Next Scientists
EUROPEAN INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND MANAGEMENT STUDIES

TYPE Original Research
PAGE NO. 72-83

OPEN ACCESS

SUBMITTED 01 October 2025
ACCEPTED 15 October 2025
PUBLISHED 31 October 2025
VOLUME Vol.05 Issue10 2025

Resilient Sourcing and Strategic Adaptation in High-Technology Supply Chains: A Theoretical Synthesis for Semiconductor Reshoring and Disruption Mitigation

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Abstract This article develops a comprehensive theoretical synthesis addressing resilient sourcing strategies, disruption mitigation, and reshoring adaptations in high-technology supply chains, with an emphasis on semiconductor production and multi-echelon inventory networks. Drawing on cross-disciplinary literature spanning inventory control with stochastic review intervals, multi-sourcing under competition and uncertainty, reactive mitigation for supply disruption, bargaining under asymmetric beliefs, recycled-material contingent sourcing, expediting with multiple demand classes, two-echelon supply modes, demand-disruption recovery financing, dynamic pricing with heterogeneous patience, and lateral transshipment policies, the paper constructs an integrated conceptual framework for strategic decision-making when firms consider reshoring production capacity to geographically and politically sensitive regions. The framework identifies key trade-offs among reliability, flexibility, cost, and strategic control; formalizes an extended taxonomy of mitigations (proactive, reactive, contingent, and financial); and articulates managerial rules-of-thumb and theoretical implications for policy and firm-level strategy. By synthesizing principles from inventory theory, operations management, supply chain finance, and bargaining theory, the paper reveals how firms can sequence decisions—sourcing portfolio design, information sharing, financing arrangements, transshipment options, and pricing strategies—to manage ripple effects and demand shocks while pursuing strategic reshoring. The analysis surfaces critical limitations in extant models when applied to complex semiconductor ecosystems and proposes research directions that bridge inventory models with bargaining, financial instruments, and policy constraints relevant to reshoring efforts. The article concludes with prescriptive insights for practitioners deciding on reshoring investments and for policymakers designing incentives to strengthen domestic production without undermining adaptive supply network resilience.

Keywords: supply chain resilience, reshoring, semiconductor supply, multi-sourcing, disruption mitigation, inventory control, supply chain finance

Introduction

Background: Increasing geopolitical tensions and supply-chain fragilities have motivated both firms and governments to consider reshoring strategic manufacturing such as semiconductors. Traditional literature treats inventory, sourcing, and disruption mitigation in separate silos. This paper synthesizes these strands to provide an integrated view relevant to reshoring decisions. (Karimi-Nasab & Konstantaras, 2013; Wu et al., 2019; Lulla, 2025)

Methods: We conduct a theoretical synthesis and integrative analysis of existing models across inventory review, multi-sourcing, reactive mitigation, bargaining under asymmetric beliefs, contingent sourcing with recycled materials, expediting under multiple demand classes, two-echelon supply modes, demand-disruption financing, dynamic pricing behavior, and lateral transshipment. We map these to stages of reshoring decision-making and develop a conceptual decision framework. (Arts & Kiesmüller, 2013; Paul et al., 2018; Hsieh & Chang, 2021)

Results: The integrated framework identifies complementarities among sourcing diversification, finance-driven recovery strategies, and operational policies such as expedited orders and lateral transshipments; it highlights the importance of information sharing under competition and supply uncertainty; and it shows that buyer-supplier bargaining and asymmetric reliability beliefs critically influence contract design and reshoring incentives. (Wu et al., 2019; Gurnani & Shi, 2006; Zhao et al., 2022)

Conclusions: Reshoring can strengthen strategic control but introduces operational and financial trade-offs. Effective reshoring requires combined operational, contractual, and financial measures: multi-sourcing including recycled-material contingencies, explicit financing strategies for recovery, dynamic pricing to segment demand patience, and lateral transshipment policies. The paper recommends future empirical and modeling work to quantify these interactions specifically for semiconductor ecosystems. (Lulla, 2025; Khan, 2020)

Global supply chains in high-technology sectors—semiconductors being a preeminent example—are complex, interdependent networks that deliver critical inputs to modern economies. Growing political tensions, export controls, and concentrated production have exposed vulnerabilities in these networks, prompting renewed interest in reshoring production to increase national resilience and strategic autonomy (Lulla, 2025; Khan, 2020). While reshoring promises proximity, strategic control, and political insulation, it is not a panacea: reshoring changes cost structures, creates new uncertainties, and interacts with operational policies such as inventory review schedules, transshipment rules, and sourcing contracts. This paper addresses the pressing need to integrate deep operational theory with strategic reshoring decisions and supply-chain finance considerations so that firms and policymakers can make informed, holistic choices.

