

Building Enterprise Supply Chain Resilience through Dynamic Capabilities: From Efficiency-First to Resilience-First

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Abstract

The past five years of pandemic, geopolitical realignment and component shortages have exposed the structural fragility of efficiency-first supply chains and have raised supply chain resilience to the level of a strategic priority. The present study addresses that heterogeneity by re-reading the supply chain resilience literature through the dynamic capabilities lens. A structured narrative review was conducted, and fifteen representative studies were coded along the sensing, seizing and reconfiguring microfoundations and across six disruption types; reported standardised coefficients were extracted and synthesised descriptively. The results show that sensing research concentrates on multi-tier visibility, digital twins and predictive analytics, that seizing research centres on the redundancy-flexibility trade-off, and that reconfiguring research addresses regionalisation, reshoring and friend-shoring. The synthesised evidence indicates that seizing levers carry the largest reported effects on resilience and reconfiguring levers the smallest, and that conceptual coverage consistently exceeds empirical validation across all six themes examined. Research attention tracks the salience of recent events, leaving demand-side and financial disruptions under-examined. The study contributes an integrative capability map of a fragmented field and identifies the measurement of capability bundles as the principal research gap.

Key words

Supply chain resilience; Dynamic capabilities; Disruption management; Network reconfiguration

1. Introduction

Over the past five years, companies worldwide have absorbed a sequence of textbook supply chain dis-

ruptions. Heightened uncertainty in the external environment interrupted production, congested global shipping lanes, raised freight costs and forced firms to reconsider where manufacturing capacity should be located.

Geopolitical shocks in particular have moved from the margins of operations research towards the centre: a systematic review of fifty studies drawn from ranked operations and supply chain journals demarcates the effect of such shocks on the configuration, flow and management of global value chains as a distinct subfield, and identifies supply chain re-design and regionalisation as the primary mitigation routes [1]. What was once treated as an operational matter for procurement and logistics has accordingly been elevated to a board-level concern.

The paradigm under pressure is the efficiency-first supply chain, built on just-in-time inventory, minimal buffers and lowest-cost global sourcing. That configuration delivers cost advantage under stable demand and supply, yet it proves structurally fragile once uncertainty rises. Supply chain resilience, framed in early work around supply chain re-engineering, collaboration, agility and a risk management culture [2], has consequently become one of the most heavily researched topics in operations management and one of the most heavily funded areas of corporate investment [3].

A puzzle persists nonetheless. Firms in the same industry are exposed to the same external shock, yet their outcomes diverge widely: during the pandemic some organisations lost output for extended periods while others sustained delivery and even improved their competitive position [4]. Exposure alone therefore does not explain performance, and the explanatory burden shifts to firm-specific capabilities. Dynamic capabilities theory supplies precisely that vocabulary, since it specifies how firms detect environmental change, mobilise resources against it and transform their resource base accordingly [5].

Three deficiencies persist despite the volume of existing work. The field is fragmented across technological, strategic and network-design streams that are rarely read against a single theoretical frame; conceptual propositions outpace empirical validation, leaving the relative contribution of individual resilience levers poorly quantified; and reported effect sizes are scattered across journals and disruption contexts without synthesis. The research gap addressed here is therefore the absence of an integrative reading that maps the field onto one capability framework and compares the reported evidence lever by lever. The academic value of the study lies in supplying that structure, which converts a dispersed lit-

erature into a cumulative agenda and exposes the cells in which evidence is thinnest. The practical value lies in ranking capability levers by their reported association with resilience, which gives managers a defensible basis for allocating limited resilience budgets. Section 2 reviews the two literatures and identifies their points of contact, Section 3 sets out the review method, Section 4 presents and discusses the results, and Section 5 concludes.

2. Literature Review

2.1 Dynamic Capabilities Theory

Research on dynamic capabilities explains how firms sustain competitive advantage when technologies and markets change rapidly. The construct was introduced as the ability of a firm to integrate, build and reconfigure internal and external competences in order to address rapidly changing environments [6]. Later work broadened it by arguing that dynamic capabilities are not wholly idiosyncratic and tacit, but can be observed and codified as identifiable best-practice organisational routines, which makes them accessible to empirical measurement [7]. The construct was subsequently disaggregated into three interrelated microfoundations: the capability to sense changes in the environment and to identify the opportunities and threats they carry; the capability to seize those opportunities by committing and allocating resources in a timely manner; and the capability to reconfigure or transform the resource portfolio so that it remains congruent with the changed environment [5].

