

**STRATEGIC SUPPLY CHAIN INNOVATION AND COMPETITIVE
ADVANTAGE: THE MEDIATING ROLE OF SUPPLY CHAIN AGILITY****Kangwei Wu** ^{1*}**Suprawin Nachiangmai** ²**Ling Qian** ³**Lifeng Xie** ⁴**Hongwei Chu** ⁵¹⁻⁵ Innovation College, North-Chiang Mai University* **Corresponding Author, E-mail:** g676302032@northcm.ac.th

Abstract: In the context of increasing market uncertainty and digital transformation, strategic supply chain innovation has become a key driver of competitive advantage. This study examines the relationships among strategic supply chain innovation, supply chain agility, and competitive advantage in Chinese enterprises. Based on survey data from 428 mid- to senior-level managers across the manufacturing, logistics, and e-commerce sectors, structural equation modeling was employed to test the proposed hypotheses. The results reveal that strategic supply chain innovation-operationalized through exploration and exploitation strategies-positively influences both supply chain agility and competitive advantage. Moreover, supply chain agility has a significant positive effect on competitive advantage and partially mediates the relationship between strategic supply chain innovation and competitive advantage. These findings highlight the importance of building agile capabilities to fully realize the strategic value of supply chain innovation in dynamic environments.

Keywords: Strategic Supply Chain Innovation, Supply Chain Agility, Competitive Advantage, Exploration and Exploitation, Structural Equation Modeling

Introduction

In today's rapidly changing business environment, characterized by digital transformation, global competition, and increased uncertainty, organizations are under mounting pressure to develop more responsive and adaptive supply chain strategies. Strategic Supply Chain Innovation (SSCI) has emerged as a critical strategic initiative for firms striving to build long-term competitive advantage (Costa & Matias, 2020). SSCI involves rethinking and reconfiguring supply chain operations to drive innovation in areas such as digital optimization, collaborative partnerships, sustainability integration, and business model transformation (Xin et al., 2023). Through these innovation efforts, firms are better

able to respond to dynamic market conditions and disruptive events.

While SSCI has been recognized as a key enabler of firm performance and sustainability, recent research has highlighted the importance of Supply Chain Agility (SCA) as a mediating mechanism through which innovation exerts its influence (Shan et al., 2020). SCA reflects a firm's ability to sense, respond to, and adapt to unpredictable changes in demand and supply conditions. The integration of agility into innovative supply chain strategies can enhance responsiveness, shorten lead times, and foster resilience (Bag et al., 2019). However, the implementation of SSCI and its conversion into competitive advantage is not straightforward. Firms often face challenges in translating innovation into agility and, subsequently, into measurable strategic outcomes. Therefore, understanding the role of agility as a bridge between SSCI and competitive advantage becomes essential.

Drawing on the Resource-Based View (RBV) and the Strategy-Structure-Performance (SSP) paradigm, this study proposes that SSCI contributes to competitive advantage both directly and indirectly through the enhancement of supply chain agility. Firms that effectively balance exploration (e.g., experimenting with new logistics technologies) and exploitation (e.g., improving operational efficiency) within their supply chains can achieve ambidexterity, which further strengthens their market responsiveness and performance.

Research Objectives

1. To examine the effect of strategic supply chain innovation on firm competitive advantage.
2. To examine the effect of strategic supply chain innovation on supply chain agility.
3. To examine the impact of supply chain agility on firm competitive advantage.
4. To examine the mediating role of supply chain agility in the relationship between strategic supply chain innovation and competitive advantage.

Literature Review

1. Strategic Supply Chain Innovation (SSCI) and Competitive Advantage

In today's rapidly evolving business landscape-driven by technological advancements, shifting consumer demands, and intensifying global competition-Strategic Supply Chain Innovation (SSCI) has become a critical pathway for firms seeking to achieve sustainable competitive advantage. SSCI refers to the deliberate integration of innovation across supply chain processes to fulfill key strategic objectives such as enhancing responsiveness, improving operational efficiency, and increasing adaptability to market changes (Xin et al., 2023). As competition increasingly occurs between supply chains rather than individual firms, organizations are compelled to engage in collaborative innovation within interconnected networks. This shift highlights the need for agile and strategically aligned supply chains that can perform under uncertainty. Traditional, siloed innovation models often fall short in this context, prompting a transition toward open and collaborative innovation practices across the supply

chain (Costa & Matias, 2020).

