



Innovation Diffusion under Geopolitical Uncertainty: Toward a Theory of Strategic Industrial Competitiveness

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Abstract

Growing geopolitical fragmentation has fundamentally reshaped the global innovation landscape by disrupting cross-border knowledge flows, technological collaboration, and industrial ecosystems. While existing studies have documented the effects of geopolitical uncertainty on corporate innovation and strategic decision-making, current theoretical perspectives remain fragmented in explaining how innovation diffusion can be strategically reconfigured to sustain industrial competitiveness under persistent geopolitical disruption. This conceptual paper addresses this theoretical gap by developing a middle-range framework that integrates innovation diffusion theory, dynamic capabilities, absorptive capacity, innovation ecosystems, and geopolitical risk into a unified explanatory model. Through critical theory synthesis and conceptual integration, the paper proposes the Theory of Strategic Industrial Competitiveness, which conceptualizes innovation diffusion as a strategic organizational capability rather than a passive dissemination process. The proposed framework explains how geopolitical uncertainty stimulates strategic adaptation, strengthens innovation diffusion capability, enhances industrial resilience, and ultimately generates sustainable industrial competitiveness. By repositioning innovation diffusion as a mechanism of strategic capability development, this study extends existing innovation and strategic management theories while providing a theoretical foundation for future empirical research on industrial transformation, technological resilience, and innovation governance in an increasingly fragmented global economy.

Keywords

geopolitical uncertainty; innovation diffusion capability;
strategic industrial competitiveness; dynamic capabilities;
industrial resilience; innovation ecosystems

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1. Introduction

The contemporary global economy is experiencing an unprecedented period of geopolitical fragmentation, characterized by escalating trade tensions, technological decoupling, economic sanctions, regional conflicts, and the restructuring of global value chains. These developments have fundamentally altered the environment in which firms innovate, collaborate, and compete. Unlike previous periods of globalization that facilitated cross-border knowledge exchange and technological diffusion, the emerging geopolitical landscape introduces persistent uncertainty that reshapes industrial strategies and innovation trajectories. Consequently, firms are increasingly compelled to reconsider not only where innovation occurs but also how innovation is generated, transferred, adopted, and transformed into long-term competitive advantage (Baker *et al.*, 2016; Caldara & Iacoviello, 2022; Vanino *et al.*, 2026).

Recent studies demonstrate that geopolitical uncertainty extends beyond macroeconomic instability by directly influencing firms' innovation activities. Growing geopolitical risks reduce investment predictability, increase financing constraints, alter collaborative networks, and encourage firms to reorganize innovation ecosystems to reduce strategic dependence on vulnerable international partners (Jia *et al.*, 2022; Wang & Wang, 2024; Huang *et al.*, 2025). Simultaneously, governments around the world have responded through renewed industrial policies emphasizing technological sovereignty, resilient supply chains, domestic innovation capabilities, and strategic industries, signaling a shift from efficiency-oriented globalization toward resilience-oriented industrial development (Juhász *et al.*, 2024; Grossman *et al.*, 2023). These structural transformations indicate that geopolitical uncertainty has become a defining condition of contemporary industrial competition rather than a temporary external shock.

Despite these profound changes, existing innovation literature has largely examined innovation diffusion under relatively stable institutional and economic environments. Classical diffusion research primarily explains how innovations spread through social systems, communication channels, organizational learning, and adoption decisions (Bass, 1969; Attewell, 1992; Greenhalgh *et al.*, 2004). Subsequent studies expanded these perspectives by incorporating network structures, institutional pressures, knowledge spillovers, and open innovation ecosystems to explain heterogeneous diffusion outcomes across organizations and industries (Abrahamson, 1991; Powell *et al.*, 1996; Chesbrough & Crowther, 2006; West & Bogers, 2014). Collectively, these studies have significantly advanced understanding of innovation adoption and dissemination but generally assume relatively stable institutional arrangements that facilitate knowledge mobility across organizational and national boundaries.

This limitation becomes more apparent when viewed from the perspective of technological paradigms. Technological change does not simply involve the diffusion of isolated innovations but also reflects shifts in technological trajectories that shape firms' search processes, learning patterns, and industrial evolution. Under geopolitical fragmentation, these trajectories become increasingly constrained by political and institutional boundaries, suggesting that the direction of technological development is no longer governed solely by market forces or technological opportunities (Dosi, 1982).

Strategic management research has similarly contributed important explanations regarding firms' ability to sustain competitive advantage through resources, capabilities, organizational learning, and ecosystem positioning. The resource-based view emphasizes valuable and inimitable resources as the foundation of sustained competitiveness (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984), while dynamic capability theory highlights firms' capacity to sense environmental changes, seize emerging opportunities, and reconfigure organizational resources under changing conditions (Teece *et al.*, 1997; Teece, 2007). Complementary

perspectives on absorptive capacity further explain how firms acquire, assimilate, transform, and exploit external knowledge to enhance innovation performance (Cohen & Levinthal, 1990; Zahra & George, 2002). More recently, ecosystem perspectives have illustrated that innovation increasingly emerges through interdependent networks of organizations rather than isolated firms (Adner & Kapoor, 2010; Jacobides *et al.*, 2018).

The strategic challenge is further intensified because firms must continuously balance exploration and exploitation. While exploration encourages experimentation with emerging technologies and alternative innovation networks, exploitation emphasizes the refinement of existing technological capabilities and organizational routines. Persistent geopolitical uncertainty complicates this balance by simultaneously increasing the need for experimentation while raising the costs and risks associated with long-term innovation investments (March, 1991).

Although these theoretical perspectives offer valuable insights, they remain insufficient for explaining how geopolitical uncertainty fundamentally transforms the diffusion process itself into a strategic mechanism for industrial competitiveness. Existing diffusion theories primarily conceptualize uncertainty as a contextual condition influencing adoption rates, whereas strategic management theories typically regard uncertainty as a trigger for capability reconfiguration. Neither perspective adequately explains how geopolitical fragmentation systematically reshapes cross-border knowledge flows, innovation networks, industrial ecosystems, and capability accumulation in ways that redefine competitive advantage at the industrial level. Consequently, the current literature provides only fragmented explanations of the strategic interactions among geopolitical uncertainty, innovation diffusion, and industrial competitiveness.

