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Strategic Entrepreneurship and Sustainable Supply Chain Innovation from the Perspective of Collaborative Advantage

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Abstract: This study aims to investigate the mechanisms by which firms' strategic entrepreneurship (SE) impacts the achievement of their collaborative advantage (CA) for sustainable supply chain innovation. It includes a comprehensive analysis of the direct effect of SE on CA, the contingent effects of organizational structure and collaborative networks on this impact and the interaction effect of exploration and exploitation strategies under SE. An integrated conceptual model is proposed and the hypotheses are tested by structural equation modeling (SEM) using survey data from 432 manufacturing firms in China. The results confirm the positive impact of SE on CA, which is moderated differently by decentralized, formalized and specialized organizational structures. Meanwhile, vertical and horizontal collaborations lead to different types of advantages, and firms need to balance exploration and exploitation strategies across functional domains to achieve strategic ambidexterity, which further improves CA and facilitates sustainable supply chain innovation. Theoretically, this study is original in applying SE to the collaborative advantage in a supply chain context, while taking into account the high complexity of supply chain collaboration with a contingency approach. Practically, this study provides important managerial implications and specific recommendations for different firms to achieve sustainability in supply chain collaboration and innovation.

Keywords: strategic entrepreneurship; collaborative advantage; organizational structure; collaborative networks; exploration and exploitation

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1. Introduction

Collaborative relationships in supply chains assist firms in reducing cost, improving services, creating technological innovation, sharing risk, gaining complementary resources and increasing productivity [1]. Collaborative integration of information technology can significantly improve supply chain agility, thereby enhancing firms' competitive advantage. Additionally, collaborative innovation has proven to have a positive effect on the sustainability of supply chains [2], and collaborative activities with supply chain partners contribute to higher environmental performance, thus boosting sustainable supply chain innovation (SSCI) [3]. However, the implementation of supply chain collaboration (SCC) is a difficult and complex process [4]. It is "a paradigm based on collaborative advantage rather than competitive advantage" [5], so if SCC does not bring about a collaborative advantage (CA) to supply chain partners, it will inevitably be challenged, and as a result, supply chain innovation is unlikely to be sustained. In other words, CA is an important foundation for SSCI. In reality, most collaborations progress painfully and slowly, and some even end up failing due to conflicts or mismatches in objectives, structures and strategies [6]. This apparently does not favor the sustainability of supply chain management. Traditionally, firms are often advised to build long-term and stable collaborative relationships. However, actual collaboration between supply chain partners is usually context

dependent and constantly evolving. This leads to a "coopetitive" environment where partners cooperate behind the scenes yet compete when facing the market [7]. Therefore, the complicated internal and external environment has been calling for a contingent view to establish dynamic collaborative relationships and thus achieve SSCI through balancing cooperation and competition [4].

The level of CA generated signifies whether and to what extent collaboration is effective. When CA is absent or low, the positive impacts of SCC on firm performance become limited or disappear [5]. This raises an important question for firms intending to engage in SCC—how can they achieve a CA to maximize the effectiveness of SCC? However, despite recognizing the importance of SCC, the current literature has paid insufficient attention to achieving a CA. Bryson et al. (2016) proposed discovering CA through goal categories and visual strategy mapping [8]. Mulyana and Wasitowati (2021) validated the positive effects of collaborative networks on small- and medium-sized enterprises' (SMEs) performance [9]. Li et al. (2021) identified the mechanism for achieving a sustainable competitive advantage through collaborative dual innovation [10]. Verweij and Satheesh (2023) studied the theory of CA in public–private partnerships [11]. While these studies reveal key factors for establishing CA, such as a supportive strategy, leadership and culture [12], a holistic approach from both strategic and operational levels is still lacking. According to the Schumpeterian view, entrepreneurship drives innovation and economic prosperity [13]. However, for sustainable development, firms need both entrepreneurship and strategic actions. Thus, the concept of Strategic Entrepreneurship (SE) was developed by combining the disciplines of entrepreneurship and strategic management, encompassing the elements of culture, leadership, resource management and innovation involved in the entire value creation process [14]. In light of this, this study proposes that SE is a valuable strategic option for achieving a CA and SSCI.

