transitions, we capture the oscillatory and state-dependent nature of GPO participation, rather than treating membership as a static outcome (Cook & Lawless, 2007).

Addressing Estimation Challenges: Attrition and Endogeneity

We faced two econometric challenges in this research. First, employing a hospital fixed-effects model, although effective for removing unobserved, time-invariant heterogeneity, substantially reduced the estimation sample. In our setting, many hospitals exhibit stable GPO participation across years; therefore, conditional fixed-effects logit omits units without within-hospital variation in the dependent variable. Such attrition produces an estimation sample composed solely of hospitals with within-unit variation in GPO participation. In contrast, random-effects estimators retain all hospitals in the sample and account for hospital-level heterogeneity through random intercepts. However,

random-effects models require the assumption that unobserved hospital characteristics are uncorrelated with the explanatory variables, an assumption that may be violated where management practices, market conditions, or hospital size can affect costs and participation decisions (Wooldridge, 2010; Baltagi, 2021).

Second, the hospital Procurement Costs variable, which is central to our analysis, is potentially endogenous. Several mechanisms may generate endogeneity in this context. For instance, hospitals with higher procurement costs may be inclined to join a GPO in search of procurement efficiency. However, GPO membership itself can subsequently reduce or stabilize those costs, creating reverse causality, a standard simultaneity problem. Similarly, unobserved managerial practices, supplier relationships, or local market conditions may simultaneously influence both the decision to join a GPO and procurement costs, resulting in omitted variable bias (Basu & Rathouz, 2005; Angrist & Pischke, 2009).

To address these challenges jointly, we employ a two-stage residual inclusion (2SRI) control-function strategy (Terza et al., 2008; Bhargava et al., 2024). This approach corrects for endogeneity in nonlinear outcome models while avoiding the sample attrition associated with fixed-effects logit. In the first stage, we estimate a hospital fixed-effects equation for supply-chain costs as a function of relevant instruments and covariates, including hospital and year fixed effects. This specification purges time-invariant hospital characteristics and common temporal shocks, so that remaining fitted variation reflects within-hospital changes over time. Our instrument is the hospital's Laundry Linen Expenses, which proxy exogenous movements in input and operating conditions affecting procurement costs but are unlikely to directly influence the GPO participation aside from

their impact on procurement costs. The residual from this fixed-effects regression isolates the endogenous component of procurement costs, i.e., the portion correlated with unobserved factors affecting participation (Cameron & Trivedi, 2005).

In the second stage, we estimate a random-effects logit model of GPO participation using the same time controls and hospital-level random intercepts and the observed (first-stage purged) procurement cost and residuals as regressors. Endogeneity is controlled by the first-stage residual in the nonlinear model (Terza et al., 2008; Basu & Rathouz, 2015). Importantly, the cost-participation link is identified from within-hospital temporal variation rather than cross-sectional variations since the fixed-effects first stage generates exogenous procurement cost fluctuation. In the second stage, the random-effects framework estimates participation probability while keeping all hospitals, avoiding fixed-effects logit sample exclusion.

This combined fixed-effects 2SRI strategy effectively resolves both methodological concerns. It leverages the strengths of fixed effects to obtain exogenous variation in procurement costs, while utilizing the flexibility of random-effects logit estimation to preserve the full panel and accurately model the binary nature of GPO participation.

## RESULTS

Results from the first-stage fixed-effects model are reported in e-companion OA2. The laundry and linen expenses (Laundry Linen Expenses) instrument is positively and significantly associated with current supply-chain costs, confirming its relevance (11.11; $p<0.01$). The first-stage F-statistic exceeds the conventional threshold of 10 (Staiger & Stock, 1997; Sanderson & Windmeijer, 2016), indicating a strong instrument. The estimated residuals from this specification, representing the endogenous component of

supply-chain costs, are carried forward to the second-stage random-effects logit models to address endogeneity in GPO participation decisions (First stage residual).

Results of our analysis are presented in Table 2. Models 1-4 estimate the likelihood of joining a GPO, Models 5-8 estimate the likelihood of dropping, and Models 9-12 estimate the likelihood of rejoining. In each set, the first model includes the direct effects of the independent variables and moderators, the second and third models include the moderations added one at a time, and the final model includes all the interactions.

First, we find that procurement costs play a central role in driving GPO participation. In Model 1, the Procurement Costs variable is positive and significant ($\beta = 0.02$, $p<0.01$), supporting H1a by showing that hospitals with higher procurement costs are more likely to join a GPO than hospitals with lower procurement costs. In contrast, in Model 5, this variable is negative and significant ($\beta = -0.008$, $p<0.01$), consistent with H1b indicating that hospitals with lower costs are more likely to drop from a GPO. Finally, in Model 9, Procurement Costs are again positive and significant ($\beta = 0.003$, $p<0.05$), supporting H1c by demonstrating that hospitals facing greater cost pressures are more likely to rejoin a GPO. Taken together, these results provide strong evidence that cost pressures are a primary driver of dynamic GPO engagement. Similarly, in Model 1, the coefficient on the Geographic Dispersion variable is positive and significant ($\beta = 2.41$, $p<0.01$), suggesting that hospitals located in more dispersed regions are more likely to join a GPO, which supports H2a. However, in Model 5, this coefficient is negative but statistically insignificant, providing no reliable effect on dropping. Finally, consistent with H2c, in Model 9, Geographic Dispersion is positive and significant ($\beta = 1.77$, $p<0.05$), indicating that hospitals in more geographically dispersed settings are more likely to

rejoin. Taken together, these findings suggest that Geographic Dispersion systematically shapes join and rejoin into GPOs, while exhibiting limited association with drop behavior. In other words, geographically dispersed hospitals show a strong affinity to remain with a GPO. While H2b is not formally supported, these results are nevertheless consistent with the spirit of the arguments for H2(a-c), which proposed that hospital-GPO associations tend to be stable in hospitals with relatively high geographic dispersion. Specifically, it appears that dispersion stabilizes GPO affiliation through higher entry and re-entry likelihood, rather than by suppressing exit.

Turning to the moderating role of Disability Load, we find supportive evidence for H3. In Model 2, the interaction between procurement costs and Disability Load is positive and significant ($\beta = 0.004$, $p < 0.05$), suggesting that hospitals serving populations with higher disability burdens may be more likely to join a GPO when procurement costs rise, consistent with H3a. Consistent with H3b, the interaction is negative and marginally significant ($\beta = -0.001$, $p < 0.10$) in Model 6, indicating that when procurement costs are low, hospitals with higher disability rates are more likely to drop out of a GPO. Finally, Model 10 reveals a marginally significant interaction effect ($\beta = 0.002$, $p < 0.10$), providing support for H3c. Taken together, these results suggest that disability prevalence intensifies the influence of procurement costs on decisions to join, drop out, and rejoin. However, we find no significance for H4, meaning we find no support for the moderating relationship between Disability Load and Geographic Dispersion.

## Table 2. Regression Results for Hospital GPO Participation Events (Join, Drop, Rejoin)[1]

| | Join | | | | Drop | | | | Rejoin | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** | **Model 7** | **Model 8** | **Model 9** | **Model 10** | **Model 11** | **Model 12** |
| Procurement costs | 0.02*** | 0.009* | 0.02*** | 0.009* | -0.008*** | -0.005** | -0.008*** | -0.005** | 0.003** | -0.001 | 0.003** | -0.001 |
| | (0.004) | (0.005) | (0.004) | (0.005) | (0.002) | (0.002) | (0.002) | (0.002) | (0.001) | (0.002) | (0.001) | (0.002) |
| Geographic dispersion | 2.41*** | 2.45*** | 2.53*** | 2.50*** | -0.16 | -0.17 | -0.16 | -0.14 | 1.77** | 1.83** | 1.95** | 2.02** |
| | (0.838) | (0.837) | (0.927) | (0.927) | (0.477) | (0.476) | (0.514) | (0.513) | (0.879) | (0.892) | (0.952) | (0.964) |
| Disability load | -0.02 | -0.11** | 0.01 | -0.09 | -0.007 | 0.01 | -0.006 | 0.02 | 0.04 | 0.009 | 0.12 | 0.08 |
| | (0.039) | (0.054) | (0.135) | (0.143) | (0.018) | (0.024) | (0.059) | (0.063) | (0.037) | (0.044) | (0.149) | (0.146) |
| Procurement costs * Disability load | | 0.004** | | 0.004** | | -0.001* | | -0.001* | | 0.002* | | 0.002* |
| | | (0.002) | | (0.002) | | (0.0008) | | (0.0008) | | (0.001) | | (0.001) |
| Geographic dispersion * Disability load | | | -0.08 | -0.03 | | | -0.004 | -0.02 | | | -0.18 | -0.18 |
| | | | (0.314) | (0.318) | | | (0.144) | (0.147) | | | (0.364) | (0.351) |
| COVID | -1.48*** | -1.47*** | -1.48*** | -1.48*** | 0.38*** | 0.37*** | 0.38*** | 0.37** | -0.73** | -0.74** | -0.73** | -0.75** |
| | (0.195) | (0.194) | (0.195) | (0.195) | (0.146) | (0.146) | (0.146) | (0.146) | (0.347) | (0.348) | (0.347) | (0.348) |
| First stage residual | -0.04*** | -0.03*** | -0.04*** | -0.03*** | 0.009 | 0.008 | 0.009 | 0.008 | 0.0001 | -0.0001 | 0.0005 | 0.0003 |
| | (0.013) | (0.013) | (0.013) | (0.0138) | (0.008) | (0.008) | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) | (0.007) |
| Constant | 3.75*** | 3.89*** | 3.69*** | 3.87*** | -2.83*** | -2.87*** | -2.84*** | -2.88*** | -1.01 | -0.993 | -1.10 | -1.083 |
| | (0.851) | (0.853) | (0.876) | (0.879) | (0.412) | (0.414) | (0.424) | (0.425) | (0.837) | (0.831) | (0.854) | (0.847) |
| Control variables | included | included | included | included | included | included | included | included | included | included | included | included |
| Hospital random effects | included | included | included | included | included | included | included | included | included | included | included | included |
| Year fixed effects | includ | includ | includ | included | included | included | included | included | include | included | include | include |

[1] We exclude the presentation of control variables in the main manuscript; results with the full set of controls are presented in the e-companion OA3.

| | Join | | | | Drop | | | | Rejoin | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Model 1** | **Model 2** | **Model 3** | **Model 4** | **Model 5** | **Model 6** | **Model 7** | **Model 8** | **Model 9** | **Model 10** | **Model 11** | **Model 12** |
| Observations | ed 10,460 | ed 10,460 | ed 10,460 | 10,460 | 8,454 | 8,454 | 8,454 | 8,454 | d 811 | 811 | d 811 | d 811 |
| Log Likelihood | -415.3 | -414.7 | -415.3 | -414.7 | -241.5 | -240.8 | -241.5 | -240.7 | -435.7 | -435.1 | -435.7 | -435.0 |

**** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses*

Next, we turn to Table 3, which presents the results for H5 and examines how GPO participation influences hospital performance after the COVID-19 disruption. Model 1 includes the main effects, and interactions are introduced in Model 2. We find that the COVID indicator is positive and statistically significant ($\beta = 1.57$, $p < 0.01$) in Model 1 indicating that hospitals experienced longer LOS after the pandemic period. In contrast, GPO Participation is negative and significant ($\beta = -0.64$, $p < 0.01$), suggesting that GPO-affiliated hospitals exhibit shorter LOS on average, consistent with more efficient patient throughput. Interestingly, in Model 2, we find that the interaction term is negative and highly significant ($\beta = -0.98$, $p < 0.01$), indicating that the increase in LOS was significantly smaller among hospitals participating in GPOs relative to non-GPO hospitals. Taken together, these findings support H5 by showing that collaborative purchasing arrangements are associated with less severe deterioration in operational performance and a faster return toward normal operating conditions following the disruption.

**Table 3. Fixed-Effects Regression Results for Length of Stay During Disruption Periods[2]**

| D.V. Length of Stay | Model 1 | Model 2 |
|---|---|---|
| COVID | 1.57*** (0.372) | 2.28*** (0.445) |
| GPO Participation | -0.64*** (0.207) | -0.05 (0.275) |
| COVID * GPO Participation | | -0.98*** (0.285) |
| Constant | 17.18*** (3.146) | 16.75*** (3.127) |
| Control variables | included | included |
| Year fixed effects | included | included |
| Firm fixed effects | included | included |
| F-statistic | 5.54 | 5.41 |
| Observations | 11,633 | 11,633 |
| R-squared | 0.923 | 0.924 |

**** p<0.01; Robust standard errors in parentheses*

[2] Results with the full set of controls are presented in the e-companion OA4

## POST-HOC ANALYSIS AND ROBUSTNESS CHECKS

### State Transition Probabilities

To further illustrate the state changes in GPO participation, we estimate a transition matrix that summarizes the likelihood of hospitals moving across participation states from year t to year t+1 (e.g., Lin & Wang, 2025). Guided by the Markov chain framework, the matrix captures four distinct statuses: (0) no GPO participation, (1) currently in a GPO, (2) dropped from a GPO, and (3) rejoined a GPO. Transitions between these states are estimated from the direct-effects logistic models reported in Table 2. Model 1 provides the probability of joining (0→1), Model 5 provides the probability of dropping (1→2), and Model 9 provides the probability of rejoining (2→3). Because a rejoin event returns the hospital to active membership, we set the transition from state 3 to state 1 as deterministic (3→1 = 1).

To compute the transition probabilities, we evaluate each logistic regression at the sample means (Table 1), setting COVID = 0 to represent a non-pandemic baseline. This involves constructing the linear predictor from estimated coefficients and applying the logistic transformation

For each origin state, the row of the transition matrix is completed by allocating the residual probability to the "stay" state (e.g., 0→0 = 1 – p{0→1}). Thus, each row of the matrix sums to one and represents the probability distribution of next-period outcomes conditional on the current state.

**Table 4. Estimated Transition Matrix**

| From \ To | 0 (No GPO) | 1 (In GPO) | 2 (Drop) | 3 (Rejoin) |
|---|---|---|---|---|
| **0 (No GPO)** | 0.30 | **0.70** | 0.00 | 0.00 |
| **1 (In GPO)** | 0.00 | **0.92** | **0.08** | 0.00 |
| **2 (Drop)** | 0.00 | 0.00 | **0.77** | **0.23** |

| From \ To | 0 (No GPO) | 1 (In GPO) | 2 (Drop) | 3 (Rejoin) |
|---|---|---|---|---|
| **3 (Rejoin)** | 0.00 | **1.00** | 0.00 | 0.00 |

The transition matrix highlights (Table 4) several important features of hospital procurement behavior. First, hospitals that are not affiliated with a GPO have a 70% likelihood of joining from year t to t+1, reflecting the strong pull of participation in the absence of prior membership. This pattern is consistent with prior findings in the GPO literature (Opoku-Agyeman et al., 2020). Second, once in a GPO, there is a 92% chance of staying and an 8% chance of dropping in any given year, consistent with prior research (e.g., Lin & Wang, 2025). Third, among hospitals that have dropped, 23% rejoin, underscoring the oscillatory nature of participation. Taken together, these results emphasize that GPO participation is not a static one-time choice but rather a dynamic process of entry, exit, and re-entry (consistent with our proposed premise of OPR), with strong baseline propensities for joining and evidence of churn.

**Non-linear Dynamics of GPO Participation**

To further investigate whether hospitals' GPO participation follows oscillatory patterns, we modeled GPO Status as a function of first, second, and third-order polynomial terms for Procurement Costs and Geographic Dispersion. This specification allows us to capture potential nonlinear dynamics that cannot be observed using simple linear predictors. As March (1991) argued in his seminal work on exploration-exploitation, organizational decisions often oscillate between opposing logics rather than converging monotonically; thus, higher-order terms can provide important insight into whether hospitals tend to alternate between participation and non-participation in response to cost pressures.

The results presented in Table 5 demonstrate a cubic relationship with Procurement Costs. The first-order term is positive and significant. This implies that as procurement costs increase, hospitals are relatively more likely to join a GPO. This is consistent with the notion that a rising cost structure will prompt hospitals to assess the desirability of collective bargaining through GPO participation. The second-order term, however, is negative and significant, indicating that the marginal benefits of participation become lower as the cost structure rises, associated with the hospital's withdrawal from a GPO, emphasizing that savings from GPO participation plateau when internal efficiencies are achieved or scale benefits are realized (Saha et al., 2019). Importantly, the third-order term is again positive and significant, indicating that beyond a certain level of high pressures on costs, there is an incentive to return to GPO participation. This positive-negative-positive pattern is suggestive of the OPR behavior introduced in this manuscript. Figure 4 is presented to graphically portray the cubic relationship between procurement costs and GPO participation reported in Table 5. The shaded areas represent insignificant regions, where the effect that procurement costs might have on GPO participation is indiscernible from a zero value. Overall, Figure 4 highlights the oscillatory nature of participation, reinforcing our findings of H1a-c. By contrast, Geographic Dispersion does not exhibit significant effects in any of the polynomial specifications. It indicates that dispersion represents a relatively stable attribute of hospital markets (Furukawa et al., 2020), whereas procurement costs fluctuate more dynamically, giving rise to oscillations in GPO participation.

These results indicate that GPO participation adheres to a nonlinear trajectory influenced by cost pressures. Hospitals seem to engage in participation cyclically,

entering when expenses rise, withdrawing when marginal advantages diminish, and re-engaging when costs become prohibitive. This oscillating trend underscores that supply chain management decisions develop iteratively in reaction to both immediate disruptions and enduring efficiency plateaus (In et al., 2019).

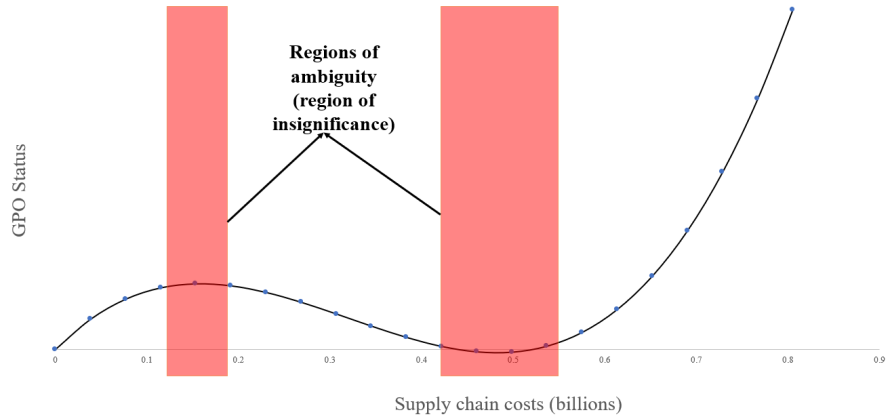
**Table 5. Negative Binomial Regression Results with Cubic Terms [3]**

| D.V. GPO Status | Model 1 | Model 2 |
|---|---|---|
| Procurement costs (millions) | 3.60*** (0.450) | 0.85*** (0.116) |
| Geographic dispersion | 0.43*** (0.073) | 0.40 (0.798) |
| Disability load | -0.008*** (0.003) | -0.006* (0.003) |
| Procurement costs * Procurement costs | -13.89*** (2.461) | |
| Procurement costs * Procurement costs * Procurement costs | 14.06*** (3.018) | |
| Geographic dispersion * Geographic dispersion | | 0.82 (1.482) |
| Geographic dispersion * Geographic dispersion * Geographic dispersion | | -0.96 (0.885) |
| Constant | -0.10 (0.070) | -0.15 (0.151) |
| Controls | included | included |
| Year controls | included | included |
| Observations | 11,633 | 11,633 |
| Log-likelihood | -12558.636 | -12563.833 |

**** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses*

**Figure 4. Cubic Effects of Procurement Costs on GPO Participation**

[3] Results with the full set of controls are presented in the e-companion OA5




## Readmissions as a Complementary Outcome

In addition to the LOS analysis, we look at hospital readmission rates to evaluate if GPO participation had a continuing impact on the operational aspect of readmissions, regardless of inpatient days. In Table 6, we find that the interaction between COVID and GPO Participation is statistically insignificant. Combined with the previous LOS analysis showing that GPO participants had reduced LOS following COVID, these results provide clear evidence that efficiency gains can be realized following GPO participation without having to take additional risks to patients after discharge that could have resulted in higher readmissions.

**Table 6. Fixed-Effects Regression Results for Readmission Disruption Periods**

| D.V. Readmissions | Model 1 | Model 2 |
|---|---|---|
| COVID | -0.75*** (0.031) | -0.75*** (0.036) |
| GPO Participation | -0.01 (0.020) | -0.01 (0.024) |
| COVID * GPO Participation | | 0.0009 (0.024) |
| Constant | 15.53*** (0.201) | 15.53*** (0.202) |
| Control variables | included | included |
| Year fixed effects | included | included |
| Firm fixed effects | included | included |
| F-statistic | 158.71 | 150.77 |
| Observations | 11,452 | 11,452 |
| R-squared | 0.687 | 0.687 |

*** p<0.01, ** p<0.05, * p<0.1; Robust standard errors in parentheses*

**The Contingent Role of GPO Size Across Participation Transitions**

An additional factor that may influence GPO participation is GPO size. Prior research suggests that the GPO size can shape hospitals' incentives to participate by affecting bargaining power, contract breadth, and administrative scale (Lin & Wang, 2025). However, GPO size is only observed when a hospital is affiliated with a GPO, and is therefore not available for hospitals that are not members at a given point in time. As a result, it cannot be included as a baseline covariate in the main models. To nonetheless assess whether GPO scale plays a role in participation dynamics, we examine GPO size as a robustness check using stage-specific measurements. This variable is first calculated as the total number of hospital beds across all member hospitals of the GPO. For the drop stage, GPO size reflects the size of the GPO in which the hospital is currently enrolled. For the join and rejoin models, GPO size is assessed based on the size of the GPO that the hospital subsequently joins, capturing the scale of GPO ultimately selected by the hospital. Results presented in e-companion OA7 indicate that GPO size exhibits a significant moderating effect in the join and drop models, while it is statistically insignificant in the rejoin model, suggesting that GPO size may influence hospitals' initial participation and exit decisions, but does not meaningfully shape reentry behavior within the GPO cycle.

## DISCUSSION

In this study, we investigated how hospitals adapt their procurement governance over time by drawing on the SCP paradigm and DCT. Consistent with our theorized

arguments, we proposed that GPO participation is not a static decision but part of a dynamic, reconfigurable procurement process shaped by cost pressures, geographic structures, and patient mix. Below, we interpret these findings and discuss their implications for theory and practice.

Our empirical analyses reveal that GPO membership is not a static, one-time choice but an oscillatory process characterized by entry, exit, and re-entry. These shifts signal that hospitals actively reconfigure procurement arrangements when cost pressures change. This insight parallels research on cyclical customer and membership dynamics and organizational life-cycle and resource reconfiguration perspectives, where firms manage repeated states of engagement and disengagement using Markov or hidden Markov frameworks (Netzer et al., 2008; Helfat et al., 2009). We also provide strong evidence that procurement costs are the primary driver of GPO participation cycles. This is consistent with SCP's emphasis on how cost structures guide organizational conduct. Because supply and materials expenses constitute a major share of hospital operating costs (Essila & Motwani, 2024), hospitals adjust their GPO participation in direct response to cost fluctuations, aligning with DCT's view of organizational adaptation governance choices under changing environmental pressures (Teece et al., 1997).

We also highlight the significant role of geographic dispersion in influencing GPO participation. Hospitals located in more geographically dispersed markets are more likely to join or rejoin GPOs, suggesting GPOs may offer disproportionate value within fragmented supply markets. Structural constraints arising from dispersion make collective procurement mechanisms more attractive (Carroll et al., 2022). However, we do not find evidence that geographic dispersion increases the likelihood of dropping out of a GPO,

suggesting that dispersion primarily motivates entry rather than exit, likely because its structural disadvantages persist even after GPO membership.

We further demonstrate that patient mix plays an important role in procurement strategy. Hospitals serving populations with higher disability loads may be especially reliant on GPOs when procurement costs rise as these individuals may require more resource-intensive care. Prior research on hospital case mix also supports the notion that patients with higher complexity impose disproportionate resource demands (Lee et al., 2005). In contrast, disability load does not significantly moderate the effect of geographic dispersion on participation decisions, suggesting that dispersion already exerts a strong and persistent pressure to remain engaged with GPOs irrespective of disability load's influence.

Finally, we find strong evidence that GPO participation is associated with shorter inpatient stays completing SCP's central link between procurement conduct and hospital performance. This association suggests that efficiencies gained in procurement cascade into downstream clinical operations, consistent with DCT's view that organizational adjustments in one domain can generate performance gains in others. Importantly, these reductions in LOS do not come at the expense of higher readmission rates, indicating that shorter stays reflect efficiency gains rather than compromised care quality. LOS reductions contribute to improved patient flow, better capacity utilization, and stronger alignment with value-based purchasing metrics (Rumbold et al., 2015). In fact, combining improvements in procurement efficiency with shorter stays can yield substantial financial and operational benefits. For example, one study found that joint replacement procedures achieved a 14.5% savings when device pricing improvements were paired with reduced

LOS (Robinson & Brown, 2014). Thus, GPO participation appears to be associated with improvements in key operational performance metrics.

### Theoretical Implications

Our study contributes to the SCP paradigm by demonstrating how structural conditions, i.e., procurement costs, geographic dispersion, and disability loads shape procurement conduct in the form of GPO participation. Our findings extend SCP applications in healthcare by showing that conduct is not static but dynamically responsive to shifting structural pressures and that these procurement behaviors have downstream implications for hospital performance. In doing so, our study reinforces SCP's core logic that structure influences conduct and, ultimately, performance in operational settings.

The findings also make a contribution to DCT by illustrating how hospital procurement strategies, particularly participation in GPOs, operate as dynamic rather than static processes. Evidence of oscillatory join-drop-rejoin behavior demonstrates reconfiguration can occur in cyclical rather than linear patterns. More importantly, we introduce the concept of oscillatory procurement reconfiguration, in which hospitals repeatedly adjust their engagement with GPOs as structural pressures evolve. We identified that hospitals do not treat GPO participation as a permanent structural arrangement; instead, they repeatedly oscillate engagement in response to shifting environmental conditions, moving in and out of GPOs as pressures change. It therefore adds to DCT by suggesting that organizations can achieve superior performance not only through constant evolution, but also through oscillatory engagement and disengagement with external entities. This pattern aligns with Helfat et al. (2009), who argue that

reconfiguring competencies is central to sustaining performance in turbulent environments.

Secondly, our findings underscore the significance of cost pressures as catalysts for sensing and seizing actions. Joining or rejoining a GPO signifies the exploitation of opportunities to consolidate purchasing demand and stabilize procurement costs under these circumstances (Ndrecaj et al., 2025). Conversely, disengagement from a GPO transpires when marginal benefits are considered to decline, indicating that companies withdraw when collective purchasing ceases to offer competitive advantages (Peteraf et al., 2013). This cyclical pattern of sensing and seizing highlights that dynamic capacities are not used linearly but rather in reaction to constantly changing trade-offs, illustrating the flexibility of resource orchestration in unpredictable situations (Mandal, 2017).

Third, our findings elucidate the boundary conditions for adaptive capacity by demonstrating that not all environmental pressures trigger the same pathways. The burden of disability influences the impact of costs, amplifying hospitals' dependence on GPOs when catering to intricate patient demographics. Geographic dispersion functions as an autonomous structural force, directly influencing participation rather than interacting with patient demographics. This distinction enhances DCT by proposing that environmental forces vary in their interaction with organizational capacities. Previous research indicates that the efficacy of dynamic capabilities depends on the environmental situation (e.g., Wilden et al., 2013). While certain stressors, such as financial strain coupled with patient complexity, collectively induce adaptive reconfiguration, others, like geographical structure, exercise their effects through distinct structural logics.