The emerging empirical evidence further reinforces this theoretical limitation. Recent studies consistently report that geopolitical risk influences corporate innovation behavior, research collaboration, technology investment, and industrial restructuring (Cui *et al.*, 2025; Huang *et al.*, 2025; Vanino *et al.*, 2026). However, these investigations predominantly examine direct relationships between geopolitical risk and innovation outcomes, emphasizing either innovation intensity or investment decisions. Comparatively little attention has been devoted to understanding the underlying strategic mechanisms through which firms intentionally redesign innovation diffusion processes in response to geopolitical uncertainty. More importantly, existing research rarely conceptualizes innovation diffusion as a dynamic strategic capability capable of generating sustainable industrial competitiveness under conditions of prolonged geopolitical fragmentation.

This conceptual gap becomes increasingly significant because contemporary industrial competition is no longer determined solely by firms' ability to create innovations but also by their capacity to strategically redirect, protect, absorb, and diffuse technological knowledge across evolving industrial ecosystems. Under geopolitical uncertainty, firms increasingly engage in selective collaboration, regionalized innovation networks, supply chain diversification, technological localization, and ecosystem reconfiguration to maintain strategic competitiveness. These adaptive responses suggest that innovation diffusion itself has evolved from a passive dissemination process into an active strategic capability through which firms restructure industrial relationships and preserve long-term competitive positions. Existing theories, however, have yet to provide an integrated explanation of this transformation.

Accordingly, this paper argues that geopolitical uncertainty should not merely be viewed as an external environmental constraint but as a strategic condition that fundamentally reshapes the mechanisms through which innovation diffuses across firms, industries, and national innovation systems. Building upon insights from innovation diffusion theory, dynamic capabilities, absorptive capacity, innovation ecosystem theory, and industrial competitiveness research, this paper develops a conceptual framework that explains how

firms strategically reconfigure innovation diffusion under geopolitical uncertainty to strengthen industrial competitiveness. Rather than extending existing diffusion theory incrementally, the proposed framework seeks to integrate previously disconnected theoretical perspectives into a coherent explanatory mechanism that captures the strategic nature of innovation diffusion in an increasingly fragmented global economy.

The primary contribution of this paper is therefore theoretical. First, it extends innovation diffusion theory by repositioning diffusion as a strategic organizational capability rather than merely an adoption process. Second, it integrates geopolitical uncertainty into the strategic management literature as an endogenous driver of innovation ecosystem reconfiguration instead of treating it solely as an external environmental contingency. Third, it proposes the concept of Strategic Industrial Competitiveness, which explains how firms accumulate competitive advantage through the strategic orchestration of innovation diffusion under conditions of persistent geopolitical uncertainty. By integrating perspectives from innovation management, strategic management, industrial policy, and organizational theory, the proposed framework offers a middle-range theoretical explanation that bridges firm-level adaptive behavior with broader industrial competitiveness.

Ultimately, this paper seeks to answer the following overarching research question: How does geopolitical uncertainty strategically reshape innovation diffusion processes to generate sustained industrial competitiveness? Addressing this question contributes to the growing discourse on innovation and strategic management by offering a new theoretical perspective capable of explaining industrial competitiveness in an era characterized by geopolitical fragmentation, technological rivalry, and the reconfiguration of global innovation systems.

2. Theoretical Foundations and Conceptual Gap

2.1 Classical Innovation Diffusion Theory

Innovation diffusion theory has long served as one of the dominant perspectives for explaining how new technologies, products, and practices spread across individuals, organizations, and industries. Early diffusion research primarily conceptualized innovation adoption as a process influenced by communication channels, information dissemination, and social interaction, in which adoption follows a predictable pattern over time (Bass, 1969). Subsequent organizational studies extended this perspective by emphasizing the importance of learning processes, organizational readiness, and technological characteristics in determining innovation adoption decisions (Attewell, 1992; Tornatzky & Klein, 1982). Classical diffusion processes are also influenced by increasing returns and technological lock-in. As technologies become widely adopted, positive feedback mechanisms reinforce dominant technological standards, making alternative innovations progressively more difficult to diffuse. Consequently, diffusion is shaped not only by innovation quality but also by path-dependent adoption dynamics that influence long-term industrial evolution (Arthur, 1989).

Later developments shifted attention from individual adoption to organizational and interorganizational diffusion processes. Innovation was increasingly viewed as a socially embedded phenomenon shaped by institutional environments, managerial legitimacy, collaborative networks, and knowledge exchanges (Abrahamson, 1991; DiMaggio & Powell, 1983; Powell *et al.*, 1996). Greenhalgh *et al.* (2004) further demonstrated that innovation diffusion in complex organizations depends on interactions among organizational capabilities, external environments, and implementation processes rather than solely on technological superiority.

More recent perspectives recognize that innovation diffusion extends beyond linear knowledge transfer toward interactive knowledge creation within innovation ecosystems. Open innovation encourages firms to combine internal and external knowledge sources to accelerate innovation, while ecosystem perspectives emphasize value co-creation among multiple actors rather than isolated organizational innovation (Chesbrough & Crowther, 2006; West & Bogers, 2014; Adner & Kapoor, 2010).

Despite these important advances, classical innovation diffusion theory implicitly assumes relatively stable institutional environments where cross-border knowledge exchange remains accessible and collaboration networks function with minimal geopolitical constraints. Consequently, existing diffusion models provide limited explanations regarding how innovation diffusion evolves when international collaboration becomes politically constrained, technological exchange is strategically restricted, and firms intentionally redesign knowledge flows to enhance industrial competitiveness under geopolitical uncertainty.

2.2 Strategic Perspectives on Innovation

Strategic management literature offers complementary explanations regarding firms' ability to sustain innovation under changing environments. The resource-based view argues that firms achieve sustained competitive advantage through valuable, rare, inimitable, and non-substitutable resources (Wernerfelt, 1984; Barney, 1991; Peteraf, 1993). However, as competitive environments become increasingly volatile, static resource endowments alone are insufficient to explain long-term competitiveness.

Dynamic capability theory addresses this limitation by emphasizing firms' abilities to sense environmental changes, seize emerging opportunities, and continuously reconfigure organizational resources to adapt to external disruptions (Teece *et al.*, 1997; Teece, 2007). Under this perspective, competitive advantage derives not only from possessing superior resources but also from continuously transforming organizational capabilities in response to environmental change.

The absorptive capacity literature complements this view by explaining how firms identify, assimilate, transform, and exploit external knowledge to strengthen innovation performance (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998; Zahra & George, 2002). Firms possessing greater absorptive capacity are better positioned to integrate external technologies into internal innovation processes, thereby strengthening adaptive capabilities under uncertain environments. Knowledge-based perspectives further suggest that firms exist because they provide superior mechanisms for creating, integrating, and transferring knowledge relative to market transactions. From this viewpoint, organizational competitiveness increasingly depends on how effectively firms coordinate specialized knowledge across organizational boundaries, an issue that becomes substantially more complex under geopolitical uncertainty (Kogut & Zander, 1992).