The literature on operational resilience offers many partial perspectives. Inventory models with stochastic review intervals explain how ordering cadence interacts with demand variability and special sale promotions (Karimi-Nasab & Konstantaras, 2013). Multi-sourcing literature emphasizes the value of diversified supplier portfolios and information sharing, particularly when competition and supply uncertainty intertwine (Wu et al., 2019). Reactive mitigation research elaborates tactics to manage three-tier disruptions after they occur, including rapid rerouting and substitution (Paul et al., 2018). Bargaining models show that asymmetric beliefs about supply reliability shape contractual outcomes in initial interactions (Gurnani & Shi, 2006), while contingent sourcing literature integrates recycled-material options and setup-time uncertainty as mitigation for ripple effects (Hsieh & Chang, 2021). Expediting and multiple demand-class models introduce priority mechanisms for fulfilling heterogeneous customer classes during constrained supply (Shen et al., 2019). Two-echelon supply-mode analysis illuminates choices between regular and expedited supply modes across echelons (Arts & Kiesmüller, 2013). Recovery from demand disruptions includes finance strategies to manage capital constraints (Zhao et al., 2022). Behavioral and pricing aspects, including patient versus impatient customers, influence dynamic pricing decisions during supply contractions (Cao et al., 2015). Finally, lateral transshipment policies offer an operational buffer across locations facing asymmetric demands (van Wijk et al., 2019). Together, these contributions provide necessary building blocks for a coherent theory of reshoring under uncertainty.

Despite this rich literature, there remains a gap: models seldom connect the strategic decision of reshoring—often driven by geopolitical or policy objectives—with the operational and financial instruments used to manage disruptions. Reshoring introduces changes to supplier reliability perceptions, bargaining leverage, capital requirements, and the feasibility of tactics like lateral transshipment and expedited supply. For semiconductors, which are embedded in a global ecosystem of equipment, materials, and specialized knowledge, the gap becomes especially consequential (Khan, 2020; Lulla, 2025). A synthesis that aligns sourcing portfolio choices, contractual forms, finance-based recovery strategies, and operational rules offers both theoretical insight and practical guidance.

This article aims to fill that gap through an integrative theoretical analysis. It constructs a decision framework linking (1) sourcing architecture (multi-sourcing, contingency sourcing), (2) operational policies (review intervals, expediting, lateral transshipment), (3) contractual and bargaining mechanisms (information sharing, asymmetric reliability beliefs), and (4) financial instruments (two-stage financing, recovery capital) to the strategic goal of reshoring production. By mapping the interactions and trade-offs, the paper identifies how reshoring reshapes the optimal combination of mitigation tools and where existing models need extension. The rest of the paper is organized as follows. The methodology section explains the synthetic approach used to merge disparate literatures. The results section presents the integrated framework and descriptive analyses of decision scenarios. The discussion interprets the findings, highlights limitations, and sets out future research directions. The conclusion distills actionable recommendations for managers and policymakers.

Methodology

This study follows a theory-synthesis methodology that systematically integrates findings and formal insights from a curated set of peer-reviewed contributions relevant to supply-chain resilience and reshoring. Instead of empirical estimation or numerical simulation, the research constructs a conceptual framework grounded in prior analytic results and derives new propositions by layering insights from complementary literatures. The approach draws on canonical modeling conclusions, comparative statics, and qualitative mechanisms identified in the references. The methodological steps are as follows.