Beyond technological transformation, SSCI relies heavily on strategic partnerships and value co-creation mechanisms. Collaboration with suppliers, customers, and other stakeholders enables shared risk, resource integration, and accelerated innovation outcomes (Shan et al., 2020). At the same time, the adoption of digital technologies-such as IoT, big data analytics, artificial intelligence, and blockchain-has significantly enhanced supply chain visibility, real-time decision-making, and overall agility (Bag et al., 2019). In industries such as agri-food and manufacturing, these innovations are enabling digital transformation and building more responsive and resilient supply chains. Through the integration of technological capabilities, strategic collaboration, and innovation ecosystems, SSCI not only boosts short-term performance but also builds long-term, hard-to-replicate capabilities that lead to differentiation and market leadership (Kumar et al., 2021). Research also suggests that SSCI supports first-mover advantages and enhances firms' strategic positioning among customers, regulators, and investors (Rani et al., 2019). Ultimately, SSCI is not merely a tactical response to change-it is a foundational strategy for building sustainable, innovation-driven competitiveness (Zaid et al., 2018). Based on this reasoning, the following hypothesis is proposed:

H1: Strategic supply chain innovation has a positive and significant impact on competitive advantage.

2. Strategic Supply Chain Innovation (SSCI) and Supply Chain Agility

Strategic Supply Chain Innovation (SSCI) has emerged as a key driver of organizational adaptability in increasingly volatile and complex supply chain environments. SSCI reflects a firm's capacity to integrate innovation into supply chain processes-such as sourcing, production, distribution, and collaboration-guided by strategic intent and long-term value creation. Through SSCI, organizations develop flexible structures, enhance knowledge flow, and adopt new technologies that enable rapid responses to market fluctuations (Costa & Matias, 2020). As firms shift from rigid, efficiency-focused supply chain models to more dynamic and responsive systems, SSCI plays a critical role in establishing the organizational foundations required for agility.

Supply Chain Agility (SCA) refers to a firm's ability to quickly sense and respond to changes in demand, supply disruptions, or competitive pressures with speed and flexibility (Sun et al., 2022). SSCI supports agility by fostering digitalization, process innovation, and cross-functional integration-elements essential for shortening lead times and improving decision-making under uncertainty (Shan et al., 2020). Collaborative innovation, a core feature of SSCI, strengthens coordination across supply chain partners, further enhancing responsiveness and adaptability. Moreover, the implementation of intelligent systems such as IoT, big data, and AI not only enables real-time visibility but also empowers proactive risk mitigation and agile resource allocation (Bag et al., 2019). Therefore, SSCI serves as a foundational enabler of SCA by embedding innovation into the structural and behavioral dimensions of the supply chain. Based on this understanding, the following hypothesis is proposed:

H2: Strategic supply chain innovation has a positive and significant impact on supply chain agility.

3. Supply Chain Agility and Competitive Advantage

Supply chain agility (SCA) refers to a company's ability to respond quickly to continuously changing market trends (Hu et al., 2022). Previous literature has identified SCA as a crucial source of competitiveness, particularly in today's era of organizational instability. In recent years, increasing market volatility has pushed firms to enhance their supply chain capabilities to improve their competitive advantage (Zhu & Gao, 2021).

In support of this notion, research suggests that a firm's SCA redesigns internal processes, thereby improving both business performance and competitive positioning (Hu et al., 2022). Furthermore, SCA enhances a firm's ability to meet market demand and respond effectively to customer needs. The literature highlights that SCA positively drives stakeholder satisfaction, ultimately boosting firm performance and competitiveness (Manzoor et al., 2022).