Meanwhile, ecosystem perspectives further extend strategic thinking by emphasizing that innovation increasingly emerges through interconnected networks involving suppliers, research institutions, governments, and complementary firms (Jacobides *et al.*, 2018). Rather than competing individually, firms increasingly compete through ecosystems whose effectiveness depends upon collaboration, complementarities, and coordinated capability development (Adner & Kapoor, 2010). The open innovation literature further demonstrates that firms benefit from combining diverse external knowledge sources rather than relying exclusively on internal research capabilities. Nevertheless, the breadth and depth of external search strategies become increasingly constrained when geopolitical tensions restrict international collaboration, thereby requiring firms to strategically redesign external knowledge sourcing practices (Laursen & Salter, 2006).

Nevertheless, these strategic perspectives primarily explain how firms adapt to uncertainty without explicitly addressing how geopolitical uncertainty fundamentally restructures

innovation diffusion across industrial ecosystems. Dynamic capabilities describe organizational adaptation, while absorptive capacity explains knowledge utilization. Yet neither perspective sufficiently explains why geopolitical fragmentation transforms innovation diffusion itself into a strategic capability that shapes industrial competitiveness beyond individual firm performance.

2.3 Geopolitical Uncertainty and Industrial Transformation

The growing importance of geopolitical uncertainty has stimulated extensive research examining its consequences for investment, innovation, and industrial development. Economic policy uncertainty literature demonstrates that uncertainty discourages investment, delays strategic decision-making, and increases firms' risk aversion (Bloom, 2009; Baker *et al.*, 2016; Gulen & Ion, 2016). Political uncertainty similarly affects firms' long-term investment strategies and innovation activities by increasing environmental unpredictability (Julio & Yook, 2012).

Building upon this foundation, geopolitical risk research conceptualizes geopolitical uncertainty as arising from international conflicts, geopolitical tensions, trade disputes, sanctions, and strategic competition among nations (Caldara & Iacoviello, 2022). Unlike conventional policy uncertainty, geopolitical uncertainty directly influences technological collaboration, knowledge mobility, industrial policies, and global production networks.

Recent empirical evidence consistently demonstrates that geopolitical uncertainty affects firms' innovation behavior. Firms exposed to higher geopolitical risks frequently adjust R&D investment, diversify innovation partnerships, localize technological capabilities, and restructure innovation activities to reduce strategic vulnerability (Jia *et al.*, 2022; Wang & Wang, 2024; Huang *et al.*, 2025; Cui *et al.*, 2025). At the macro level, geopolitical fragmentation has encouraged governments to strengthen industrial policy, promote technological sovereignty, and build resilient domestic innovation systems capable of reducing dependence on foreign technologies (Juhász *et al.*, 2024).

Simultaneously, disruptions to global supply chains have accelerated industrial transformation. Research on supply-chain resilience suggests that firms increasingly prioritize flexibility, redundancy, and network viability over efficiency, fundamentally altering industrial organization and knowledge exchange patterns (Ivanov, 2020; Ivanov & Dolgui, 2020; Grossman *et al.*, 2023). These developments indicate that geopolitical uncertainty is reshaping not only production systems but also the mechanisms through which innovation circulates within industrial ecosystems.

However, most existing studies remain predominantly empirical and focus on direct relationships between geopolitical uncertainty and innovation outputs, investment, or firm performance. Limited theoretical attention has been devoted to explaining how geopolitical uncertainty transforms innovation diffusion into a strategic mechanism through which industries accumulate sustainable competitive advantage. As a result, the broader theoretical implications for industrial competitiveness remain insufficiently developed.

2.4 Theoretical Gap

The preceding discussion reveals an important conceptual discontinuity across the existing literature. Innovation diffusion theory primarily explains how innovations spread across organizations under relatively stable institutional conditions. Strategic management theories explain how firms develop adaptive capabilities in response to environmental change. Meanwhile, geopolitical risk research documents the disruptive consequences of geopolitical uncertainty for innovation activities and industrial transformation. Despite their individual strengths, these perspectives remain theoretically disconnected.

Specifically, existing diffusion theories emphasize the movement of knowledge but pay limited attention to the strategic reconfiguration of diffusion processes under geopolitical fragmentation. Strategic management theories explain organizational adaptation but do not explicitly conceptualize innovation diffusion as a strategic capability that can generate industrial competitiveness. Likewise, geopolitical uncertainty studies identify important empirical relationships but rarely provide an integrative theoretical mechanism linking geopolitical uncertainty, innovation diffusion, and long-term industrial competitiveness.

This conceptual fragmentation creates an important opportunity for theory building. Rather than treating geopolitical uncertainty solely as an external environmental shock, it can be reconceptualized as a strategic condition that reshapes how firms create, access, orchestrate, and diffuse innovation across industrial ecosystems. Under this perspective, innovation diffusion becomes an intentional strategic process through which firms redesign knowledge networks, strengthen industrial resilience, and accumulate competitive capabilities.

The preceding discussion demonstrates that existing theoretical perspectives remain analytically disconnected despite addressing related dimensions of innovation, strategic adaptation, and geopolitical uncertainty. The following conceptual synthesis visualizes the resulting research gap and the rationale for theoretical integration.