Ultimately, our research integrates operational outcomes into the DCT and SCP frameworks by linking procurement-related competencies with patient-level performance metrics. The association between GPO participation and lower hospital duration of stay suggests that dynamic procurement capabilities influence essential operational processes, transcending mere financial or strategic benefits. This connects strategic frameworks with operational performance, illustrating how the reconfiguration of supply chain networks leads to measurable enhancements in clinical operations.

**Practical Implications**

The findings of our study provide significant implications for hospital executives, GPO administrators, and policymakers. For hospital executives, we suggest that they should not perceive GPO membership as a one-time decision. Instead, they should re-evaluate their group purchasing contracts on a regular basis as their operating conditions change. Specifically, the cost patterns functions as an early warning mechanism, indicating when collective purchasing agreements may be most beneficial (Dean et al., 2024). Rather than perceiving GPO membership as fixed, they may employ cost trajectories as signals for when to initiate, terminate, or reevaluate membership. By doing so, hospitals may synchronize purchasing plans with financial constraints, ensuring that collective procurement is initiated at the optimal moment for maximum benefit (Burns, 2014).

Next, we advise GPO managers to formulate plans that account for churn. Instead of presuming permanent membership, GPOs ought to design contracts, services, and value propositions with flexibility, facilitating hospitals' re-engagement during times of withdrawal. Modular service packages, tiered membership costs, and readmission

incentives could enhance GPOs' ability to attract returning members, akin to subscription models in other sectors that utilize churn management strategies (Ascarza & Hardie, 2013). Moreover, our findings indicate a distinct opportunity to enhance outreach to hospitals located in remote markets. GPO administrators can establish unique membership structures, including reduced entry fees or enhanced distribution support, tailored for hospitals encountering restricted local supplier options and increased transactional costs (Furukawa et al., 2020; Rosko & Mutter, 2010). This focused recruitment and service provision strategy for geographically diverse markets allows GPO managers to improve cost efficiency and patient accessibility, while fostering equity in healthcare access.

Our findings underscore the necessity for governmental intervention to reduce the impact of disability load on ensuring steady supply access. Hospitals serving these populations may necessitate enhanced procurement flexibility or assistance to ensure continuous access to vital products. Targeted interventions, subsidies for GPO participation, modifications to reimbursement formulae, or procurement-related incentives within value-based care programs, could alleviate the burden on high-complexity hospitals.

## LIMITATIONS AND FUTURE RESEARCH

As with any empirical study, our analysis is subject to several limitations that warrant consideration. Although we can observe whether hospitals participate in a GPO, we lack insight into the actual volume or proportion of supply purchases that flow through these arrangements. To our knowledge, no comprehensive dataset exists that captures transaction-level data across hospitals, which restricts researchers’ ability to directly

assess the intensity of GPO utilization. This limitation means that our findings speak to the presence or absence of participation rather than the magnitude of reliance on collective procurement. Future research should investigate the volume of purchasing through the GPO contract and attempt to replicate and extend our results when such data becomes available. The extent of our data does not adequately reflect the changing role of GPOs. Many GPOs have evolved beyond conventional group purchasing roles to include technology-driven solutions, data analytics, consultancy, and more value-added services. These offerings could significantly influence hospital operations and procurement strategies; yet, existing datasets lack the necessary granularity to systematically monitor hospitals' involvement with these emerging functions. These constraints underscore the necessity for future studies capable of obtaining more comprehensive, transaction-level, or proprietary data to assess the extent of GPO integration.

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# CHAPTER 2: DANCING WHILE TRAPPED? ORGANIZATIONAL LEARNING, ADAPTIVE CYCLE TRAPS, AND THE MECHANISMS OF SUPPLY CHAIN RESILIENCE

## ABSTRACT

Organizations facing environmental disruption often fail to adapt not because they lack capability but because the learning processes that sustained their prior success actively prevent the unlearning and relearning that new conditions require. This study examines how organizational learning dynamics produce and resolve the four adaptive cycle traps identified in the socio-ecological adaptive cycle framework — the dissolution trap, the rigidity trap, the poverty trap, and the vagabond trap — and develops a theoretical argument that each trap corresponds to a distinct learning failure mode requiring a trap-specific combination of unlearning and relearning to escape. Drawing on organizational learning theory and qualitative interview data from 10 supply chain managers, we identify four unlearning processes — wiping, switching, deep unlearning, and reversing — and two relearning modes — exploration and exploitation — whose alignment with specific trap conditions determines whether organizations escape entrapment or deepen it. The findings reveal that applying the wrong learning mode to a given trap condition systematically worsens rather than resolves the entrapment, and that organizations frequently misdiagnose their trap condition in ways that produce precisely this mismatch. The study contributes a learning-theoretic account of adaptive cycle trap formation and escape that prior work has lacked, establishes learning mode mismatch as a mechanism of trap maintenance, and provides practical

guidance for how organizations can diagnose their trap condition and design their adaptive response accordingly. Implications for supply chain resilience, organizational ambidexterity, and the management of disruptive change are discussed.

**Keywords:** Adaptive cycle traps, organizational learning, unlearning, supply chain resilience, socio-ecological adaptive cycle, dynamic capabilities, qualitative research, disruption management

## INTRODUCTION

History has consistently pointed to the need for businesses to adapt to the ebbs and flows of their operating environment. Consider the aftermath of the 2011 Tōhoku earthquake and tsunami in Japan (Kim et al., 2015; Matsuo, 2015). Among those affected was Renesas Electronics, a leading semiconductor supplier whose focus on efficiency had produced a highly productive but tightly coupled production process. When the earthquake disrupted its supply chain, Renesas's reliance on practices such as just-in-time inventory and single-source suppliers resulted in significant production losses and financial hardship. Toyota, also affected by the same disaster, had tempered its commitment to just-in-time with multiple sourcing arrangements and alternative production facilities. Faced with the same disruption, Toyota recovered more quickly and sustained a markedly lower impact on its bottom line.

What differentiates these organizations from one another? How is it that some are able to leverage change in their operating environment to survive and succeed while others descend toward failure? The variance in organizational reactions to disruptions has attracted significant scholarly attention, sparking research aimed at deciphering the patterns and factors that define an organization's resilience (Kochan and Nowicki, 2018;

Richey et al., 2022). One important contribution that offers a starting point for explaining such variance comes from the socio-ecological adaptive cycle (SEAC), developed by Gunderson and Holling (2002). The SEAC model defines four phases through which organizations cycle: the development and exploitation phase (r), the conservation phase (k), the collapse or release phase (Ω), and the reorganization phase (α). How organizations navigate through these phases to adapt to their environment is, according to the model, central to understanding their resilience. The framework has been integrated into the supply chain management (SCM) literature by Wieland (2021), who reinterpreted supply chains as holistic and interpretivist systems whose management centers on navigation and experimentation rather than optimization, and whose objectives orient toward transformation rather than growth alone.

Embedded within the SEAC framework is the concept of “traps”, specific barriers that organizations face which may initially appear advantageous but ultimately create dependencies that limit flexibility to respond to environmental change (Allison and Hobbs, 2004). Four traps are conceptualized in the model: rigidity, dissolution, poverty, and vagabond. Traps materialize as hidden burdens entangled within an organization’s mindset and culture, often woven into its core values and beliefs such that they become behavioral codes difficult to recognize and harder still to escape (Carpenter and Brock, 2008; Gunderson and Holling, 2002). Returning to our opening example, one could argue that Renesas fell victim to the rigidity trap, an overcommitment to efficient operations that narrowed the scope of opportunities for adaptation, while Toyota’s broader sourcing network and production flexibility allowed it to avoid that fate. Yet despite their explanatory potential, traps have received limited empirical attention in the supply chain literature

(Wieland, 2021). Existing supply chain resilience research explains what capabilities improve adaptation but provides limited insight into why those same capabilities later constrain adaptation, particularly how traps emerge, how they evolve, and how learning processes can produce or resolve them.

The current study is motivated by this gap. We address two research questions: (1) Why do traps emerge at particular points as organizations traverse the adaptive cycle? and (2) How do learning processes produce or resolve traps? To answer these questions, we rely on organizational learning theory, framing learning as a two-phase process. The first phase involves unlearning, determining which knowledge and skills must be retained and which must be discarded (Starbuck, 2017). Unlearning requires organizations to decipher knowledge and expertise that is no longer viable from what remains applicable; arguably, the knowledge that led to falling into a trap must be identified and discarded. The second phase involves re-learning, replacing, or augmenting the existing knowledge base with new knowledge. Following Cyert and March (2015), we suggest this learning stage may be attained through exploration, exploitation, or both. We draw on semi-structured interviews with 10 supply chain professionals across diverse industries, including aerospace, logistics, pharmaceuticals, consumer goods, retail, technology, and manufacturing, to examine the nuances of each trap through the lens of these organizational unlearning and re-learning processes.

This study offers several contributions to the field. First, it reveals overlooked dynamics in adaptive cycle traps that existing theory does not fully explain; specifically, how traps evolve, interact, and reinforce one another as organizations traverse the cycle. While the SEAC framework conceptualizes traps as discrete states, our findings show

they form a system of interdependent constraints in which falling into one trap creates conditions for others to emerge. Building upon the original SEAC framework and drawing on literature from multiple disciplines, we reassess the placement of the four traps within the adaptive cycle, offering a more nuanced understanding of the process through which organizations become entrapped and how entrapment propagates. Second, by linking traps to the organizational learning literature, we develop a process model that explains how learning misalignment drives trap formation and how organizations can recognize, avoid, and escape traps through targeted unlearning and re-learning. Our findings suggest that the capacity to escape traps is not merely a function of resource availability or operational flexibility but is fundamentally tied to an organization's ability to engage in deliberate knowledge management, discarding outdated mental models while cultivating new capabilities aligned with environmental demands. Third, we provide actionable guidance for supply chain managers by identifying the warning signs of each trap and the specific learning mechanisms that can facilitate escape, thereby strengthening the practical foundations of the adaptive cycle for professionals operating in turbulent environments.

The remainder of this paper is organized as follows. In the second section, we discuss the theoretical background, including the SEAC framework, the four traps, and the organizational learning literature that informs our analytical lens. The third section presents the research methodology, detailing our qualitative research design, sampling strategy, data collection, and analysis procedures. Findings are presented in the fourth section, organized around each of the four traps and the learning processes associated with their avoidance and escape. The fifth section discusses the implications of our

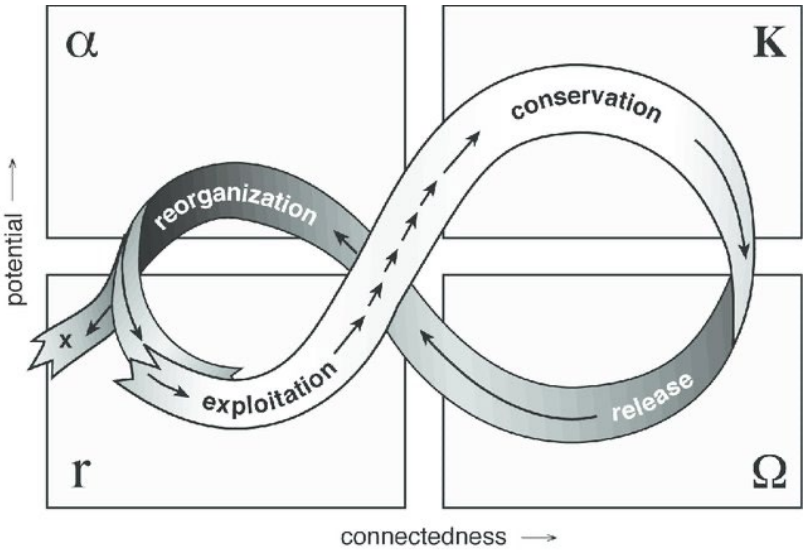
findings for theory and practice, while the sixth section addresses limitations and directions for future research before concluding.

## LITERATURE REVIEW

### The Socio-Ecological Adaptive Cycle

Developed by Gunderson and Holling (2002), the socio-ecological adaptive cycle (SEAC) is a versatile model for analyzing organizational behavior across a range of environments. At its core, the model explains the importance of organizational resilience and adaptation in response to disturbances in their operating environment (Salvia and Quaranta, 2015). The SEAC framework details four phases through which an organization structures, collapses, and reorganizes itself: the growth and exploitation phase (r), the conservation phase (k), the collapse or release phase (Ω), and the reorganization phase (α) (see Figure 1). SEAC has been used to analyze organizational dynamics in political, managerial, and societal settings, demonstrating broad applicability across disciplines. Specific to supply chain management, Wieland (2021) reinterpreted the model by framing supply chains as holistic and interpretivist (versus positivist), their management as navigation and experimentation (versus optimization), and their objective as transformation (versus growth). This reinterpretation embedded the cycle's concepts in the SCM domain with parallels to ecological methods regarding creation, reorganization, and disruption.

**Figure 1. Gunderson and Holling Adaptive Cycle**




**Adaptive Cycle Traps**

A central premise of the SEAC is that organizations may not progress smoothly through the four phases (Walker et al., 2004). Organizations may become “stuck” in a particular phase because of constraints and barriers that Gunderson and Holling (2002) label “traps”, conditions in which an organization is entrenched in an undesirable state, often reinforced by feedback loops that strengthen the urge to maintain the status quo. In defining what constitutes a trap, we reference concepts from the ecological literature, where a trap is described as an extreme scenario in which a suboptimal habitat appears deceptively appealing, thereby enticing individuals to settle in it (Maru and Chewings, 2011; Robertson and Hutto, 2006; Schlaepfer et al., 2002). This ecological framing is especially pertinent for structured systems like supply chains, where development constraints may restrict the system from reacting to external disruptions. Consider the case of Sears: the strong and lucrative infrastructure of its physical stores acted as a trap, creating a dependency that prevented the company from embracing the online retail wave that was overtaking the brick-and-mortar model.

Four traps are conceptualized in the SEAC model (Allison and Hobbs, 2004; Gunderson et al., 2012). In this study, we define each as follows. A rigidity trap is a situation in which focus on efficiency improvements across organizational systems narrows the scope of opportunities for adaptation (Carpenter and Brock, 2008). A dissolution trap is a situation in which focus on efficiency improvements in a subset of organizational systems boxes in the organization's opportunities for adaptation (Folke et al., 2010). A poverty trap is a situation in which constraints in available resources in the operating environment deprive the organization of the ability to make appropriate adjustments to survive and adapt (Bowles et al., 2011). Finally, a vagabond trap is a situation in which the freedom offered in the operating environment to choose any relationship makes it difficult for the organization to form meaningful and productive connections (Gunderson et al., 2012).

Prior work treats traps as static states, conditions to be described and classified, limiting our ability to understand how they evolve, how organizations become entrapped over time, and how the traps interact with one another across adaptive cycle phases. This framing leaves the dynamic process through which traps emerge, and the learning misalignments that drive them, undertheorized. Our data suggest that these traps are not merely theoretical constructs but lived realities for supply chain managers. For example, a supply chain director at a major aerospace firm described a situation consistent with the rigidity trap: the organization's deeply embedded commitment to lean processes had made it nearly impossible to accommodate design changes demanded by a shifting regulatory environment. Similarly, a logistics manager at a global third-party logistics provider recounted a scenario resembling the vagabond trap, in which the abundance of

available partnerships diluted the organization's ability to invest meaningfully in any single relationship. In the sections that follow, we explain each of the four traps and their potential prevalence in the adaptive cycle, beginning with the definitions offered by extant literature and refining them as warranted by our empirical findings.

## THEORY: AN ORGANIZATIONAL UNLEARNING AND RELEARNING PERSPECTIVE

Organizational learning theory suggests that organizations adapt to their environment through a process of collecting, interpreting, applying, and discarding knowledge (Duncan, 1974; Fiol and Lyles, 1985; Levitt and March, 1988). Central to this process is organizational unlearning, the intentional discarding of practices, norms, and knowledge that are no longer valuable or relevant (Akgün et al., 2007; Grisold et al., 2017; Starbuck, 2017). Unlearning is not simply the elimination of old or nonfunctional practices. Rather, it involves a deliberate and strategic replacement of the current knowledge base with new insights and understandings that have emerged through learning (Starbuck et al., 1978). To use an analogy: just as a computer must delete obsolete or duplicative files to free memory for new, timely information, an organization must eliminate outdated beliefs, methods, and practices that no longer serve its purpose or align with its evolving goals.

Building upon the organizational unlearning literature, we identify four distinct unlearning processes that correspond to the four traps in the adaptive cycle: wiping, switching, deep unlearning, and reversing. Each process addresses a different type of knowledge entrenchment and requires a different balance of explorative and exploitative learning to execute. Two factors are critical to all four processes. The first concerns the

depth of embeddedness: some organizational behaviors and knowledge are embedded more deeply than others (Nag et al., 2007), and the degree of embeddedness affects the difficulty and duration of the unlearning process. The second concerns the difficulty of differentiating between knowledge that should be eliminated and knowledge that should be preserved. Given that many organizational practices are intertwined, deciphering between that which is to be preserved and that which is to be discarded can be challenging (Macdonald, 2002).

The next step in the learning process is to replace the discarded with new and useful knowledge. This relearning process can occur through exploration or exploitation (Cyert and March, 2015). Exploitative learning entails refining and enhancing existing knowledge, whereas explorative learning involves the active search for new knowledge through experimentation with novel ideas (March, 1991). At times, a balance between the two is necessary. A balance often referred to as ambidexterity (Azadegan and Dooley, 2010). In the sections that follow, we explain each of the four traps and how the concepts of unlearning and relearning apply to breaking free from them.

**The Dissolution Trap**

To comprehend the dissolution trap, we must first understand the process through which it develops. The dissolution trap takes place when an organization has well-functioning processes and is operating in a familiar environment. Remarkably, it is the well-functioning operations and the familiarity with the environment that may lead the organization to fall into the trap. Well-functioning operations in a stable environment lead the organization to the desire to improve them further, often by partitioning the system into smaller components for optimizing each part independently. For instance, to improve

a chocolate assembly line, organizations often assign teams to improve the mixing step, the molding step, or the packaging step separately. This breakdown—or dissolution—of the system into its components for the purpose of improvement has multiple benefits: it allows for pinpointing more specifically where a problem or inefficiency occurs, changing a small part of a process is much easier than changing an entire system, and different components may require unique solutions.

However, this dissolution process, often referred to as suboptimization, suffers from one significant drawback (Cachon and Fisher, 2000; Narayanan and Raman, 2004). By focusing on enhancing any one particular element of the system, the organization prioritizes enhancements in distinct segments of the process, often disregarding the coherence and tenacity of the overall system (Flynn et al., 2010). Consequently, although some parts are improved, the complete system becomes heavy and less flexible. In essence, the encouragement of a “silo mentality” leads to local optimization at the sacrifice of the entire system (Hult et al., 2002; Pagell, 2004). More importantly, the positive feedback received from observing localized performance improvements leads the organization to further encourage and carry on with the practice, reinforcing the trap.

***Placement of the dissolution trap.***

We propose that the dissolution trap manifests most strongly in organizations transitioning from the r (exploitation) phase to the k (conservation) phase. This transition represents a turning point at which learned knowledge and operations become internalized and explorative learning decreases (Fath et al., 2015). During the exploitation phase, the organization has adapted to its external environment, integrating market conditions, customer requirements, competitive dynamics, and regulatory environments

(Levinthal and March, 1993; O'Reilly III and Tushman, 2013; Siggelkow, 2001). Through exploitative learning techniques, existing knowledge is refined to improve operational efficiency and yield improvements in the short run (March, 1991). Although investing in internal capabilities is not the primary cause of the dissolution trap, it lays the groundwork for the trap to occur (Fath et al., 2015). As the organization transitions from r to k, its focus becomes increasingly confined to optimizing parts of its business, often at the expense of greater strategic flexibility (Kristal et al., 2010; Levinthal and March, 1993). This intense focus on fine-tuning and streamlining can unintentionally trap the organization in dissolution.

Within the SEAC, the dissolution trap sets itself apart from other transitional phases by its focus on internalization for tactical and operational suboptimization (Flynn et al., 2010; Swink et al., 2007). Contrasting with phases shaped by external influences or overarching strategic objectives, this stage is marked by a deep inward focus in which the organization dedicates itself to meticulously honing its internal procedures and systems. The ultimate goal of this deep reflection is not efficiency for efficiency's sake but integrating enhanced efficiency into everyday operations in the hope of achieving superior performance across all levels of the organization. It is this distinction, the subsystem-level focus, that differentiates the dissolution trap from the rigidity trap, which operates at the system level.

### *Breaking free from the dissolution trap.*

Organizations must reevaluate and reconfigure their behaviors and practices to escape the dissolution trap. This process involves eliminating practices that create silos and prevent cross-functional collaboration and innovation (Pagell, 2004; Schoenherr and

Swink, 2012). In the unlearning literature, this type of unlearning is conceptualized as wiping, the conscious decision to stop certain behaviors, ideas, or practices. Wiping has two functions: first, it refines and improves internal processes, ensuring all methods and mental approaches are aligned with current objectives; second, it enhances the organization's adaptiveness to external change. To escape the dissolution trap, the organization must prune behaviors and practices that contribute to the boxed-in mentality, much as one prunes an overgrown tree, cutting back limbs that are draining resources from the branches that support the core. Furthermore, the organization's learning strategy should expand from exploitative to explorative learning (Kristal et al., 2010; Swink et al., 2007). March (1999) defines explorative learning as the active pursuit of knowledge accompanied by an openness to experiment and change. The process involves identifying and nurturing knowledge that needs further development while discarding obsolete or counterproductive aspects (Tsang and Zahra, 2008).

Based on the foregoing, we propose the following:

*Proposition 1a. The presence of the dissolution trap is more pronounced for firms that are transitioning between the exploitation and conservation phases than under other circumstances.*

*Proposition 1b. The primary challenge in escaping the dissolution trap lies in differentiating and discarding old practices (unlearning), as compared to their replacement (relearning) with new practices.*

*Proposition 1c. Escape from the dissolution trap requires emphasis on exploratory learning.*

**The Rigidity Trap**

The rigidity trap exhibits a resemblance to the dissolution trap but emerges from a distinct organizational dynamic. Whereas the dissolution trap arises from suboptimization of system components, the rigidity trap is the result of a conscious effort to maximize efficiency across the whole system given the current environment (Christopher and Holweg, 2011; Wieland and Wallenburg, 2013). This strategy appears beneficial but often leads to an unreliable and highly rigid system (Sheffi and Rice Jr, 2005; Tang and Tomlin, 2008). In this context, it is not just the operations that are inflexible but the organization itself. The paradox is that high-efficiency systems are usually more prone to disruptions because their reduced sensitivity to environmental change, precisely calibrated for certain conditions, makes them struggle to adapt when those conditions change or become unstable (Ivanov and Dolgui, 2020; Tang and Tomlin, 2008). This inherent rigidity severely limits the system's ability to react quickly and effectively to new challenges, thereby increasing exposure to vulnerabilities and systemic breakdown risk (Essuman et al., 2020; Staw et al., 1981).

***Placement of the rigidity trap.***

We propose that the rigidity trap is strongest in the transition from the k (conservation) phase to the Ω (release) phase. The k phase marks an organization's peak of efficiency and concludes the exploitation phase (Fath & Cabezas, 2004). At this point, the chances for additional optimization are limited because of the thorough exploitation of resources and capabilities. The organization has developed an efficient system that requires minimal maintenance to run smoothly. Nevertheless, this efficiency itself opens the door to the rigidity trap (Adobor, 2020).

While the k phase sets the stage for the rigidity trap, it is not the direct cause of entrapment. The actual rigidity trap is triggered by a sudden disruptive event that forces the organization into the Ω (release) phase. Therefore, the rigidity trap is not a static state but a dynamic process (Fath et al., 2015). It unfolds as the organization transitions from conservation, where stability and efficiency reign, to release, where adaptability and change become paramount. Under these circumstances, the organization's structure, designed for minimal and static changes, and its internalized processes result in self-imposed bottlenecks that hinder effective adaptation (Gunderson and Holling, 2002).

A key distinction in our placement of traps within the SEAC model warrants clarification. We placed the dissolution trap between the r and k phases and the rigidity trap between the k and Ω phases. The reason lies in the behavior of the traps themselves. The dissolution trap deals with suboptimization, which occurs during the optimization of operations, making it most relevant when the organization is moving from the explorative into the conservative phase. The rigidity trap, by contrast, deals with system-level bottlenecks, an issue more likely to manifest once the efficient systems established during conservation encounter the adaptive demands of the release phase.

***Breaking free from the rigidity trap.***

Overcoming the rigidity trap requires switching, the deliberate choice to replace one behavior, idea, or practice with another. The distinctiveness of switching lies in its dual nature: unlike wiping, which involves the removal of behaviors or knowledge, switching not only removes old and useless components but also integrates new behaviors and knowledge (Zahra et al., 2011). To break free from the rigidity trap, an organization must perform two tasks simultaneously: unlearning outdated or irrelevant

practices and learning new, relevant information and behaviors that align with the current environment (Zhao et al., 2013). Effective switching requires the organization to actively engage in explorative learning. Once antiquated practices are removed, the organization must fill the knowledge gap (Tsang and Zahra, 2008). This new knowledge is then integrated, leading to a transformation in the organization's operations, strategies, and culture (Klammer and Gueldenberg, 2019). The cycle of unlearning and relearning is vital for the organization to break free from the rigidity trap.

*Proposition 2a. The presence of the rigidity trap is more pronounced for firms at the latter part of conservation, the earlier part of release, and the transitional phase between them.*

*Proposition 2b. The primary challenge in escaping the rigidity trap lies in the replacement (relearning) of new practices, as compared to differentiating and discarding (unlearning) old practices.*

*Proposition 2c. Escape from the rigidity trap requires emphasis on exploratory learning.*

**The Poverty Trap**

The poverty trap occurs when a system is unable to gather the resources necessary to initiate performance beyond survival and toward growth. It is characterized by a lack of resources and limited opportunities, leading to an ongoing cycle of impoverishment and severely limited prospects for adjustment. The lack of resources in the operating environment hinders the organization from developing solutions or alternatives to break out of its existing patterns. As with all traps, there is a self-reinforcing element: a small company without financial backing finds it difficult to invest in machinery

and process improvements, which in turn limits its efficiency improvement and growth, which further constrains its ability to attract investment.

Building on the broader resilience and organizational literature, we define the poverty trap as: a situation in which constraints in available resources in the operating environment deprive the organization of making appropriate adjustments to survive and adapt. This definition encompasses the external and internal causes of poverty, its persistence, and its exclusionary challenges. It highlights the layered nature of the poverty trap, implying it is not merely a product of external conditions but also of underlying attitudes and reactions to change.

***Placement of the poverty trap.***

We propose that the poverty trap is most evident during the Ω (release) phase. This stage is triggered by a disruptive event that ushers in a period characterized by profound disintegration and upheaval (Thapa et al., 2016). In this phase, the organization experiences a significant breakdown of its core structures, relationships, and essential resources. This disruption is not merely a breakdown but also a transformational phase in which the old ways of functioning are challenged, and the organization is forced to confront and navigate a radically altered environment (Holling, 2001).

The behaviors that surface during this phase are primarily what entangle an organization in the poverty trap (Carpenter and Brock, 2008). Organizations are often overly cautious due to the uncertainty and instability of this period. This cautiousness is a natural instinct to avoid further losses or failure, but can also become a barrier to recovery and development (Gans, 2016). In its haste to protect what remains during the release phase, the organization may become risk-averse, avoiding investments,

innovations, or changes that, while uncertain, are necessary for renewal. This is why we propose that the poverty trap is most prominently observed in the Ω (release) phase of the SEAC.