Altogether, supply chain agility plays a vital role in achieving and sustaining competitive advantage. To maintain competitiveness in the knowledge economy, organizations are encouraged to foster supply chain agility as a strategic imperative (Gligor et al., 2020). Based on this reasoning, the current study proposes the following hypothesis:

H3: Supply chain agility positively influences firm competitive advantage.

4. The Mediating Role of Supply Chain Agility

While Strategic Supply Chain Innovation (SSCI) has been widely acknowledged as a critical enabler of competitive advantage, its impact often unfolds through indirect mechanisms. One such mechanism is Supply Chain Agility (SCA), which plays a pivotal mediating role in translating innovation into sustainable performance outcomes. Through SSCI, firms introduce advanced technologies, reconfigure processes, and build strategic partnerships that improve flexibility, responsiveness, and cross-functional coordination (Gligor et al., 2020). These innovation-driven capabilities significantly enhance supply chain agility, enabling firms to sense and respond quickly to changing market dynamics, mitigate risks, and maintain operational continuity (Hu et al., 2022).

In turn, enhanced agility allows firms to capitalize on innovation by improving their ability to deliver timely and customized solutions, adapt to customer needs, and outperform competitors in volatile environments. Agile supply chains facilitate faster decision-making, better resource alignment, and stronger stakeholder engagement—all of which are key contributors to competitive positioning (Manzoor et al., 2022; Omowole et al., 2024). As such, SCA serves as a conduit through which SSCI can exert a more substantial and sustained influence on firm competitiveness. Therefore, this study posits that the relationship between SSCI and competitive advantage is mediated by supply chain agility. Based on this reasoning, the following hypothesis is proposed:

H4: Supply chain agility mediates the relationship between strategic supply chain innovation

and competitive advantage.

Methodology

This study adopted a quantitative research approach, using a structured questionnaire and Structural Equation Modeling (SEM) to empirically examine the relationships among Strategic Supply Chain Innovation (SSCI), Supply Chain Agility (SCA), and Competitive Advantage (CA), including both direct and mediating effects.

Data were collected from mid- to senior-level managers in the manufacturing, logistics, and e-commerce sectors, covering supply chain executives, operations managers, and digital transformation leaders. A stratified random sampling method was applied across firms of varying digital maturity in China's Yangtze River Delta, Pearl River Delta, and Beijing-Tianjin-Hebei regions. Out of 500 distributed questionnaires, 428 valid responses were retained after data cleaning.

The questionnaire was designed around three core variables and employed a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Strategic supply chain innovation was measured across four dimensions: collaborative innovation, digital optimization, sustainability integration, and business model transformation (Xin et al., 2023). Supply chain agility was assessed based on performance in flexible responsiveness, decision-making speed, adaptability, and response to external disruptions (Hermanto et al., 2024). Competitive advantage was measured using four dimensions: operational efficiency, supply chain resilience, market positioning, and sustainability-based differentiation (Kumar et al., 2021).

Results

1. Descriptive Statistical Analysis

The sample in this study primarily consists of private enterprises (48.8%) with medium-sized operations (55.5% having 200-499 employees) and annual revenues below RMB 10 million (75.8%). Additionally, most firms have been established for less than eight years (73.7%), indicating that the surveyed companies are predominantly small to medium-sized and in a growth stage. These characteristics suggest a strong reliance on supply chain innovation to enhance operational efficiency and adaptability, making the exploration of the relationship between Strategic Supply Chain Innovation (SSCI) and Supply Chain Agility (SCA) particularly relevant.

In terms of industry distribution, the majority of respondents come from the logistics (40.5%) and manufacturing (30.6%) sectors. Most participants hold mid-to-senior management positions, such as department heads (47.2%) and supply chain managers (25.1%), ensuring a professional and experience-based perspective. These attributes support a deeper understanding of the practical demands

for innovation and agility in supply chain operations, providing a solid foundation for the empirical analysis of their impact on competitive advantage.