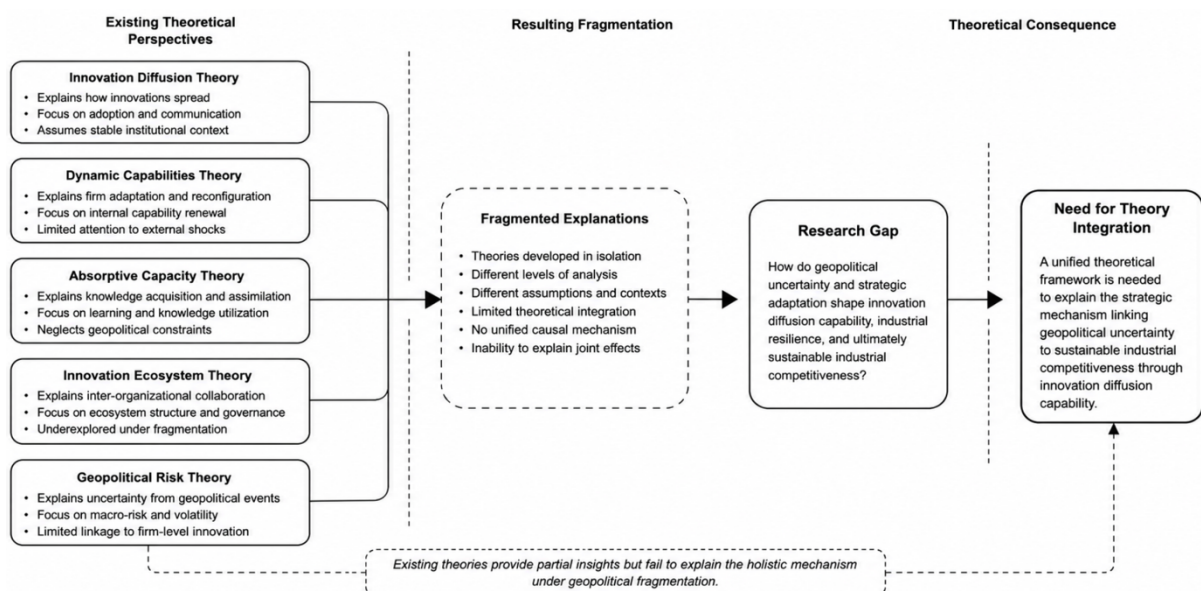


Figure 1. Fragmentation of Existing Theoretical Perspectives and the Emerging Research Gap

Source: Developed by the authors based on Bass (1969), Barney (1991), Cohen and Levinthal (1990), Teece et al. (1997), Adner and Kapoor (2010), Jacobides et al. (2018), and Caldara and Iacoviello (2022).

Figure 1 illustrates that existing theoretical perspectives provide valuable but isolated explanations of innovation diffusion, strategic adaptation, knowledge capability, innovation ecosystems, and geopolitical uncertainty. Their limited integration leaves unresolved the strategic mechanism linking geopolitical uncertainty to sustainable industrial competitiveness. This conceptual discontinuity establishes the theoretical justification for developing the proposed Theory of Strategic Industrial Competitiveness in the subsequent section.

Accordingly, this paper proposes moving beyond conventional innovation diffusion models toward a new theoretical perspective that explains how geopolitical uncertainty induces strategic adaptation, restructures innovation diffusion, and ultimately generates Strategic Industrial Competitiveness. This theoretical integration serves as the foundation for the conceptual framework developed in the following section.

A systematic comparison of existing theoretical perspectives further clarifies their complementary strengths while revealing persistent limitations that prevent a comprehensive explanation of innovation diffusion under geopolitical uncertainty.

Tabel 1. Comparison of Existing Theoretical Perspectives

Theory	Primary Focus	Major Strength	Key Limitation under Geopolitical Uncertainty
Innovation Diffusion Theory	Adoption and dissemination of innovation	Explains diffusion processes	Assumes relatively stable institutional environments
Resource-Based View	Internal strategic resources	Explains sources of competitive advantage	Limited attention to external geopolitical dynamics
Dynamic Capabilities	Organizational adaptation	Explains capability reconfiguration	Does not explain strategic diffusion mechanisms
Absorptive Capacity	Knowledge acquisition and utilization	Explains learning capability	Focuses on knowledge use rather than diffusion redesign
Innovation Ecosystem Theory	Collaborative innovation networks	Explains interdependence among actors	Limited explanation of ecosystem fragmentation under geopolitical tensions
Geopolitical Risk Literature	Effects of geopolitical uncertainty	Explains environmental disruption	Lacks an integrated theory linking uncertainty, diffusion, and industrial competitiveness

Source: Developed by the authors based on the reviewed literature.

Table 1 synthesizes the principal theoretical perspectives underpinning this study by comparing their primary focus, major strengths, and limitations under geopolitical uncertainty. Although each perspective contributes valuable insights, none independently explains how geopolitical uncertainty strategically reshapes innovation diffusion to generate sustainable industrial competitiveness. This comparison reinforces the need for the integrative theoretical framework proposed in this paper.

3. Toward a Theory of Strategic Industrial Competitiveness

3.1 Defining Strategic Industrial Competitiveness

The preceding discussion demonstrates that the existing literature has yet to provide an integrated explanation of how geopolitical uncertainty reshapes innovation diffusion into a strategic source of industrial competitiveness. To address this theoretical gap, this paper introduces the concept of Strategic Industrial Competitiveness (SIC), defined as the *capability of firms and industrial ecosystems to strategically orchestrate the creation, absorption, diffusion, and reconfiguration of innovation in response to geopolitical uncertainty, thereby generating sustainable competitive advantage at both firm and industry levels.*

Unlike conventional notions of competitiveness, which primarily emphasize productivity, technological superiority, or resource efficiency (Porter, 1991; Barney, 1991), Strategic Industrial Competitiveness highlights the dynamic capacity to sustain innovation under persistent geopolitical disruption. In this perspective, competitiveness is no longer determined solely by the ability to produce superior technologies but also by the ability to continuously reorganize innovation networks, redirect knowledge flows, and preserve technological capabilities despite increasing geopolitical fragmentation.

This perspective is consistent with the argument that competitive advantage increasingly depends on aligning innovation activities with coherent strategic objectives rather than

treating innovation as an isolated organizational function. Firms capable of integrating innovation strategy with long-term industrial positioning are more likely to sustain competitiveness in uncertain geopolitical environments (Pisano, 2015).

This conceptualization extends the resource-based view by recognizing that valuable resources increasingly reside within interorganizational innovation ecosystems rather than individual firms alone (Wernerfelt, 1984; Jacobides *et al.*, 2018). It also extends dynamic capability theory by proposing that firms must develop capabilities not only to sense and seize opportunities but also to strategically redesign innovation diffusion mechanisms under conditions of prolonged geopolitical uncertainty (Teece *et al.*, 1997; Teece, 2007).

Accordingly, Strategic Industrial Competitiveness should be viewed as an ecosystem-level strategic capability emerging from the interaction between organizational adaptation, knowledge mobility, industrial policy, and innovation ecosystem reconfiguration.

3.2 Core Constructs

The proposed theory consists of five interrelated constructs that collectively explain the emergence of Strategic Industrial Competitiveness.

The first construct, geopolitical uncertainty, represents persistent uncertainty arising from geopolitical conflicts, technological rivalry, trade restrictions, sanctions, and policy fragmentation that reshape firms' strategic environments (Caldara & Iacoviello, 2022; Baker *et al.*, 2016). Unlike temporary economic volatility, geopolitical uncertainty creates long-term structural pressures that influence strategic decision-making, technological collaboration, and industrial organization.

The second construct, strategic adaptation, refers to firms' deliberate efforts to reconfigure organizational resources, partnerships, investment priorities, and innovation strategies in response to changing geopolitical conditions. Consistent with dynamic capability theory, strategic adaptation reflects managerial actions that continuously align organizational capabilities with evolving external environments (Teece, 2007). Rather than passively responding to uncertainty, firms actively redesign their innovation strategies to maintain long-term competitiveness.