SE reflects a firm's ability to reconfigure strategies to achieve long-term growth and a sustainable advantage [15]. There are two main components of SE, namely an exploration strategy and an exploitation strategy [16]. Through balancing these two strategies, a dynamic process is realized that promotes sustainable business development. From the level of collaborative relationships, SE emphasizes networking and collaboration for accessing resources [17], which also provides the basis for achieving a CA. SE drives firms to explore new opportunities and exploit them through strategic actions [18]. This also provides support for cross-organizational relationships that are fundamental for establishing a CA. Additionally, SE is correlated with collaborative innovation [19,20] and can improve sustainable supply chain management and enhance organizational performance [21,22]. Thus, there are solid reasons to expect a potential impact of SE on CA. Meanwhile, drawing on the strategy–structure–performance (SSP) paradigm and the extended resource-based view (RBV), this study concludes that the organizational structure is a key factor influencing the impact of SE on CA. Furthermore, collaborative networks can provide network resources to facilitate the achievement of a CA in supply chains.

Therefore, this study explores the impacts and detailed mechanisms of SE on SSCI from the perspective of CA. Specifically, it poses three research questions: (1) Do the exploration and exploitation strategies under SE have a positive impact on achieving a CA? (2) What are the contingent effects of organizational structure and collaborative networks on this impact? Finally, (3) How can firms balance exploration and exploitation strategies to achieve strategic ambidexterity and further promote SSCI? Through extensive interdisciplinary research, this study develops an integrated conceptual model for achieving a CA and proposes that both exploration and exploitation strategies under SE positively impact CA, while organizational structure and collaborative networks have contingent effects on this impact. Additionally, although there are different conclusions in the literature about the relationship between exploration and exploitation strategies [23,24], this study examines and confirms their positive interaction effects on CA. Accordingly, an ad hoc analysis is conducted, and the results suggest that strategic interactions need to be carried out across

the functional domains. As such, this study provides specific insights for supply chain innovation research and supply chain management practices in firms of different sizes.

The rest of this paper is organized as follows. Section 2 is the literature review on SE, SSCI, CA, and the theoretical foundations; Section 3 proposes the conceptual model and hypotheses of the study; Sections 4 and 5 present the methodology and empirical analysis, respectively; Section 6 contains the conclusions and implications; and Section 7 details the limitations and future research directions.

2. Literature Review and Theoretical Foundations

2.1. Literature Review

2.1.1. Strategic Entrepreneurship (SE)

SE is entrepreneurial behavior with a strategic vision [25] and is an important strategic resource that influences a firm's direction and business philosophy [26]. Mazzei (2018) defined SE as "organizationally consequential innovations within existing firms that involve the combination/integration of opportunity- and advantage-seeking behaviors" [27]. It combines a firm's entrepreneurial and strategic pursuits to manage risk and uncertainty in an increasingly challenging environment [17,18]. Firms with SE are inherently more innovative, open and flexible. They are often committed not only to exploiting resources within the organization, but also to exploring across organizational boundaries. Networking is one of the key domains of SE, as it provides vital access to resources and opportunities [17]. Consequently, SE is considered as a fundamental driver of a firm's survival, growth and sustainable competitive advantage [27,28]. At the same time, the characteristics of SE provide an important supportive culture and foundation for the establishment of collaborative relationships that may lead to a CA.

The process of SE is realized through exploration and exploitation strategies [16]. The exploration strategy is defined as "search, change, adventure, experimentation, play, flexibility, discovery, and innovation", while the exploitation strategy implies "refinement, selection, production, efficiency, choice, and implementation" [29]. On the other hand, the exploration strategy emphasizes broadening knowledge and building new networks, and the exploitation strategy stresses accuracy and efficiency by strengthening existing partnerships [30]. Thus, both strategies pursue innovation and collaboration, albeit through differing innovation approaches and collaborators. These competencies are vital necessities for firms to achieve a CA and SSCI.

2.1.2. Sustainable Supply Chain Innovation (SSCI)

As market turbulence becomes the norm, competition is no longer between individual firms but between the supply chains in which they operate, and therefore the appropriate competitive strategy is to build responsive supply chains [31]. While sustainability efforts have primarily focused on individual market actors, supply chains have gained increasing attention recently [32]. Research has shown that building supply chain synergies with partners, such as suppliers and customers, is an effective way to realize the benefits of collaboration and thus improve firm performance [5]. Meanwhile, supply chain collaborative innovation facilitates the sustainable development of supply chains [2], and the implementation of collaborative activities can promote SSCI [3].