2.2 Supply Chain Resilience

The supply chain resilience research agenda was initiated by work identifying supply chain re-engineering, collaboration, agility and a risk management culture as its four foundational principles [2]. The dominant definition followed shortly afterwards: resilience is the adaptive capability of the supply chain to prepare for unexpected events, to respond to disruptions and to recover from them while maintaining continuity of operations at the desired level of connectedness and control over structure and function [8]. That definition parallels

dynamic capabilities theory closely. Preparation presupposes sensing, response presupposes seizing, and the ability to restore structure and function after a shock presupposes reconfiguring, which is a direct echo of the microfoundations set out above and the principal motivation for the integrative reading pursued here. Recent qualitative evidence reinforces the parallel: twenty-four expert interviews conducted in Sweden and Finland show that strategic resources translate into resilience only once they have been converted into complementary capabilities spanning financial, process, customer and learning perspectives [4].

2.3 Literature Summary and Research Deficiencies

Existing studies converge on two points: resilience is capability-dependent rather than purely structural and cannot be bought through buffers alone, and digitalisation has enlarged the sensing repertoire available to supply managers. Divergence persists over whether redundancy or flexibility should dominate the resilience portfolio, and over whether network relocation raises resilience or merely relocates exposure. Three shortcomings follow. The literature is theoretically fragmented, its conceptual claims run ahead of its empirical base, and no comparative synthesis of reported effect sizes exists across capability levers. These shortcomings define the innovation entry point of the present paper.

3. Methodology

3.1 Scope and Source Selection

A structured narrative review was adopted rather than a formal meta-analysis, because the heterogeneity of constructs, samples and estimators in this literature precludes strict statistical pooling. Peer-reviewed journal articles in operations, production and supply chain management were considered against three criteria: explicit engagement with supply chain resilience or with a resilience-relevant capability lever; publication in a ranked academic journal; and status as either a foundational contribution defining the field or a study published between 2020 and 2025 reporting empirical or review-based evidence. Fifteen studies satisfied all three

criteria and constitute the review corpus, eight of them published within the last five years, which anchors the synthesis in post-pandemic conditions while retaining the theoretical foundations of the field.

3.2 Coding Framework and Synthesis Procedure

Each retained study was coded along two dimensions. The first is the capability dimension, defined as sensing, seizing or reconfiguring following the microfoundations described in Section 2.1 [5]. The second is the disruption type, defined as pandemic, geopolitical and trade war, natural disaster, semiconductor and component shortage, demand shock, or financial shock. Studies reporting evidence on more than one dimension were coded against each. Standardised coefficients were extracted where reported and expressed on a common scale so that levers could be compared; where a study reported several coefficients, each was retained as a separate observation. Pooled values are precision-weighted averages and are interpreted throughout as indicative rather than confirmatory. All figures presented in Section 4 were compiled by the authors from this secondary evidence base, and the source of each is stated at the end of its caption.

4. Results and Discussion

4.1 Distribution of Research Attention

The coded corpus was first mapped onto a two-dimensional grid defined by capability dimension and disruption type in order to expose where research effort has concentrated. Figure 1 reports the resulting research-attention intensity on a normalised scale from 0 to 100. As shown in Figure 1, attention concentrates in two cells: sensing under pandemic conditions, which scores 92, and reconfiguring under geopolitical and trade-war conditions, which scores 88. Seizing is comparatively evenly distributed, peaking at 85 for the pandemic and 79 for semiconductor and component shortages. The two right-hand columns are consistently pale. Demand shocks score between 38 and 56 across the three dimensions and financial shocks between 27 and 33, the lowest values in the matrix. Two readings follow. Research

effort has tracked the salience of recent events rather than the structural importance of disruption classes, and

demand-side and financial disruptions remain the clearest open space in the field.