Table 1: Descriptive Statistical Analysis

Attitude	classification indicators	Frequency	Percent (%)
1. Nature of the Enterprise	State-owned Enterprise	68	16.1
	Private Enterprise	206	48.8
	Joint Venture	96	22.7
	Foreign-funded Enterprise	52	12.3
2. Years Since Establishment	Less than 3 years	134	31.8
	3–8 years	177	41.9
	9–14 years	59	14.0
	15–20 years	43	10.2
	More than 20 years	9	2.1
3. Number of Full-time Employees	Fewer than 200 employees	71	16.8
	200–499 employees	234	55.5
	500–999 employees	105	24.9
	1,000 employees or more	12	2.8
4. Annual Revenue (RMB)	Less than 5 million	146	34.6
	5–10 million	174	41.2
	10–50 million	75	17.8
	50–100 million	23	5.5
	Over 100 million	4	0.9
5. What is your company's industry?	Manufacturing	129	30.6
	Logistics	171	40.5
	E-commerce	79	18.7
	Other	43	10.2
6. Position of the Respondent	Senior Executive / General Manager	48	11.4
	Department Head	199	47.2
	Supply Chain Manager	106	25.1
	Other	69	16.4

2. Empirical Analysis

To test the proposed hypotheses, this study employed Structural Equation Modeling (SEM) using the maximum likelihood estimation method in AMOS 26.0. The baseline model (Figure 1) was

constructed to examine the direct effects of Strategic Supply Chain Innovation (SSCI)-measured through its two core dimensions: Exploration and Exploitation-on Supply Chain Agility and Competitive Advantage.

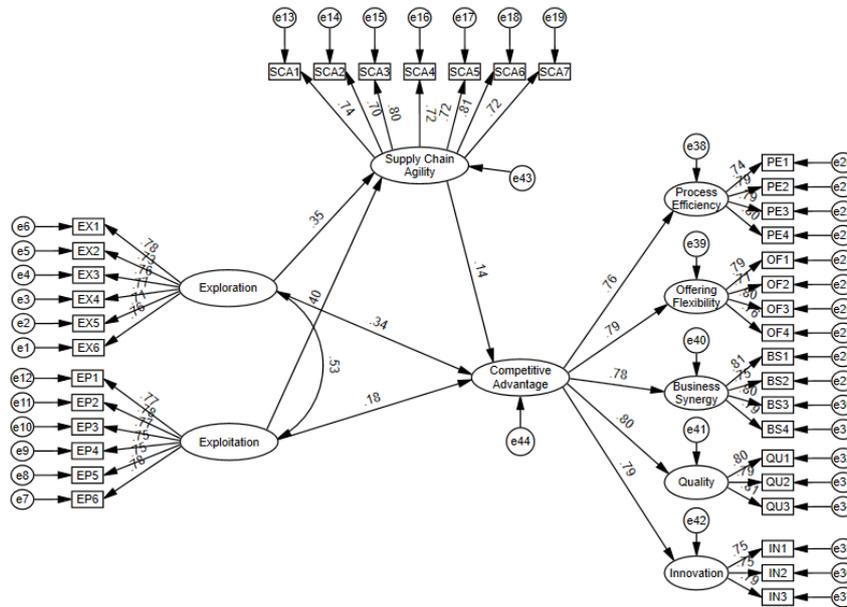


Figure 1: Structural Equation Modeling
Source: This study compiles

Figure 1. Baseline path analysis for main effects (source: drawn by the authors based on data analysis results).

Note: 1) ** path is significant at the $p < 0.01$ level; 2) t-value is in parentheses; 3) $\chi^2/df = 1.146$, IFI = 0.989, TLI = 0.988, CFI = 0.989, RMSEA = 0.019.

To test the proposed hypotheses, this study employed Structural Equation Modeling using the maximum likelihood estimation method in AMOS 26.0. The baseline model (Figure 2) was constructed to examine the effects of Strategic Supply Chain Innovation-conceptualized through its two dimensions: Exploration and Exploitation-on Supply Chain Agility and Competitive Advantage. Firm ownership, size, and age were included as control variables and were log-transformed to address skewness.