From an innovation perspective, SSCI is defined as a balanced innovation performance across economic, social and environmental dimensions [33]. SSCI also represents innovations implemented in the context of supply chains to meet the needs of sustainable development [34]. The importance of SCC for a modern business strategy is therefore heightened by the higher risks and uncertainties associated with in-house innovation alone. Collaborative and open innovation has become an inevitable strategic choice for improving firm performance, sharing risks and enhancing sustainable innovation ecosystems [35]. Firms with established supply chain strategies excel at integrating resources, including suppliers, customers and internal assets, to positively impact operations [36]. As technology is upgraded, firms like agri-food businesses seek digital and sustainable transformation for a

long-term advantage [37]. The concept of a circular economy is another emerging trend in sustainable supply chain management, where transparency and collaborative partner choices greatly impact business models and value propositions [38,39]. SSCI requires strategic management of SCC, such as designing, planning, organizing and controlling collaborative activities, to create net value for partners and achieve a collaborative advantage. Collaboration between interconnected and interrelated network players can result in synergistic solutions and integrated structures that lead to high-quality outcomes [40].

2.1.3. Collaborative Advantage (CA)

CA refers to the strategic benefits derived from SCC that cannot be realized by any one firm alone, or that can be better realized together by the collaborators [41]. It is a shared competitive edge enabling firms to improve supply chain performance through spill-over effects by leveraging partners' resources, opportunities and knowledge. Cross-firm supply chain collaboration makes economic sense, as it can reduce costs and improve the competitiveness of individual firms and the supply chain as a whole. Although broad in scope, collaboration can be categorized into external and internal types [42] or horizontal and vertical forms [12]. This study specifically focuses on external collaboration research. Nevertheless, implementing collaboration remains challenging. For instance, horizontal collaboration may affect vertical collaboration [4], and supply chain parties have demonstrated varying collaboration attitudes over time [43].

However, research on how to achieve a CA, or even how to identify it, has received insufficient attention in the literature [8]. Kanter (1994) argues that the scope of collaboration should be achievable and that all elements of strategic, tactical, operational, interpersonal and cultural levels need to be considered [44]. Lasker et al. (2001) consider resources that could enhance partnership synergy in CA [45]. Vangen and Huxham (2006) suggest developing collaborative leadership to manage ideological and pragmatic balances [41]. Fawcett et al. (2021) argue that it is the commitment of managers that leads to collaborative capacity and value co-creation that overcomes the challenges of collaboration [46]. Given this, this study proposes that SE provides a comprehensive approach to achieve a CA. SE involves entrepreneurial mindset, culture, leadership, strategic resource management and innovation [14]. Particularly, SE emphasizes networking, organizational learning and growth [17], all of which are key factors in establishing a CA and thus create favorable conditions for SSCI. This is the origin of this study and an important reason to explore the achievement of a CA and SSCI from the perspective of SE.

For ease of understanding, Table 1 provides a comprehensive overview of existing research and the objectives of this study.

Table 1. Overview of the relevant studies.

Research Themes	Content of Research	Source
Strategic approach of supply chain management	Strategic entrepreneurship and sustainable supply chain management; Supply chain from a strategic approach with the aspect of quality; Firms that develop a supply chain strategy are better at supply chain integration; Agri-food firms are looking to digitalization and sustainable transformations for a long-term advantage.	Tipu and Fantazy (2018) [21]; Kunnapapdeelert and Pitchayadejanant (2021) [36]; Kadlubek (2022) [40]; Abbate et al. (2023) [37].
Supply chain collaboration and collaborative innovation	The impact of supply chain collaboration on collaborative advantage and firm performance; The interactions between SE, collaborative innovation and organizational performance.	Cao and Zhang (2011) [5]; Tsai and Lei (2016) [20]; Estrada-Cruz et al. (2022) [22].