First, selection and mapping. Each provided reference was read for its core insights, assumptions, and resulting managerial implications. For example, Karimi-Nasab and Konstantaras (2013) were mined for how stochastic review intervals interact with special-sale offers; Wu et al. (2019) for the interplay of multi-sourcing and information sharing under competitive supplier landscapes; Paul et al. (2018) for the taxonomy of reactive mitigation strategies in three-tier chains; and Lulla (2025) for reshoring-specific considerations and factory-level test-strategy adaptations in semiconductor contexts. The remaining works provided complementary mechanisms—bargaining under asymmetric beliefs (Gurnani & Shi, 2006), contingent sourcing with recycled inputs and setup time uncertainty (Hsieh & Chang, 2021), expediting with demand classes (Shen et al., 2019), two-echelon supply modes (Arts & Kiesmüller, 2013), two-stage finance for recovery from demand disruption (Zhao et al., 2022), dynamic pricing for patient/impatient customers (Cao et al., 2015), and lateral transshipments across locations with multiple demand classes (van Wijk et al., 2019). The semiconductor industry context and geopolitically motivated reshoring rationale were anchored by policy and industry synthesis documents (Khan, 2020; Khan, 2021; Accenture et al., 2020; Semiconductor Industry Association reports) and Lulla's recent analysis of reshoring test strategies (Lulla, 2025).

Second, extraction of core mechanisms and constraints. From each paper, the principal mechanism(s) were translated into decision levers and constraints relevant to the reshoring problem. Examples: (i) stochastic review intervals imply that ordering cadence affects exposure to supply disruptions and sale-induced demand spikes (Karimi-Nasab & Konstantaras, 2013); (ii) information sharing in competitive settings can paradoxically reduce a firm's bargaining leverage if not structured properly (Wu et al., 2019); (iii) reactive mitigation is effective but costly and dependent on the existence of alternative tiers capable of absorbing redirected demand (Paul et al., 2018); (iv) recycled-material contingent sourcing can offer low-cost substitutes but introduces setup-time uncertainty and potential quality variability (Hsieh & Chang, 2021); (v) expediting prioritizes critical demand classes at the expense of cost and other customers (Shen et al., 2019); (vi) two-stage financing can enable capital-constrained recovery after demand disruptions (Zhao et al., 2022); and (vii) bargaining under asymmetric beliefs alters contract initiation outcomes in first-time supplier relationships (Gurnani & Shi, 2006).

Third, integrative modeling through descriptive comparative statics and scenario mapping. Rather than creating new closed-form models, this research builds layered scenario maps that show how changing a strategic pivot—e.g., moving production from overseas to a domestic factory—alters the feasible set of mitigation tools and their relative effectiveness. For each scenario, we trace the causal chain: strategic decision (reshore yes/no) → operational levers available or constrained (e.g., lateral transshipment viability, expediting lead times) → contractual and information dynamics (bargaining power, need for information sharing) → financial implications (capital needs, financing options) → performance outcomes (service level, cost, time to recovery).

Fourth, developing managerial propositions and policy implications. Drawing on the scenario analysis and mechanism mapping, the paper formulates propositions about when reshoring increases resilience net of operational and financial costs, which combinations of instruments dominate under specific conditions, and what policy structures (e.g., financing support, coordinated standards) would most effectively support reshoring without creating systemic fragility.

Fifth, sensitivity and caveat analysis. Because the synthesis draws on models with differing assumptions, the methodology includes an explicit examination of where conflicting model assumptions create trade-offs or ambiguity. These are documented and used to generate future research questions.

Throughout the methodology, every major claim is anchored to the source literature using (Author, Year) in-text citations so that readers can verify the provenance of each mechanism and conclusion.

Results

This section presents the integrative framework and descriptive analyses that result from synthesizing the referenced literature. The goal is to produce layered, evidence-based propositions and managerial heuristics for firms weighing reshoring in the context of high-technology supply chains, particularly semiconductors.

1. An integrated taxonomy of mitigation strategies

The literature suggests that mitigation strategies can be classified into four primary categories—proactive, reactive, contingent, and financial—each comprising several operational and contractual tools.

Proactive measures include multi-sourcing portfolio design and strategic inventory placement. Multi-sourcing acts as a hedge against supplier-specific failures and can be particularly valuable when suppliers are located in politically divergent jurisdictions (Wu et al., 2019). However, multi-sourcing interacts with competition: if multiple buyers source from the same set of suppliers, information sharing can be a double-edged sword, improving coordination but potentially diluting bargaining power (Wu et al., 2019). Inventory strategies, especially those accounting for stochastic review intervals, influence exposure during demand spikes, such as sale-induced rushes or sudden contract wins (Karimi-Nasab & Konstantaras, 2013).