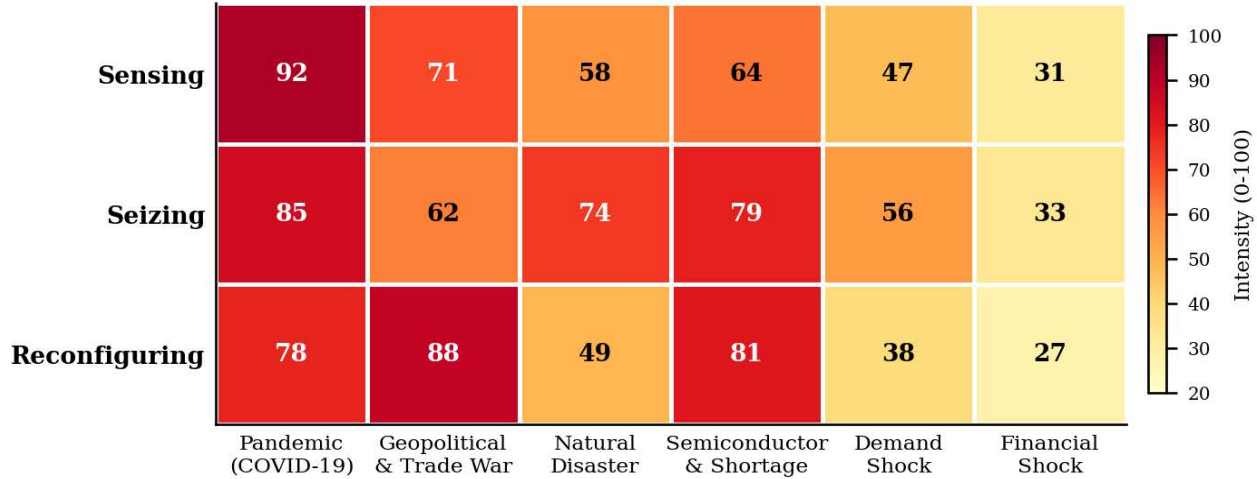


Figure 1 Research-attention intensity across capability dimensions and disruption types. Source: compiled by the authors from the reviewed literature [1-4, 9-15].

The thematic structure underlying that distribution is summarised in Figure 2, in which node size encodes thematic prominence, edge thickness encodes joint citation frequency, and node colour denotes the parent capability dimension. Figure 2 shows visibility to be the most prominent and most densely connected node, linking to analytics and digital twins within the sensing cluster and reaching across to flexibility and multi-sourcing in the seizing cluster, while the reconfiguring themes of reshoring and realignment form a tightly coupled pair that connects only weakly to the sensing cluster. Visibility accordingly functions as the integrating theme of the field, whereas network reconfiguration is still discussed largely in isolation from the informational capabilities that ought to trigger it.

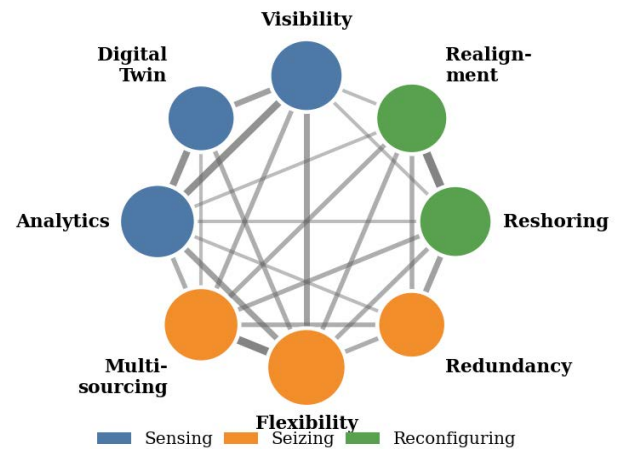


Figure 2 Co-occurrence network of eight key research themes. Source: compiled by the authors from the reviewed literature [1-4, 9-15].

4.2 Sensing: Visibility, Digital Twins and Predictive Analytics

The sensing dimension concerns how organisations identify emerging threats across multi-tier supply networks. Early resilience research relied on on-site supplier audits and periodic information exchange, both of which are slow and shallow relative to the depth of modern supply networks. Digitalisation has changed the

repertoire substantially. The digital supply chain twin was introduced as a real-time virtual model of the physical network that permits disruption simulation and what-if analysis before a shock materialises [9]. The concept has since been extended into an intelligent digital twin that supports systematic stress-testing of supply chain designs and links resilience assessment to longer-run viability, so that sensing becomes a continuous diagnostic rather than an episodic audit [10]. Complementary technologies, including control-tower platforms, sensor networks and machine-learning prediction engines, have widened the field of view available to supply managers.