Table 1. *Cont.*

Research Themes	Content of Research	Source
Collaboration and sustainable supply chain innovation	The positive effect of collaborative innovation on the sustainability of supply chains; Collaborative activities with supply chain partners boost sustainable supply chain innovation; The complexity of collaboration in supply chain networks; Open innovation as an enhancer of sustainable innovation ecosystems; Supply chain transparency and the choice of collaborative partners in a circular economy impact sustainable supply chain management.	Lee (2019) [3]; Shan et al. (2020) [2]; Huang et al. (2020) [4]; Costa and Matias (2020) [35]; Abbate et al. (2023) [38].
Strategic entrepreneurship and collaborative advantage	Explore how to build dynamic collaborative relationships and achieve collaborative advantage for supply chain partners in order to maximize the effectiveness of supply chain collaboration and promote sustainable supply chain innovation.	The present study.

2.2. Theoretical Foundations

2.2.1. Strategy–Structure–Performance (SSP) Paradigm

The SSP paradigm emphasizes the importance of strategy–structure alignment as a prerequisite for superior business performance. The SSP paradigm argues that the organizational structure should match the strategy to ensure the successful implementation of the strategy [47]. In recent years, the SSP paradigm has been widely used in supply chain research, for example, in the areas of supply chain strategy and risk management [48]. This study will enrich the related literature by applying the SSP paradigm to the study of the impact of SE on CA.

Specifically, this study seeks to validate how to align strategy and organizational structure to achieve a greater CA. Organizational structure is categorized into decentralization, formalization and specialization [49]. In order to achieve better performance in SCC, which is measured by CA in this study, the appropriate organizational structure should match the strategy. This implies that the impact of SE on CA is moderated by the organizational structure, and, therefore, the SSP paradigm provides a theoretical basis for investigating the contingent effect of organizational structure on this impact.

2.2.2. Extended Resource-Based View (RBV)

According to the RBV, valuable, scarce, inimitable and non-substitutable (VRIN) unique resources and capabilities give firms a competitive advantage [50]. Firms with strong dynamic capabilities are highly entrepreneurial, willing to adapt themselves to the business ecosystem through innovation and collaboration [30], and can leverage not only strategic resources within the organization, but also across organizational boundaries to access network resources.

Furthermore, the RBV is extended to the context of ecosystems where the value proposition is provided by multiple partners with complementary resources [51]. This brings about an inter-organizational competitive advantage, namely s CA belonging to the collaborators [4]. This recognizes network relationships as an important strategic resource, and thus the extended RBV provides a theoretical basis for exploring the role of collaborative networks in achieving a CA in supply chains. Meanwhile, regarding the relationship between exploration and exploitation strategies, there is a concern that the two strategies may hinder each other due to resource constraints within the firm. To address this concern, this study distinguishes the different resource attributes in vertical and horizontal collaboration and proposes solutions to achieve strategic ambidexterity in different functional domains.

3. Conceptual Model and Hypotheses Development

3.1. Conceptual Model

Based on the literature review in Section 2, this study develops an integrated SE-based conceptual model for achieving a CA, as shown in Figure 1. In the model, this study proposes that both exploration and exploitation strategies under SE have a positive impact on CA, and that this impact is influenced by the contingent effects of organizational structure and collaborative networks. Furthermore, this study explores the detailed relationship between exploration and exploitation strategies and how to balance the two strategies to further improve CA. These are important issues for exploring the underlying mechanism for achieving a CA and SSCI. Therefore, the hypotheses discussed in Section 3.2 (H1a–H5c) are presented in this study.

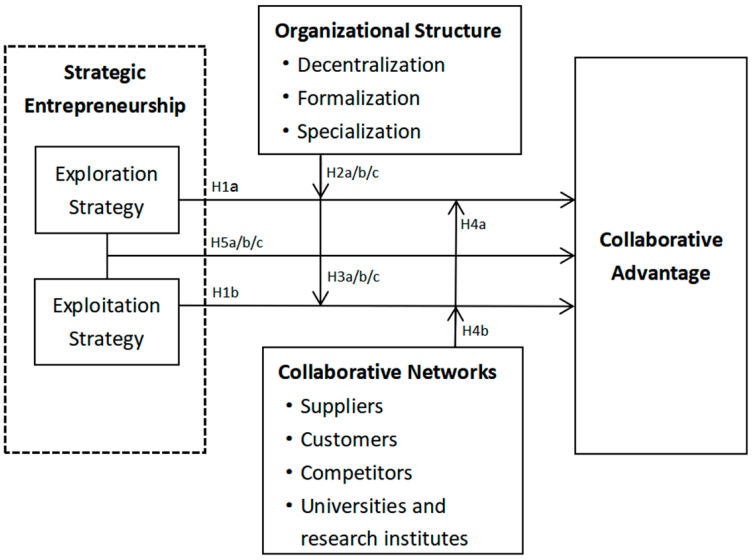

Figure 1. An integrated SE-based conceptual model for achieving a CA (source: drawn by the authors).