***Breaking free from the poverty trap.***

Escaping the poverty trap requires a complex and comprehensive approach centered on deep unlearning. When an organization falls into this trap, it must make an essential paradigm change, reshaping its understanding and actions to meet the new environment (Martignoni and Keil, 2021). However, untangling from the poverty trap is a particularly complex challenge because deep unlearning alone is insufficient (Adobor, 2020). The organization must eliminate irrelevant behaviors, systems, and resources and replace them with new and relevant ones. This differs from switching, where the organization is conscious of its environment. Within the poverty trap, the organization lacks an understanding of its new surroundings, making the task of replacing what it discards more difficult and uncertain.

An organization must be ambidextrous in managing its learning processes to navigate the dual challenge of discarding obsolete elements and embracing new ones. March (1991) established the foundation for this approach by introducing the concepts of exploitation and exploration and emphasizing the need to balance these two approaches, a balance necessary to keep an organization competitive and flexible in changing environments. This concept was further developed into organizational ambidexterity (Azadegan and Dooley, 2010), which proposes a way to maintain and develop core competencies through exploitation while integrating new ideas and innovations through

exploration. This harmonious blend of learning and adapting is crucial for escaping the poverty trap.

*Proposition 3a. The presence of the poverty trap is more pronounced for firms operating in the release phase than under other circumstances.*

*Proposition 3b. Escaping the poverty trap is the most difficult of the four traps. The challenges of differentiating and discarding old practices (unlearning) and replacing them with new practices (relearning) are equally difficult.*

*Proposition 3c. Escape from the poverty trap requires simultaneous emphasis on exploitative and exploratory learning.*

**The Vagabond Trap**

The vagabond trap entails the inability of a system to reorient or reconnect its constituents (Gunderson and Holling, 2002). While similar to the poverty trap's inability to adapt, the vagabond trap emerges from a fundamentally different context, characterized not by inflexibility and stagnation but by exploration and newfound freedom. Often after a period of stagnation, organizations find themselves completely free from established constraints or hierarchical structures, triggering a moment of liberation that unleashes unprecedented possibilities for self-definition. But that very freedom and loosening of control can become the vagabond trap's essence. The loss of former boundaries and the proliferation of many paths can cause a loss of direction and focus. Captivated by this freedom, organizations may pursue too many opportunities without a strategy or understanding of their strengths, resulting in waste, inefficiency, and loss of core competencies (Goldschmidt et al., 2021).

***Placement of the vagabond trap.***

We propose that the α (reorganize) phase of the SEAC is the period in which organizations are most vulnerable to the vagabond trap. This phase is marked by adaptation to new environments, which involves the creation of new connections and networks to access needed resources (Folke et al., 2010). The phase presents a challenge not only for strengthening new connections but also for doing so in an environment poorly understood by the organization (Gunderson and Holling, 2002). Identifying and leveraging potential beneficial alliances or networks is critical for navigating the new environment, yet a lack of clarity and understanding of these new dynamics can significantly hinder effective adaptation (Dahdouh-Guebas et al., 2021; Kim et al., 2015).

In this uncertainty, organizations can find themselves in a precarious situation, drifting without direction (Blair et al., 2018). This drifting state is characterized by non-adherence to the new environment, either through the inability to depart from earlier paths or by failing to lay a solid foundation for future operations. Such a situation can create a vacuum and lack of strategic direction as the organization lacks access to and utilization of networks and resources (Gunderson, 2000). The risk is not simply stagnation but regression, because the organization is potentially stretching itself too thin across too many nascent relationships, none of which develop sufficient depth to generate meaningful value.

***Breaking free from the vagabond trap.***

When faced with the vagabond trap, an organization encounters the significant challenge of assessing and redefining its core competencies within a new and unfamiliar

environment. The organization must introspectively examine its previous strengths and core competencies (Sundstrom & Allen, 2019), carefully analyzing which past capabilities remain relevant under current circumstances and prioritizing those areas that promise the most significant impact (Gunderson and Holling, 2002). This process is referred to as reversing in the context of unlearning, the intentional act of returning to a behavior, idea, or method that was previously discontinued (Tsang & Zahra, 2008).

To effectively implement reversal, an organization needs to embrace exploitative learning by internalizing its operations, which helps reduce the decentralized aspects of its structure (Siggelkow & Rivkin, 2006). This learning is especially important in reversing, which consists of searching for best practices previously used within the organization and replicating them across departments and units. By identifying and scaling these tested strategies, the organization can leverage its existing knowledge base to ensure a cohesive and efficient approach to current challenges (Peschl, 2019). Reversing is more than mere replication, the organization needs a thorough review of previous failures to discover why particular strategies were successful and how they can be applied in the current environment (Zahra & George, 2002). By building around exploitative learning and executing the reversing process, the organization can consolidate around its core competencies, enabling it to break free from the vagabond trap (Ambulkar et al., 2015; Fath et al., 2015).

*Proposition 4a. The presence of the vagabond trap is more pronounced for firms operating in the reorganization phase than under other circumstances.*

*Proposition 4b. The primary challenge in escaping the vagabond trap lies in differentiating and discarding old practices (unlearning), as compared to their replacement (relearning) with new practices.*

*Proposition 4c. Escape from the vagabond trap requires emphasis on exploitative learning.*

Table 1 summarizes the twelve propositions developed across the four adaptive cycle traps, linking each trap to its theorized phase placement and to the unlearning and relearning emphasis required for escape.

**Table 1. Propositions Summary**

| Proposition | Statement |
|---|---|
| **P1a — Dissolution** | The presence of the dissolution trap is more pronounced for firms that are transitioning between the exploitation and conservation phases than under other circumstances. |
| **P1b — Dissolution** | The primary challenge in escaping the dissolution trap lies in differentiating and discarding old practices (unlearning), as compared to their replacement (relearning) with new practices. |
| **P1c — Dissolution** | Escape from the dissolution trap requires emphasis on exploratory learning. |
| **P2a — Rigidity** | The presence of the rigidity trap is more pronounced for firms at the latter part of conservation, the earlier part of release, and the transitional phase between them. |
| **P2b — Rigidity** | The primary challenge in escaping the rigidity trap lies in the replacement (relearning) of new practices, as compared to differentiating and discarding (unlearning) old practices. |
| **P2c — Rigidity** | Escape from the rigidity trap requires emphasis on exploratory learning. |
| **P3a — Poverty** | The presence of the poverty trap is more pronounced for firms operating in the release phase than under other circumstances. |
| **P3b — Poverty** | Escaping the poverty trap is the most difficult of the four traps; the challenges of differentiating and discarding old practices (unlearning) and replacing them with new practices (relearning) are equally difficult. |
| **P3c — Poverty** | Escape from the poverty trap requires simultaneous emphasis on exploitative and exploratory learning. |
| **P4a — Vagabond** | The presence of the vagabond trap is more pronounced for firms operating in the reorganization phase than under other circumstances. |

| Proposition | Statement |
|---|---|
| **P4b — Vagabond** | The primary challenge in escaping the vagabond trap lies in differentiating and discarding old practices (unlearning), as compared to their replacement (relearning) with new practices. |
| **P4c — Vagabond** | Escape from the vagabond trap requires emphasis on exploitative learning. |

## METHODOLOGY

### Research Design

This study employs a qualitative research design grounded in an abductive approach (Dubois and Gadde, 2002; Kovács and Spens, 2005) to examine the manifestation of socio-ecological adaptive cycle (SEAC) traps in supply chain management. An abductive approach is appropriate when the aim is to elaborate and refine existing theory through confrontation with empirical data (Ketokivi and Choi, 2014). Given that the SEAC trap constructs have been conceptually established but lack empirical grounding in supply chain contexts, our research design iterates between the theoretical framework of the four traps, rigidity, dissolution, poverty, and vagabond, and the experiences reported by supply chain practitioners. This aligns with the theory elaboration purpose articulated by Fisher and Aguinis (2017), whereby an existing conceptual framework is extended, refined, and contextualized through qualitative evidence.

We adopt an abductive epistemological stance grounded in theory elaboration (Fisher & Aguinis, 2017), consistent with Wieland's (2021) call for interpretivist perspectives in supply chain research. This orientation recognizes that supply chain managers' experiences of being "trapped" in suboptimal states are socially constructed

and context-dependent, requiring methods that capture the richness of situated organizational experiences. The propositions we develop are theoretical rather than statistical generalizations—they specify relational conditions between constructs that future quantitative research can test, rather than claiming representative applicability across all supply chain contexts.

**Sampling and Participants**

We employed a snowball sampling strategy to recruit supply chain managers with direct experience navigating operational disruptions, strategic transitions, and organizational constraints. Snowball sampling is appropriate for this study because practitioners who have encountered SEAC-type traps represent a specialized population whose experiences are not easily identified through random or convenience sampling (Patton, 2015). Initial contacts were identified through professional networks and academic-industry connections, and subsequent participants were recruited through referrals from existing interviewees. We acknowledge that snowball sampling introduces the possibility of network homogeneity: participants recruited through referrals may share similar professional perspectives, industry logics, or organizational cultures, potentially producing a sample that reflects a shared cognitive frame rather than the full range of experiences across supply chain contexts. To mitigate this risk, we deliberately pursued referrals across industry boundaries, and probed for experiences that diverged from patterns established in prior interviews. Despite these precautions, the findings should be interpreted with awareness that the sample may not capture the perspectives of managers embedded in very different institutional environments, such as developing economy supply chains or highly regulated public sector contexts.

The final sample comprises 10 supply chain professionals from organizations spanning diverse industries, including aerospace and defense, pharmaceuticals, logistics, consumer goods, retail, technology, and manufacturing. This diversity was intentionally pursued to enhance the transferability of findings across supply chain contexts and to capture variation in how traps manifest across different operational environments. Table 2 provides an overview of the participant profiles.

**Table 2. Participant Overview**

| ID | Industry | Duration |
|---|---|---|
| P1 | Consumer Goods | ~30 min |
| P2 | 3PL / Fulfillment | ~30 min |
| P3 | Air Freight | ~30 min |
| P4 | Retail / Fabrics | ~30 min |
| P5 | Aerospace / Defense | ~30 min |
| P6 | Pharmaceuticals / Consumer Health | ~30 min |
| P7 | Automotive / Manufacturing | ~30 min |
| P8 | Logistics / 3PL | ~30 min |
| P9 | Technology / Consulting | ~30 min |
| P10 | Aerospace / Space | ~30 min |

## Data Collection

Data were collected through 10 semi-structured interviews with 10 supply chain professionals, conducted via Zoom over a two-year period. Two of these participants were re-interviewed to clarify and deepen emergent themes; their follow-up conversations were consolidated with their original interviews, so the analysis draws on 10 interviews in total. Semi-structured interviews were selected because they allow for consistency across participants through a core set of guiding questions while providing flexibility to probe

unanticipated topics as they arise (Brinkmann and Kvale, 2015). Each interview lasted approximately 30 minutes.

The interview protocol was organized around themes derived from the SEAC framework, including questions about organizational responses to disruptions, constraints on strategic adaptation, resource limitations, and relationship dynamics within supply chains. Example questions included: “Can you describe a time when your organization’s established processes made it difficult to respond to a disruption?” and “How does your organization evaluate and form supply chain partnerships?” Probing questions were used to elicit concrete examples and to encourage participants to reflect on the underlying mechanisms that contributed to their experiences.

All interviews were recorded with participant consent and transcribed verbatim. Transcriptions were reviewed against audio recordings for accuracy before being imported into MAXQDA for systematic analysis.

**Data Analysis**

Data analysis followed abductive logic, iterating between the a priori theoretical constructs of the four SEAC traps and patterns emerging from the interview data (Dubois and Gadde, 2002). We employed a template analysis approach (King, 2012), in which the four traps, rigidity, dissolution, poverty, and vagabond, served as initial coding categories. These predefined codes provided a structured starting point for analysis while remaining open to modification, expansion, and refinement as the data were examined.

In the first phase of coding, interview transcripts were systematically coded in MAXQDA using the four trap constructs as template codes. Segments of text were assigned to one or more trap categories based on their alignment with the conceptual

definitions established in the theoretical framework. Importantly, the use of a priori codes did not predetermine the findings: the template served as a sensitizing device rather than a confirmatory filter (Blumer, 1954). Consistent with abductive logic, coders were explicitly instructed to flag passages that resisted categorization, contradicted theoretical expectations, or introduced new dimensions not anticipated by the framework. These passages were treated as analytic opportunities rather than noise, and several of them, particularly those describing simultaneous or sequential trap experiences—generated the cross-cutting findings reported in the section on trap interdependence. During this phase, attention was also given to passages that did not fit neatly within the existing template, signaling opportunities for refinement or sub-categorization.

In the second phase, codes were iteratively refined through constant comparison within and across cases (Miles et al., 2014). Sub-themes were developed to capture the nuanced ways in which each trap manifested across different supply chain contexts. For instance, rigidity trap codes were differentiated by whether the constraint originated from technological lock-in, procedural inertia, or cultural resistance to change. Throughout this process, the theoretical framework was revisited and adjusted to accommodate the empirical patterns, consistent with the systematic combining approach advocated by Dubois and Gadde (2002).

### Trustworthiness and Rigor

Several measures were taken to ensure the trustworthiness of the findings, following the criteria established by Lincoln and Guba (1985). Credibility was addressed through member checking, in which preliminary findings and interpretations were shared with selected participants to verify that the analysis accurately represented their

experiences. Transferability was enhanced by sampling across diverse industries and organizational contexts, providing thick descriptions of each participant's operational environment, and presenting rich illustrative quotations in the findings. Dependability was supported through a detailed audit trail maintained throughout the research process, including coding decisions, analytic memos, and iterative revisions to the coding template documented in MAXQDA. Confirmability was strengthened by grounding all interpretations in direct participant quotations and by transparently reporting the abductive process through which theoretical constructs were refined against empirical data.

Additionally, the extended data collection period of two years allowed for prolonged engagement with the research context, enabling deeper understanding of the phenomena under study and providing opportunities to revisit and verify earlier interpretations as new data were collected.

## FINDINGS

Our analysis of interviews with 10 supply chain professionals across diverse industries reveals that each of the four SEAC traps, rigidity, poverty, dissolution, and vagabond, manifests in distinct and recognizable ways within supply chain operations. In this section, we present the findings organized by trap type, grounding each in the first-order concepts that emerged from participant accounts, the second-order themes derived through our template analysis, and the aggregate theoretical dimensions of the SEAC framework. For each trap, we illustrate how organizations fall into the trap, the mechanisms that sustain it, and the unlearning and relearning processes that participants described as instrumental to escape. Table 3 presents the complete data structure.

**Table 3. Gioia Data Structure: First-Order Codes, Second-Order Themes, and Aggregate Dimensions**

| First-Order Codes (Informant Terms) | Second-Order Themes (Researcher Constructs) | Aggregate Dimensions |
|---|---|---|
| ***Aggregate Dimension: Dissolution Trap Dynamics*** | | |
| Siloed projects; Due to siloed project, no information sharing; Siloed relationship; Suboptimization of components | *Suboptimization and fragmentation of system components* | Dissolution trap dynamics |
| Supply chain disruptions; Coordination role; Strategic decision-making in a crisis; Reliance on partners | *Adaptive coordination response during disruption* | Dissolution trap dynamics |
| Supplier diversification; Risk of partner dependency; Resilience through diversification; Alignment with partners | *Structural reconfiguration through partner diversification* | Dissolution trap dynamics |
| Process innovation; Functional realignment; Workflow modification | *Cross-functional process redesign* | Dissolution trap dynamics |
| ***Aggregate Dimension: Rigidity Trap Dynamics*** | | |
| Short-term cost focus transition to long-term strategy; Balancing short and long-term goals; Efficiency metrics | *Temporal orientation shift away from efficiency logic* | Rigidity trap dynamics |
| Leadership change; Network scalability; Operational responsiveness impairment; Structural impairment | *Structural rigidity constraining adaptive response* | Rigidity trap dynamics |
| Geopolitical risk in supply chains; Labor and quality concerns; Uncertainty in trade policies | *Environmental turbulence triggering rigidity exposure* | Rigidity trap dynamics |
| Supply chain agility; Supply chain efficiency; Limited flexibility; Contractual relationship | *Efficiency-locked capability architecture* | Rigidity trap dynamics |
| ***Aggregate Dimension: Poverty Trap Dynamics*** | | |

| | | |
|---|---|---|
| Competing priorities; Efficiency driven; Resource constraints; Infrastructure limitations | *Resource constraint entrenchment* | Poverty trap dynamics |
| Cost structure; Variable cost to flexible cost structure; Labor market dynamics; Disruption, price stabilization | *Cost architecture foreclosing adaptive investment* | Poverty trap dynamics |
| Labor dependency shift; Recognition of digitization; Industry transformation; Technology integration | *Capability gap awareness under resource pressure* | Poverty trap dynamics |
| Risk absorption; Supplier diversification; Operational risk management; Risk anticipation | *Reactive risk management under constrained resources* | Poverty trap dynamics |
| ***Aggregate Dimension: Vagabond Trap Dynamics*** | | |
| Partner diversification; Risk diversification; Positioning of partnerships; Optimization of partnership portfolio | *Excessive relationship experimentation preventing commitment* | Vagabond trap dynamics |
| Flexibility vs. standardization; Collaborative KPIs; Policy flexibility; Performance-based contracts | *Governance instability undermining relational investment* | Vagabond trap dynamics |
| Transactional relationship; Transactional risk; Holding power in relationship; Siloed relationship | *Transactional orientation preventing structural commitment* | Vagabond trap dynamics |
| Previous relationship; Supplier transition; Reputational management; Key supplier | *Relationship instability and partner switching* | Vagabond trap dynamics |
| ***Aggregate Dimension: Escape Mechanisms*** | | |
| Adaptability is the new norm; Resiliency as adaptability; Adaption to work changes; Increased flexibility | *Adaptive orientation formation (wiping old logic)* | Escape mechanisms |
| Proactive management; Enhanced transparency; Post-disruption adaptability; Proactive supply chain management | *Proactive relearning mode (exploratory)* | Escape mechanisms |

| | | |
|---|---|---|
| Transparency and accountability; Information sharing in partnerships; Resilience and responsiveness | *Collaborative knowledge reconstruction (exploitative)* | Escape mechanisms |
| Strategic alignment; Collaborative decision making; Long-term relationships; Collaborative continuous improvement | *Relational re-anchoring through exploitative relearning* | Escape mechanisms |
| Adaptive strategies; Impact of disruption; Navigating adaptations; Strategic value adjustments | *Deep learning from disruption experience* | Escape mechanisms |

Note. First-order codes are drawn directly from participant language across 10 semi-structured interviews (N = 195 coded segments). Second-order themes represent researcher-level theoretical constructs derived from systematic comparison of first-order codes. Aggregate dimensions map to the four adaptive cycle traps (Allison & Hobbs, 2004; Gunderson & Holling, 2002) and the escape mechanisms theorized in this study.

### The Rigidity Trap: When Efficiency Narrows Adaptation

The rigidity trap emerged as perhaps the most pervasive constraint described by participants. Defined in the SEAC framework as a situation in which focus on efficiency improvements across organizational systems narrows the scope of opportunities for adaptation, the rigidity trap was most vividly illustrated in contexts where cost reduction had become the dominant organizational logic, crowding out other strategic considerations. Three second-order themes constitute this trap: cost efficiency as dominant logic, over-optimization producing unintended complexity, and formal controls substituting for flexibility.

Cost efficiency as dominant logic. Across multiple interviews, participants described organizational environments in which cost reduction had evolved from a strategic priority into an all-consuming mandate that constrained operational decision-making. The transportation analyst at P4 offered one of the most candid accounts of this

dynamic, describing a persistent tension between servicing stores effectively and meeting relentless budget pressures:

"We're told that… my mission is to be the best advocate I can for the business to service [the stores]… and telling us, hey, you need to save money, pinch pennies, cut costs, cut costs, cut costs. I can't do that. I can't service the stores effectively in the manner that you would like me to if we have to be super hawkish about the budget." (P4)

This participant's account illustrates how cost efficiency, when elevated to a dominant logic, creates competing priorities that are fundamentally antithetical: the organization demands both cost minimization and service excellence but provides resources adequate for neither. The result is an operational environment in which managers are trapped between irreconcilable mandates. A similar pattern emerged at P2, where the participant described how private equity ownership reinforced short-term cost focus at the expense of longer-term strategic investments:

"It's always been about dollars and cents. What can we get now?… And when you do that, you trade the… responsibility portion of it, the long-term portion of it, in some sense. So it's about balancing… you don't want to blow the company up long term for short-term gain." (P2)

At P9, the participant described a broader organizational pattern in which risk management investments made during the pandemic were subsequently abandoned once the immediate crisis had passed, a reversion to cost-first thinking that effectively dismantled the resilience capabilities the organization had built:

"The whole risk component is not being used, just the cost optimization… It's just a pure cost optimization now… Everything lives and dies by the quarter." (P9)

These accounts reveal a critical mechanism of the rigidity trap: cost efficiency does not merely narrow the scope of adaptation, it actively dismantles the organizational capacity for adaptation by redirecting resources away from resilience-building activities. The P9 case is particularly instructive because it demonstrates that even organizations that have successfully built risk management capabilities can fall back into the rigidity trap when the dominant logic of quarterly cost performance reasserts itself.

Over-optimization producing unintended complexity. A particularly counterintuitive finding was that aggressive cost optimization frequently produced the opposite of its intended effect, generating new forms of complexity and cost that further constrained the organization. The P4 participant provided a striking example of this paradox in the context of trailer loading decisions:

"It also caused us to have a lot more LTL shipments because she was wanting us to cut trailers short… that human judgment aspect when it comes to planning out the loads… kind of took that away and put more of our eggs in the LTL basket… which really, to me, didn't make sense because it's antithetical to trying to make things cheaper." (P4)

In this case, the directive to minimize trailer costs by cutting loads short paradoxically increased overall transportation expenditure by pushing freight into more expensive less-than-truckload shipments. The optimization of one parameter (trailer utilization) degraded the performance of the broader system (total transportation cost). This finding extends our understanding of the rigidity trap by revealing that the trap is not simply about pursuing efficiency, it is about the cascading unintended consequences that arise when efficiency is pursued through narrow, system-level optimization without regard

for the interdependencies across the supply chain. The participant at P2 described an analogous technology-related challenge:

"They chose… they were beeping on me [relying on few] carriers and they were wrong because COVID happening… diversity happening and more diverse carrier base. So this company… they have a need to get more carriers but they don't have a TMS, they're just using their WMS. And doing transportation type stuff on the WMS is like trying to put a microwave function on a PlayStation." (P2)

The vivid analogy of "trying to put a microwave function on a PlayStation" captures the essence of what happens when organizations attempt to force systems designed for one purpose into serving fundamentally different operational needs. The decision to avoid investing in a transportation management system, itself a cost-saving measure, became a rigidity-reinforcing constraint that made it operationally difficult to diversify carriers, even when the strategic need was recognized.

Formal controls substituting for flexibility. The third dimension of the rigidity trap concerns the role of contracts and formal governance mechanisms in creating inertia. Participants described scenarios in which contractual structures, initially designed to provide stability and predictability, became barriers to adaptation. The participant at P5 described a supplier landscape characterized by long-term contracts and high switching costs:

"It would be super hard. They hold our supply or demand for a year. So at minimum, it would take a year to transition… and then some of these parts have a yearly lead time. So then you have two years." (P5)

In this context, the contractual structure that provides P5 with supply certainty simultaneously creates a two-year minimum transition period for any supplier change, a rigidity that is structurally embedded in the organization's procurement architecture. The P4 participant described a related phenomenon from the leadership level, where a new director's singular focus on cost avoidance through national carrier contracts created operational inflexibility:

"She was big on cost avoidance and cost savings… that singular focus severely hampered our responsiveness during the times when our particular building was behind… that really hampered our abilities to deal with that and to secure on-time deliveries to our stores." (P4)

Collectively, these findings suggest that the rigidity trap in supply chains operates through a self-reinforcing cycle: cost efficiency as a dominant logic drives narrow optimization, which produces unintended complexity, which in turn is managed through tighter formal controls, which further reduces the organization's capacity to adapt. Breaking this cycle, as our theory section suggests, requires the unlearning process of switching, a deliberate strategic-level abandonment of the efficiency-first behavioral code in favor of a more balanced approach to cost and flexibility.

**The Poverty Trap: When Resource Constraints Deprive Adaptation**

The poverty trap, defined as a situation in which constraints in available resources in the operating environment deprive the organization of the ability to make appropriate adjustments—was described across multiple contexts, though it manifested most acutely in organizations facing infrastructure limitations, technology deficits, and human capital

erosion. Three second-order themes constitute this trap: underinvestment in enabling infrastructure, lack of adaptive digital capacity, and human capital erosion.

Underinvestment in enabling infrastructure. The most vivid illustration of infrastructure-driven poverty came from P4, where the participant described a distribution center that had been opened during the COVID-era demand surge but remained fundamentally underdeveloped:

"That distribution center in Ohio that they opened… right now they don't even have infrastructure set up to receive anything but pallets. They don't even have conveyors. And that's wild to think about in a warehouse." (P4)

The absence of basic warehousing infrastructure, conveyors, in this case, meant that a facility designed to absorb overflow demand could not fulfill its intended function, forcing product to be rerouted to other distribution centers and generating cascading operational disruptions across the network. The participant's observation that it is "wild to think about" a warehouse without conveyors captures the abnormality of the situation: the organization had invested in the physical space but not in the enabling infrastructure that would make the space functional. This pattern of partial investment, sufficient to create the appearance of capacity but insufficient to deliver actual capability, is a defining characteristic of the poverty trap as it manifests in supply chains.

Lack of adaptive digital capacity. Technology constraints emerged as a second dimension of the poverty trap, particularly in contexts where organizations lacked the digital infrastructure necessary to respond to environmental changes. The P2 participant described an organization attempting to manage transportation through a warehouse

management system, a technology mismatch that severely constrained operational agility:

"Doing transportation type stuff on the WMS is like trying to put a microwave function on a PlayStation… the coding and work that has to happen to bring on new carriers is substantial, it takes a long time. So that nimbleness… technology is a big thing. Having a proper TMS is now more important than ever." (P2)

This excerpt illustrates how the absence of appropriate technology does not simply create inconvenience, it fundamentally constrains the organization's ability to diversify its carrier portfolio, a capability that became critical during COVID-era disruptions. The P8 participant offered a contrasting perspective, describing an organization that had proactively invested in digitalization before the pandemic, positioning itself to adapt more effectively when disruption arrived:

"My previous employer… was doing an excellent job of recognizing the importance of digitalization long before most of the market did. Digitalization was a term that we used prior to COVID. And I think COVID just simply expanded that so quickly, but they were ahead of the curve." (P8)

The contrast between these two accounts, one describing an organization constrained by technology poverty, the other describing an organization that had proactively invested in digital capability, underscores a key insight about the poverty trap: it is not merely about the absence of resources but about the consequences of underinvestment decisions that, at the time they were made, may have appeared rational but ultimately deprived the organization of adaptive capacity when it was most needed.