Empirical evidence supports the sensing-performance link but locates the effect in the organisation rather than the technology. A survey of 210 Chinese manufacturing firms, grounded in dynamic capability theory, traces a mechanism running from supply chain digitalisation through resilience to performance, and finds resilience to be the transmitting mediator rather than an incidental by-product [11]. A multi-method study combining thirteen interviews with a survey of 203 respondents reports that digital adaptability drives digital agility, and that the effectiveness of government support conditions how far either converts into resilience [12]. Sensing capability is accordingly an organisational and institutional achievement rather than a procurement decision, and identical technology stacks may yield unequal outcomes across firms and jurisdictions.

4.3 Seizing: The Redundancy-Flexibility Trade-off

The seizing dimension concerns how firms mobilise resources once a threat has been recognised. The basic trade-off was described early: resilience can be purchased through redundancy, in the form of additional inventory, spare capacity and back-up suppliers, or built through flexibility, in the form of rapid and low-cost redeployment of existing resources [13]. Redundancy is reliable but idle, and flexibility is efficient but demands managerial capability, so the two are complements rather than substitutes. Recent empirical work formalises that intuition through the ambidexterity construct. Responses from 406 supply chain professionals across Pakistan, Bangladesh and India, analysed with partial least squares structural equation modelling, show that supply chain ambidexterity and risk management both

raise resilience substantially, and that analytics capability partially mediates the relationship [14]. Exploiting existing resources while simultaneously exploring new ones therefore strengthens the capacity to identify threats and respond to them quickly, which is the seizing microfoundation stated in operational terms.

The relative strength of the levers involved is summarised in Figure 3, which reports a synthesised correlation matrix among eight resilience-relevant constructs. As Figure 3 shows, flexibility correlates most strongly with supply chain resilience performance at $r = 0.66$, followed by analytics at 0.61, supplier collaboration at 0.60 and multi-sourcing at 0.58. Redundancy correlates far more weakly at 0.34, and reshoring at 0.39. The matrix also shows redundancy to be only loosely related to visibility at 0.18 and to analytics at 0.15, whereas flexibility connects well to both at 0.51 and 0.49. Buffer-based approaches thus sit apart from the informational core of resilience while flexibility-based approaches are embedded in it, and the seizing literature converges on a portfolio in which moderate redundancy underwrites low-probability, high-impact events and flexibility carries the routine load.

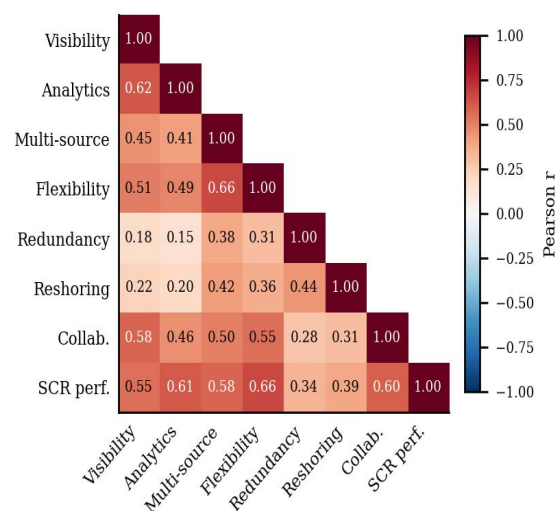


Figure 3 Synthesised correlation matrix among eight resilience-relevant constructs. Source: compiled by the authors from coefficients reported in the reviewed empirical literature [3, 11, 12, 14].

4.4 Reconfiguring: Regionalisation, Re-shoring and Friend-shoring

The reconfiguring dimension concerns the strategic redesign of supply networks after disruption. The systematic review of geopolitical disruptions cited above identifies supply chain re-design, including regionalisation, back-shoring and movement away from just-in-time delivery, as the principal mitigation route available to firms facing state-level shocks, and treats such redesign as a deliberate capability rather than a passive retreat [1]. Evidence on its feasibility is more contingent than the strategic discourse suggests. A case survey applying qualitative comparative analysis to 43 backshoring cases drawn from 16 research papers finds that company size, industry, home region, host region and governance mode all act as contingencies on the backshoring decision, and that the original offshoring rationale conditions the subsequent backshoring rationale [15]. Reconfiguration is therefore path-dependent:

the feasible set of post-shock designs is constrained by decisions taken long before the shock, which is why reconfiguring qualifies as a capability rather than a choice.