3.2. Hypotheses Development

3.2.1. Relationship between SE and CA

SE signifies a firm's ability to be ambidextrous regarding both the exploration strategy and the exploitation strategy [52]. The exploration strategy is more favorable for the future viability of the firm and the exploitation strategy serves for present viability [53]. More specifically, the exploration strategy implies ways to innovate and differentiate products and services from competitors [54]. As such, firms are pursuing a CA more aggressively by absorbing new resources from the outside [55], including through expanding collaborative networks.

In contrast, the exploitation strategy emphasizes operation efficiency, refinement and reliability [35]. It impels firms to deeply exploit the existing knowledge to improve their capacity for development [56]. It further exploits the increase in present competitive advantage by managing existing resources more effectively and efficiently through continuous innovation of products and services or by strengthening the relationships with existing supply chain partners [30], which will subsequently increase the CA. Despite differences in means and objectives, both strategies contribute to building organizational advantages and facilitating collaborative relationships [22,32]. Therefore, this study proposes the following hypotheses:

H1a. *The exploration strategy has a positive and significant impact on CA.*

H1b. *The exploitation strategy has a positive and significant impact on CA.*

3.2.2. Moderating Effect of Organizational Structure

The organizational structure is a means through which team members coordinate work that has been divided into specific tasks. It is a critical element for strategic implementation and a unique, inimitable and non-substitutable resource that affects organization members' behaviors [57]. There are three types of organizational structure, i.e., decentralization, formalization and specialization. Decentralization is the extent to which top management delegates decision making and evaluation authority to lower-level teams [39]; formalization is the extent to which formal rules, instructions and procedures govern the working relationships and communication in writing [58]; and specialization refers to the degree of segmentation of tasks and activities and the autonomy of members in accomplishing tasks.

In highly centralized firms, the top management controls the authority for decision making and evaluation [59]. This reduces the efficiency and effectiveness of decision making, as well as employee engagement. Effective collaboration depends on the participation of all levels of organization [28] under either an exploration or exploitation strategy. In contrast, a decentralized organization means more authority to the whole team, and higher employee participation facilitates the team to gain the resources needed for exploration or exploitation strategies and assists in a high-quality implementation of strategies from the top to the bottom. Therefore, the effect of both exploration and exploitation strategies on CA should increase for firms with a decentralized organizational structure than for those with a centralized one. This leads to the following hypotheses:

H2a. *Decentralization has a positive and significant moderating effect on the positive impact of the exploration strategy on CA.*

H3a. *Decentralization has a positive and significant moderating effect on the positive impact of the exploitation strategy on CA.*

In highly formalized firms, organizational activities and staff behaviors are governed by formal procedures and rules, resulting in high organization structural inertia and low flexibility. On the contrary, firms with an organizational structure with a low level of formalization encourage horizontal and vertical collaborations and interactions [39]. To achieve a higher level of CA, both exploration and exploitation strategies drive the focal firm to engage in some kind of collaboration with supply chain partners. A high level of formalization would restrict the access to both internal and external or horizontal and vertical collaborations, and also would limit the effectiveness and creativeness of resource utilization gained through collaboration. This leads to hypotheses as follows:

H2b. *Formalization has a negative and significant moderating effect on the positive impact of the exploration strategy on CA.*

H3b. *Formalization has a negative and significant moderating effect on the positive impact of the exploitation strategy on CA.*

In highly specialized firms, there is a high proportion of employees who are the experts in specific areas and put their efforts into well-defined work activities [39], and the work is usually divided narrowly according to the requested know-how. Additionally, firms with a high level of specialization tend to be less flexible and usually highly specialized in providing certain specific products or services [60]. This would decrease the compatibility and adaptability required in collaborative relationships under both exploration and exploitation strategies. Therefore, this study proposes hypotheses as follows:

H2c. *Specialization has a negative and significant moderating effect on the positive impact of the exploration strategy on CA.*

H3c. *Specialization has a negative and significant moderating effect on the positive impact of the exploitation strategy on CA.*

3.2.3. Moderating Effect of Collaborative Networks

Based on the industrial network approach, firms are embedded in complex networks that provide resources for viability and sustainability [61]. There are four types of partners in collaborative networks, namely suppliers, customers, competitors and universities and research institutes [62]. Collaboration with suppliers can assist firms to gain the expertise and more comprehensive perspectives to improve and optimize the ways of developing products and services. Collaboration with customers can assist firms to better identify the potential market opportunities and position themselves more precisely in the market. Collaboration with competitors provides a synergistic effect in solving the same problems, keeps firms more knowledgeable about the competitors' strategies, and then enables them to differentiate themselves. Collaboration with universities and research institutes is an important means to gain the state-of-the-art scientific knowledge and innovation outcomes. Therefore, this study proposes hypotheses as follows:

H4a. *Collaborative networks have a positive and significant moderating effect on the positive impact of the exploration strategy on CA.*

H4b. *Collaborative networks have a positive and significant moderating effect on the positive impact of the exploitation strategy on CA.*

3.2.4. Interaction between Exploration and Exploitation Strategies

Exploration and exploitation strategies are two ways that organizations achieve different types of innovation. The exploration strategy often means searching for new knowledge that leads to radical innovation, while the exploitation strategy uses the current knowledge base to generate incremental innovation; therefore, some scholars argue that exploration and exploitation strategies are difficult to deploy simultaneously or may be mutually constraining due to resource restrictions [35]. Additionally, there is a high requirement on managers' multifaceted capabilities and expertise, which might be particularly lacking in SMEs compared to large firms [63]. Conversely, other scholars have found that the two strategies are mutually reinforcing, as the resources gained from one promote the other, and therefore they are correlated positively [24] and imbalance between them would decrease performance [64]. In line with the latter view, this study argues that exploration and exploitation strategies interact positively with CA because, contrary to the traditional assumption that treats a firm's resources as constant and limited within organizational boundaries, firms can gain access to network resources through collaboration. However, the interaction effects do differ between SMEs and large firms due to the differences in the ability to manage resources. Therefore, the following hypotheses are proposed:

H5a. *There is a positive interaction effect between exploration and exploitation strategies on CA.*

H5b. *The imbalance between exploration and exploitation strategies has a negative and significant impact on CA.*

H5c. *Firm size positively moderates the interaction effect of exploration and exploitation strategies on CA, such that the interaction effect of the two strategies on CA is stronger in large firms than in SMEs.*

4. Methodology

4.1. Sample and Data Collection

For the purpose of empirical research, this study conducted a questionnaire survey with manufacturing firms in three provinces in Northeast China, namely Liaoning, Jilin and Heilongjiang. The selected sample contains 1000 firms, which are roughly equal in number across major industries and include a variety of firm sizes. The reasons for this choice of sample are threefold: firstly, Northeast China is one of the most important industrial bases in Asia and there are complete manufacturing supply chains; secondly, the chosen region

is undergoing a historic revitalization and industrial transformation [65] which will have important theoretical and practical implications, especially for other regions of the world with similar circumstances; thirdly, this study follows the suggestion to choose samples from the same geographical and market environment [66].

The sample firms were checked individually and 35 were found to be inoperative or unreachable, leaving 965 potential respondents. The questionnaire was prepared in both English and Chinese for publication and data processing, respectively, and was translated back and forth by two professional translators with relevant industry experience to minimize potential misinterpretation. To facilitate data collection, an online questionnaire compiled by wjx.cn (a survey platform commonly applied in China) was used and distributed to senior executives holding positions such as CEO, (vice) president and general manager. Two follow up, reminder emails were sent to each of the users who had not responded within two weeks. Finally, a total of 432 valid responses were collected, yielding a response rate of 44.7% of the potential respondents. Non-response bias was checked by comparing the response correlations of early and late respondents, and no significant differences were found in terms of key characteristics. Out of the 432 valid firms, 15.1% are from the automobile and machinery manufacturing sector, 15.5% are from the pharmaceutical sector, 13.9% are from the aerospace and equipment sector, 15.3% are from electronic communications, 15.7% are from the apparel sector, 15.9% are from the food sector and 8.6% are from others. More detailed information is shown in Table 2.