Human capital erosion. The third dimension of the poverty trap concerns the erosion of human capital, the loss of skilled personnel, institutional knowledge, and organizational expertise that deprives the organization of the capacity to adapt. The P4 participant connected budget constraints directly to retention failures:

"I still feel like because… we're watching the budget so closely, that's really hurting us all around in our supply chain structure within our building. And that's even from just not being able to retain people." (P4)

The P8 participant described the broader labor market dynamics that amplified this challenge across the industry, particularly during and after the pandemic:

"Amazon and Walmart were raising their pay rates because they weren't getting people… So even if you had people on site, people were leaving and going to work for these other organizations because they had an opportunity to make more money. What did that do? That required us to have to raise the rates." (P8)

P7 offered a particularly illustrative account of how human capital poverty manifests in manufacturing contexts. Faced with labor shortages driven by increasing competition from Asian manufacturers establishing local operations, the organization was forced to develop creative recruitment strategies:

"You have to put… more companies come into the manufacturing area… that goes to an employee, somebody gives them extra money and they just take a flight… We created a vocational school… you pick 100 students, high school kids… they do their education partly in their school and partly in our factories. And then upon graduation, you give them a job opportunity. Retention is about 20%." (P7)

This response, investing in a vocational school to develop a labor pipeline from scratch, yet achieving only 20 percent retention, illustrates the depth of the poverty trap when it manifests through human capital erosion. The organization recognized the need for adaptation and invested creative resources into a solution, yet the structural conditions of the operating environment (competitive labor markets, employee preferences for non-manufacturing work) continued to constrain outcomes. Breaking free from the poverty trap, as our theoretical framework suggests, requires deep unlearning—a fundamental reframing of how the organization understands its relationship to resources in its environment.

**The Dissolution Trap: When Expediency Erodes Governance**

The dissolution trap, defined as a situation in which focus on efficiency improvements in a subset of organizational systems boxes in the organization's opportunities for adaptation, emerged in our data as a pattern of governance erosion driven by operational expediency. Unlike the rigidity trap, which is characterized by the tightening of formal structures, the dissolution trap involves the loosening or abandonment of governance mechanisms in pursuit of short-term operational goals. Three second-order themes constitute this trap: governance erosion through expediency, sacrificing learning for speed, and informal coordination replacing structure.

Governance erosion through expediency. Participants described multiple instances in which established processes and policies were bypassed in order to meet immediate operational demands. The P4 participant provided one of the most candid accounts of this dynamic, describing how the departure of a senior leader created space for process circumvention:

"We're able to kind of go around things… not necessarily under the table, but… necessarily outside of the constraints of our normal processes and policies… I see it more as my job to keep the stores happy right now… I see that as a greater need than necessarily making sure I'm being efficient and as lean as possible." (P4)

While this participant framed the bypass as a pragmatic response to customer needs, and indeed, the immediate operational outcomes may have been positive, the underlying dynamic reveals the dissolution trap at work: established governance structures are eroded not through deliberate strategic choice but through the accumulation of expedient workarounds. The P10 participant described a similar pattern in the context of procurement, where urgency overrode established sourcing procedures:

"We're like, well, I can't really… we don't have time to research all the different quotes. So we give it to you… Because they're very strict on having three quotes. So there was a… she taught me something, it's 'too fast to get.'" (P10)

The phrase "too fast to get" is particularly revealing. It captures a situation in which the organization has informally codified the practice of bypassing its own procurement controls when time pressure is perceived to be sufficient justification. What begins as an exceptional response to urgency becomes a normalized behavior, the essence of the dissolution trap.

Sacrificing learning for speed. A second dimension of the dissolution trap concerns the organizational tendency to abbreviate or eliminate learning processes in pursuit of speed. The P4 participant described how onboarding procedures for carriers were compressed to accelerate partner reintegration:

"We can keep them under contract for… a calendar year… and bring them back on under a probationary basis. But… we actually shortened that probationary period to 30 days. So we could go ahead and… give [them the contract] because the way it was working was they were like verbal agreement… 'Hey, we're gonna give you 10 loads next week.'" (P4)

The compression of a probationary period from its standard duration to 30 days, and the reliance on verbal agreements in the interim, represents a sacrifice of the learning that the probationary period was designed to generate. The organization needed to understand whether the carrier could meet performance thresholds, but the pressure to lock in capacity overrode the need for that knowledge. This pattern was echoed in the P5's description of quality inspection processes that were found to be inadequate only after extended disruption:

"Kind of the bigger problem with getting a supply issue like this… is how much of our stock that they've been holding for a year has this condition… A big policy change because they're required to do documented checks on what they're holding for us." (P5)

In this case, the discovery that a supplier's quality inspection processes were insufficient to detect defects in held inventory revealed that the organization had traded thoroughness for convenience in its oversight procedures, a dissolution of governance that only became apparent when the consequences materialized.

Informal coordination replacing structure. The third dimension of the dissolution trap emerged in accounts of informal coordination mechanisms, gradually replacing formal structures. P4 described carrier relationships that had become remarkably informal:

"When it comes to the day-to-day managing of the relationship… I don't feel like we're contractually managing… It is more… about as informal as you could get with a business-to-business relationship… as much like friendship as you could get it, because it's very open." (P4)

While informal coordination can foster responsiveness and relational trust, and the participant clearly valued this approach, it also creates vulnerability. When relationships are managed informally, the organization's supply chain capabilities become dependent on individual relationships rather than institutional structures. This was evidenced when a carrier abruptly departed just before peak season, leaving the organization scrambling precisely because the governance mechanisms that might have provided early warning or contractual recourse had been eroded in favor of informal arrangements. The dissolution trap, as our framework suggests, requires the unlearning process of wiping, the elimination of deeply internalized operational-level habits that have become normalized through repetition. Organizations must unlearn the expedient workarounds that have become embedded in daily practice and replace them with governance structures that balance responsiveness with oversight.

**The Vagabond Trap: When Endless Exploration Prevents Commitment**

The vagabond trap, defined as a situation in which the freedom offered in the operating environment to choose any relationship makes it difficult for the organization to form meaningful and productive connections, manifested in our data as a pattern of persistent exploration without consolidation. This trap was particularly prevalent in the transportation and logistics contexts, where carrier diversification strategies, while strategically sound in principle, sometimes produced a state of perpetual reconfiguration

that undermined the depth and stability of partnerships. Three second-order themes constitute this trap: persistent exploration without consolidation, opportunistic reconfiguration, and adaptation as a permanent state.

Persistent exploration without consolidation. The P2 participant described an organizational posture of continuous carrier diversification that, while responsive to market conditions, risked becoming an end in itself rather than a means to strategic positioning:

"It goes all year, I think that's the main point… carrier diversity. The more diverse you are, the more you can navigate those things in the future… you've got to be ever [diversifying] and you've got to be nimble." (P2)

The language of perpetual diversification, "all year," "ever," "nimble" reveals a strategic orientation in which the search for new relationships has been normalized as a continuous activity. While diversification is widely recognized as a risk mitigation strategy, the vagabond trap emerges when diversification becomes so persistent that it prevents the organization from developing the deep, strategic partnerships that yield long-term value. The P1 participant described this tension explicitly in the context of the post-COVID carrier landscape:

"Those typical national carrier solutions were stretched thin on capacity… So you had to begin sourcing other carriers to help fill that need… Where we are now, I think [we], along with probably the rest of the industry… everyone's a little more level-headed now… they understand that you're not always going to be able to see everything around the corner." (P1)

This account captures the industry-wide dynamic that creates conditions for the vagabond trap: a disruption forces rapid diversification, which then becomes embedded as a permanent strategic orientation even after the triggering conditions have resolved.

Opportunistic reconfiguration. A second dimension of the vagabond trap concerns the tendency toward opportunistic switching between partners based on short-term economic signals rather than strategic alignment. The P2 participant described how market-driven rate fluctuations drive carrier switching decisions:

"Pitney Bowes has come in and… because we're trying to show a profit margin of a certain percentage… we're very sensitive to price. So… when some of the postal induction [carriers offer better rates]… the problem is… about two years ago, they screwed… it over in the Atlanta facility during peak season, which was a big, big deal." (P2)

This excerpt illustrates the core mechanism of opportunistic reconfiguration: the organization switches to a lower-cost carrier, experiences a service failure, moves away from that carrier, and then is tempted back when rates become favorable again. The cycle of attraction, failure, departure, and return is characteristic of the vagabond trap; the organization never develops sufficient depth with any partner to build the mutual understanding and operational integration that would prevent such failures. The P3 participant described the broader industry challenge with similar candor:

"If the market is at 100 and you bought capacity maybe at 20, do you have some flexibility that maybe you can adjust to 40? That's where the partnership comes in place. On the other hand, you also want to be locked in at 100 and the market goes to 10… So I think you build the trust during the easy times and you put the trust into… test." (P3)

Adaptation as a permanent state. The third and perhaps most theoretically significant dimension of the vagabond trap concerns organizations that have internalized adaptation itself as a permanent operating state, a condition in which the organization is always in transition but never arrives at a stable configuration. The P8 participant articulated this new reality with striking clarity:

"If you find yourself in a position… that becomes your norm of adapting and changing, another big blow isn't going to knock you off the train… Because you're accustomed to adapting to things… Before, we were just full steam ahead… everybody's figured out how to be more adaptable." (P8)

While this participant framed perpetual adaptation positively, as a form of developed resilience, the vagabond trap perspective suggests a more nuanced interpretation. When adaptation becomes the permanent state, the organization may never consolidate the learning from any given adaptation cycle. Each reconfiguration is treated as another iteration in an endless series rather than as a transition toward a more stable and effective operating model. The P3 participant described the costs of this posture in the context of capacity markets:

"As flexible as we were during COVID… at one point it's probably over. So maybe we left a little bit of money on the table because we could have gobbled up more capacity. But normally, then that price was so high that now post-COVID, you probably… the short-term money you made in three or six months, you're probably going to blow in one or two months." (P3)

The vagabond trap, as our theoretical framework suggests, requires the unlearning process of reversing, a deliberate choice to revert to previously abandoned consolidation

behaviors, regroup around partnerships that matter most, and resist the organizational impulse to continue exploring when consolidation would yield greater value. Organizations caught in the vagabond trap must unlearn the belief that perpetual flexibility is inherently superior to strategic commitment.

### Cross-Cutting Patterns: The Interrelationship Among Traps

An important finding that transcends the individual trap categories is the degree to which the traps interact and reinforce one another. Several participants described organizational trajectories that moved through multiple traps sequentially or experienced multiple traps simultaneously. The P4 case is particularly instructive: the organization exhibited characteristics of the rigidity trap (cost efficiency as dominant logic), the poverty trap (underinvestment in distribution center infrastructure and human capital erosion), and the dissolution trap (governance bypass and informal coordination), all operating concurrently. This suggests that traps may not be isolated phenomena but rather interconnected conditions that, once one is triggered, create the conditions for others to emerge.

Similarly, the P9 participant's account of building and then dismantling risk management capabilities suggests a trajectory from vagabond-like exploration (post-disruption investments in diversification and analytics) through a cycle back to rigidity (reversion to pure cost optimization). The P3 participant described a comparable dynamic in the air freight market, where the COVID-era expansion of networks and partnerships (vagabond-like behavior) gave way to market normalization that exposed the unsustainability of overextended relationships.

These cross-cutting patterns have important implications for both theory and practice. Theoretically, they suggest that the four traps may not operate independently within the adaptive cycle but rather form a system of interdependent constraints. Practically, they imply that organizations seeking to escape one trap must be alert to the possibility that their escape strategy may inadvertently propel them into another, for example, escaping the rigidity trap through aggressive diversification may lead directly into the vagabond trap if consolidation does not follow.

## DISCUSSION

This study set out to address two research questions: (1) Why do traps emerge at particular points as organizations traverse the adaptive cycle? and (2) How do learning processes produce or resolve traps? Drawing on semi-structured interviews with 10 supply chain professionals across diverse industries, we examined the manifestation of the four SEAC traps, rigidity, dissolution, poverty, and vagabond, through the lens of organizational unlearning and relearning theory. In this section, we evaluate our propositions against the empirical evidence, discuss the theoretical contributions of the study, articulate implications for practice, and address limitations and directions for future research.

### Evaluation of Propositions

The dissolution trap (Propositions 1a–1c). Proposition 1a posited that the dissolution trap is more pronounced for firms transitioning between the exploitation (r) and conservation (k) phases. Our findings support this proposition. The P4 case provides the clearest illustration: the organization was operating in a familiar environment with well-functioning processes and was actively pursuing localized efficiency improvements—

precisely the conditions that characterize the r-to-k transition. The erosion of governance structures at P4 occurred not during crisis but during a period of operational stability, when the organization's focus on optimizing subsets of its transportation operations (e.g., shortening carrier probationary periods, relying on verbal agreements) reflected the subsystem-level optimization that defines the dissolution trap. Similarly, the P10 participant's account of bypassing three-quote procurement procedures under the informal codification of "too fast to get" describes an organization in the exploitation phase whose governance structures are dissolving through the cumulative effect of expedient workarounds, a pattern consistent with the r-to-k transitional dynamics we theorized.

Proposition 1b suggested that the primary challenge in escaping the dissolution trap lies in differentiating and discarding old practices (unlearning) rather than in their replacement with new practices (relearning). Our findings support this proposition, though with important nuance. The data reveal that the dissolution trap is particularly insidious precisely because the practices that need to be unlearned do not appear problematic. At P4, the informal carrier relationships, shortened probationary periods, and governance workarounds were all experienced by participants as pragmatic adaptations that improved short-term responsiveness. The challenge was not in identifying what to replace them with, formal contracts, structured onboarding, documented procedures, but in recognizing that the current practices constituted a trap at all. This finding extends the wiping construct by suggesting that the difficulty of wiping lies not in the mechanical act of discarding practices but in the cognitive challenge of recognizing deeply normalized behaviors as candidates for discarding.

Proposition 1c proposed that escape from the dissolution trap requires emphasis on exploratory learning. Our findings support this proposition. Participants whose organizations exhibited dissolution trap characteristics described the need to explore new governance models, carrier management frameworks, and quality oversight mechanisms. The P5 participant's account of discovering inadequate quality inspection processes in held inventory, and the subsequent policy change requiring documented checks, represents an instance of exploratory learning triggered by the failure of a dissolved governance structure. The organization had to explore what a robust inspection regime would look like in its specific context rather than simply reverting to a known model.

The rigidity trap (Propositions 2a–2c). Proposition 2a posited that the rigidity trap is more pronounced for firms at the latter part of conservation (k), the earlier part of release (Ω), and the transitional phase between them. Our findings strongly support this proposition. The P9 case offers the most compelling evidence: the organization had achieved peak operational efficiency through its supplier allocation model, a system so refined that it had earned an industry award—yet when the pandemic forced a transition into the release phase, the risk management capabilities built during disruption were subsequently dismantled in favor of pure cost optimization once the crisis passed. The participant's observation that "everything lives and dies by the quarter" captures the essence of the k-to-Ω dynamic: the organization's conservation-phase efficiency logic persisted even as the environment demanded the flexibility of the release phase. The P5 case similarly illustrates this transition. The organization's two-year minimum supplier transition period, a structural artifact of its conservation-phase procurement architecture,

represents precisely the kind of system-level rigidity that becomes acutely problematic when external disruption demands rapid adaptation.

Proposition 2b suggested that the primary challenge in escaping the rigidity trap lies in the replacement (relearning) of new practices rather than in the discarding (unlearning) of old ones. Our findings support this proposition. A consistent pattern across rigidity trap cases was that participants could identify the constraining practices, cost-first mandates, contractual lock-in, technology limitations, but struggled to articulate or implement alternatives. At P2, the organization recognized the need for a transportation management system and understood that its WMS-based approach was inadequate ("like trying to put a microwave function on a PlayStation"), yet the relearning challenge, selecting, implementing, and integrating a TMS into existing operations, remained unresolved. At P9, the participant was fully aware that abandoning the risk component of the allocation model was strategically unsound, yet the organization lacked a viable alternative that could satisfy both risk management and quarterly cost targets. This pattern, clear identification of the problem coupled with inability to operationalize the solution, is consistent with the switching construct, which requires not just the removal of old practices but the simultaneous integration of new ones (Zahra et al., 2011).

Proposition 2c proposed that escape from the rigidity trap requires emphasis on exploratory learning. Our findings support this proposition. The P8 case offers a positive exemplar: the organization's pre-COVID investment in digitalization represented an instance of exploratory learning, pursuing automation and digital infrastructure before the market demanded it, that positioned it to avoid the rigidity trap when disruption arrived. By contrast, organizations that relied exclusively on exploitative learning (refining existing

cost structures) found themselves unable to respond when the environment shifted. This contrast between P8 and the organizations caught in rigidity underscores the proposition's central claim: exploratory learning creates the adaptive capacity necessary to escape or avoid the rigidity trap.

The poverty trap (Propositions 3a–3c). Proposition 3a posited that the poverty trap is more pronounced for firms operating in the release (Ω) phase. Our findings support this proposition. The poverty trap cases in our data consistently involved organizations confronting resource constraints in the aftermath of disruption. P4's distribution center without conveyors exemplifies this dynamic: the facility was opened during the COVID-era demand surge (a release-phase response to disruption) but was inadequately resourced to fulfill its intended function. P7's labor challenges similarly emerged in the context of a disrupted operating environment; increasing competition from Asian manufacturers entering the local market represented an environmental shift that deprived the organization of a previously stable resource (labor). The P8 participant's account of labor market disruptions across the logistics industry further supports this placement: the pandemic triggered a release-phase upheaval in which previously reliable resources (affordable labor, stable cost structures) were suddenly unavailable, and organizations lacked the resource base to adapt quickly.

Proposition 3b suggested that escaping the poverty trap is the most difficult of the four traps, with unlearning and relearning challenges being equally difficult. Our findings strongly support this proposition. The P7 case is particularly illustrative: the organization had to simultaneously unlearn its traditional recruitment approach (which assumed a stable, captive labor pool) and relearn how to attract and retain workers in a competitive

environment, creating a vocational school, hiring women in a traditionally male-dominated industry, and investing in workplace amenities. Yet despite these creative investments, retention remained at only 20 percent, suggesting that both the unlearning and relearning challenges remained formidable. The P4 case reinforces this finding from a different angle: the organization recognized that budget constraints were eroding its human capital and infrastructure capabilities (the unlearning challenge of recognizing that "watching the budget so closely" was counterproductive), but the relearning challenge, identifying how to build capability within severe resource constraints, proved equally daunting. The poverty trap is thus distinctive in that organizations face a double bind: they must fundamentally rethink their operating assumptions and find ways to implement new approaches with the very resources that are constrained.

Proposition 3c proposed that escape from the poverty trap requires simultaneous emphasis on exploitative and exploratory learning, that is, ambidexterity. Our findings support this proposition. P7's response demonstrates both dimensions: the vocational school represents exploratory learning (experimenting with a fundamentally new labor pipeline model), while the focus on hiring women and improving workplace conditions represents exploitative learning (leveraging existing physical infrastructure and factory expertise to attract a previously untapped labor pool). The P8 participant's account similarly illustrates ambidexterity: the organization exploited its existing digital infrastructure investments while simultaneously exploring new automation solutions and flexible work arrangements. The poverty trap cases thus confirm that neither explorative nor exploitative learning alone is sufficient; organizations must engage in both simultaneously to navigate the resource-constrained conditions that define this trap.

The vagabond trap (Propositions 4a–4c). Proposition 4a posited that the vagabond trap is more pronounced for firms operating in the reorganization (α) phase. Our findings support this proposition. The vagabond trap cases in our data consistently involved organizations that had emerged from disruption and were in the process of rebuilding their networks and relationships, precisely the conditions of the α phase. P2's continuous carrier diversification, P1's post-COVID expansion of regional carrier relationships, and the broader industry shift toward postal induction partners all represent organizations in the reorganization phase, creating new connections and networks in an environment that was still being understood. The P8 participant's characterization of adaptation as the "new norm" captures the α-phase dynamic: the organization has moved past the release-phase crisis but has not yet consolidated into a stable operating configuration.

Proposition 4b suggested that the primary challenge in escaping the vagabond trap lies in differentiating and discarding old practices (unlearning) rather than in their replacement with new practices (relearning). Our findings partially support this proposition, with an important qualification. The data suggest that the unlearning challenge in the vagabond trap is not about discarding specific practices per se but about discarding a strategic orientation, specifically, the belief that perpetual diversification and flexibility are inherently superior to consolidation and commitment. At P2, the participant's language of continuous diversification ("all year," "ever," "nimble") reveals not a set of discrete practices to be discarded but an organizational mindset to be unlearned. This finding extends the reversing construct (Tsang & Zahra, 2008) by suggesting that what must be reversed is not merely a specific behavior but an entire strategic posture. The relearning component, consolidating around core partnerships, deepening relational

investments, building mutual understanding, is relatively well understood (as evidenced by the P1 and P8 participants' articulation of what effective partnerships look like). The challenge lies in recognizing that the current posture of perpetual exploration is itself the problem. This nuance suggests that Proposition 4b may be more accurately stated as: the primary challenge in escaping the vagabond trap lies in recognizing and discarding the strategic orientation of perpetual exploration.

Proposition 4c proposed that escape from the vagabond trap requires emphasis on exploitative learning. Our findings support this proposition. Participants whose organizations had successfully navigated vagabond-like conditions described processes of consolidation and internalization consistent with exploitative learning. The P1 participant described a deliberate shift from reactive diversification to a more "level-headed" portfolio approach, leveraging existing carrier relationships rather than continuously searching for new ones. The P8 participant described building resilience through deepening existing partnerships rather than expanding the partnership base. The P3 participant's account of building trust "during the easy times" and then testing it during disruption reflects an exploitative logic: investing in the refinement and deepening of existing relationships rather than exploring new ones. These accounts confirm that escape from the vagabond trap is fundamentally about exploitation, consolidating around proven relationships and refining the organization's partnership management capabilities rather than continuing to search for new connections.

Theoretical Contributions

This study makes three principal contributions to the supply chain management and organizational resilience literatures. First, we advance SEAC trap theory by shifting

the theoretical frame from classification to process. While the SEAC framework has been integrated into the SCM literature conceptually (Wieland, 2021), the trap constructs embedded within it have been treated as static states to be described and classified rather than as dynamic processes to be explained. Our findings reveal that traps are better understood as emergent processes driven by learning misalignment: organizations become entrapped not through discrete failure events but through gradual shifts in what they learn and unlearn as they traverse adaptive cycle phases. This process orientation explains not only how traps form but why specific traps materialize at specific cycle transitions, dissolution at r-to-k because exploitative refinement displaces integrative thinking; rigidity at k-to-Ω because conservation-phase efficiency logic persists into the release phase; poverty during Ω because resource depletion forecloses both explorative and exploitative options; and vagabond during α because the freedom of reorganization lacks the exploitative anchoring needed to consolidate new relationships. By grounding these dynamics in the experiences of practitioners across diverse industries, we move the discussion from conceptual identification to empirical elaboration, providing the field with a richer understanding of how and why entrapment occurs.

Second, we develop a process model linking organizational unlearning and relearning to trap escape. By integrating the organizational unlearning lens with the SEAC trap constructs, we identify the specific learning mechanisms, wiping, switching, deep unlearning, and reversing, that correspond to each trap and the type of learning (explorative, exploitative, or ambidextrous) required for escape. This integration is a novel theoretical contribution that bridges two previously disconnected literatures: the adaptive cycle literature, which identifies the conditions under which organizations become

trapped, and the organizational learning literature, which provides the mechanisms through which escape is possible. Our empirical findings validate and extend this integration by revealing, for example, that the wiping required to escape the dissolution trap involves not just the mechanical discarding of practices but the cognitive challenge of recognizing normalized behaviors as candidates for discarding, a refinement of the unlearning framework that has implications beyond the SEAC context.

Third, and most importantly, we reveal that traps interact and reinforce one another in ways the original SEAC framework did not theorize. Our cross-cutting findings demonstrate that trap interdependence is a central feature of organizational resilience dynamics, not an anomaly. The P4 case exhibited characteristics of rigidity, poverty, and dissolution simultaneously; the P9 case traced a trajectory from vagabond-like exploration back to rigidity. These patterns suggest a theoretically significant proposition: escaping one trap may inadvertently create the conditions for entering another. A firm that aggressively diversifies to escape rigidity may drift into vagabond territory if consolidation does not follow; a firm that tightens governance to escape dissolution may inadvertently cultivate the formal controls that feed rigidity. This finding reconceptualizes traps as interconnected rather than discrete and has important implications for resilience building: effective adaptation requires awareness not only of the trap currently faced but of the traps that lie in the trajectory of the escape strategy itself.

Implications for Practice

Our findings offer several actionable insights for supply chain managers operating in turbulent environments. Recognize the warning signs of each trap. Our data reveal that each trap has identifiable precursors that, if recognized early, may allow organizations to

intervene before entrenchment deepens. For the rigidity trap, the warning sign is when cost reduction evolves from a strategic priority into an all-consuming mandate that crowds out other considerations, when managers find themselves unable to service customers effectively because of budget constraints, the trap may already be taking hold. For the dissolution trap, the warning sign is the normalization of workarounds and informal processes, when phrases like "too fast to get" become part of the organizational vocabulary, and governance structures are eroding. For the poverty trap, the warning sign is partial investment, when the organization invests in physical capacity (e.g., a new warehouse) but not in the enabling infrastructure that makes that capacity functional. For the vagabond trap, the warning sign is when diversification becomes a permanent activity rather than a response to specific conditions, when the organization is "always diversifying" without consolidating, the trap is forming.

Match the learning response to the trap. Our findings suggest that different traps require different learning approaches. Managers facing rigidity should invest in exploratory learning, seeking fundamentally new approaches rather than refining existing ones. Managers facing poverty should pursue ambidexterity, simultaneously exploiting existing resources creatively while exploring new resource models. Managers facing the vagabond trap should deliberately shift toward exploitative learning, consolidating around proven partnerships and deepening existing relationships rather than continuing to diversify. Managers facing dissolution should focus on identifying and eliminating the normalized workarounds that have eroded governance structures. Applying the wrong learning approach to a given trap, for example, pursuing further exploration when the

organization is already overextended in a vagabond trap, may deepen rather than resolve the entrenchment.

Anticipate trap migration. Perhaps the most practically significant finding of this study is that traps are interconnected. Organizations that aggressively diversify their supplier base to escape the rigidity of sole-sourcing may find themselves in the vagabond trap if they fail to consolidate those relationships. Organizations that tighten governance to escape dissolution may inadvertently create the formal controls that feed rigidity. Supply chain leaders should therefore approach trap escape with a holistic view of the adaptive cycle, recognizing that the solution to one trap may be the precursor to another. Periodic assessment of the organization's position within the adaptive cycle, and of which traps are most proximate, can help managers avoid the oscillation between traps that several of our participants described.

### Limitations and Future Research

As with all research, this study has limitations that should be acknowledged and that suggest directions for future inquiry. First, our sample of 10 participants, while diverse in industry representation, is relatively small. Although qualitative research does not require large samples to generate theoretical insight (Eisenhardt, 1989; Patton, 2018), the small sample size limits the breadth of organizational contexts represented in our findings. Future research should examine SEAC traps across a larger and more varied sample, including organizations of different sizes, ownership structures, and geographic contexts. Longitudinal case studies that track organizations through multiple phases of the adaptive cycle would be particularly valuable for capturing the dynamic, temporal nature of traps that our cross-sectional interview data can only approximate.

Second, the coding was conducted by a single researcher, which may introduce interpretive bias despite the rigor measures employed (member checking, audit trail, prolonged engagement). Future studies would benefit from multiple coders and intercoder reliability assessments to strengthen the dependability of the analysis. Collaborative coding teams could also bring diverse disciplinary perspectives to the interpretation of data, potentially revealing dimensions of the traps that a single coder might overlook.

Third, our snowball sampling strategy, while appropriate for accessing a specialized population of supply chain practitioners with disruption experience, introduces the possibility of network homogeneity. Participants recruited through referrals may share similar industry perspectives, professional networks, or organizational cultures. Future research using theoretical sampling, deliberately seeking participants whose experiences are expected to contrast with existing data, could enhance the variation in the sample and provide more rigorous tests of the trap constructs.