Reactive measures emerge post-disruption and include rerouting, expediting, and emergency procurement from alternate tiers. Paul et al. (2018) emphasize that reactive mitigation effectiveness depends on lead-time reduction potential within substitute tiers and the ability to coordinate across three-tier networks quickly. Expediting is a classic reactive tool that prioritizes demand classes; it can secure supplies for high-priority customers but is costly and can lead to service-level trade-offs for lower-priority classes (Shen et al., 2019).

Contingent measures are pre-planned but only enacted when triggers occur. Contingent sourcing with recycled materials is an example: firms design contracts so that recycled-material suppliers can be switched on when primary supplies fail, but setup-time uncertainty adds operational risk (Hsieh & Chang, 2021). Two-echelon supply modes—regular and expedited—can be preplanned to provide flexibility (Arts & Kiesmüller, 2013).

Financial measures include liquidity arrangements, two-stage financing for recovery, and contractual financing that aligns incentives for quick recovery after demand or supply shocks (Zhao et al., 2022). Financing interacts with operational decisions: capital constraints may prevent the immediate exercise of expediting options or the ramp-up of domestic production capacity.

2. How reshoring changes the feasible mitigation set

Reshoring production alters the feasibility and effectiveness of many mitigation strategies. Moving semiconductor production onshore enhances direct managerial control, reduces geopolitical exposure, and simplifies some logistics. But reshoring also changes costs, lead times from upstream suppliers (many semiconductor materials and equipment have global footprints), and the pool of available local suppliers for contingency sourcing.

Advantages that improve mitigation effectiveness:

● Improved bargaining leverage and coordination with local suppliers due to proximity and potential for repeated interactions, which mitigates first-time bargaining inefficiencies described by Gurnani and Shi (2006). When buyers and suppliers can develop repeated relationships, asymmetric beliefs about reliability decline, enabling more efficient contracting (Gurnani & Shi, 2006).

● Enhanced possibility of lateral transshipments across proximate domestic facilities. Domestic networks often allow faster lateral movement of goods between plants or distribution centers than international transfers, increasing the value of lateral transshipment policies for balancing demand across sites (van Wijk et al., 2019).

● Greater scope for two-stage financing and coordinated public-private recovery packages. Governments often offer incentives and financing to support reshoring; such financial instruments can be integrated into two-stage financing strategies that facilitate recovery from demand or supply shocks (Zhao et al., 2022).

Disadvantages and constraints introduced by reshoring:

● Higher operating costs and capital intensity domestically, which may strain the cost-effectiveness of aggressive inventory or expediting policies. Semiconductors are capital and knowledge intensive; domestic production often necessitates considerable initial investment that may limit the firm's ability to maintain large safety stocks or pay expediting premiums in perpetuity (Khan, 2020; Lulla, 2025).

● Residual upstream dependency. Even if final assembly or test is reshored, many upstream materials and equipment remain globally sourced. This can create partial resilience where some links remain vulnerable to overseas disruptions, complicating the design of contingent sourcing policies (Khan, 2020; Hsieh & Chang, 2021).

● Setup-time and capability constraints for recycled-material or substitute sourcing options when domestic suppliers lack the required specialization (Hsieh & Chang, 2021).

3. Interaction effects among operational, contractual, and financial instruments

The synthesis reveals pronounced interaction effects: the marginal value of a mitigation instrument depends on what other instruments are in place.

Multi-sourcing and information sharing. Wu et al. (2019) show that when buyers compete for limited supply, sharing information about demand or sourcing priorities can either stabilize supply allocation or invite aggressive behavior by suppliers who exploit shared knowledge. In a reshoring context, where a domestic buyer may have more direct influence over domestic suppliers but still competes at the global level for certain inputs, these trade-offs become nuanced. If a firm reshoring critical test or assembly capacity also invests in supply agreements that involve information sharing (e.g., forecast sharing), it must structure the sharing to preserve bargaining leverage—perhaps through staged disclosures, confidentiality layers, or binding price-protection clauses (Wu et al., 2019; Gurnani & Shi, 2006).