The third construct, innovation diffusion capability, constitutes the central theoretical contribution of this paper. Existing diffusion literature predominantly conceptualizes diffusion as the dissemination or adoption of innovation (Bass, 1969; Greenhalgh *et al.*, 2004). In contrast, this paper reconceptualizes innovation diffusion capability as a strategic organizational capability through which firms intentionally orchestrate knowledge acquisition, technological collaboration, ecosystem participation, and knowledge transfer to sustain innovation under geopolitical constraints. This capability encompasses not only the movement of knowledge but also its strategic redirection across evolving industrial networks.

The fourth construct, industrial resilience, captures the ability of industrial ecosystems to maintain innovation continuity despite geopolitical disruptions. Previous studies primarily associate resilience with supply-chain survivability and operational continuity (Ivanov & Dolgui, 2020; Grossman *et al.*, 2023). The proposed theory extends this perspective by positioning resilience as an innovation-oriented capability that enables industries to preserve knowledge creation, technological upgrading, and collaborative innovation despite external disruptions.

Strategic Industrial Competitiveness represents the outcome of the interaction among the preceding constructs. Competitive advantage is achieved not through isolated technological superiority but through continuous capability accumulation resulting from strategic innovation diffusion within resilient industrial ecosystems.

The proposed theory is built upon several interrelated constructs whose conceptual definitions establish the analytical foundation for explaining the sequential mechanism of strategic industrial competitiveness.

Tabel 2. Definitions of Core Constructs

Construct	Definition	Theoretical Foundation
Geopolitical Uncertainty	Persistent geopolitical instability affecting technological and industrial environments	Geopolitical Risk Theory
Strategic Adaptation	Organizational reconfiguration in response to environmental uncertainty	Dynamic Capabilities
Innovation Diffusion Capability	Strategic capability to orchestrate knowledge creation, transfer, absorption, and ecosystem coordination	Innovation Diffusion Theory; Absorptive Capacity
Industrial Resilience	Capability of industrial ecosystems to sustain innovation under disruption	Supply Chain Resilience; Innovation Ecosystems
Strategic Industrial Competitiveness	Sustainable competitive advantage generated through strategic innovation diffusion under geopolitical uncertainty	Proposed Theory

Source: Developed by the authors based on the integrated theoretical framework.

Table 2 defines the five core constructs comprising the proposed theory and identifies their respective theoretical foundations. Together, these constructs provide the conceptual building blocks for the subsequent causal mechanism, demonstrating how established theories are integrated into a coherent middle-range explanation of strategic industrial competitiveness under conditions of persistent geopolitical uncertainty.

3.3 Proposed Mechanism

The proposed theory argues that geopolitical uncertainty does not directly determine industrial competitiveness. Instead, its influence is transmitted through a sequence of strategic organizational responses that reshape innovation diffusion processes.

The causal mechanism begins with geopolitical uncertainty, which disrupts traditional patterns of technological collaboration and increases uncertainty surrounding cross-border knowledge exchange. Rather than merely reducing innovation activities, these disruptions encourage firms to strategically reassess their innovation architectures, collaborative networks, and technological dependencies (Jia *et al.*, 2022; Huang *et al.*, 2025).

These pressures stimulate strategic adaptation, whereby firms redesign their innovation portfolios, diversify technological alliances, regionalize research collaborations, and strengthen domestic innovation capabilities. Dynamic capability theory suggests that such adaptation enables firms to continuously align internal capabilities with changing external environments (Teece, 2007). However, adaptation alone is insufficient to sustain competitiveness unless accompanied by the effective orchestration of innovation diffusion. Strategic adaptation is further reinforced by competitive pressures arising from changes in international trade and technological competition. Previous studies demonstrate that exposure to intensified global competition can accelerate technological upgrading and organizational innovation, although such responses depend on firms' capability to reconfigure knowledge resources and production systems effectively (Bloom *et al.*, 2016).

Consequently, firms develop innovation diffusion capability, allowing them to redirect knowledge flows toward strategically valuable partners, selectively absorb external technologies, and reconfigure innovation ecosystems. This represents the central theoretical departure from classical diffusion theory. Innovation diffusion is no longer interpreted as an automatic dissemination process but as a deliberate strategic capability that coordinates knowledge mobility under geopolitical constraints.

As innovation diffusion capability strengthens, industrial ecosystems become increasingly resilient. Knowledge creation no longer depends exclusively on globalized innovation networks but emerges from diversified, regionally embedded, and strategically coordinated collaborations. This resilience enables industries to maintain technological upgrading despite external disruptions, preserving innovation continuity while reducing vulnerability to geopolitical fragmentation.

Ultimately, resilient innovation ecosystems facilitate the accumulation of Strategic Industrial Competitiveness. Competitive advantage emerges because firms continuously adapt innovation networks, coordinate ecosystem relationships, and sustain technological learning despite persistent geopolitical uncertainty. The proposed mechanism therefore explains competitiveness as an emergent property of strategically managed innovation diffusion rather than merely superior technological assets.

The proposed constructs collectively form a coherent explanatory mechanism rather than independent concepts. Their sequential relationships illustrate how geopolitical uncertainty initiates strategic capability development that ultimately generates sustainable industrial competitiveness.