Fourth, our interviews captured participants' retrospective accounts of organizational experiences, which are subject to recall bias and post hoc rationalization. Participants may have reconstructed events in ways that align with their current understanding rather than accurately reflecting the dynamics as they unfolded in real time. Future research employing real-time data collection methods, such as diary studies, ethnographic observation, or longitudinal embedded case studies, could address this limitation and provide a more granular view of how traps develop and evolve.

Fifth, our study identifies the interdependence among traps as a cross-cutting finding but does not fully theorize the mechanisms through which traps interact. Future research should develop formal models of trap interaction, examining, for example, under

what conditions escape from one trap triggers entry into another, whether certain trap sequences are more common than others, and whether organizational characteristics (size, industry, ownership) moderate the likelihood of trap migration. Quantitative approaches, including simulation models or longitudinal panel data analyses, could complement our qualitative findings by testing the generalizability of the trap interaction patterns we observed.

Finally, our study focuses on the supply chain management context, and the transferability of findings to other organizational domains remains an open question. While the SEAC framework was developed as a general model of organizational resilience, the specific manifestations of traps we identified, such as carrier diversification as a vagabond trap mechanism or contractual lock-in as a rigidity trap mechanism, may be context-specific. Future research should examine whether analogous trap manifestations occur in other organizational domains, such as healthcare operations, financial services, or public sector management, and whether the unlearning and relearning mechanisms we propose are equally applicable across contexts.

## CONCLUSION

This study examined how supply chain organizations encounter, experience, and navigate the four adaptive cycle traps- rigidity, dissolution, poverty, and vagabond, conceptualized within the socio-ecological adaptive cycle framework. Through semi-structured interviews with 10 supply chain professionals across diverse industries, we reveal overlooked dynamics in how traps evolve and interact, demonstrating that traps are not merely theoretical abstractions but lived organizational realities with tangible consequences for operational performance and strategic adaptability.

Our findings advance SEAC trap theory in three ways. First, they shift the theoretical frame from static classification to a dynamic process, explaining why specific traps emerge at specific cycle transitions through learning misalignment. Second, they validate the correspondence between each trap and its associated unlearning mechanism, wiping for dissolution, switching for rigidity, deep unlearning for poverty, and reversing for vagabond, while clarifying why each trap requires a distinct learning response. Third, and most critically, they reveal that traps interact, reinforce one another, and migrate: escape from one trap may inadvertently create conditions for another. This interdependence reconceptualizes organizational resilience not as the avoidance of individual traps but as the navigation of an interconnected system of constraints across the adaptive cycle.

For supply chain managers, the practical takeaway is that awareness is the first line of defense. Recognizing the warning signs of each trap, the normalization of cost-first thinking, the erosion of governance through workarounds, the constraints of resource poverty, the dissipation of strategic focus through perpetual diversification, enables proactive intervention before entrenchment deepens. Matching the appropriate learning response to the specific trap, and anticipating the possibility that escape strategies may create new vulnerabilities, are essential capabilities for organizations seeking to build durable resilience in an era of increasing supply chain complexity and disruption frequency.

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# CHAPTER 3: ORGANIZATIONAL NUDGES, AGILITY ORIENTATION, AND SUPPLY CHAIN TRAP FORMATION

## ABSTRACT

This study examines whether supervisor-delivered organizational nudges shape supply chain managers' long-term collaborative intent during disruption, and whether agility-oriented signaling actively suppresses the adaptability orientation that structural resilience requires. Using a 2 (nudge type: long-term adaptability vs. short-term agility) × 3 (nudge intensity: low, medium, high) between-subjects experiment with 685 supply chain professionals, we find that adaptability-oriented supervisor communication produces significantly greater long-term collaborative intent than agility-oriented communication ($F(1, 679) = 193.32$, $p < .001$, $\eta^2 = .220$, $d = 1.07$), and that this effect holds across all intensity levels and model specifications. Critically, process agility orientation was a significant negative predictor of long-term collaborative intent ($\beta = -.183$, $p = .001$) while structural adaptability orientation was a significant positive predictor ($\beta = +.135$, $p = .016$) when entered simultaneously, establishing that agility and adaptability are not complementary orientations but competing cognitive frameworks in which agility actively suppresses the long-horizon collaborative thinking that adaptability deployment requires. Nudge type also drove behavioral contagion across supply chain boundaries, accounting for nearly half the variance in whether managers transmitted a long-horizon collaborative orientation to supply chain partners ($\beta = +.608$, $p < .001$, $R^2 = .495$). Moderate-frequency adaptability nudges significantly outperformed low-frequency nudges ($\beta = +.373$, $p = .050$), providing evidence for a

minimum exposure threshold below which nudges fail to produce durable orientation effects. Together these findings establish supervisor communication as an underexplored mechanism of supply chain trap formation and position the behavioral experiment as a productive methodological lens for understanding how macro-level adaptive failure originates in the micro-level signals managers receive before disruption arrives.

**Keywords:** Organizational nudges, supply chain resilience, agility orientation, adaptability orientation, collaborative intent, behavioral contagion, experimental design, supervisor communication, trap formation

## INTRODUCTION

Supply chain disruptions do not simply test organizational capabilities. They expose the decision orientations that managers formed long before the disruption arrived. This study examines whether supervisor-delivered organizational nudges shape supply chain managers' long-term collaborative intent during disruption, and whether agility-oriented signaling actively suppresses the adaptability orientation that structural resilience requires. The collapse of just-in-time (JIT) manufacturing networks during the COVID-19 pandemic made the consequences of misaligned orientation visible at scale — but the pattern is not unique to the pandemic. Port congestion along the Red Sea corridor in 2024, semiconductor shortages that persisted through 2023, and recurring logistics provider failures have each exposed the same structural vulnerability: organizations optimized for efficiency under stable conditions finding that the same architecture constrains their adaptive response when conditions shift. JIT systems were not failures of execution. They were failures of orientation: organizations had built

evaluation criteria, supplier relationships, and operational protocols around a logic of lean efficiency that left no structural capacity for the kind of adaptive response disruption demanded (Christopher and Peck, 2004; Dubey et al., 2021). The ecological literature has identified this condition as a trap, a state in which the orientations and dependencies that produced prior performance actively constrain the adaptive responses that new environmental conditions demand (Gunderson and Holling, 2002; Wieland, 2021; Allison and Hobbs, 2004). Traps are not imposed from outside. They develop internally, become embedded in organizational mindset and culture, and are difficult to escape precisely because the logic that sustains them presents as competence rather than constraint (Carpenter and Brock, 2008; Sterman et al., 2015).

The ecological literature from which the trap concept originates defines four trap conditions that prevent cycling adaptively through phases of growth, conservation, release, and reorganization (Gunderson and Holling, 2002; Fath et al., 2015). The rigidity trap, in which efficiency optimization narrows adaptive scope; the dissolution trap, in which subsystem optimization fragments integrative capacity; the poverty trap, in which resource constraints foreclose adaptive options; and the vagabond trap, in which excessive relationship exploration prevents productive commitment (Allison and Hobbs, 2004). Wieland (2021) applied the ecological framework to supply chain management, contending that the relevant managerial objective is not optimization but the capacity to navigate across adaptive cycle phases as environmental conditions shift. What neither the ecological nor the supply chain application of this framework specifies is the organizational process through which trap conditions are produced at the level of individual managerial decision-making. Traps are described as systemic states, but they

are entered through decisions, and decisions are shaped by the orientations of managers. Understanding trap formation therefore requires understanding how those orientations are produced and sustained before any disruption arrives.

The evidence points to a specific mechanism: supervisor communication as a form of organizational nudge. Performance metrics, incentive structures, and the everyday signals supervisors send do more than measure or direct organizational activity. They constitute the choice architecture within which supply chain managers interpret priorities and form orientations before any disruption arrives (Malina and Selto, 2015; Narayanan and Raman, 2004; De Ridder et al., 2022). Nudge theory provides the framework for understanding how this architecture operates: by altering the cognitive accessibility of certain responses without restricting choice or requiring explicit instruction, organizational signals systematically orient managers toward a default decision stance (Kahneman, 2011; Thaler and Sunstein, 2008; Abdukadirov, 2016; Beshears and Gino, 2015; Johnson et al., 2012). A supervisor who consistently signals that speed and process responsiveness are the paramount virtues is nudging their managers toward agility orientation and, by extension, toward the rigidity trap that agility orientation produces when disruption demands structural adaptation instead (Gligor and Holcomb, 2012; Dubey et al., 2021).

Importantly, nudge effects are more than a theoretical prediction. They are a behavioral phenomenon conditioned by the frequency and type of signal delivered, and the conditions under which organizational signals produce durable orientation effects are not well understood in supply chain management. Prior work documents that cognitive biases distort supply chain decisions (Croson and Donohue, 2006; Bendoly et al., 2006),

that framing alters risk perception (Craighead et al., 2020), and that evaluation structures shape organizational priorities (De Ridder et al., 2022; Narayanan and Raman, 2004; Malina and Selto, 2015). What this work does not address is whether one organizationally embedded orientation can displace another — whether the repeated signaling of one strategic priority forecloses competing orientations rather than simply failing to promote them.

In the context of supply chain management, this question takes a specific and consequential form. Organizations simultaneously operate under pressure to develop agility, the capacity for rapid process-level response to immediate disruptions, and adaptability, the capacity for long-horizon structural evolution in response to shifting environmental conditions (Christopher and Holweg, 2011; Wieland and Wallenburg, 2013; Gligor and Holcomb, 2012). When supervisors consistently signal that speed and short-cycle responsiveness are the paramount organizational virtues, does adaptability orientation simply go unaddressed, or is it actively crowded out by the same signals that reward agility? These are not peripheral questions. If signal frequency determines whether a nudge produces internalization or resistance, and if agility-oriented signals actively displace adaptability rather than simply leaving it undeveloped, then the design of supervisor communication has consequences for trap vulnerability that the existing literature has not examined.

We address these questions through a 2 (nudge type: long-term adaptability vs. short-term agility) × 3 (nudge intensity: low, medium, high) between-subjects experiment with 685 supply chain professionals recruited through Prolific. Participants were randomly assigned to receive supervisor messaging framed around either long-term adaptability or

short-term agility, delivered at one of three frequency levels, before responding to a realistic supply chain disruption scenario. Three research questions guide the inquiry. RQ1: Do supervisor-delivered organizational nudges shift supply chain managers' long-term collaborative orientation, and does adaptability-oriented messaging produce meaningfully stronger long-horizon intent than agility-oriented messaging? RQ2: Does nudge frequency moderate orientation formation such that moderate exposure produces stronger and more durable effects than either low or high-frequency exposure, with high-frequency signaling triggering resistance rather than internalization? RQ3: Does agility orientation actively suppress long-term collaborative intent beyond simply failing to produce it, establishing the competitive relationship between the two orientations that trap formation requires?

We organize our theoretical framework around nudge theory and psychological reactance, which together hold that the effectiveness of organizational signals on behavior follows a non-linear pattern: moderate exposure reinforces the intended orientation, while high-frequency exposure triggers motivational resistance that attenuates and potentially reverses the intended effect (Brehm, 1966; Thaler and Sunstein, 2008; Jonas et al., 2009; Steindl et al., 2015). Adaptability nudges and agility nudges do not represent different points on a common continuum. They constitute competing architectures that orient managers toward categorically different collaborative stances. The frequency with which either signal is delivered conditions its effect: moderate exposure produces internalization, while high-frequency exposure produces resistance (Brehm, 1966; Momsen and Stoerk, 2014; Steindl et al., 2015). Agility does

not simply occupy the space that adaptability leaves vacant. It actively displaces it — the behavioral mechanism of trap entry.

This study makes four contributions to supply chain management and behavioral operations management. First, and most consequentially, we provide experimental evidence that agility-dominant supervisor signaling actively suppresses long-term collaborative intent — establishing that the agility-adaptability relationship is not one of complementarity but of behavioral competition with direct implications for supply chain vulnerability. Organizations that signal agility as the paramount operational virtue are not simply failing to build adaptability orientation; they are constructing the cognitive framework through which managers will fail to respond adaptively when disruption arrives. Second, we establish that supervisor communication constitutes a form of organizational nudge that shapes supply chain managers' long-term collaborative orientation before disruption arrives, providing the first experimental evidence that trap entry mechanisms are consistent with operating at the level of everyday managerial communication. Third, we demonstrate that adaptability-oriented supervisor nudges propagate across supply chain boundaries through behavioral contagion, with nudge type accounting for nearly half the variance in whether managers transmit a long-horizon collaborative orientation to supply chain partners. Fourth, we document a minimum exposure threshold below which supervisor nudges fail to produce durable orientation effects, providing directional evidence for a dosage boundary with practical implications for how organizations design performance communication in turbulent environments.

## LITERATURE REVIEW AND HYPOTHESES

**Nudges and Organizational Evaluation Structures**

The behavioral OM literature establishes that evaluation design shifts managerial priorities (De Ridder et al., 2022; Narayanan and Raman, 2004; Malina and Selto, 2015; Bendoly et al., 2006; DeNisi and Mitchell, 1978), that performance metrics orient cognition before operational challenges arrive (Sprinkle, 2003; Gino and Pisano, 2008), and that signal frequency conditions whether those effects hold or reverse (Bendoly and Oliva, 2025; Boute et al., 2019; Komaki et al., 1978; Kelly, 2010). In the trap context, these findings converge on a single implication: the performance metrics and incentive structures that define a manager's evaluation environment signal which orientation is organizationally valued, and managers internalize that signal in ways that determine their collaborative stance before any disruption tests it.

From a behavioral science perspective, managerial orientation toward agility or adaptability before disruption is shaped at least as much by the structure of everyday decision environments as by formal programs or explicit directives (Thaler and Sunstein, 2008; O'Keefe et al., 2025; Krijnen, Tannenbaum, and Fox, 2018). Nudge theory and the broader choice architecture literature explain this mechanism: patterns of behavior emerge from how options, defaults, and information are organized in routine workflows, so that managers are steered toward particular priorities without any change in formal training or stated strategy (Thaler and Sunstein, 2008; Johnson et al., 2012; Mertens et al., 2022). Organizational research has applied this logic to understand how institutional pressures shape strategic behavior (Craighead et al., 2020; Croson et al., 2013), how performance metrics orient managerial attention (Malina and Selto, 2015; Sprinkle, 2003; Gino and Pisano, 2008), and how default structures influence resource allocation

decisions (Momsen and Stoerk, 2014; Shen and Su, 2007; Croson and Donohue, 2006). In each case the finding is the same: the architecture of evaluation shapes behavior independent of formal directives or conscious deliberation.

Nudge theory applied to the trap context produces a specific and testable prediction. An organization whose evaluation criteria consistently signal that speed and process responsiveness are the paramount virtues is nudging its managers toward agility orientation. Because that signal is delivered through the daily fabric of performance measurement rather than through explicit instruction, it does not register as a strategic choice. It registers as the normal operating logic of the organization. The trap is entered not through a decision to prioritize agility over adaptability but through the accumulated internalization of evaluation signals that made agility the only orientation that organizational membership rewarded. This leads to our first hypothesis:

> *H1: Managers receiving adaptability-oriented nudges will exhibit significantly greater long-term collaborative intent than managers receiving agility-oriented nudges.*

**Agility, Adaptability, and the Suppression Mechanism**

Agility and adaptability are not different points on a common continuum of supply chain responsiveness. They constitute competing orientations that pull managers toward categorically different collaborative stances and make categorically different demands on organizational structure (Christopher and Holweg, 2011; Wieland and Wallenburg, 2013; Gligor and Holcomb, 2012; Dubey et al., 2021). Agility orients managers toward process-level responsiveness — the rapid reconfiguration of existing workflows and resources to address immediate disruptions within the current operational architecture (Gligor and

Holcomb, 2012; Tachizawa and Wong, 2014). Adaptability orients managers toward structural evolution — the reconfiguration of the operational architecture itself in response to shifts in the environmental conditions that define what effective supply chain performance requires (Wieland and Wallenburg, 2013; Dubey et al., 2021; Kim and Choi, 2024).

The relationship between these orientations is not one of complementarity. Research on supply chain resilience has treated agility and adaptability as capabilities that organizations can develop in parallel, building responsiveness at the process level while simultaneously investing in structural flexibility (Christopher and Peck, 2004; Dubey et al., 2021; Kim and Choi, 2024). This assumption deserves scrutiny. Agility orientation does not simply occupy the cognitive space that adaptability leaves vacant. When evaluation criteria consistently reward speed, short-cycle responsiveness, and process efficiency, they do not merely fail to develop adaptability orientation — they actively displace it, crowding out the long-horizon collaborative thinking that structural resilience requires before any disruption makes the deficit visible (Wieland and Wallenburg, 2013; Dubey et al., 2021; Kim and Choi, 2024). This suppression mechanism is the behavioral process through which evaluation-embedded agility nudges produce trap conditions.

The suppression mechanism has direct implications for how trap entry should be understood. If agility and adaptability were genuinely complementary, organizations could address trap vulnerability through capability investment, adding adaptability-oriented training or structural flexibility programs alongside existing agility-oriented evaluation systems. The suppression mechanism forecloses this solution. An evaluation architecture that signals agility as the paramount organizational virtue will attenuate the effect of any

adaptability-oriented intervention delivered within it, because the daily signal of the evaluation system outweighs the periodic signal of the training program (Malina and Selto, 2015; Narayanan and Raman, 2004; Bendoly et al., 2006). Trap entry is therefore not a capability problem with a capability solution. It is an evaluation architecture problem that requires reconfiguration of the organizational processes through which managerial orientation is formed. This leads to our second hypothesis:

> *H2: Agility orientation will significantly and negatively predict long-term collaborative intent after controlling for nudge type, while adaptability orientation will significantly and positively predict long-term collaborative intent, establishing the competitive rather than complementary relationship between the two orientations.*

**Nudge Dosage and the Limits of Signal Frequency**

The effectiveness of organizational signals on managerial orientation is not linear in signal frequency. Below a minimum threshold, evaluation signals register but do not accumulate into the stable orientation that shapes decision-making before disruption arrives. Evidence from habit formation and behavioral management research shows that a single exposure to a new cue or contingency is generally insufficient to produce stable shifts in automatic responding (Lally et al., 2010; Wood and Neal, 2007; Komaki et al., 1978). Repeated exposure in a relatively stable context allows a cue to move from a one-off prompt to part of an automatic response tendency, supporting more enduring changes in how managers interpret situations and act within them (Lally et al., 2010; Wood and Neal, 2007; Neal et al., 2012). Applied to supply chains, low-frequency nudges toward agility or adaptability are unlikely to displace existing cognitive frameworks, and their

effect on long-term collaborative intent will be correspondingly weak (Narayanan and Raman, 2004; Komaki et al., 1978; Kelly, 2010).

Beyond a frequency threshold, however, the same process that produces internalization at moderate exposure produces resistance. When evaluation signals are delivered at high frequency, managers perceive their decision autonomy as constrained and push back against the signaled orientation rather than internalizing it (Brehm, 1966; Jonas et al., 2009; Steindl et al., 2015; Rains, 2013). This resistance is an automatic motivational response to the perceived loss of decisional freedom that high-frequency persuasive pressure produces (Brehm, 1966; Quick and Stephenson, 2008). The intended orientation shift attenuates, and in some cases reverses, as the manager's response to the signal becomes oppositional rather than receptive (Steindl et al., 2015; Momsen and Stoerk, 2014; Dillard and Shen, 2005). This dosage boundary has been documented across behavioral OM contexts including decision fatigue (Bendoly and Oliva, 2025; Boute et al., 2019), compliance versus internalization dynamics (Malina and Selto, 2015; Sprinkle, 2003), and the behavioral consequences of organizational communication design (De Ridder et al., 2022; Narayanan and Raman, 2004).

*H3: Managers receiving adaptability-oriented nudges at moderate frequency will exhibit significantly greater long-term collaborative intent than managers receiving adaptability-oriented nudges at low frequency, with low-frequency exposure insufficient to produce the internalization that durable orientation requires.*

*H4: Managers receiving adaptability-oriented nudges at moderate frequency will exhibit significantly greater long-term collaborative intent than managers receiving*

*adaptability-oriented nudges at high frequency, with high-frequency exposure triggering resistance that attenuates the intended orientation shift.*

**Nudge Type, Frequency, and Behavioral Contagion**

Behavioral contagion describes the process through which an orientation formed in one organizational actor is transmitted to others through the content and framing of their communications (Loersch et al., 2008; McFarland and Buehler, 2008; Barsade, 2002; Hatfield et al., 1994). In supply chain contexts, this transmission occurs when managers whose collaborative orientation has been shaped by organizational evaluation signals encode that orientation into the guidance, directives, and framing they pass to supply chain partners, effectively extending the reach of the original nudge beyond the manager who received it (Craighead et al., 2020; De Ridder et al., 2022; Narayanan and Raman, 2004). Behavioral contagion is therefore not merely a secondary outcome of nudge exposure. It is the mechanism through which individual orientation effects aggregate into systemic supply chain orientations, and through which trap conditions may propagate across organizational boundaries (Loersch and Payne, 2011; Barsade and Gibson, 2012).

The type of nudge a manager receives determines the content of what gets transmitted. A manager whose orientation has been shifted toward long-horizon adaptability will encode that logic into the communications they pass to supply chain partners — framing problems as structural rather than process-level, emphasizing relationship investment over transactional efficiency, and signaling long-horizon thinking as the organizationally valued response. A manager whose orientation has been shifted toward agility will transmit the opposite logic. This leads to our fifth hypothesis:

*H5: Managers receiving adaptability-oriented nudges will exhibit significantly greater behavioral contagion than managers receiving agility-oriented nudges, transmitting long-horizon collaborative orientation to supply chain partners at a higher rate.*

The conditions under which contagion occurs are further constrained by the same dosage dynamics that govern direct orientation effects. A manager whose collaborative orientation has been durably shifted by moderate-frequency adaptability-oriented nudges has internalized a long-horizon collaborative logic that shapes not only their own decisions but the content of the communications through which they engage supply chain partners. A manager whose orientation has been attenuated by high-frequency nudge exposure, or who has not received sufficient nudge exposure to displace their existing cognitive framework, has no stable orientation to transmit. The contagion mechanism requires a durable sender orientation, and durable sender orientation requires moderate frequency exposure (Lally et al., 2010; Wood and Neal, 2007; Brehm, 1966; Steindl et al., 2015). This leads to our sixth hypothesis:

*H6: Managers receiving adaptability-oriented nudges at moderate frequency will exhibit significantly greater behavioral contagion than managers receiving adaptability-oriented nudges at either low or high frequency, with low-frequency exposure insufficient to produce the durable orientation that transmission requires and high-frequency exposure triggering resistance that attenuates both orientation formation and its transmission to supply chain partners.*

Table 1 summarizes the key constructs developed across the preceding sections, their definitions, and their theoretical sources. This serves as a reference for the operationalization decisions described in the measures section.

**Table 1. Key Constructs**

| Construct | Definition | Source |
|---|---|---|
| Process agility | The capacity for rapid process-level response to immediate disruptions within the current operational architecture | Gligor & Holcomb, 2012; Tachizawa & Wong, 2014 |
| Structural adaptability | The capacity for long-horizon structural evolution in response to shifts in environmental conditions that define effective supply chain performance | Wieland & Wallenburg, 2013; Dubey et al., 2021 |
| Agility orientation | A managerial cognitive stance that prioritizes speed, process efficiency, and short-cycle responsiveness as the primary virtues of supply chain performance | Gligor & Holcomb, 2012 |
| Adaptability orientation | A managerial cognitive stance that prioritizes long-horizon relationship investment, structural flexibility, and adaptive capacity as the primary virtues of supply chain performance | Wieland & Wallenburg, 2013 |
| Agility-oriented nudge (AgO nudge) | Supervisor communication that signals short-term responsiveness and speed as the organizationally valued orientation before disruption arrives | Thaler & Sunstein, 2008 |
| Adaptability-oriented nudge (AdO nudge) | Supervisor communication that signals long-term relationship investment and structural evolution as the organizationally valued orientation before disruption arrives | Thaler & Sunstein, 2008 |
| Nudge type | The directional content of the organizational signal — whether it orients managers toward agility or adaptability | Thaler & Sunstein, 2008 |
| Nudge dosage | The combination of nudge type and intensity that determines whether a signal produces internalization or resistance | Brehm, 1966 |
| Behavioral contagion | The process through which a managerial orientation formed through nudge exposure is transmitted to supply chain partners through the content and framing of communications | Loersch et al., 2008; Barsade, 2002 |

| Construct | Definition | Source |
|---|---|---|
| Orientation transmission | The mechanism through which an individual manager's internalized orientation shapes the decision environment of supply chain partners | Loersch & Payne, 2011 |
| Reactance | An automatic motivational response to perceived loss of decisional freedom produced by high-frequency persuasive pressure, resulting in resistance to the intended orientation shift | Brehm, 1966; Steindl et al., 2015 |
| Cognitive overload | A state in which signal frequency exceeds processing capacity, resulting in reduced signal retention and attenuated orientation effects | Bendoly & Oliva, 2025 |
| Vulnerability | The susceptibility of a supply chain to trap entry produced by evaluation-embedded agility orientation that constrains adaptive response before disruption arrives | Wieland, 2021; this study |
| Framing | The directional emphasis of supervisor communication that makes certain orientations more cognitively accessible than others without restricting managerial choice | Thaler & Sunstein, 2008; Kahneman, 2011 |

## METHODOLOGY

### Research Design and Sample

This study employed a 2 (nudge type: long-term adaptability vs. short-term agility) × 3 (nudge intensity: low, medium, high) between-subjects experimental design, yielding six conditions to which participants were randomly assigned. The between-subjects structure was chosen to eliminate carryover effects that would otherwise compromise the independence of orientation measures across nudge conditions. The study was approved by the Institutional Review Board and all participants provided informed consent prior to participation.

Participants were recruited through Prolific's verified professional panel using two pre-screening criteria applied at the platform level: active decision-making responsibilities in supply chain or logistics functions, and a minimum of one year of supply chain experience. A within-survey screener confirmed these criteria prior to scenario exposure. Participants who failed the screener were excluded before randomization. The final sample consisted of 685 supply chain professionals. The sample was 70.7% male and 29.2% female, with 0.1% preferring not to say. Ethnicity was 76.1% White, 8.5% Asian, 6.1% Black, 6.0% Mixed, and 3.2% other or prefer not to say. Industry representation included manufacturing (23.9%), retail (23.5%), other (21.6%), technology (13.7%), healthcare (8.9%), consumer packaged goods (5.1%), and automotive (3.2%). Company size ranged from under 100 employees (36.5%) to 100–999 employees (32.1%) to 1,000 or more employees (31.4%). Annual revenue ranged from under $50 million (48.5%) to over $1 billion (13.6%). Seniority levels included manager-level (53.0%), individual contributor (18.1%), director or VP level (13.1%), executive or C-suite (12.3%), and entry-level (3.5%).

**Participant Flow and Exclusions**

Of the 685 participants who completed the survey, all were retained for primary ANOVA analyses. Two embedded attention checks were included in the survey: one item within the manipulation check block instructed participants to select a specific response value (correct response = 6), and one item within the structural adaptability scale block served as an instructed response check (correct response = 2). Both items were verified as true attention checks that do not vary by condition. Of the 685 participants, 528 (77.1%) passed both attention checks. Sensitivity analyses restricted to attention check passers

confirmed that all primary findings replicated, with the exception of H3, which attenuated to p = .130 in the reduced sample, consistent with the marginal p-value in the primary analysis and reduced statistical power from smaller cell sizes. Participants were not excluded based on manipulation check performance, consistent with recommendations for between-subjects experimental designs in which check performance may be correlated with the treatment by design.