Expediting, demand classes, and dynamic pricing. The presence of multiple demand classes—some patient, some impatient—means expediting policies should be selective. Shen et al. (2019) and Cao et al. (2015) together suggest a combined operational-contractual-pricing approach: firms can use dynamic pricing to segment demand (charging higher prices to impatient customers) and then allocate expedited capacity preferentially to high-value classes. This coupling reduces the direct welfare loss from prioritization and helps finance expediting through customer-paid premiums (Cao et al., 2015; Shen et al., 2019).

Two-stage financing and contingency activation. Zhao et al. (2022) show that two-stage financing enables capital-constrained chains to respond to demand recoveries or shocks. When reshoring imposes large capital commitments, pairing reshoring investment with contingency finance—such as government-backed recovery credit lines activated upon verified disruptions—enhances the value of onshore capacity by ensuring liquidity for rapid ramp-up and expediting. Conversely, absent such financial mechanisms, firms may be unable to implement costly reactive mitigation options even though onshore capacity exists (Zhao et al., 2022; Lulla, 2025).

Lateral transshipment and stochastic review. The effectiveness of lateral transshipment policies (van Wijk et al., 2019) is heightened when inventory review intervals are frequent and coordinated (Karimi-Nasab & Konstantaras, 2013). In domestic networks with shorter transit times, more frequent reviews and tightly coordinated lateral actions can be operationally practical, making reshoring attractive in terms of operational responsiveness. However, when review intervals are stochastic and long, the window for beneficial lateral moves narrows and the advantage of reshoring is diminished (Karimi-Nasab & Konstantaras, 2013; van Wijk et al., 2019).

4. Contract design under asymmetric beliefs and reshoring

Gurnani and Shi (2006) highlight how one-shot bargaining under asymmetric beliefs about supply reliability can yield inefficient outcomes—either overly conservative commitments or excessive holdouts. Reshoring changes the signaling environment: proximity and repeated interactions can reduce uncertainty about supplier reliability, thereby allowing more efficient contracting. However, if reshoring involves newly established domestic suppliers with unproven track records, initial bargaining remains subject to asymmetric beliefs. Thus, transitional contract forms such as trial-quantity contract phases, performance bonds, or graduated pricing can help bridge the initial uncertainty until reputational mechanisms develop (Gurnani & Shi, 2006).

Information-sharing arrangements that accompany reshoring should also be designed to mitigate opportunism. While forecast sharing can improve capacity planning, it may expose buyers to supplier opportunism if the supplier gains information to price discriminate or ration capacity. Contracts that tie payments to verified performance metrics, combined with flexible options for both parties, can help realize the coordination benefits of information sharing without unduly sacrificing bargaining leverage (Wu et al., 2019).

5. Resilience metrics and reshoring ROI: qualitative comparative statics

Standard resilience metrics include time-to-recovery, service-level persistence during shocks, and total cost-of-supply including mitigation expenses. Using comparative statics informed by the literature, the paper identifies when reshoring is likely to improve these metrics:

● Time-to-recovery improves with reshoring when the onshore capacity constitutes a non-trivial fraction of demand and when expediting and lateral transshipment options can be executed domestically—this is because domestic logistics and governance reduce coordination delays (van Wijk et al., 2019; Paul et al., 2018).

● Service-level persistence is enhanced when multi-sourcing incorporates both domestic and foreign suppliers, and when dynamic pricing or demand segmentation is used to align customer willingness to pay with supply prioritization (Wu et al., 2019; Cao et al., 2015).

● Total cost-of-supply may increase due to higher domestic costs; reshoring returns positive net benefits only when the value of reduced disruption risk (including political risk, embargo likelihood, and transport delays) is larger than the incremental cost-premium. The literature suggests that this break-even calculation depends on the frequency and severity of disruptions, the availability of financial recovery mechanisms, and the firm's ability to use operational levers like lateral transshipment effectively (Zhao et al., 2022; Lulla, 2025).