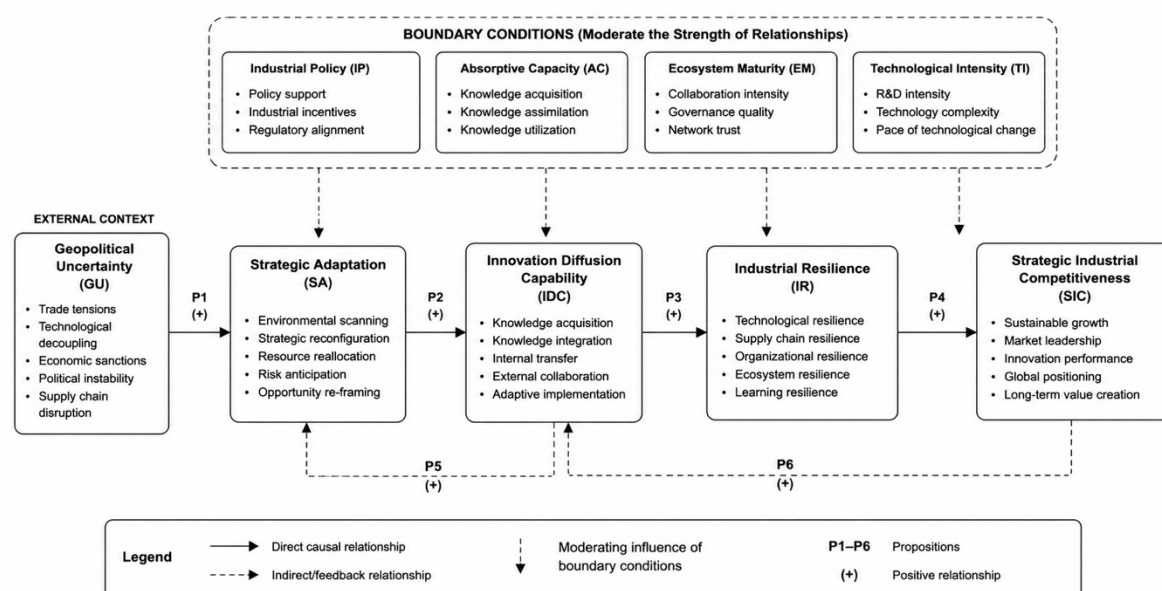


Figure 2. Proposed Theory of Strategic Industrial Competitiveness

Source: Developed by the authors.

Figure 2 presents the proposed Theory of Strategic Industrial Competitiveness as a sequential causal mechanism. Geopolitical uncertainty stimulates strategic adaptation, which strengthens innovation diffusion capability and subsequently enhances industrial resilience, ultimately generating sustainable industrial competitiveness. The framework also recognizes that the strength of these relationships depends on contextual boundary conditions, thereby defining the theory's scope and explanatory domain.

3.4 Boundary Conditions

The explanatory power of the proposed theory depends upon several contextual conditions that influence the strength of the proposed relationships.

First, industrial policy plays a critical enabling role. Governments promoting technological sovereignty, innovation investment, and domestic capability development provide institutional support that strengthens firms' strategic adaptation and innovation diffusion efforts (Juhász *et al.*, 2024; Rodrik, 2014).

Second, absorptive capacity determines firms' ability to recognize, assimilate, and exploit external knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002). Firms possessing stronger absorptive capacity are expected to develop more effective innovation diffusion capabilities under geopolitical uncertainty.

Third, ecosystem maturity influences firms' access to complementary resources and collaborative innovation opportunities. Mature innovation ecosystems provide greater redundancy, stronger knowledge networks, and enhanced capability coordination, thereby reinforcing industrial resilience (Jacobides *et al.*, 2018).

Finally, technological intensity conditions firms' dependence on global knowledge networks. High-technology industries characterized by intensive international collaboration are expected to experience stronger geopolitical effects than industries relying primarily on localized technological capabilities.

The proposed mechanism is expected to operate under specific organizational and industrial contexts. Several contextual conditions determine when the theoretical relationships become stronger, weaker, or more strategically influential.

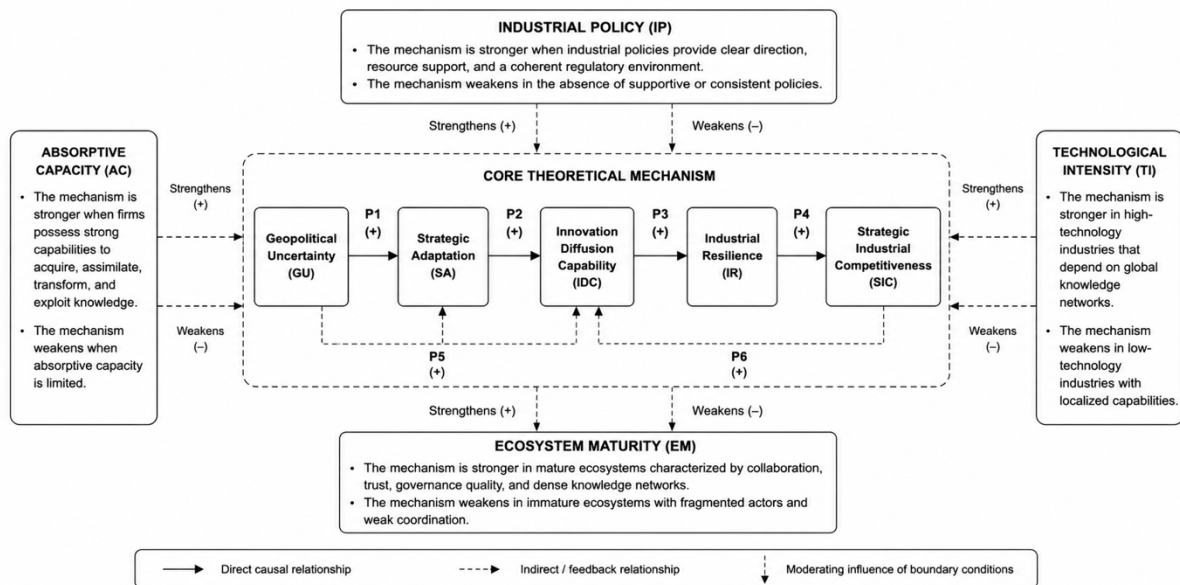


Figure 3. Boundary Conditions of the Theory of Strategic Industrial Competitiveness
Source: Developed by the authors.

Figure 3 illustrates the contextual boundaries of the proposed theory. Rather than acting as independent causal drivers, industrial policy, absorptive capacity, ecosystem maturity, and technological intensity define the conditions under which the proposed mechanism is expected to operate most effectively. These boundary conditions specify the theory's explanatory scope, strengthen its analytical precision, and clarify its applicability across different industrial and institutional contexts.

3.5 Proposition Development

Based on the proposed theoretical mechanism, six propositions are advanced.

Proposition 1 (P1).

Geopolitical uncertainty positively stimulates firms' strategic adaptation by increasing the need to reconfigure innovation strategies and organizational capabilities.

Proposition 2 (P2).

Strategic adaptation positively enhances firms' innovation diffusion capability through the strategic reconfiguration of knowledge networks and collaborative innovation arrangements.

Proposition 3 (P3).

Innovation diffusion capability positively strengthens industrial resilience by facilitating the continuity of knowledge creation, technological learning, and ecosystem coordination under geopolitical uncertainty.

Proposition 4 (P4).

Industrial resilience positively contributes to Strategic Industrial Competitiveness by enabling sustained innovation and capability accumulation despite geopolitical disruptions.

Proposition 5 (P5).

Industrial policy positively moderates the relationship between innovation diffusion capability and industrial resilience, such that the relationship becomes stronger under supportive policy environments.

Proposition 6 (P6).