The regression models incorporating process agility and structural adaptability scale scores used a subsample of N = 538. The scale items were presented in a separate survey block after the primary outcome measures, and 147 participants did not complete this block. Scale completion was not significantly associated with nudge intensity condition ($\chi^2(2) = 0.59$, $p = .746$) and was only marginally associated with nudge type condition ($\chi^2(1) = 3.34$, $p = .068$), with slightly higher attrition in the adaptability condition (24.3%) than the agility condition (18.6%). The nudge type effect on collaborative intent was confirmed to be equivalent in scale completers and non-completers, indicating that attrition on the scale block does not systematically bias the regression estimates.

**Scenario and Experimental Procedure**

Upon completing the screener and firmographic items, participants read a supply chain disruption scenario in which they were positioned as a newly appointed supply chain manager for a consumer goods manufacturer. The scenario described two simultaneous disruptions: severe port congestion causing unpredictable delays across the supply chain, and the unexpected termination of the relationship with the organization's primary logistics provider, requiring immediate identification of alternative providers, contract negotiation, and transportation strategy reconfiguration. These

disruptions were selected to create genuine decision complexity requiring participants to weigh short-term responsiveness against long-horizon structural adjustment, making both agility and adaptability orientations plausible responses to the same disruption context. The full scenario text is provided in Appendix A.

Before making any decisions, participants received supervisor communication in the form of email messages from their direct supervisor. The content and frequency of these messages constituted the experimental manipulation. Supervisor communication was selected as the nudge vehicle because it represents a primary channel through which organizational evaluation priorities are transmitted to managers before disruption arrives, and because prior research has established that supervisor communication directly shapes the priorities and orientations managers bring to operational decisions (De Ridder et al., 2022; Narayanan and Raman, 2004; Malina and Selto, 2015). In the adaptability condition, the supervisor's initial email communicated that the organization prioritized long-term relationships and long-horizon thinking, with follow-up messages consistently reinforcing structural evolution, relationship investment, and adaptive capacity. In the agility condition, the supervisor's initial email communicated that the organization prioritized short-term responsiveness and speed, with follow-up messages consistently reinforcing process efficiency, rapid reconfiguration, and short-cycle responsiveness. Nudge intensity was operationalized as the total number of supervisor messages delivered: low intensity consisted of the initial email only (1 message), medium intensity added two follow-up messages (3 messages total), and high intensity added five follow-up messages (6 messages total). All messages within a condition were consistent in directional orientation, varying in specific content and framing while maintaining the same

underlying signal. The full text of all stimulus messages by condition is provided in Appendix A.

## Measures

### *Long-Term Collaborative Intent*

The primary dependent variable captured the extent to which participants' collaborative orientation was directed toward long-term outcomes following nudge exposure. Two items were retained after reliability analysis: "I am more motivated to collaborate when it supports long-term success over quick wins" and "I felt that considering the long-term impact guided my choice to collaborate on a project." A third item was dropped due to poor fit with the scale construct. Items were rated on a seven-point scale anchored at 1 (highly disagree) and 7 (highly agree), and demonstrated good internal consistency ($\alpha = .884$). Full item wording is provided in Appendix B.

### *Behavioral Contagion*

The secondary dependent variable captured the extent to which participants transmitted the nudge orientation they received to a supply chain partner. Participants were asked to write a brief open-ended message advising a new team member on how to handle the disruption scenario. Responses were coded by the primary researcher using a three-category scheme developed prior to data collection: L (long-term adaptability orientation) was assigned when the message included explicit references to long-term partnerships, relationship investment, structural flexibility, or future-oriented planning language; A (agility orientation) was assigned when the message included explicit references to speed, efficiency, cost minimization, or immediate problem resolution

without longer-horizon framing; N (neutral) was assigned when the message was ambiguous, generic, or contained no clear directional orientation signal. The validity of the coding scheme is supported by the strong alignment between coded responses and experimental condition: 88.2% of responses in the adaptability condition were coded L, while 96.0% of responses in the agility condition were coded A or N, consistent with successful transmission of the experimentally induced orientation. The binary contagion variable was constructed by coding L responses as 1 and A and N responses as 0.

### *Process Agility Scale*

Four items assessed participants' perceptions of their organization's process-level agility, including rapid adjustment of processes in response to customer requirements, modification of internal processes in response to market changes, accommodation of demand fluctuations, and reconfiguration of processes to meet emerging market needs ($\alpha = .895$). Full item wording is provided in Appendix B.

### *Structural Adaptability Scale*

Three items assessed participants' perceptions of their organization's structural adaptability, including the evolution of the supply chain in response to shifts in business priorities, the use of strategic simulations to design adaptable processes, and the recognition and adjustment of business relationships in response to market shifts ($\alpha = .745$). A fourth item served as an attention check and was excluded from the scale. One item loading (.498) marginally fell below the conventional .50 threshold but was retained given its theoretical content, statistical significance ($z = 11.12$, $p < .001$), and the scale's

adequate AVE (.503) and composite reliability (.745). Full item wording is provided in Appendix B.

### *Control Variables*

Firmographic controls included sex, ethnicity, country of birth, language, company revenue, company size, and supply chain role. Country of residence and nationality were excluded from the control set due to collinearity with country of birth (VIF > 10 when included simultaneously). All substantive findings were confirmed to be unchanged by this exclusion. Variance inflation factors for all retained controls were examined and all fell below the conventional threshold of 5.0 (mean VIF = 2.11 in the primary model).

## Manipulation Checks

Two items assessed whether the experimental manipulation was perceived as intended. Participants rated the extent to which their boss valued long-term adaptability over immediate results, and the extent to which their boss put pressure on them to prioritize long-term adaptability, both on seven-point scales. Participants in the adaptability condition reported significantly higher scores on both items relative to participants in the agility condition. The perceived value check produced a large and significant difference (adaptability M = 6.16, SD = 1.00; agility M = 3.13, SD = 1.88; $t(683) = 26.26$, $p < .001$, $d = 2.01$), and the perceived pressure check produced a strong and significant difference (adaptability M = 5.23, SD = 1.48; agility M = 3.21, SD = 1.87; $t(683) = 15.71$, $p < .001$, $d = 1.20$), confirming that the directional content of the nudge was successfully communicated across conditions. The manipulation worked equally well across intensity levels: the nudge type × intensity interaction was not significant for either

manipulation check item (perceived value: $F(2,679) = 0.69$, $p = .502$; perceived pressure: $F(2,679) = 1.08$, $p = .340$), confirming that signal frequency did not alter participants' perception of the nudge direction.

A recall check asked participants to report how many pieces of advice their boss provided. Correct recall rates were 71.0% in the low-intensity condition, 88.7% in the medium-intensity condition, and 60.2% in the high-intensity condition. The inverted-U pattern in recall rates is consistent with the cognitive overload mechanism that underlies the reactance prediction in H4, providing ancillary behavioral support for the dosage boundary hypothesis prior to the formal analysis.

**Confirmatory Factor Analysis**

Prior to hypothesis testing, a confirmatory factor analysis was conducted using Stata's structural equation modeling command with full information maximum likelihood estimation to handle missing data. The measurement model specified three latent factors: Process Agility (four items), Structural Adaptability (three items), and Long-Term Collaborative Intent (two items). All items were allowed to load only on their designated factor and the three factors were allowed to correlate freely.

The three-factor CFA demonstrated acceptable model fit: CFI = .956, TLI = .934, RMSEA = .089 (90% CI [.075, .102]), CD = .994. The chi-square test was significant ($\chi^2(24) = 152.87$, $p < .001$), which is expected given the large sample size ($N = 685$) and the well-documented sensitivity of this statistic to sample size. SRMR could not be computed due to missing data handled via full information maximum likelihood. The RMSEA falls within the acceptable range (< .10) though above the threshold for close fit (< .08), which is consistent with the high inter-factor correlation between Process Agility

and Structural Adaptability documented in the discriminant validity analysis. Modification indices indicated that freeing cross-loadings between two structural adaptability items and the Process Agility factor would improve model fit (MI = 30.18 and 30.19). These modifications were not implemented because doing so would be theoretically unjustified — the items in question assess structural evolution and relationship reconfiguration, not process-level agility. The elevated modification indices reflect the conceptual proximity of the constructs rather than model misspecification. CFI and TLI both exceed conventional thresholds, supporting overall model adequacy. Table 2 presents a summary of fit indices.

**Table 2. Summary of Fit Indices**

| Index | Value | Threshold | Status |
|---|---|---|---|
| $\chi^2(24)$ | 152.87, $p < .001$ | Non-sig preferred; sensitive to N | Expected at N = 685 |
| CFI | .956 | ≥ .95 | Pass |
| TLI | .934 | ≥ .90 | Pass |
| RMSEA | .089 [.075, .102] | < .08 good; < .10 acceptable | Acceptable |
| SRMR | Not available | < .08 | mlmv limitation in Stata |
| CD | .994 | — | Excellent |

CFA Model Fit Indices

Note. SRMR could not be computed due to missing data handled via mlmv estimation in Stata. RMSEA above the .08 threshold for close fit reflects high inter-factor correlation between Process Agility and Structural Adaptability (r = .918) rather than fundamental model misspecification. CFI and TLI both meet conventional thresholds.

All factor loadings were positive, statistically significant, and of meaningful magnitude. Process Agility loadings ranged from .790 to .862. Structural Adaptability loadings ranged from .498 to .826, with one item marginally below the .50 threshold as

noted above. Collaborative Intent loadings were .914 and .868. Average variance extracted exceeded .50 for all three factors (Process Agility AVE = .683, Structural Adaptability AVE = .503, Collaborative Intent AVE = .794), and composite reliability exceeded .70 for all three factors (Process Agility CR = .896, Structural Adaptability CR = .745, Collaborative Intent CR = .885), supporting convergent validity.

Discriminant validity was assessed using three complementary approaches, summarized in Table 3. The Fornell-Larcker criterion was not satisfied for Process Agility and Structural Adaptability, as the latent factor correlation (r = .918) exceeded the square root of both factors' AVE (√.683 = .827; √.503 = .709). The HTMT ratio for Process Agility and Structural Adaptability was .885, falling below the .90 threshold recommended for conceptually related constructs (Henseler et al., 2015; Gold et al., 2001). The HTMT ratios for Collaborative Intent against Process Agility (.149) and Structural Adaptability (.136) were well below the stricter .85 threshold. A three-factor model fit the data significantly better than a two-factor model collapsing Process Agility and Structural Adaptability into a single construct ($\Delta\chi^2(1) = 27.21$, $p < .001$), confirming empirical distinguishability. VIF values for the Process Agility and Structural Adaptability scale scores in the regression models were 2.15 and 2.14 respectively, and their observed scale score correlation was r = .716, indicating sufficient independent variance for simultaneous inclusion as predictors.

The Fornell-Larcker failure is acknowledged as a limitation and interpreted in light of the theoretical argument of this study. Both constructs measure organizationally embedded orientations arising from the same evaluation architecture, and their empirical proximity reflects the theoretical premise of the suppression hypothesis: agility and

adaptability are not independent capabilities but competing orientations arising from the same organizational logic and pulling in opposite directions. The functional evidence for their distinctiveness is provided by the suppression analysis: the two constructs produce opposite and significant effects on collaborative intent when entered simultaneously — agility negative (β = −.183, p = .001) and adaptability positive (β = +.135, p = .016) — which constitutes the strongest available evidence of distinct behavioral consequences despite high measurement overlap.

**Table 3. Factor Correlations, Square Root of AVE (diagonal), HTMT Ratios, and VIF Values**

| Factor | Process Agility | Struct. Adaptability | Collab. Intent | AVE | CR |
|---|---|---|---|---|---|
| Process Agility | (.827) | | | .683 | .896 |
| Structural Adaptability | .918† | (.709) | | .503 | .745 |
| Collaborative Intent | −.158 | −.123 | (.891) | .794 | .885 |
| HTMT | .885 | .136† | .149† | — | — |
| Scale score VIF | 2.15 | 2.14 | — | — | — |

Factor Correlations, Square Root of AVE (diagonal), HTMT Ratios, and VIF Values

Note. Bold diagonal values are square roots of AVE. Off-diagonal values are latent factor correlations from the three-factor CFA (N = 685). AVE = average variance extracted; CR = composite reliability. † Fornell-Larcker criterion not satisfied for Process Agility–Structural Adaptability pair (r = .918 > √AVE = .827, .709). HTMT ratio = .885 < .90 threshold. Three-factor model fits significantly better than two-factor model: $\Delta\chi^2(1) = 27.21$, $p < .001$. Opposite suppression effects (agility β = −.183; adaptability β = +.135) provide functional evidence of construct distinctiveness. VIF: agility = 2.15, adaptability = 2.14. †† HTMT well below .85 threshold.

### Statistical Analysis

Hypotheses regarding the experimental manipulation effects were tested using a 2 × 3 between-subjects ANOVA. The suppression and contagion hypotheses were tested using ordinary least squares regression with heteroskedasticity-robust standard errors, as these require simultaneous inclusion of scale-level predictors that fall outside the ANOVA framework. All regression models included firmographic controls for sex, ethnicity, country of birth, language, company revenue, company size, and supply chain role. All VIF values fell below 5.0 (mean VIF = 2.11 in Model 1; 2.13 in Models 4 and 5), confirming that multicollinearity does not threaten the validity of the estimates. Post-hoc power analysis confirmed adequate statistical power for the primary hypothesis: based on the observed effect size for the nudge type main effect (Cohen's d = 1.07), achieved power at alpha = .05 with N = 685 exceeded .999. Power for the dosage contrast hypotheses was more limited given smaller within-condition cell sizes (n ≈ 110–120 per cell), which is consistent with the marginal significance of H3 and the non-significance of H4.

## RESULTS

### Preliminary Analyses

Confirmatory factor analysis established the convergent and discriminant validity of the study's measures prior to hypothesis testing, as reported in the measures section. Hypotheses regarding the experimental manipulation effects were tested using a 2 (nudge type) × 3 (nudge intensity) between-subjects ANOVA. The suppression

hypothesis and contagion hypotheses were tested using ordinary least squares regression with heteroskedasticity-robust standard errors, as these require the simultaneous inclusion of scale-level predictors that fall outside the ANOVA framework. All regression models included firmographic controls for sex, ethnicity, country of birth, language, company revenue, company size, and supply chain role. Common method variance was assessed using Harman's single factor test, with the first unrotated factor explaining 49.7% of variance — just below the conventional 50% threshold — and using a marker variable approach in which three CMV items were added to the primary regression model. All CMV items were non-significant ($p > .32$) and substantive findings were unchanged, indicating that common method variance is not a primary concern.

**Nudge Type and Long-Term Collaborative Intent**

Table 4 presents cell means and standard deviations for long-term collaborative intent across all six experimental conditions. The ANOVA revealed a large and highly significant main effect of nudge type ($F(1, 679) = 193.32$, $p < .001$, $\eta^2 = .220$), confirming that managers receiving adaptability-oriented nudges reported substantially greater long-term collaborative intent than managers receiving agility-oriented nudges ($M = 5.30$, $SD = .84$ vs. $M = 4.17$, $SD = 1.23$). This effect held across all intensity levels and provides strong support for H1. Figure 1 displays the predicted cell means that underlie these pairwise contrasts.

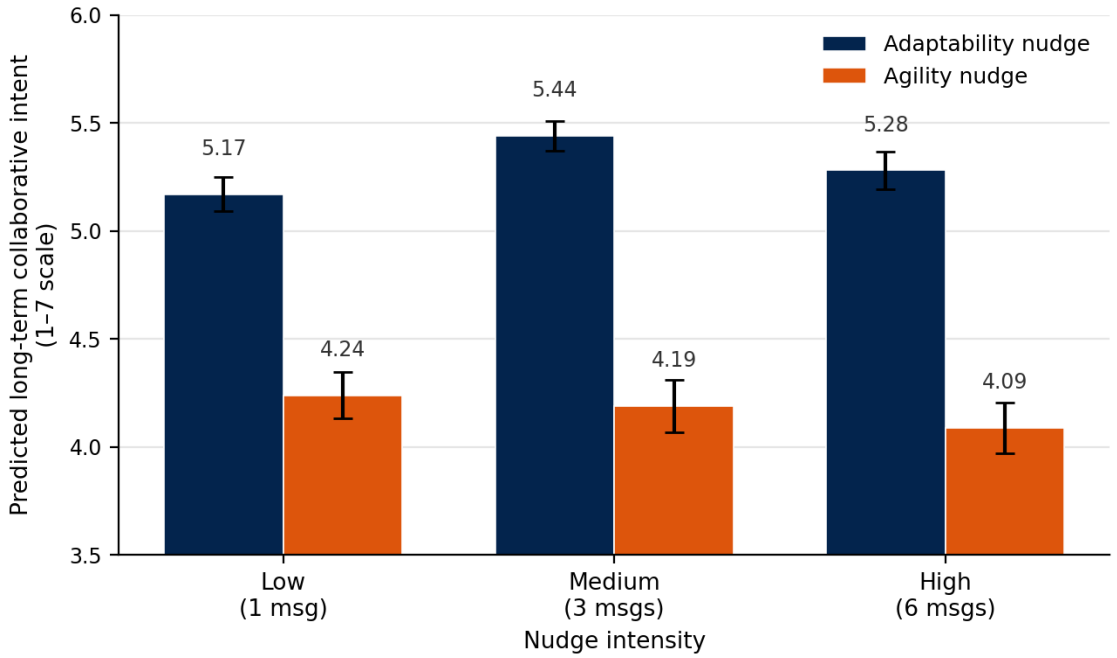


**Figure 1. Pairwise Contrasts in Predicted Long-Term Collaborative Intent**

*Note. Predicted long-term collaborative intent (1–7 scale) by nudge type and intensity; error bars are approximate standard errors derived from the cell statistics reported in Table 4. N = 685.*

The main effect of nudge intensity was not significant ($F(2, 679) = 1.02$, $p = .361$), indicating that signal frequency alone did not drive collaborative orientation independent of nudge type. The nudge type × intensity interaction was not significant at conventional thresholds ($F(2, 679) = 1.53$, $p = .217$), though the pattern of cell means is directionally consistent with the inverted-U dosage prediction. Among agility-nudged managers, collaborative intent was essentially flat across intensity levels (low M = 4.24, medium M = 4.19, high M = 4.09), indicating that frequency of agility-oriented signaling produces no meaningful change in collaborative orientation. Among adaptability-nudged managers, collaborative intent followed the predicted inverted-U pattern (low M = 5.17, medium M = 5.44, high M = 5.28), with medium-frequency exposure producing the highest orientation.

Direct pairwise contrasts among adaptability-nudged managers tested H3 and H4 explicitly. Medium-frequency exposure significantly outperformed low-frequency exposure ($\beta = 0.373$, $SE = 0.190$, $t = 1.97$, $p = .050$), providing support for H3 and

confirming that a minimum exposure threshold exists below which adaptability nudges fail to produce durable orientation effects. The contrast between medium and high-frequency exposure did not reach statistical significance ($\beta = 0.088$, SE = 0.197, $t = 0.45$, $p = .653$), and H4 is not supported statistically, though the directional pattern is consistent with the reactance mechanism. Ancillary support for the dosage boundary comes from the recall data: correct intensity recall followed the same inverted-U pattern across conditions (low = 71.0%, medium = 88.7%, high = 60.2%), with the pronounced drop at high intensity consistent with cognitive overload rather than active processing. Together the cell means pattern and recall data suggest the dosage boundary is operating behaviorally, but the collaborative intent outcome does not detect it at the conventional significance threshold given the current sample size and intensity spacing.

**Orientation Scales: An Unexpected Finding**

Separate ANOVAs examined whether nudge type affected participants' reported organizational agility and adaptability orientations. Contrary to expectation, managers in the agility condition reported significantly higher scores on both the structural adaptability scale (agility M = 5.68 vs. adaptability M = 5.02, $F(1, 536) = 15.01$, $p < .001$) and the process agility scale (agility M = 5.68 vs. adaptability M = 5.22, $F(1, 536) = 26.04$, $p < .001$). This pattern was not hypothesized and is consistent with a reactance or gap-awareness effect: managers receiving agility-oriented nudges may have recognized a discrepancy between the signaled organizational priority and their perceived operational needs, producing heightened sensitivity to both orientations as organizationally relevant capabilities. This post-hoc finding is discussed further in the contributions section.

### Active Suppression of Long-Term Collaborative Intent

To test H2, process agility and structural adaptability scale scores were entered simultaneously as predictors of long-term collaborative intent alongside nudge type, intensity, and all controls (N = 538, $R^2$ = .278). The nudge type effect remained large and significant after controlling for organizational orientation scores (β = 0.946, SE = 0.153, p < .001), confirming that the direct effect of adaptability nudges on collaborative intent is not fully explained by differences in perceived organizational orientation. Critically, process agility orientation was a significant negative predictor of long-term collaborative intent (β = −0.183, SE = 0.056, p = .001), while structural adaptability orientation was a significant positive predictor (β = 0.135, SE = 0.056, p = .016), providing strong support for H2. These findings establish that agility and adaptability orientations exert opposite and simultaneous effects on collaborative intent, with agility actively suppressing the long-horizon collaborative thinking that adaptability promotes. This is the most robust finding of the study and is consistent across all model specifications and the full set of controls.

### Behavioral Contagion

A regression model examined behavioral contagion as a function of nudge type, intensity, orientation scales, and all controls (N = 538, $R^2$ = .495). The nudge type effect on contagion was large and highly significant: managers receiving adaptability-oriented nudges were substantially more likely to transmit a long-horizon collaborative orientation to their supply chain partner than managers receiving agility-oriented nudges (β = 0.608, SE = 0.061, p < .001), providing strong support for H5. Nudge type accounts for nearly half the variance in whether managers transmitted the orientation they received,

underscoring the strength of the contagion effect and its implications for how orientation may propagate across supply chain boundaries.

Intensity did not significantly moderate the contagion effect: neither the medium (β = 0.089, SE = 0.079, p = .263) nor the high intensity interaction (β = 0.117, SE = 0.079, p = .140) reached significance, and H6 is not supported. The type of nudge a manager receives is the primary determinant of whether and what orientation is transmitted to supply chain partners, independent of how frequently the nudge is delivered. Adaptability orientation (β = −0.016, p = .408) and agility orientation (β = −0.003, p = .872) did not significantly predict contagion after accounting for nudge type, suggesting that orientation transmission is driven by the nudge signal itself rather than by the participant's internalized orientation scores.

**Table 4. Cell Means and Standard Deviations for Long-Term Collaborative Intent by Nudge Type and Intensity**

| Condition | Low (1 msg) | Medium (3 msgs) | High (6 msgs) | Total |
|---|---|---|---|---|
| Agility nudge | 4.24 (1.16) | 4.19 (1.29) | 4.09 (1.25) | 4.17 (1.23) |
| Adaptability nudge | 5.17 (0.83) | 5.44 (0.75) | 5.28 (0.93) | 5.30 (0.84) |
| Total | 4.72 (1.10) | 4.81 (1.23) | 4.67 (1.26) | 4.73 (1.20) |

Cell Means and Standard Deviations for Long-Term Collaborative Intent

Note. Values are means with standard deviations in parentheses. Scale range 1–7. N = 685. Nudge type main effect: $F(1, 679) = 193.32$, $p < .001$, $\eta^2 = .220$. Intensity main effect: $F(2, 679) = 1.02$, $p = .361$. Interaction: $F(2, 679) = 1.53$, $p = .217$.

**Table 5. Hypotheses Results**

| H | Prediction | Result | Verdict |
|---|---|---|---|
| H1 | Adaptability nudges produce greater long-term collaborative intent than agility nudges | $F(1, 679) = 193.32$, $p < .001$, $\eta^2 = .220$, $d = 1.07$ | Supported |
| H2 | Agility orientation suppresses collaborative intent; adaptability orientation promotes it | Agility: $\beta = -0.183$, $p = .001$ Adaptability: $\beta = +0.135$, $p = .016$ $N = 538$, $R^2 = .278$ | Supported — strongest finding |
| H3 | Medium-frequency adaptability nudges produce greater collaborative intent than low-frequency nudges | $\beta = +0.373$, $SE = 0.190$, $p = .050$ — medium vs. low direct contrast | Supported (marginal) |
| H4 | Medium-frequency adaptability nudges produce greater collaborative intent than high-frequency nudges | $\beta = +0.088$, $p = .653$ — not significant; recall pattern directionally consistent (89% vs. 60%) | Not supported |
| H5 | Adaptability nudges produce greater behavioral contagion than agility nudges | $\beta = +0.608$, $SE = 0.061$, $p < .001$, $R^2 = .495$ | Supported |
| H6 | Medium-frequency adaptability nudges maximize behavioral contagion relative to low and high frequency | Medium: $\beta = +0.089$, $p = .263$; High: $\beta = +0.117$, $p = .140$ — neither significant | Not supported |
| Post-hoc | Agility condition scores higher on both orientation scales | Adaptability scale: agility $M = 5.68$ vs. 5.02, $p < .001$ Agility scale: agility $M = 5.68$ vs. 5.22, $p < .001$ | Unexpected — reactance or gap awareness |

Summary of Hypotheses, Predictions, and Results

Note. H2 tested via OLS regression with robust standard errors ($N = 538$, $R^2 = .278$). H3 and H4 tested via lincom contrasts from regression model. H5 and H6 tested via OLS regression with robust standard errors ($N = 538$, $R^2 = .495$). All regression models include firmographic controls for sex, ethnicity, country of birth, language, revenue, company size, and role. Post-hoc finding interpreted as consistent with reactance or gap awareness.

## DISCUSSION AND CONTRIBUTIONS

This study set out to examine whether and how nudges embedded in organizational evaluation structures orient supply chain managers toward agility or adaptability before disruption arrives, and whether agility orientation actively suppresses the long-horizon collaborative thinking that structural resilience requires. The results provide clear answers to both questions, partial answers to a third, and an unexpected finding that extends the theoretical argument in a direction the original hypotheses did not anticipate.

### Nudge Type as a Determinant of Collaborative Orientation

The most fundamental finding of this study is that the type of nudge embedded in supervisor communication significantly and substantially shifts supply chain managers' long-term collaborative intent, providing strong support for H1. Managers receiving adaptability-oriented nudges reported collaborative orientation nearly a full point higher on a seven-point scale than managers receiving agility-oriented nudges, a difference that persisted across all model specifications and remained significant after controlling for organizational orientation scores, firmographic characteristics, and intensity conditions. This finding establishes that the choice architecture embedded in supervisor communication is a consequential determinant of how supply chain managers form collaborative stances. It extends the behavioral operations management literature beyond capability-level antecedents of resilience to encompass the communicative processes through which managerial orientation is produced prior to disruption. And it provides the first experimental evidence that trap entry mechanisms are consistent with operating at

the level of individual supervisor communication rather than solely at the level of organizational structure or incentive design.

The practical implication is direct. Organizations that signal agility as the dominant operational virtue through their performance metrics, evaluation criteria, and supervisor messaging are not simply failing to build adaptability orientation. They are actively constructing the cognitive framework through which managers will interpret disruption when it arrives. Changing that framework does not require restructuring capabilities or redesigning supply chain architecture. It requires reconfiguring the signals that supervisors send before disruption arrives — a lever that is considerably more accessible than structural redesign and considerably more consequential than conventional training interventions.

**Agility as an Active Suppressor, Not a Neutral Alternative**

The second and most robust finding of this study is that agility orientation does not simply represent the absence of adaptability, providing strong support for H2. It actively suppresses long-term collaborative intent. After controlling for nudge type and all covariates, process agility orientation was a significant negative predictor of long-term collaborative intent ($\beta = -0.183$, $p = .001$), while structural adaptability orientation was a significant positive predictor ($\beta = 0.135$, $p = .016$). These two findings together establish that agility and adaptability are not complementary orientations that organizations can simultaneously maximize through parallel investment. They are competing cognitive frameworks in which agility orientation crowds out the long-horizon collaborative thinking that adaptability requires.