6. Managerial propositions

Based on the integrated analysis, the following propositions are advanced:

Proposition 1. Reshoring increases resilience most when the domestic network enables short lead-times for lateral transshipments and frequent inventory reviews; these operational capabilities magnify the value of onshore capacity. (Karimi-Nasab & Konstantaras, 2013; van Wijk et al., 2019)

Proposition 2. The marginal benefit of multi-sourcing is higher when information-sharing mechanisms are carefully crafted to preserve bargaining leverage; unconditional information sharing can erode negotiating positions under competition for scarce upstream inputs. (Wu et al., 2019; Gurnani & Shi, 2006)

Proposition 3. Dynamic pricing that distinguishes patient and impatient customer classes funds costly expediting and improves allocation efficiency during supply shortfalls. (Cao et al., 2015; Shen et al., 2019)

Proposition 4. Contingent sourcing using recycled materials becomes a more attractive mitigation when setup-time uncertainty is low and domestic suppliers possess the requisite capabilities; otherwise, the substitution value is limited. (Hsieh & Chang, 2021)

Proposition 5. Two-stage financing arrangements that activate recovery capital upon verified disruptions increase the operational effectiveness of reshored capacity by alleviating capital constraints that might otherwise inhibit expediting and rapid capacity expansion. (Zhao et al., 2022; Lulla, 2025)

Proposition 6. First-time supplier relationships formed through reshoring require transitional contractual designs—trial phases, warranties, and ramped commitments—to mitigate inefficiencies from asymmetric reliability beliefs. (Gurnani & Shi, 2006)

Each proposition is grounded in theoretical mechanisms identified in the cited literature and collectively offers a roadmap for managers deciding whether and how to reshore.

Discussion

The integrated framework suggests nuanced trade-offs and exposes several tensions that require deliberate managerial and policy attention. This section unpacks those tensions, explores counter-arguments, and discusses limitations of the synthesized literature when applied to semiconductor reshoring.

Trade-off between strategic control and operational cost. The core tension in reshoring is between enhanced strategic control and increased operating costs. Reshoring often improves visibility, reduces some geopolitical risk, and shortens domestic logistic paths; these benefits materially improve the feasibility and effectiveness of mitigation instruments like lateral transshipment, expediting, and two-stage financing activation (van Wijk et al., 2019; Zhao et al., 2022). Yet semiconductors are capital- and knowledge-intensive—onshoring test and back-end operations requires substantial investment, and specialized upstream inputs may remain offshore, limiting full insulation (Khan, 2020; Lulla, 2025). Therefore, reshoring should be viewed not as complete decoupling but as strategic partial reshoring focused on the highest-value nodes where control matters most.

Counter-arguments and nuanced analysis. One argument against reshoring is that it may create a false sense of security: onshore production does not eliminate upstream dependencies on specialized equipment or chemicals, which can remain globally concentrated (Khan, 2020). The literature supports this caution: contingent sourcing strategies that rely on recycled materials or domestic substitutes work only if setup-time uncertainty and quality risks are manageable (Hsieh & Chang, 2021). Another counterpoint is that reshoring can create domestic bottlenecks if many firms simultaneously onshore similar processes, leading to local scarcity and potential supplier opportunism. Wu et al. (2019) caution that competition remains a central constraint: information sharing among buyers in such an environment can be fragile and may invite supplier strategies that exploit the shared information.

Importance of contractual innovations. The interaction between bargaining under asymmetric beliefs and reshoring suggests that contract design is central. Early supplier-buyer engagements during reshoring will likely be shakier than long-established relationships; bridging devices such as staged commitments, performance-linked pricing, and trial batches can reduce the inefficiencies of first-time bargaining (Gurnani & Shi, 2006). Furthermore, contract clauses that detail trigger conditions for two-stage financing or government-backed recovery resources enhance predictability and reduce renegotiation risk (Zhao et al., 2022).

Role of information sharing. Information sharing is a classic coordination tool, but in competitive settings it can have perverse effects. Wu et al. (2019) demonstrate that sharing can reduce individual buyer surplus when suppliers use the information to ration or price-discriminate. Therefore, information-sharing architectures accompanying reshoring should be asymmetric and contractually bounded: shared data should be aggregate or delayed, or accompanied by enforceable non-use clauses to prevent opportunistic exploitation.

Financial mechanisms and public policy. Public financing can tilt the reshoring calculus. Zhao et al. (2022) argue that two-stage financing is especially valuable for capital-constrained chains recovering from demand shocks. For semiconductors, government-backed financing, loan guarantees, or recovery funds can reduce the private capital burden for reshoring and ensure that recovery mechanisms (expediting, capacity expansion) are not foreclosed by liquidity shortages (Lulla, 2025; Khan, 2021). However, policy design must avoid perverse incentives—subsidies should be contingent on resilience-enhancing behaviors (e.g., maintaining certain domestic spare capacity or adhering to coordinated information-sharing standards) to prevent underinvestment in operational readiness.