Firms with higher absorptive capacity develop stronger innovation diffusion capabilities under geopolitical uncertainty than firms with lower absorptive capacity.

Collectively, these propositions form the foundation of the proposed Theory of Strategic Industrial Competitiveness. The theory explains that sustainable industrial competitiveness does not arise directly from innovation output or resource endowments alone. Instead, it emerges through a dynamic process in which geopolitical uncertainty induces strategic adaptation, enabling firms to cultivate innovation diffusion capability, strengthen industrial resilience, and ultimately build enduring competitive advantage within increasingly fragmented global innovation ecosystems.

4. Discussion

The proposed Theory of Strategic Industrial Competitiveness advances the innovation and strategic management literature by repositioning innovation diffusion from a passive dissemination process to an active strategic capability that enables firms and industrial ecosystems to remain competitive under persistent geopolitical uncertainty. Rather than viewing geopolitical uncertainty solely as an external constraint that suppresses innovation, this theory conceptualizes uncertainty as a strategic condition that stimulates capability reconfiguration, ecosystem transformation, and industrial upgrading. Consequently, the proposed framework contributes to a more dynamic understanding of how innovation systems evolve in an increasingly fragmented global economy.

4.1 Theoretical Contributions

The first theoretical contribution lies in extending classical innovation diffusion theory. Existing diffusion research has predominantly focused on explaining how innovations spread across individuals, organizations, and social systems through communication, learning, and adoption mechanisms (Bass, 1969; Attewell, 1992; Greenhalgh *et al.*, 2004). Although these perspectives explain the diffusion process effectively under relatively stable institutional environments, they provide limited insight into how firms intentionally redesign innovation diffusion when geopolitical fragmentation disrupts international knowledge flows.

The proposed theory addresses this limitation by introducing Innovation Diffusion Capability as a higher-order strategic capability. Unlike conventional diffusion, which primarily concerns the movement of innovation, innovation diffusion capability refers to firms' ability to deliberately orchestrate knowledge creation, absorption, collaboration, and technological exchange in response to geopolitical constraints. This reconceptualization shifts diffusion theory from explaining "how innovation spreads" toward explaining "how firms strategically govern innovation flows" to sustain competitiveness.

Second, this study extends dynamic capability theory. Dynamic capability literature emphasizes firms' capacities to sense environmental change, seize opportunities, and reconfigure organizational resources (Teece *et al.*, 1997; Teece, 2007). While these capabilities explain organizational adaptation, they do not explicitly identify the strategic mechanism through which innovation networks themselves become reconfigured under geopolitical disruption. The proposed framework fills this gap by identifying innovation diffusion capability as an intermediate capability that connects organizational adaptation with long-term industrial competitiveness.

Third, the proposed framework enriches absorptive capacity theory. Previous studies conceptualize absorptive capacity primarily as firms' ability to acquire and utilize external knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002). However, under conditions of geopolitical fragmentation, firms no longer simply absorb available knowledge. Instead, they actively determine which knowledge should be accessed, protected, localized, or redirected across evolving innovation ecosystems. Consequently, absorptive capacity becomes one enabling condition for strategic innovation diffusion rather than the final explanation of competitive advantage.

Fourth, this study contributes to the rapidly growing literature on geopolitical uncertainty. Existing empirical studies consistently demonstrate that geopolitical risk affects innovation investment, research collaboration, technological development, and firm performance (Jia *et al.*, 2022; Wang & Wang, 2024; Huang *et al.*, 2025; Cui *et al.*, 2025). Nevertheless, these studies generally investigate direct effects without offering an integrative theoretical explanation of the mechanisms connecting geopolitical uncertainty and industrial competitiveness. The proposed theory addresses this omission by specifying a sequential causal process in which geopolitical uncertainty stimulates strategic adaptation, strengthens innovation diffusion capability, enhances industrial resilience, and ultimately generates Strategic Industrial Competitiveness.

Finally, this paper contributes to the industrial competitiveness literature by proposing that competitiveness increasingly depends on ecosystem-level capability development rather than firm-level resource superiority alone. This perspective aligns with emerging research emphasizing innovation ecosystems, technological sovereignty, industrial resilience, and strategic industrial policy in shaping national and industrial competitiveness under global uncertainty (Jacobides *et al.*, 2018; Juhász *et al.*, 2024). By integrating these previously disconnected perspectives, the proposed theory offers a middle-range explanation linking firm behavior with broader industrial transformation.

4.2 Managerial Implications

The proposed theory offers several implications for managers operating in industries exposed to geopolitical uncertainty. Traditional innovation strategies often emphasize maximizing technological efficiency, expanding international collaboration, and exploiting globally distributed knowledge networks. However, increasing geopolitical fragmentation suggests that these assumptions may no longer be sufficient for sustaining competitive advantage.

Managers should therefore view innovation diffusion as a strategic capability requiring deliberate governance rather than an automatic consequence of innovation activities. This involves continuously evaluating technological dependencies, diversifying innovation partnerships, strengthening domestic research capabilities, and developing alternative knowledge networks capable of maintaining innovation continuity during geopolitical disruptions. Such strategic actions enhance firms' capacity to adapt while simultaneously reducing technological vulnerability.

The theory also highlights the importance of balancing openness and strategic protection. Open innovation remains an important source of knowledge creation and external knowledge

sourcing (Chesbrough & Crowther, 2006; Laursen & Salter, 2006; West & Bogers, 2014). Yet unrestricted openness may expose firms to geopolitical risks involving intellectual property, technological dependence, or supply-chain disruption. Managers therefore need to selectively manage collaborative relationships by identifying which technologies should remain globally connected and which should be localized within strategically secure ecosystems.

Furthermore, investment decisions should increasingly prioritize organizational capabilities that strengthen industrial resilience rather than merely maximizing short-term efficiency. Investments in absorptive capacity, digital collaboration platforms, diversified innovation ecosystems, and organizational learning enable firms to sustain innovation performance despite persistent geopolitical uncertainty.

4.3 Policy Implications

The proposed theory also carries important implications for policymakers responsible for industrial development and innovation policy. The resurgence of industrial policy across many economies reflects growing recognition that technological capability has become a strategic national asset rather than simply an economic resource (Rodrik, 2014; Juhász *et al.*, 2024). Under conditions of geopolitical uncertainty, governments play an increasingly important role in facilitating industrial resilience and strengthening domestic innovation ecosystems.

The policy implications of the proposed theory should also be understood within the broader context of heterogeneous firm capabilities. International competition does not affect all firms equally; instead, more productive firms are generally better positioned to absorb external shocks, adopt advanced technologies, and participate in global markets. Consequently, industrial policies designed to strengthen innovation diffusion capability should recognize substantial heterogeneity in firms' adaptive capacities and technological readiness (Melitz, 2003).