This finding has direct implications for how supply chain trap entry should be understood. The existing trap literature treats trap conditions as systemic states produced by accumulated organizational logic, but it does not specify the individual-level behavioral mechanism through which that logic is internalized and sustained. The suppression finding is consistent with the argument that trap entry may operate through the accumulated internalization of evaluation signals: managers whose organizational environment has oriented them toward agility do not simply lack adaptability orientation — they are actively oriented away from it by the same evaluation architecture that rewards their short-term performance. This means that trap entry may not be a capability problem with a capability solution. Deploying adaptability-oriented training programs or structural flexibility investments within an evaluation environment that signals agility as the paramount virtue may not produce durable orientation change, because the daily signal of the evaluation system outweighs the periodic signal of the intervention. Addressing trap vulnerability may require reconfiguring the evaluation architecture itself.

For practitioners, this finding reframes the agility-adaptability tradeoff in a way that has immediate organizational consequences. The dominant view in supply chain management holds that agility and adaptability are complementary capabilities that organizations should build in parallel, with agility addressing short-term disruptions and adaptability addressing long-term environmental shifts. The suppression finding challenges this view at the cognitive level: even if both capabilities are organizationally available, the orientation through which managers access and deploy them is shaped by the evaluation signals they receive, and agility-oriented signals suppress the collaborative intent that adaptability deployment requires. Organizations cannot solve this problem by

building more capability. They must attend to what their evaluation systems signal about which orientation is organizationally valued.

### Behavioral Contagion as an Amplification Mechanism

The third finding is that nudge type drives behavioral contagion with striking force, providing strong support for H5. Managers receiving adaptability-oriented nudges were substantially more likely to transmit a long-horizon collaborative orientation to supply chain partners than managers receiving agility-oriented nudges ($\beta = 0.608$, $p < .001$), with nudge type accounting for nearly half the variance in contagion outcomes ($R^2 = .495$). This finding extends the theoretical argument beyond the individual manager to the supply chain system. If the orientation a manager receives through supervisor communication shapes the orientation they transmit to partners, then the evaluation architecture of a single organization may propagate its effects across organizational boundaries through the content of managerial communications. An agility-oriented evaluation environment does not merely trap the managers within it. It may transmit agility orientation outward through their communications with suppliers, distributors, and logistics providers, potentially orienting the broader supply chain network toward the efficiency logic that systemic trap conditions require.

H6, which predicted that nudge intensity would moderate contagion such that medium-frequency exposure maximizes transmission, was not supported. Intensity did not significantly moderate the contagion effect at either the medium or high level, indicating that the type of nudge a manager receives is the primary determinant of whether and what orientation is transmitted to supply chain partners, independent of how frequently that nudge is delivered.

The practical implication is that the leverage point for trap avoidance may be higher in the supply chain than the individual organization level might suggest. Changing the evaluation signals that senior managers receive and transmit does not simply shift the orientation of one organization. It alters the choice architecture experienced by every supply chain partner that organization's managers communicate with. This amplification effect means that relatively targeted interventions at the supervisor communication level may produce disproportionately large orientation effects across the supply chain network — and conversely, that agility-oriented evaluation systems may propagate their trap-producing effects well beyond the organizational boundary.

**The Dosage Boundary: Directional Evidence and an Open Question**

H3, which predicted that medium-frequency adaptability nudges would produce greater collaborative intent than low-frequency nudges, received support: medium-frequency exposure significantly outperformed low-frequency exposure among adaptability-nudged managers ($\beta = 0.373$, $p = .050$), confirming that a minimum exposure threshold exists below which nudge signals fail to produce durable orientation effects. H4, which predicted that medium-frequency nudges would also outperform high-frequency nudges, did not receive statistical support. The medium versus high contrast was not significant ($\beta = 0.088$, $p = .653$), though the directional pattern across predicted margins is consistent with the inverted-U prediction (low = 5.17, medium = 5.44, high = 5.28). The recall data provide ancillary behavioral evidence that high-intensity exposure produces cognitive overload consistent with the reactance mechanism: correct recall rates followed the same inverted-U pattern (low = 71.0%, medium = 88.7%, high = 60.2%), with the

pronounced drop at high intensity consistent with processing saturation rather than active engagement. H4 therefore receives directional but not confirmatory support.

This qualified finding is itself theoretically informative. The absence of a clean dosage boundary in the collaborative intent data may reflect the specific intensity levels chosen — 1, 3, and 6 messages — which may not have been sufficiently spread to produce a detectable reactance effect in the primary outcome even while producing detectable differences in recall. It may also reflect the between-subjects design, which limits power to detect interaction effects. Future research should examine whether dosage effects become more pronounced under conditions of higher intensity contrast, longer exposure windows, or more naturalistic evaluation environments.

For practitioners, the dosage finding carries a cautious implication even without full statistical confirmation on H4. The recall data indicate that high-frequency signaling produces measurably lower retention of the signal content than moderate-frequency signaling, which means that organizations attempting to shift managerial orientation through intensive communication campaigns may be undermining their own objectives. Moderate, sustained signaling of adaptability-oriented priorities is likely to be more effective than intensive campaigns, not because intensive signaling triggers active resistance in every case, but because the cognitive capacity to process and internalize repeated signals is finite.

### An Unexpected Finding: Reactance and Gap Awareness in the Agility Condition

The data produced one post-hoc finding that was not hypothesized and that merits attention in its own right. Managers in the agility condition reported significantly higher scores on both the structural adaptability scale and the process agility scale than

managers in the adaptability condition. This is the opposite of what a simple orientation transfer model would predict, and it was not anticipated by any of the six hypotheses. One interpretation consistent with the reactance literature is that agility-oriented nudges triggered awareness of a gap between the signaled organizational priority and the manager's perceived operational needs, producing heightened sensitivity to both agility and adaptability as organizationally relevant capabilities. A second interpretation is that managers in the agility condition, having been primed toward short-term responsiveness, interpreted the scale items through a lens of operational urgency that inflated both scale scores. A third possibility is that the agility nudge produced genuine reactance, causing managers to overassert both orientations as a form of psychological compensation. Distinguishing among these interpretations requires future research with process measures that can capture the cognitive pathway between nudge receipt and scale response.

**Limitations and Future Directions**

Several limitations bound the conclusions of this study. First, the experimental scenario, while realistic and grounded in actual supply chain disruption conditions, involves a single disruption context with a specific set of response options. Whether the nudge effects observed here generalize across different disruption types, decision contexts, and organizational settings requires further investigation. Second, the between-subjects design, while appropriate for eliminating carryover effects, limits statistical power to detect interaction effects, which may account for the failure to confirm H4 at conventional significance thresholds. Third, the behavioral contagion measure, while theoretically motivated and practically grounded, relies on written message content coded

as a binary indicator by the primary researcher, which may not fully capture the nuance of orientation transmission in actual supply chain communication; future work should employ multiple coders with established inter-rater reliability. Fourth, the sample, while professionally verified and drawn from a range of industries and organizational contexts, was recruited through an online platform and may not fully represent the distribution of supply chain management experience and organizational cultures present in the broader population. Fifth, the discriminant validity between Process Agility and Structural Adaptability is partial: the Fornell-Larcker criterion is not satisfied for this pair, and while the HTMT ratio passes the .90 threshold and the suppression findings provide functional evidence of distinctiveness, future research should examine whether improved construct separation can be achieved through refined scale development or sampling from organizations with more clearly differentiated agility and adaptability evaluation systems. Future research should examine nudge effects in longitudinal field settings where cumulative signal frequency can be observed over time, with process measures that capture cognitive pathways between evaluation signal receipt and collaborative decision-making, and with outcome measures that extend beyond collaborative intent to actual supply chain partner behavior and disruption response outcomes.

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# CHAPTER 4: GENERAL DISCUSSION AND CONCLUSION

This dissertation set out to understand why organizations fail to adapt when environmental disruption demands it. Three studies examined this question at different levels of analysis — structural procurement behavior, organizational learning dynamics, and individual managerial orientation — and the findings across them converge on a coherent account of how adaptive failure is produced, sustained, and potentially addressed.

## Synthesis of Findings

Chapter 1 established that organizational adaptation at the structural level is neither linear nor permanent. Hospitals cycle — joining, dropping, and rejoining GPO relationships in response to shifting structural conditions. This oscillatory pattern is a dynamic adaptive strategy through which organizations manage procurement under evolving environmental pressures. The finding that procurement costs, geographic dispersion, and patient mix complexity all shape GPO participation cycles demonstrates that adaptive behavior at the structural level is environmentally conditioned in systematic and theoretically predictable ways. Critically, the study also found that this adaptive procurement behavior carried performance consequences: GPO participation was associated with shorter length of stay during the COVID-era disruption, with no

corresponding increase in readmissions, indicating that pooled purchasing supported operational resilience and patient throughput when supply chains were under stress.

Chapter 2 provided the theoretical account of how the four adaptive cycle traps are produced through learning failures and how escape from each requires a specific combination of unlearning and relearning. Organizations do not simply become trapped because they are inefficient or strategically misaligned. They become trapped because the learning routines that produced their prior success prevent the specific type of unlearning and relearning that their current trap condition requires. The qualitative evidence from supply chain managers confirmed that these trap-specific learning patterns are recognizable in practice and that mismatching the learning response to the trap condition tends to deepen rather than resolve the entrapment.

Chapter 3 provided the behavioral mechanism connecting organizational evaluation architecture to adaptive failure at the individual managerial level. The most consequential finding is that agility-oriented supervisor communication does not simply fail to build adaptability orientation — it actively suppresses it. This establishes a behavioral pathway from supervisor communication to trap vulnerability that the prior literature had not documented experimentally. The nudge experiment also established that the effects of supervisor communication extend beyond the individual manager through behavioral contagion: nudge type accounted for nearly half the variance in whether managers transmitted long-horizon collaborative orientation to supply chain partners.

**Overarching Theoretical Contribution**

Taken together, the three studies advance a multilevel theory of adaptive failure in supply chain management. First, this dissertation establishes the behavioral mechanism of trap entry: traps are produced through the daily accumulation of evaluation signals that orient individual managers away from adaptive response before any disruption arrives. Second, it specifies the learning-level mechanism of trap maintenance and escape: organizations remain trapped because their learning routines are mismatched to the specific type of unlearning and relearning their trap condition requires. Third, it documents the structural dynamics of adaptive behavior under trap conditions: hospitals oscillate in and out of pooled procurement as cost, spatial, and demand pressures shift, and participation during disruption is associated with greater operational resilience.

Together these three mechanisms — communicative orientation formation, learning mode mismatch, and oscillatory structural reconfiguration — constitute a multilevel account of how adaptive failure is produced and sustained across the organizational system. Addressing any one of them in isolation is insufficient. The dissertation's contribution is to make visible the full system of mechanisms through which adaptive failure is produced — and to establish that addressing it requires intervention at all three levels.

**Practical Implications**

For supply chain managers and organizational leaders, the findings carry several practical implications. First, supervisor communication is a higher-leverage point for organizational resilience than conventional capability investment. Reconfiguring what supervisors signal about which orientation is organizationally valued may be the most accessible and consequential lever available for building trap resistance. Second, the

dosage of supervisor communication matters — moderate-frequency adaptability signaling produced significantly greater collaborative intent than either low or high-frequency signaling. Third, trap diagnosis requires learning mode assessment: escape from each trap requires a trap-specific learning response. Fourth, hospital leaders should treat GPO membership as a reversible operational lever rather than a fixed commitment, using procurement-cost trajectories as early signals for when to join, exit, or rejoin.

## Limitations and Future Research

Several limitations bound the conclusions of this dissertation. The three studies examine different levels of analysis using different methods, which strengthens the multilevel account but limits direct comparability of findings. Future research should develop integrative empirical designs capturing interactions among communicative, learning, and structural mechanisms within a single organizational setting. The nudge experiment involved a single disruption scenario with a brief exposure window; longitudinal field research tracking managerial orientation formation over extended periods would substantially strengthen the behavioral argument. The GPO study examined a single industry; replication across manufacturing, retail, and technology supply chains is needed. The adaptive cycle traps theory makes strong propositions that require large-sample quantitative testing.

## Conclusion

This dissertation began with a question motivated by the COVID-19 pandemic: why do networks fail to adapt? The three studies reported here provide a multilevel answer. Organizations fail to adapt because their evaluation architectures orient

individual managers away from adaptive thinking before disruption arrives, because their learning routines are mismatched to the specific unlearning and relearning that their trap condition requires, and because their structural procurement behavior responds reactively to cost pressures, shaping their exposure and resilience when disruption arrives. Addressing adaptive failure requires attending to all three mechanisms and designing interventions that target the specific level at which the binding constraint on adaptation operates. This dissertation establishes a foundation: a multilevel account of how traps form, how they are sustained, and how they might be escaped, grounded in structural, learning, and behavioral evidence from three distinct levels of organizational life.

## APPENDIX 1A: E-COMPANION — CHAPTER 1 (GPO OSCILLATORY RECONFIGURATION)

This appendix contains supplementary technical materials for Chapter 1, including the Haversine distance formula used to compute geographic dispersion and full regression tables with the complete set of control variables for all models.

### Section OA1. Haversine Distance Calculations

Geographic dispersion was computed using the Haversine formula, which calculates the great-circle distance between two points on a sphere:

$$a = \sin^2(\Delta\varphi/2) + \cos(\varphi_1) \cdot \cos(\varphi_2) \cdot \sin^2(\Delta\lambda/2)$$

$$c = 2 \cdot \text{atan2}(\sqrt{a}, \sqrt{(1-a)})$$

$$d = R \cdot c$$

Where: $\varphi_1$, $\varphi_2$ = latitudes in radians; $\lambda_1$, $\lambda_2$ = longitudes in radians; R = Earth's radius (6,371 km); $\Delta\varphi = \varphi_2 - \varphi_1$; $\Delta\lambda = \lambda_2 - \lambda_1$; d = great-circle distance.

### Table OA2. First-Stage Fixed-Effects Regression Results

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

| D.V.: Procurement Costs | Model 1 |
|---|---|
| Laundry Linen Expenses | 11.11*** |
| | (0.530) |
| Geographic dispersion | -2.39 |
| | (5.706) |
| Disability load | -0.22 |
| | (0.525) |

| D.V.: Procurement Costs | Model 1 |
|---|---|
| Admissions per bed | -0.004 |
| | (0.004) |
| Operating margin | -0.006 |
| | (0.015) |
| System affiliation | 3.92*** |
| | (0.992) |
| Surgical intensity | -0.08 |
| | (0.064) |
| Staffing intensity | 1.02** |
| | (0.404) |
| RUCA | 0.34 |
| | (0.478) |
| 340b | -1.23* |
| | (0.662) |
| Income ratio | -0.91 |
| | (0.757) |
| Uninsured | -0.04 |
| | (0.085) |
| Limited food access | -0.05 |
| | (0.086) |
| Primary care | 8,213*** |
| | (2,052) |
| Mortality | -0.01** |
| | (0.007) |
| Constant | 17.69*** |
| | (6.047) |
| Year fixed effects | included |
| Firm fixed effects | included |
| F-statistic | 33.80 |
| Observations | 11,285 |
| R-squared | 0.93 |

**Table OA3. Regression Results with Full Set of Control Variables (Join, Drop, Rejoin)**

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

| | Join | Join | Join | Join | Drop | Drop | Drop | Drop | Rejoin | Rejoin | Rejoin | Rejoin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 | Model 10 | Model 11 | Model 12 |
| Procurement costs | 0.02*** | 0.009* | 0.02*** | 0.009* | -0.008*** | -0.005** | -0.008*** | -0.005** | 0.003** | -0.001 | 0.003** | -0.001 |
| | (0.004) | (0.005) | (0.004) | (0.005) | (0.002) | (0.002) | (0.002) | (0.002) | (0.001) | (0.002) | (0.001) | (0.002) |
| Geographic dispersion | 2.41*** | 2.45*** | 2.53*** | 2.50*** | -0.16 | -0.17 | -0.16 | -0.14 | 1.77** | 1.83** | 1.95** | 2.02** |
| | (0.838) | (0.837) | (0.927) | (0.927) | (0.477) | (0.476) | (0.514) | (0.513) | (0.879) | (0.892) | (0.952) | (0.964) |
| Disability load | -0.02 | -0.11** | 0.01 | -0.09 | -0.007 | 0.01 | -0.006 | 0.02 | 0.04 | 0.009 | 0.12 | 0.08 |
| | (0.039) | (0.054) | (0.135) | (0.143) | (0.018) | (0.024) | (0.059) | (0.063) | (0.037) | (0.044) | (0.149) | (0.146) |
| Procurement costs * Disability load | | 0.004** | | 0.004** | | -0.001* | | -0.001* | | 0.002* | | 0.002* |
| | | (0.002) | | (0.002) | | (0.0008) | | (0.0008) | | (0.001) | | (0.001) |
| Geographic dispersion * Disability load | | | -0.08 | -0.03 | | | -0.004 | -0.02 | | | -0.18 | -0.18 |
| | | | (0.314) | (0.318) | | | (0.144) | (0.147) | | | (0.364) | (0.351) |
| COVID | -1.48*** | -1.47*** | -1.48*** | -1.48*** | 0.38*** | 0.37*** | 0.38*** | 0.37** | -0.73** | -0.74** | -0.73** | -0.75** |
| | (0.195) | (0.194) | (0.195) | (0.195) | (0.146) | (0.146) | (0.146) | (0.146) | (0.347) | (0.348) | (0.347) | (0.348) |
| Admissions per bed | 0.0007 | 0.0007 | 0.0007 | 0.0007 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.0007) | (0.0007) | (0.0007) | (0.0007) | (0.001) | (0.001) | (0.001) | (0.001) |
| Operating margin | 0.007* | 0.007* | 0.007* | 0.007* | 0.0002 | 0.00001 | 0.0002 | 0.00001 | -0.0004 | 0.0002 | -0.0004 | 0.0002 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.002) | (0.002) | (0.002) | (0.002) | (0.005) | (0.005) | (0.005) | (0.005) |
| System affiliation | 0.37* | 0.39* | 0.37* | 0.39* | -0.10 | -0.10 | -0.10 | -0.10 | -0.25 | -0.24 | -0.24 | -0.24 |
| | (0.200) | (0.201) | (0.200) | (0.201) | (0.093) | (0.093) | (0.09) | (0.0935) | (0.172) | (0.172) | (0.173) | (0.172) |
| Surgical intensity | 0.01 | 0.01 | 0.01 | 0.01 | 0.01* | 0.01* | 0.01* | 0.01* | 0.002 | 0.001 | 0.003 | 0.001 |

| | Join | Join | Join | Join | Drop | Drop | Drop | Drop | Rejoin | Rejoin | Rejoin | Rejoin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 | Model 10 | Model 11 | Model 12 |
| | (0.016) | (0.016) | (0.016) | (0.016) | (0.009) | (0.009) | (0.009) | (0.009) | (0.020) | (0.020) | (0.020) | (0.020) |
| Staffing intensity | 0.06 | 0.05 | 0.06 | 0.05 | -0.16** | -0.15** | -0.16** | -0.15** | 0.06 | 0.06 | 0.06 | 0.062 |
| | (0.112) | (0.112) | (0.112) | (0.112) | (0.080) | (0.081) | (0.080) | (0.081) | (0.134) | (0.135) | (0.136) | (0.136) |
| RUCA | -0.02 | -0.03 | -0.02 | -0.04 | 0.007 | 0.01 | 0.007 | 0.011 | -0.04 | -0.05* | -0.05 | -0.06* |
| | (0.040) | (0.040) | (0.040) | (0.040) | (0.019) | (0.019) | (0.019) | (0.019) | (0.032) | (0.033) | (0.033) | (0.034) |
| 340b | 0.24 | 0.24 | 0.244 | 0.24 | -0.14 | -0.14 | -0.14 | -0.14 | 0.18 | 0.18 | 0.18 | 0.19 |
| | (0.212) | (0.212) | (0.212) | (0.212) | (0.180) | (0.180) | (0.180) | (0.180) | (0.365) | (0.365) | (0.366) | (0.366) |
| Income ratio | -0.80*** | -0.80*** | -0.80*** | -0.80*** | 0.23*** | 0.23*** | 0.23*** | 0.23*** | -0.17 | -0.16 | -0.18 | -0.17 |
| | (0.136) | (0.137) | (0.137) | (0.137) | (0.059) | (0.059) | (0.059) | (0.059) | (0.144) | (0.143) | (0.144) | (0.143) |
| Uninsured | -0.006 | -0.005 | -0.006 | -0.005 | 0.006 | 0.006 | 0.006 | 0.006 | -0.007 | -0.006 | -0.007 | -0.005 |
| | (0.015) | (0.015) | (0.015) | (0.015) | (0.007) | (0.007) | (0.007) | (0.007) | (0.011) | (0.011) | (0.011) | (0.011) |
| Limited food access | 0.03** | 0.03** | 0.03** | 0.03** | -0.01 | -0.015 | -0.01 | -0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.018) | (0.018) | (0.018) | (0.018) | (0.009) | (0.009) | (0.009) | (0.009) | (0.020) | (0.020) | (0.020) | (0.020) |
| Primary care | 623.6* | 723.5** | 630.6* | 726.2** | -113.9 | -136.3 | -113.8 | -135.5 | 52.27 | 58.02 | 69.33 | 75.81 |
| | (346.2) | (347.7) | (347.2) | (348.5) | (167.8) | (170.6) | (167.8) | (170.5) | (328.6) | (326.9) | (331.4) | (329.8) |
| Mortality | -0.0001 | -0.0001 | 0.0001 | -0.0001 | -0.0002 | -0.0002 | -0.0002 | -0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.0005) | (0.0005) | (0.0005) | (0.0005) | (0.001) | (0.001) | (0.001) | (0.001) |
| First stage residual | -0.04*** | -0.03*** | -0.04*** | -0.03*** | 0.009 | 0.008 | 0.009 | 0.008 | 0.0001 | -0.0001 | 0.0005 | 0.0003 |
| | (0.013) | (0.013) | (0.013) | (0.0138) | (0.008) | (0.008) | (0.008) | (0.008) | (0.007) | (0.007) | (0.007) | (0.007) |
| Constant | 3.75*** | 3.89*** | 3.69*** | 3.87*** | -2.83*** | -2.87*** | -2.84*** | -2.88*** | -1.01 | -0.993 | -1.10 | -1.083 |
| | (0.851) | (0.853) | (0.876) | (0.879) | (0.412) | (0.414) | (0.424) | (0.425) | (0.837) | (0.831) | (0.854) | (0.847) |
| Hospital random effects | included | included | included | included | included | included | included | included | included | included | included | included |
| Year fixed effects | included | included | included | included | included | included | included | included | included | included | included | included |

| | Join | Join | Join | Join | Drop | Drop | Drop | Drop | Rejoin | Rejoin | Rejoin | Rejoin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 | Model 10 | Model 11 | Model 12 |
| Observations | 10,460 | 10,460 | 10,460 | 10,460 | 8,454 | 8,454 | 8,454 | 8,454 | 811 | 811 | 811 | 811 |
| Log Likelihood | -415.3 | -414.7 | -415.3 | -414.7 | -241.5 | -240.8 | -241.5 | -240.7 | -435.7 | -435.1 | -435.7 | -435.0 |

## Table OA4. Regression Results with Full Set of Control Variables (Length of Stay)

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

| D.V. Length of Stay | Model 1 | Model 2 |
|---|---|---|
| COVID | 1.57*** | 2.28*** |
| | (0.372) | (0.445) |
| GPO Participation | -0.64*** | -0.05 |
| | (0.207) | (0.275) |
| COVID * GPO Participation | | -0.98*** |
| | | (0.285) |
| Admissions per bed | -0.003* | -0.003* |
| | (0.001) | (0.001) |
| Operating margin | -0.004 | -0.005 |
| | (0.007) | (0.007) |
| System affiliation | -3.27*** | -3.18*** |
| | (1.003) | (0.996) |
| Surgical intensity | 0.03* | 0.02 |
| | (0.020) | (0.019) |
| Staffing intensity | -0.20 | -0.19 |
| | (0.132) | (0.132) |
| RUCA | -0.21 | -0.19 |
| | (0.157) | (0.157) |
| 340b | 0.17 | 0.17 |
| | (0.138) | (0.137) |
| Income ratio | 0.21 | 0.21 |
| | (0.425) | (0.426) |
| Uninsured | -0.02 | -0.03 |
| | (0.039) | (0.039) |
| Limited food access | 0.01 | 0.01 |
| | (0.041) | (0.041) |
| Primary care | -2,201 | -2,120 |

| D.V. Length of Stay | Model 1 | Model 2 |
|---|---|---|
| | (1,383) | (1,355) |
| Mortality | -0.01** | -0.01** |
| | (0.005) | (0.005) |
| Constant | 17.18*** | 16.75*** |
| | (3.146) | (3.127) |
| Year fixed effects | included | included |
| Firm fixed effects | included | included |
| F-statistic | 5.54 | 5.41 |
| Observations | 11,633 | 11,633 |
| R-squared | 0.923 | 0.924 |

## Table OA5. Regression Results with Full Set of Control Variables (Cubic Model)

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

| D.V. GPO Status | Model 1 | Model 2 |
|---|---|---|
| Procurement costs | 3.60*** | 0.85*** |
| | (0.450) | (0.116) |
| Geographic dispersion | 0.43*** | 0.40 |
| | (0.073) | (0.798) |
| Disability load | -0.008*** | -0.006* |
| | (0.003) | (0.003) |
| Procurement costs * Procurement costs | -13.89*** | |
| | (2.461) | |
| Procurement costs * Procurement costs * Procurement costs | 14.06*** | |
| | (3.018) | |
| Geographic dispersion * Geographic dispersion | | 0.82 |
| | | (1.482) |
| Geographic dispersion * Geographic dispersion * Geographic dispersion | | -0.96 |
| | | (0.885) |

| D.V. GPO Status | Model 1 | Model 2 |
|---|---|---|
| COVID | -0.01 | -0.01 |
| | (0.025) | (0.025) |
| Admissions per bed | 0.0005*** | 0.0004*** |
| | (0.0001) | (0.0001) |
| Operating margin | -0.001*** | -0.001*** |
| | (0.0004) | (0.0004) |
| System affiliation | -0.001 | -0.003 |
| | (0.015) | (0.015) |
| Surgical intensity | -0.001 | -0.0006 |
| | (0.001) | (0.001) |
| Staffing intensity | -0.004 | 0.001 |
| | (0.011) | (0.011) |
| RUCA | -0.009*** | -0.012*** |
| | (0.003) | (0.003) |
| 340b | 0.05** | 0.06*** |
| | (0.023) | (0.023) |
| Income ratio | -0.06*** | -0.06*** |
| | (0.011) | (0.011) |
| Uninsured | -0.003*** | -0.003*** |
| | (0.001) | (0.001) |
| Limited food access | 0.004** | 0.004*** |
| | (0.001) | (0.001) |
| Primary care | 111.9*** | 129.5*** |
| | (22.25) | (21.99) |
| Mortality | -0.0002** | -0.0002** |
| | (0.0001) | (0.0001) |
| Constant | -0.10 | -0.15 |
| | (0.070) | (0.151) |
| Year controls | Included | included |
| Observations | 11,633 | 11,633 |
| Log-likelihood | -12558.636 | -12563.833 |