As reported in Table 1, the model demonstrated excellent fit to the data ($\chi^2/df = 1.146$, IFI = 0.989, TLI = 0.988, CFI = 0.989, RMSEA = 0.019). The path analysis results show that Exploration has a significant positive effect on Supply Chain Agility ($\beta = 0.352$, $t = 6.108$), as does Exploitation ($\beta = 0.401$, $t = 6.879$), confirming H2. Exploration ($\beta = 0.338$, $t = 4.806$) and Exploitation ($\beta = 0.179$, $t = 2.645$) also significantly influence Competitive Advantage directly, supporting H1. Furthermore, Supply Chain Agility has a significant positive effect on Competitive Advantage ($\beta = 0.145$, $t = 2.086$), validating H3.

The results also support H4, indicating that Supply Chain Agility serves as a mediating mechanism through which Strategic Supply Chain Innovation enhances Competitive Advantage. Together, these findings empirically validate all four hypotheses (H1–H4), emphasizing the critical role of both exploration and exploitation strategies in driving competitive outcomes, directly and indirectly, through improved agility.

Table 2: Estimation of the baseline structural model

Item	Main Effect	
Model fit	Model 1	
X2/DF	1.146	
IFI	0.989	
TLI	0.988	
CFI	0.989	
RMSEA	0.019	
PATH	B	t
EX->SCA	0.352	6.108
EP->SCA	0.401	6.879
EX->CA	0.338	4.806
EP->CA	0.179	2.645
SCA->CA	0.145	2.086

Note: t-values are in parentheses.

Discussion

This study investigated the role of Strategic Supply Chain Innovation (SSCI) in enhancing Competitive Advantage (CA), with a focus on the mediating role of Supply Chain Agility (SCA). The empirical results confirm that both exploration and exploitation strategies—key components of SSCI—positively influence CA, both directly and indirectly through SCA. These findings are consistent with Xin et al. (2023) and Costa & Matias (2020), who emphasized that integrating innovation into supply chain operations strengthens responsiveness and supports long-term competitiveness.

Aligned with Shan et al. (2020) and Bag et al. (2019), this study highlights SCA as a critical enabler that links innovation to performance. The significant mediating effect of SCA suggests that innovation alone is not sufficient—organizations must also foster agility to effectively translate innovation into measurable strategic outcomes. This reinforces the idea that firms need to combine digital technologies, cross-functional collaboration, and adaptive structures to build resilient, innovation-driven supply chains (Zaid et al., 2018; Hu et al., 2022).

Moreover, these results support the Resource-Based View (RBV) and Strategy-Structure-

Performance (SSP) frameworks, showing that supply chain ambidexterity-balancing exploration and exploitation-enables firms to strengthen their competitive positioning under uncertainty (Gligor et al., 2020; Manzoor et al., 2022). Future research may explore how environmental volatility, industry type, or digital maturity moderate the effects of SSCI and SCA on firm performance, offering deeper insight into strategic supply chain design in a rapidly evolving global landscape.

Conclusion

This study contributes to the growing body of research on innovation-driven supply chain strategies by empirically validating the impact of Strategic Supply Chain Innovation (SSCI) on Competitive Advantage (CA), with a specific focus on the mediating role of Supply Chain Agility (SCA). The findings demonstrate that both exploration and exploitation strategies significantly enhance firm performance, and that SCA serves as a key mechanism through which SSCI translates into sustainable competitive outcomes.

By drawing on the Resource-Based View (RBV) and Strategy-Structure-Performance (SSP) frameworks, the study confirms that firms pursuing balanced innovation strategies-combining digital transformation, collaborative innovation, and operational adaptability-are better equipped to build agile and competitive supply chains. These insights provide practical guidance for managers seeking to strengthen their firms' market positioning in volatile and fast-changing environments.

Overall, the study underscores the importance of integrating innovation and agility in supply chain design. Future research is encouraged to explore contextual variables such as industry characteristics, digital maturity, and environmental turbulence, which may further shape the effectiveness of SSCI in driving competitive advantage.

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