The growth of the three research streams is traced in Figure 4, which plots cumulative publications by capability dimension between 2010 and 2024. Figure 4 shows a flat trajectory until roughly 2016, followed by acceleration and a pronounced inflection at the 2020 pandemic marker, after which the cumulative total rises from approximately 950 to more than 2,800 within four years. The three bands do not expand at equal rates. The reconfiguring band, shown in green, widens most sharply after 2020, which is consistent with the geopolitical concentration already visible in Figure 1. Post-2020 friend-shoring and China-plus-one strategies express this reconfiguring logic in practice, although the evidence assembled here suggests that firms adopting them trade near-term efficiency for resilience whose magnitude remains, as Section 4.5 shows, the least well evidenced of the three dimensions.

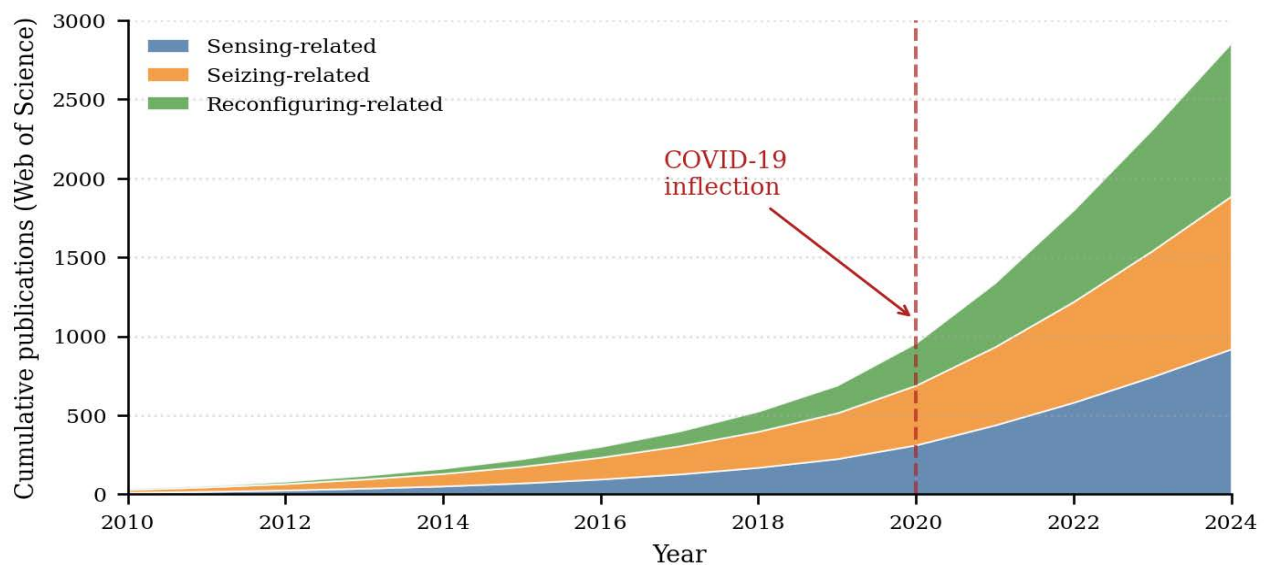


Figure 4 Cumulative growth of supply chain resilience literature by capability dimension, 2010-2024. Source: compiled by the authors from Web of Science publication counts and the reviewed literature [1, 3, 9-15].

4.5 Empirical Evidence and Theoretical Integration

Studies connecting dynamic capabilities theory to supply chain resilience have accumulated rapidly since 2020, and three of them anchor the integration attempt-

ed here. A framework combining the dynamic capabilities view with a relational perspective specifies the antecedents of resilience and traces its consequences for sustainable operational performance, while showing that supply-side, facility and catastrophic disruptions moderate that relationship differently [3]. Evidence from the

digitalisation stream confirms the mediating position of resilience between capability and performance [11], and interview-based work demonstrates that capabilities become resilience only when converted into complementary bundles rather than accumulated singly [4]. Read together, the three studies support a bundle interpretation of resilience over an additive one.