**Table OA6. Regression Results with Full Set of Control Variables (Readmissions)**

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

| D.V. Readmissions | Model 1 | Model 2 |
|---|---|---|
| COVID | -0.75*** | -0.75*** |
| | (0.031) | (0.036) |
| GPO Participation | -0.01 | -0.01 |
| | (0.020) | (0.024) |
| COVID * GPO Participation | | 0.0009 |
| | | (0.024) |
| Admissions per bed | 0.0001 | 0.0001 |
| | (0.0001) | (0.0001) |
| Operating margin | 0.001* | 0.001* |
| | (0.0005) | (0.0005) |
| System affiliation | -0.07* | -0.07* |
| | (0.039) | (0.039) |
| Surgical intensity | 0.005** | 0.005** |
| | (0.002) | (0.002) |
| Staffing intensity | -0.01 | -0.01 |
| | (0.016) | (0.016) |
| RUCA | 0.01 | 0.01 |
| | (0.016) | (0.016) |
| 340b | -0.02 | -0.02 |
| | (0.027) | (0.027) |
| Income ratio | -0.04 | -0.04 |
| | (0.030) | (0.030) |
| Uninsured | 0.006* | 0.006* |
| | (0.003) | (0.003) |
| Limited food access | -0.0008 | -0.0008 |
| | (0.003) | (0.003) |

| D.V. Readmissions | Model 1 | Model 2 |
|---|---|---|
| Primary care | -15.83 | -15.90 |
| | (75.18) | (75.19) |
| Mortality | -0.0001 | -0.0001 |
| | (0.0003) | (0.0003) |
| Constant | 15.53*** | 15.53*** |
| | (0.201) | (0.202) |
| Year fixed effects | included | included |
| Firm fixed effects | included | included |
| F-statistic | 158.71 | 150.77 |
| Observations | 11,452 | 11,452 |
| R-squared | 0.687 | 0.687 |

## Table OA7. Regression Results with Full Set of Control Variables (GPO Size Moderator)

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

| | Model 1: Join | Model 2: Drop | Model 3: Rejoin |
|---|---|---|---|
| Procurement costs | -0.011 | -0.003 | 0.003 |
| | (0.008) | (0.003) | (0.007) |
| GPO Size | -0.000*** | 0.000*** | -0.000** |
| | (0.000) | (0.000) | (0.000) |
| Procurement costs * GPO Size | 0.000*** | -0.000*** | 0.000 |
| | (0.000) | (0.000) | (0.000) |
| Disability load | -0.022 | -0.008 | 0.060 |
| | (0.041) | (0.018) | (0.039) |
| Geographic dispersion | 2.567*** | -0.228 | 1.934** |
| | (0.852) | (0.481) | (0.898) |
| COVID | -1.097*** | 0.341** | -0.555 |
| | (0.199) | (0.144) | (0.367) |
| Admissions per bed | 0.001 | 0.001 | -0.002 |
| | (0.002) | (0.001) | (0.002) |

| | Model 1: Join | Model 2: Drop | Model 3: Rejoin |
|---|---|---|---|
| Operating margin | 0.006 | 0.001 | -0.003 |
| | (0.004) | (0.003) | (0.005) |
| System affiliation | 0.307 | -0.091 | -0.307* |
| | (0.207) | (0.094) | (0.175) |
| Surgical intensity | 0.018 | 0.016* | 0.003 |
| | (0.017) | (0.010) | (0.020) |
| Staffing Intensity | 0.089 | -0.175** | 0.097 |
| | (0.119) | (0.082) | (0.136) |
| RUCA | -0.025 | 0.007 | -0.046 |
| | (0.042) | (0.019) | (0.034) |
| 340b | 0.285 | -0.153 | 0.200 |
| | (0.217) | (0.180) | (0.380) |
| Income ratio | -0.792*** | 0.234*** | -0.165 |
| | (0.140) | (0.059) | (0.143) |
| Uninsured | -0.004 | 0.006 | -0.007 |
| | (0.016) | (0.007) | (0.012) |
| Limited food access | 0.034* | -0.014 | 0.016 |
| | (0.019) | (0.010) | (0.021) |
| Primary care | 726.233** | -121.737 | 71.239 |
| | (356.835) | (169.760) | (321.587) |
| Mortality | -0.000 | -0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) |
| First stage residual | -0.038*** | 0.009 | 0.000 |
| | (0.014) | (0.008) | (0.008) |
| Constant | 5.387*** | -3.068*** | -0.467 |
| | (0.908) | (0.424) | (0.850) |
| Hospital random effects | included | included | included |
| Year fixed effects | included | included | included |
| Observations | 10,460 | 8,454 | 811 |
| Log Likelihood | -3927.271 | -2336.394 | -417.746 |

## APPENDIX 2A: INTERVIEW PROTOCOL — CHAPTER 2

The following semi-structured interview protocol was used to collect qualitative data from supply chain managers. Interviews were conducted between August 2023 and January 2024. Interview length ranged from approximately 45 to 90 minutes.

**Study Initiative:** Developing a framework of supply chain adjustment cycles — examining the relationship between responsiveness, resilience, and governance.

### Company and Background

1. Can you tell us about your company?
2. How long have you been in the industry?
3. How many employees does your organization have?
4. How many partners are in your supply chain?
5. Are you a supplier, a retailer, or a manufacturer?

### Participant Background

1. Can you tell us about yourself?
2. What is your title?
3. What is your background?
4. What is a typical day for you?

### Responsiveness

1. What is a recent disruption that the firm has taken advantage of?
2. Who was a key partner you worked with during this disruption?

3. Why is this partner key?

4. How did you respond to the disruption?

5. Have you adjusted your supply chain structure due to disruption? Have you adjusted your supply chain structure with your key partner?

6. Have you adjusted your supply chain processes due to disruption? Have you adjusted your supply chain processes with your key partner?

7. Have you adjusted your supply chain policy due to disruption? Have you adjusted your supply chain policy with your key partner?

8. Do you make last-minute adjustments to your supply chain for your key partner? How?

**Resilience**

1. What does resilience mean to you?

2. Do you think how you responded to the disruption has changed your resiliency?

**Relational Governance**

1. How or did you work with your key supply chain partner(s)?

2. What would happen if your key partner went out of business?

3. What percent of your budget is with your key partner?

4. Would you consider switching from your key partner?

5. How hard is it to switch from your key partner?

6. Have you developed goals with your partner (co-performance evaluation, process improvement, and incentive sharing)?

7. Does this help or hinder your resilience of the partnership? How?

8. Tell us how you share information with your partner. What types of information? What technology do you use?

9. Thinking of your relationship: is it long-term? How do you share risk?

10. Do you manage the relationship via contracts? Does this help or hinder your resilience in the partnership?

11. Tell us about the metrics used to measure these relationships.

12. After a disruptive event, does the resilience of your partnership update how you respond to future events?

**Closing**

1. What is an aspect related (or not) to the topics we discussed that were not covered, and you felt should have been covered?

## APPENDIX 2B: CODE FREQUENCY TABLE — CHAPTER 2

All codes developed during MAXQDA qualitative analysis and their frequency of occurrence across the interview data. Total coded segments: 195.

| Code | Frequency |
|---|---|
| The Transaction and Cost of Relationships | 1 |
| Approaches to a Disruption | 1 |
| KPI Relationships | 1 |
| Previous Relationship | 1 |
| Transactional Risk | 1 |
| Transactional Relationship | 1 |
| Due to Siloed Project, No Information Sharing | 1 |
| Holding Power in Relationship | 1 |
| Siloed Relationship | 1 |
| Supplier Transition | 1 |
| Siloed Projects | 1 |
| Reputational Management | 1 |
| Fexibility, Working Around Leadership | 1 |
| Structural Flexibility | 1 |
| Cost Structure | 1 |
| Uncertainty, Lack of Information in Environment, Alternative Partners | 1 |
| Labor Dependency Shift, Recognition of Digitization, Industry Transformation | 1 |
| Extension of Organization, Partnership vs Procurement | 1 |
| Alignment with Partners, Leveraging Different Tiers, | 1 |
| Adaptability is the New Norm | 1 |
| Resiliency as Adaptability, Awareness and Flexibility | 1 |
| Adaption to Work Changes, Increased Flexibility, Resilience | 1 |
| Disruption, Price Stabilization, Labor Impact | 1 |
| Variable Cost to Flexible Cost Structure, Labor Market Dynamics | 1 |
| Reliance on Partners, Operational Changes due to Disruption | 1 |
| Resilience, Partnership Dependence | 1 |
| Technology Integration | 1 |
| Technology Adaptability | 1 |
| Cost Measurement, Consistency Evaluation | 1 |
| Contract Management | 1 |

| Code | Frequency |
|---|---|
| Short Term Cost Focus Transition to Long Term Strategy | 1 |
| Changing Dynamics in Knowledge and Expertise | 1 |
| Partner Diversification | 2 |
| Risk Diversification, Market Dynamics | 1 |
| Transparency and Accountability, Stakeholder Communication | 1 |
| Positioning of Partnerships, Optimization of Partnership Portfolio, | 1 |
| Risk Anticipation, | 2 |
| Reponse to Market Competition, Awareness of Risk, Long Term Strategies | 1 |
| Responsiveness to the Market, Reputation Management | 1 |
| Balancing Short and Long Term Goals, Effciency Metrics, Customer Base | 1 |
| Information Sharing, Collaborative Rate Evaluation, | 1 |
| strategic Alignments, Collaborative Decision Making, Long Term Relationship | 1 |
| Resilience and Responsiveness, Information Sharing in Partnerships, | 1 |
| Interactive Partnership | 1 |
| Flexibility vs Standardization, Collaborative KPIs | 2 |
| Supplier Diversification | 2 |
| Flexibility, Contractual Oversight | 1 |
| Contractual Adjustment, Last Minute Adjustments | 1 |
| Policy Flexibility, Performance based contracts, Relationship Management | 2 |
| Working around Organizational Structures, Customer Focused, Adaptability | 1 |
| Competiting Priorities, Efficency Driven, Resource Constraints | 1 |
| Structural Impairment, Workforce Retention, | 1 |
| Leadership change, Network Scalability, Operational Responsiveness Impairment | 1 |
| Inventory, Operational Resilience | 1 |
| Infastructure Limitations, Cost of not optimizing, Supply Chain Flexibility | 1 |
| Contractual Relationship | 1 |
| Limited Flexibility | 1 |
| Key Supplier | 1 |
| Supply Chain Efficency | 1 |
| Supply Chain Agility | 1 |
| Workflow Modification | 1 |
| Process Innovation, Functional Realignment, | 1 |
| Long Term Relationships | 1 |
| Patient Centric Resilience, Strategic Allignment | 1 |
| Collaboration, Continious Improvement Projects, | 2 |
| Traceability, KPI Monitoring | 1 |
| Adaptive Strategies, Impact of Disruption | 5 |

| Code | Frequency |
|---|---|
| Post-Disruption Adaptability, Proactive Supply Chain Management, Resilience Building | 1 |
| Proactive Management, Enhanced Transparency, | 4 |
| Strategic Expansion, Labor Market Dynamics | 1 |
| Innovations, Competition in Local Markets, Disruption on Labor Market | 1 |
| Navigating Adaptations, Strategic Value, Strategy Adjustments | 1 |
| Managing External Perceptions, Audit Preperation, External Evaluation | 1 |
| quality | 5 |
| Adaption to new norms | 1 |
| Risk absorbtion, Supplier Diversification, Operational Risk Management | 1 |
| Flexibility, Opportunism | 2 |
| Consumer Centric Strategy, Business Focus, Opertational Streamlining | 1 |
| Risk Management, Strategic Relationships, Supply Chain Optimization | 2 |
| Operational Resilience, Opportunism in Disruption, Operational Consolidation | 1 |
| strategic Partnerships, Operational Adaptation, Industry Positioning | 4 |
| Flexibility in Partnerships, Role of Transparency and Success, Long term Benefits of Strong Relationships | 1 |
| New Operating Environment | 2 |
| Adaptability in Solutions, Contrasting Perspectives | 3 |
| Learning from Experience, Building Resilience, Preparedness | 2 |
| Learning from Reactive Responses, Building Resilience, Business Adaptability | 2 |
| Proactive Resilience, Responsiveness to Unforeseen Circumstances | 3 |
| Risk Management in the Network | 2 |
| Transition to a Risk Model, Optimization with Risk Model, Dual Supplier Strategy, Supplier-Level Risk Assessment | 1 |
| Balancing Cost and Risk, Recognition of Risk Management, Cost Optimization Focus | 1 |
| Transactional vs Strategic Relationships, Partner Dependency and Support, Role of Economic Leverage | 1 |
| Resilience to Change, | 8 |
| Perceived Recurrence of Disruption, Complacency in Risk Management, Short-Term Focus | 1 |
| Adaptability, Effective Crisis Management, Expanding Vendor Networks | 2 |
| Mutual Partnership | 1 |
| Adapting from Experiences, Impact of Human Factors on Operations, Learning and Adapting | 2 |
| Customer Interaction, Adaptability to Changing Environment, Performance Monitoring | 1 |
| Time Utilization, Transparency | 1 |
| Transparency | 3 |
| Limits of KPIs, Interpersonal Dynamics in Business, Strategic Partnership Evaluation | 1 |
| Network Utilization, Partnership impact on Operational Efficiency, Partnership Management | 3 |

| Code | Frequency |
|---|---|
| Trade-offs in Partner Capacity, Strategic Alignment | 1 |
| Labor Concerns | 2 |
| Geopolitical Risk In Supply Chains, Labor and Quality Concerns, Uncertainty in Trade Policies | 2 |
| Supply Chain Adaptability, Manufacturing Mobility, Long Term Planning, Strategic Response to Disrtuptions | 2 |
| Flexibility vs Stability, Price of Flexibility, Diversification Strategies | 3 |
| Supply Chain Disruptions, Coordination Role, Strategic Decision Making in a Crisis | 3 |
| Contractual Foundations, Beyond Contractual Commitments, Mutual Protection | 3 |
| Supplier Diversification, Resilience Through Diversification, Risk of Partner Dependency, | 8 |
| Proactive Resilience, Supply Chain anticipation, Strategic Vendor relationships, Scalability of resources | 4 |
| Levels of Resiliency, Recovery Speed, Resilience as a Journey | 3 |
| Flexibility in Policies, Strategic Contracts, Performance Metircs in Contracts | 1 |
| Value of collaboration, Transparency, Investment in Relationships | 2 |
| Partner selection, Process Innovation, Strategic collaboration | 6 |
| Operational Efficiency | 0 |
| Implementation of Technology, Sustainability in operations, Strategic Investment | 0 |
| Business Alignment, Future Orientated Solutions | 2 |
| Strategic Partnership, Market Opportunities | 9 |
| Continious innovation, Strategic Partnerships, Industry Engagement | 0 |
| evolving | 0 |
| Word/PDF Text Highlight | 0 |
| Paraphrased Segments | 0 |

## APPENDIX 2C: REPRESENTATIVE CODED EXCERPTS BY THEME — CHAPTER 2

Representative quotes from supply chain managers organized by emergent theme. Each excerpt illustrates how the theme manifested in participant accounts. Participant identifiers have been anonymized.

### Structural Alignment

**Excerpt 1:** *"Yeah, yeah. And part of that's part of what, you know, part of the reason why I got hired, you know, three years ago and left [a previous employer] was to put our get our company, understanding what it means to outsource and to understand. Understand that when you outsource, you can't outsource your risk, right? You outsource execution. But you can't outsource risk. Because if you outsource risk, and something happens, so th…"*

**Excerpt 2:** *"You know, again, it's the resilient ones are the ones that are in are anticipating the risk and you know, planning you know, planning ahead. So now, argue argument as a pool, the most resilient people in the market are the ones that differentiate, right they can they can, you know, stand the test. As a fan of things like that, and when things become too commoditized, they can differentiate. So third party f…"*

### Risk

**Excerpt 1:** *"as you know, the UAW is was threatening to go on strike and they could go on strike tonight. The auto industry so as in they're demanding a lot and I think a lot of the demands are along the lines that you're talking about. A work in ditches, not just*

*salary increases, but the working conditions and guarantees and all those type of things you just you just said, but are seen as increases in pricin…"*

**Excerpt 2:** *"its quality, its then then sometimes calculating duty and taxes which can change with a shift in PA Politics with the next week, God knows who's be president in the US. And what is his China Vietnam policy? Right? I mean, it's easier to make a press release, and it's shift from here to there until it really happened. It normally takes some time…."*

**Responsiveness to Resilience**

**Excerpt 1:** *"um, it within our office, we're pretty open with sharing information. And that that is kind of like a manager to manager kind of, not rule necessarily, but just kind of how they operate. Which I really like, like, my boss has no problem, letting all the carriers know what each other has, you know, what loads are pulling for the week. And the main, the main reason for that actually does have to do with resilience and respon…"*

**Excerpt 2:** *"you know, I talked about earlier, you know, what is our Mo, R Mo is, is that short term costs. So your partnerships are less, like less opportunity to happen, when you're just trying to, you know, short term costs. But I do think that eventually, you know, we've kind of as a company, maximize the rights of the carriers. Now it's time to take those gears that we have, we…"*

**Responsiveness**

**Excerpt 1:** *"um, yeah, that doesn't seem like there's the structure that Joanne tried to, or what it seems like to me, that Joanne tried to do was, like I said, change the structure*

*in the short run to deal with what we need to right now, which was the influx of fabric and the other merchandise that, you know, was selling at a higher rate than others due to everybody being insi…"*

**Excerpt 2:** *"Long Term Strategies…"*

**Resilience**

**Excerpt 1:** *"Resiliency kind of speaks to like perseverance, and just if you hit a brick wall, find a way around it or over it or under it.…"*

**Excerpt 2:** *"okay. Very much, having a team that can think outside the box, and can overcome what's in front of us. I don't think my definition has changed. I think that the importance of it has increased, I think more than ever, we have to be able to respond and respond quickly to becaus…"*

**Relational Governance**

**Excerpt 1:** *"you know, we're building relationships that last some of our relationships, you know, that we're dependent on today. I mean, our packaging relationship is 10 plus years old, our carrier relationship is, you know, eight…"*

**Excerpt 2:** *"for me, look, you can have a contract and you can have non strategic relationship, you can, you can, again, I look it as a marriage, you can be married, and you're live in separate rooms, and you never talk to your wife or spouse. So, the contract itself is just a document, you can either take it as a binding document, but I think again, what you put into it, you cannot define everything in a contract. S…"*

**Learning**

**Excerpt 1:** *“I think was that folks, particularly, you know, folks, and then the some that we've all talked about, these are folks that had a lot of experience in working within our supply chain, knew our network knew our partners, and were able to use that to figure out how to get what we needed. Done. Don…”*

**Excerpt 2:** *“there's not a foolproof plan either. Yeah, the 80% percentage or your 90 or your 50 and you learn from me quickly and you get it up, you know to the ad which you probably want to strive to. Nobody has 100% Not even because we just had the Sunday the pilot called in sick guess what if the pilot calls in sick the plane will not take off. We don't have with the union immediately somebody standby who t…”*

**Flexibility**

**Excerpt 1:** *“the disruption has to be COVID, because that was a major disruption was a sea change for a while. And I guess the partners that helped us out were the ones that were willing to accept our offers for expedite fees, and all of the additional premiums that it took to get what we needed and time to be able to deliver orders. So I mean, we weren't unique in that. But yeah, so it was really a, we were able to get what we…”*

**Excerpt 2:** *“right? There's always a price, there's a price of being flexible, in a sense, if you want to hatch something which you can do long term contract, you can do hatching of fuel, there's always a price, nothing is free. So as flexible, we were during COVID, right, at one point is run is probably over. So maybe we left probably a little bit money on the table, because we could have gobble up more capacity. Bu…”*

**Adjustment**

**Excerpt 1:** *“we have some chairs that are called regional and some carriers are national. So like UPS and FedEx will be a national carrier or company, like one track relationship, or Lone Star be a regional. And so you know, the regionals are cheaper, but like you said, can't you can't rely on one carrier that area, if you get if you've got retail, you've still got to have that national team covering everything in case you need them. Again, he says it's diver…”*

**Adaptability**

**Excerpt 1:** *“or, I'm sorry, I'm mixing up some terminology here. In a minute, since I've been in receiving the, when they were replenishing those reserves, about 50% of those were ending up on the floor, not even making it into location. And that was a very a myriad of some issues, it was spacing, you know, the actual dimension issues, but also, but mainly t…”*

**Excerpt 2:** *“I would say our organizational structures, so like how the employees I guess, like, the chain up has kind of shifted based on like I said, like more, we wanted to like work more with our suppliers and be more supplier focus. So that's kind of we've integrated with different organizational structure based on them. Okay. Morgan Lyons Interview 1_05_24_otter_ai: 28 - 28  (0)…”*

## APPENDIX 3A: EXPERIMENTAL SCENARIO AND STIMULUS MATERIALS — CHAPTER 3

Full experimental scenario and complete supervisor messages by condition. All participants read the same scenario. Messages varied by condition.

### Scenario Text (All Conditions)

*You are the new supply chain manager for a company that manufactures consumer goods. One of your primary responsibilities is ensuring the smooth flow of products from production to customers, while also managing relationships with key supply chain partners. Your organization faces a significant disruption: a major port congestion event is causing unpredictable delays, and your primary logistics provider has unexpectedly terminated your contract, leaving you without a key partner. Agility is the supply chain's ability to respond quickly to sudden changes, emphasizing speed and responsiveness, particularly in the short term. Adaptability is the capacity to evolve with long-term shifts in the business environment, requiring strategic adjustments and investments to stay competitive over time.*

### Adaptability Condition — High Intensity (6 messages)

**Initial message:**

*"Congratulations on the new post, but I want to offer some advice. We have great success as an organization prioritizing Long-Term relationships with an eye towards the horizon."*

**Follow-up messages:**

*1. "Keep in mind that adaptability is one of our greatest strengths. It might mean taking a few extra steps at times, but it positions us well to manage changes effectively in the future."*

*2. "Consider how today's choices affect our long-term adaptability. The small adjustments we make now create patterns that will determine how effectively we can respond to change months and years from now."*

*3. "Adaptability is critical here. Though it might slow us down sometimes, it ensures we're ready to pivot when the situation demands."*

*4. "Embracing long-term adaptability is central to our approach. Though it might not always be the most direct path, building systems that can evolve over time equips us to handle unforeseen obstacles and opportunities."*

*5. "Just a reminder — maintaining adaptability, even if it feels slower, keeps us prepared for changes before they even happen."*

*6. "Remember, an adaptable mindset is invaluable. Even if we take a few detours, this approach prepares us for a sustainable future."*

**Adaptability Condition — Medium Intensity (3 messages)**

**Initial message:**

*"Congratulations on the new post, but I want to offer some advice. We have great success as an organization prioritizing Long-Term relationships with an eye towards the horizon."*

**Follow-up messages:**

*1. "Keep in mind that adaptability is one of our greatest strengths. It might mean taking a few extra steps at times, but it positions us well to manage changes effectively in the future."*

*2. "Consider how today's choices affect our long-term adaptability. The small adjustments we make now create patterns that will determine how effectively we can respond to change months and years from now."*

*3. "Adaptability is critical here. Though it might slow us down sometimes, it ensures we're ready to pivot when the situation demands."*

**Adaptability Condition — Low Intensity (1 message)**

**Initial message:**

*"Congratulations on the new post, but I want to offer some advice. We have great success as an organization prioritizing Long-Term relationships with an eye towards the horizon."*

*No follow-up messages (low intensity condition).*

**Agility Condition — High Intensity (6 messages)**

**Initial message:**

> *"Congratulations on the new post. Just a quick word of advice — we've found a lot of success by staying fast on our feet and prioritizing Short-Term responsiveness. It's what helps us stay ahead when things change fast."*

**Follow-up messages:**

> *1. "Agility is one of our key strengths — it's about building better and faster processes for when things go wrong. A few extra steps now will help us respond quickly and keep momentum in the face of sudden changes."*
>
> *2. "Let's focus on decisions that boost short-term responsiveness. The quick shifts we make today strengthen our ability to shift the process when conditions change unexpectedly."*
>
> *3. "Speed matters here. Agility might mean switching gears fast, but it's what allows us to stay effective in dynamic, real-time situations."*
>
> *4. "Being agile means reacting quickly and confidently — even if it's not the most linear process. It keeps us on pace when the environment throws us something new."*
>
> *5. "A quick reminder — staying agile, even when it feels a bit scrappy, ensures we're ready to jump into action before things escalate."*

*6. "An agile mindset is a competitive edge. It's not about having the perfect process — it's about moving fast, making sharp calls, and staying responsive in the moment."*

**Agility Condition — Medium Intensity (3 messages)**

**Initial message:**

*"Congratulations on the new post. Just a quick word of advice — we've found a lot of success by staying fast on our feet and prioritizing Short-Term responsiveness. It's what helps us stay ahead when things change fast."*

**Follow-up messages:**

*1. "Agility is one of our key strengths — it's about building better and faster processes for when things go wrong."*

*2. "Let's focus on decisions that boost short-term responsiveness. The quick shifts we make today strengthen our ability to shift the process when conditions change unexpectedly."*

*3. "Speed matters here. Agility might mean switching gears fast, but it's what allows us to stay effective in dynamic, real-time situations."*

**Agility Condition — Low Intensity (1 message)**

**Initial message:**

*"Congratulations on the new post. Just a quick word of advice — we've found a lot of success by staying fast on our feet and prioritizing Short-*

*Term responsiveness. It's what helps us stay ahead when things change fast."*

*No follow-up messages (low intensity condition).*

## APPENDIX 3B: SURVEY INSTRUMENT AND SCALE ITEMS — CHAPTER 3

Complete survey instrument including all scale items, response anchors, and their disposition in the analysis.

### Long-Term Collaborative Intent (α = .884)

**Response anchors:** 1 = Highly Disagree, 4 = Neutral, 7 = Highly Agree

1. I am more motivated to collaborate when it supports long-term success over quick wins. [RETAINED]
2. I felt that considering the long-term impact guided my choice to collaborate on a project. [RETAINED]
3. I am willing to invest in collaborative efforts that may yield immediate results but not promise long-term benefits. [DROPPED — poor fit]

### Process Agility Scale (α = .895)

**Response anchors:** 1 = Highly Disagree, 4 = Neutral, 7 = Highly Agree

1. Our organization rapidly adjusts its processes in response to evolving customer requirements.
2. Our organization quickly modifies internal processes to keep pace with changes in the market environment.
3. Our organization effectively adjusts its operations to accommodate significant fluctuations in demand.

4. Our organization regularly reconfigures its processes to align with emerging market needs.

**Structural Adaptability Scale (α = .745)**

**Response anchors:** 1 = Highly Disagree, 4 = Neutral, 7 = Highly Agree

1. Our supply chain evolves rapidly in response to shifts in our business priorities. [RETAINED]

2. Our supply chain uses strategic simulations to design more adaptable supply chain processes. [RETAINED]

3. Our supply chain recognizes shifts in markets and adjusts its business relationships accordingly. [RETAINED]

4. Select '2' to show you are paying attention. [ATTENTION CHECK — excluded from scale]

**Manipulation Check Items**

**Response anchors:** 1 = Highly Disagree, 4 = Neutral, 7 = Highly Agree

1. I felt that my boss's suggestions influenced the decisions I made.

2. I felt that my boss put pressure on me to prioritize long-term adaptability. [q2dvs_2]

3. I felt that my boss valued long-term adaptability more than immediate results. [q2dvs_3]

4. Select '6' to show that you are paying attention. [ATTENTION CHECK — q2dvs_4]

5. How many pieces of advice did your boss provide? [Recall check — free response]

**Behavioral Contagion — Open-Ended Prompt**

*Based on the scenario provided, write a brief message to a new team member advising them on your suggestions. You should aim to spend no more than 5 minutes on this question.*

**Common Method Variance Marker Items**

**Note:** Participants were explicitly told this was NOT an attention check. Response anchors: 1 = Highly Disagree, 7 = Highly Agree.

1. Blue is my favorite color.
2. I love the color blue.
3. The color blue makes me happy.