Policies supporting research collaboration, technology commercialization, advanced manufacturing, strategic industries, and domestic capability development can significantly enhance firms' innovation diffusion capability. Rather than replacing market mechanisms, industrial policy should create institutional conditions that enable firms to reorganize innovation networks while maintaining international competitiveness.

The proposed framework also suggests that policymakers should promote ecosystem resilience rather than focusing exclusively on individual firms. Investments in universities, research institutes, technology clusters, digital infrastructure, and regional innovation networks strengthen knowledge circulation across industrial ecosystems, thereby improving national competitiveness under conditions of geopolitical fragmentation.

Moreover, the theory supports policy initiatives aimed at reducing excessive technological dependence while preserving productive international collaboration. Strategic diversification of innovation partnerships enables countries to maintain access to global knowledge while simultaneously strengthening domestic technological sovereignty. Such balanced policies are particularly relevant as governments increasingly seek to secure critical technologies, resilient supply chains, and sustainable industrial development.

4.4 Future Research Directions

Although the proposed framework offers an integrated theoretical explanation, several opportunities remain for future research. First, empirical studies are needed to validate the proposed causal mechanism across different industries and institutional environments. Structural equation modeling, longitudinal analysis, and multi-level research designs could

examine whether innovation diffusion capability indeed mediates the relationship between geopolitical uncertainty and industrial competitiveness.

Second, future studies should investigate sectoral differences in the proposed relationships. High-technology industries, advanced manufacturing, renewable energy, semiconductors, pharmaceuticals, and digital platforms may experience geopolitical uncertainty differently due to varying levels of technological complexity and global interdependence.

Third, comparative cross-country research could examine how differences in industrial policy, institutional quality, and national innovation systems influence the development of Strategic Industrial Competitiveness. Such studies would improve understanding of how contextual factors shape the effectiveness of innovation diffusion capability.

Finally, future theoretical work may integrate additional perspectives, including institutional theory, global value chain theory, digital transformation, artificial intelligence, and sustainability transitions. Such integration would further refine the proposed middle-range theory and broaden its explanatory scope across emerging forms of industrial competition.

Overall, the Theory of Strategic Industrial Competitiveness provides a conceptual foundation for understanding how firms and industrial ecosystems can strategically transform geopolitical uncertainty into a source of innovation, resilience, and long-term competitive advantage. By integrating innovation diffusion, strategic management, industrial policy, and geopolitical risk into a unified explanatory framework, the theory establishes a platform for future conceptual refinement and empirical validation.

5. Conclusion

The increasing fragmentation of the global economy has fundamentally transformed the context in which innovation is created, diffused, and leveraged for competitive advantage. Geopolitical tensions, technological decoupling, supply chain restructuring, and renewed industrial policy have collectively challenged the assumptions underpinning conventional innovation diffusion theories, which largely emerged in an era characterized by expanding globalization and relatively stable international collaboration. As a result, understanding industrial competitiveness today requires theoretical perspectives that explicitly recognize geopolitical uncertainty as a structural force shaping innovation ecosystems and strategic decision-making.

This paper argues that existing theoretical perspectives remain insufficient for explaining this transformation. Innovation diffusion theory primarily focuses on the dissemination and adoption of innovation, while strategic management theories emphasize organizational adaptation and capability development. Meanwhile, the rapidly growing literature on geopolitical risk has documented important empirical relationships between geopolitical uncertainty and innovation outcomes but has offered limited theoretical explanation of the strategic mechanisms connecting these phenomena. Consequently, a significant conceptual gap exists at the intersection of innovation diffusion, strategic adaptation, and industrial competitiveness.

To address this gap, this paper proposes the Theory of Strategic Industrial Competitiveness, a middle-range theoretical framework explaining how geopolitical uncertainty reshapes industrial competitiveness through a sequential process of strategic adaptation, innovation diffusion capability, and industrial resilience. The central contribution of the proposed theory lies in reconceptualizing innovation diffusion as a strategic capability rather than merely a process of knowledge dissemination. Under this perspective, firms do not simply adopt or transfer innovation; they actively orchestrate knowledge flows, reconfigure collaborative networks, and redesign innovation ecosystems to sustain competitiveness under persistent geopolitical uncertainty. This shift moves the focus of innovation diffusion research from the

efficiency of knowledge transfer toward the strategic governance of knowledge under conditions of global fragmentation.

The proposed framework also contributes to strategic management by integrating insights from innovation diffusion theory, dynamic capabilities, absorptive capacity, innovation ecosystems, industrial policy, and geopolitical risk into a coherent explanatory mechanism. By linking firm-level strategic adaptation with ecosystem-level capability development, the theory provides a more comprehensive explanation of how competitive advantage is generated in increasingly uncertain geopolitical environments. In doing so, it extends existing theories beyond firm-centric explanations and positions industrial ecosystems as critical units of analysis in understanding long-term competitiveness.

Beyond its theoretical contribution, the proposed framework offers practical relevance for managers and policymakers confronting an era of persistent geopolitical uncertainty. Firms are encouraged to strengthen innovation diffusion capability through strategic collaboration, diversified knowledge networks, and continuous capability reconfiguration, while governments are encouraged to develop industrial policies that enhance innovation ecosystem resilience and technological sovereignty without isolating firms from valuable global knowledge networks. These implications reinforce the view that industrial competitiveness increasingly depends on the ability to strategically balance openness, resilience, and adaptability rather than maximizing efficiency alone.

As a conceptual paper, this study inevitably has limitations. The proposed relationships have not yet been empirically validated, and the theoretical framework remains to be tested across industries, institutional settings, and national innovation systems. Future research should therefore examine the proposed propositions using longitudinal, multi-level, and cross-country empirical designs to assess the robustness and boundary conditions of the theory. Additional studies may also explore how emerging technologies, digital platforms, artificial intelligence, sustainability transitions, and evolving industrial policies interact with innovation diffusion capability under different geopolitical contexts.

In conclusion, this paper contends that geopolitical uncertainty should no longer be regarded solely as an external disruption that constrains innovation. Instead, it should be understood as a strategic condition that compels firms and industrial ecosystems to reconfigure the ways in which innovation is generated, diffused, and leveraged for sustained competitive advantage. By proposing the Theory of Strategic Industrial Competitiveness, this study offers a new conceptual lens for explaining industrial competitiveness in an era of geopolitical fragmentation and provides a foundation for future theoretical refinement and empirical investigation within the fields of innovation management, strategic management, and industrial policy.

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