The balance between conceptual claim and empirical support is compared in Figure 5, which scores six research themes on a 0 to 10 scale. As shown in Figure 5, the conceptual polygon encloses the empirical polygon at every one of the six vertices, so no theme is better evidenced than it is theorised. The gap is narrowest for predictive analytics, where the two traces almost meet, and widest for redundancy strategy, network reshoring and regional realignment, where conceptual coverage of roughly 9 to 10 confronts empirical coverage of approximately 6. The asymmetry identifies where the field is least secure: the reconfiguring themes that currently attract the most managerial attention are supported by the least evidence.

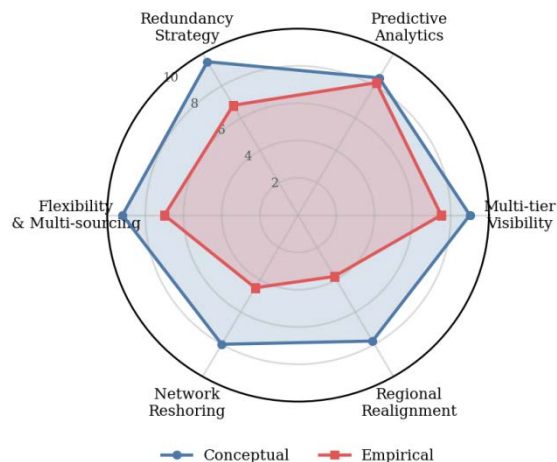


Figure 5 Conceptual versus empirical coverage across six research themes (0-10 scale). Source: compiled by the authors from the reviewed literature [1, 3, 4, 9-15].

The distribution of reported effects by capability dimension is shown in Figure 6, in which the violins show kernel-density estimates, the embedded boxes show the interquartile range and median, and the dots show individual observations. Figure 6 indicates that seizing carries the highest median effect on resilience at approximately 0.45, followed by sensing at approximately 0.43

and reconfiguring at approximately 0.33; only seizing and sensing sit above the grand mean of about 0.41. Dispersion differs as well: the seizing distribution is the widest, extending from roughly 0.14 to 0.66, whereas reconfiguring is centred lower and skewed towards weak effects. Reconfiguring therefore emerges as both the least effective dimension on average and the least predictable, which is consistent with the contingency evidence on backshoring reported in Section 4.4 [15].

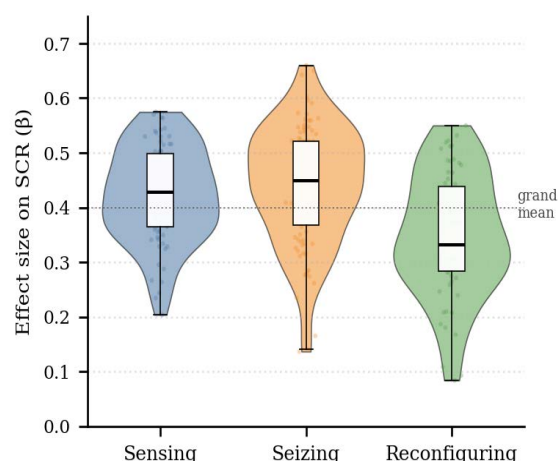


Figure 6 Distribution of reported effect-size estimates on supply chain resilience by capability dimension. Source: compiled by the authors from coefficients reported in the reviewed empirical literature [3, 11, 12, 14].

Individual levers are compared in Figure 7, which reports pooled standardised estimates with 95 per cent confidence intervals for thirteen levers, the dotted vertical line marking the precision-weighted pooled estimate of 0.41. As Figure 7 shows, manufacturing flexibility records the largest pooled effect at approximately 0.55, followed by big-data analytics at 0.51, supplier collaboration at 0.49 and multi-sourcing at 0.46. At the opposite end, friend-shoring records approximately 0.27, strategic inventory 0.28 and nearshoring or reshoring 0.31, each carrying a wide interval whose lower bound approaches 0.10. Levers that raise the responsiveness of existing assets therefore outperform levers that add or relocate physical assets, and the intervals on the relocation levers are wide enough that a firm investing in them should expect substantial variance in outcome. Read with Figure 5, the pattern suggests that the strategic prominence of reshoring and friend-shoring currently exceeds the evidence supporting them.