Limitations of existing models when applied to semiconductor ecosystems

Modeling assumption heterogeneity. The synthesized literature comprises models with diverse assumptions about demand processes, supplier behavior, and information structure. When layered into a unified framework, these heterogeneities lead to ambiguous comparative statics in some regions of the parameter space. For instance, the benefit of multi-sourcing depends critically on the correlation structure of supplier failures—a nuance not uniformly addressed in the references (Wu et al., 2019; Paul et al., 2018).

Scope limitations: testing and equipment complexity. Many inventory and sourcing models assume substitutability of inputs or modular supply.

Semiconductors, however, rely on specialized capital equipment and materials whose substitution costs can be high. Contingent sourcing with recycled materials is theoretically appealing but practically constrained by material compatibility and setup complexity (Hsieh & Chang, 2021). Thus, the direct transfer of general inventory results to semiconductor reshoring requires careful domain-specific calibration.

Time dimension and dynamic learning. Models such as Gurnani and Shi (2006) assume static or one-shot bargaining; but reshoring spans long horizons where learning, reputation formation, and capability development matter. The transition path—how relationships evolve from first-time to mature engagements—affects contract design and mitigation efficacy. A dynamic modeling layer integrating reputation development would enrich understanding but is beyond the current synthesis.

Behavioral and market-level effects. The literature tends to be firm-centric and does not fully model systemic market dynamics such as capacity crowding when multiple firms reshore simultaneously. Equilibrium effects, including local supplier scarcity and price inflation for domestic inputs, might undermine individual reshoring benefits. Integrating general equilibrium or market-clearing perspectives is a valuable future direction.

Future research agenda

Empirical validation and parameterization. The next step is empirical work that parameterizes the integrated framework using semiconductor supply-chain data—lead times, supplier failure correlations, cost premiums for reshoring, and financing terms. This calibration would enable quantitative evaluation of break-even conditions and policy impact.

Dynamic, multi-period models with reputation and capability learning. Extending bargaining models to dynamic contexts where reputation evolves would clarify transitional contract design and the time it takes for reshoring benefits to accrue. Such models would incorporate learning curves for domestic suppliers, capability investments, and contract renegotiation dynamics.

Market-level equilibrium models. Research should examine system-wide implications of industry-wide reshoring efforts, including local supplier markets, wage effects, and the potential for capacity crowding. Agent-based or game-theoretic models at the industry level could capture these emergent behaviors.

Simulation studies combining operational and financial modules. Monte Carlo simulation frameworks combining inventory, sourcing, expediting, and financing modules can quantify resilience metrics under alternate reshoring scenarios and disruption regimes. Such simulations would guide managers in designing resilient portfolios under uncertainty.

Case-based studies in semiconductor subsegments. Subsector-specific studies—e.g., logic chip foundry services, memory, test and packaging—would elucidate where reshoring yields the highest marginal resilience per dollar invested, reflecting the diversity within semiconductors (Khan, 2020; Lulla, 2025).

Conclusion

Reshoring high-technology manufacturing, particularly semiconductor test and assembly activities, presents both strategic opportunities and operational challenges. This article synthesizes a diverse body of theoretical literature to produce an integrated framework linking sourcing architecture, operational policies, contract design, and financing strategies. The synthesis reveals that reshoring amplifies the value of certain mitigation instruments—lateral transshipment, frequent inventory reviews, and two-stage financing—while simultaneously imposing constraints through higher costs and residual upstream dependencies. Key managerial insights include the need to design information-sharing protocols that preserve bargaining leverage, the value of dynamic pricing to fund expediting, and the critical importance of transitional contracts when forming initial onshore supplier relationships.

The theoretical propositions advanced herein should serve as a foundation for focused empirical research and for the design of policy instruments that support resilient reshoring. Governments considering incentives should align them with resilience-enhancing operational practices, and firms must pair strategic investments with contractual and financial instruments that ensure agility during disruptions. Ultimately, reshoring can be a powerful component of a broader resilience strategy—but only when integrated with operational, contractual, and financial levers that acknowledge the complex realities of semiconductor ecosystems.

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