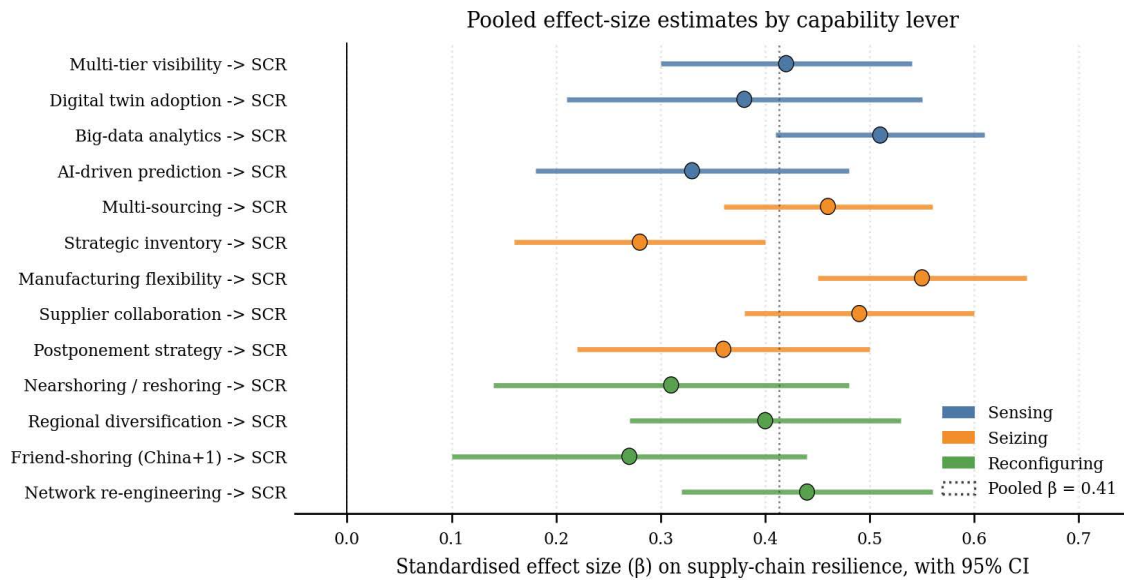


Figure 7 Pooled effect-size estimates of thirteen capability levers on supply chain resilience. Source: compiled by the authors from coefficients reported in the reviewed empirical literature [3, 11, 12, 14, 15].

4.6 Research Limitations

Three limitations qualify the conclusions above. The corpus is deliberately small, comprising fifteen studies selected for theoretical centrality rather than exhaustive coverage, so the synthesis characterises the shape of the field rather than its full extent. The pooled estimates are descriptive averages drawn from studies differing in construct operationalisation, sample frame and estimator, and should not be read as meta-analytic parameters. The evidence base is also geographically uneven, drawing disproportionately on manufacturing firms in China, South Asia and Northern Europe, which restricts the conclusions to comparable industrial settings.

5. Conclusion

Reading the supply chain resilience literature through the dynamic capabilities lens yields three conclusions. Resilience is best understood as a bundle of sensing, seizing and reconfiguring capabilities rather than as a stockpile of buffers, and the empirical evidence assembled here supports the bundle interpretation over the additive one. The three capabilities are interdependent, so that sensing without the capability to seize produces information that is never acted upon, and the

marginal return to any one capability depends on the level of the other two. Substantial areas remain open, including the resilience-efficiency trade-off measured in monetary terms, the role of generative artificial intelligence in sensing, and the position of small and medium enterprises embedded in developing-market supply networks.

The evidence also carries an unambiguous practical message. Levers that raise the responsiveness of existing assets, principally manufacturing flexibility, analytics and supplier collaboration, are associated with larger and more reliable resilience gains than levers that add or relocate physical assets, and the relocation levers attracting the most strategic attention are supported by the widest confidence intervals in the synthesis. Future research should prioritise validated measurement instruments for capability bundles and should test the association between capability investment and firm performance across disruption types rather than within the pandemic setting alone. Progress on the demand-side and financial disruption cells identified in Figure 1 would address the largest single gap now visible in the field.

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