Table 2. Demographic profile of sample firms.

Items	Types	Percent
Ownership	State-owned	25.9%
	Chinese private	27.1%
	Joint venture	23.4%
	Foreign-invested	23.6%
Years of establishment	Less than 3	19.7%
	3–8	22.5%
	9–14	30.6%
	15–20	16.7%
	21 or more	10.6%
Number of full-time employees	Less than 200	27.5%
	200–499	24.5%
	500–999	20.1%
	1000 or more	27.7%
Average annual sales in the past three years (RMB million)	Less than 5	16.9%
	5–10	22.0%
	10–50	23.6%
	50–100	14.6%
	100–400	13.2%
	400 or more	9.7%

4.2. Measures

This study used the well-established measurement items from the literature and implemented procedures to improve the validity. Firstly, the most appropriate items were used for each variable based on the context of the study and questions were developed using a seven-point Likert scale based on the measurement items. Secondly, a reference group of four industrial experts was consulted and the questions were refined according to the feedback. For example, it was suggested to integrate similar questions such as high-quality and reliable products, rapid new product development and launching new products quickly. Thirdly, a pilot study involving six senior managers was conducted to validate the measures and the items were revised further. For instance, the revisions include highlighting that process efficiency and offering flexibility are based on comparisons with industry norms. The final measurement items are attached in Appendix A and are briefly described below.

CA was measured by five indicators, namely process efficiency, offering flexibility, business synergy, quality and innovation [5], with synthesized key points from previous studies [67–69]. For SE, this paper examined the exploration strategy and the exploitation strategy, and then adopted the items from Siren et al. (2012) [70]. Organizational structure was a nine-item construct adopted from Olson et al. (2005) to measure decentralization, formalization and specialization [49]. Collaborative networks were measured using items from Tsai (2009) [61], and the extent of collaboration with suppliers, customers, competitors and universities and research institutes was surveyed.

4.3. Common Method Bias Assessment

Using data from a single respondent per firm may result in common method bias (CMB). For this reason, this study started by assessing the CMB with Harman's single-factor test. The results showed that 10 factors of eigenvalues above 1.0 explained 64.2% of the total variance. Of these, the first factor explained 25.8% of the variance, which was not the majority of the total variance. This means that CMB is not a major problem [71]. Secondly, a single factor confirmatory factor analysis (CFA) was conducted, showing fit indices of $\chi^2/df = 7.292$; IFI = 0.463; TLI = 0.434; and RMSEA = 0.121, which were significantly worse than those of the measurement model. This doubly confirms that CMB is not a problem [72]. To further assess CMB, this paper compared the measurement model and the same model with the included method factor. The model fit indices showed marginally improved (ΔCMIN/DF = 0.014; ΔRMSEA = 0.005; ΔStandardized RMR = 0.011; ΔIFI = 0.013; ΔCFI = 0.013). Once again, this indicates that CMB is not a major concern herewith [65].

4.4. Measurement Assessment, Reliability and Validity

In order to confirm the adequate fit of the measurement model to the data, a CFA was performed firstly in Amos 26.0. It showed positive results with fit indices of $\chi^2 = 1226.586$, $p < 0$, $\chi^2/df = 1.520$; GFI = 0.886, AGFI = 0.866, IFI = 0.958, TLI = 0.952, CFI = 0.958 and RMSEA = 0.035, based on the suggested threshold values of goodness-of-fit, i.e., $\chi^2/df < 3$; IFI, TLI, CFI > 0.95; and RMSEA < 0.08. The detailed statistics of the measurement analysis are listed in Table 3. It shows that all the values of Cronbach's alpha and composite reliabilities (CRs) are above 0.7, indicating adequate reliability [73]; all item loadings are above 0.6 and significant at the 0.01 level; and all average variance extracted (AVE) are above 0.5, representing adequate convergent validity. Meanwhile, the VIF values of independent and moderating variables are all less than 3.3, indicating that there is no serious multicollinearity problem [73]. As shown in Table 4, all the square roots of AVEs are greater than the corresponding inter-construct correlations, demonstrating adequate discriminant validity [74]. These indicate that both reliability and construct validity are acceptable and support proceeding to the next step of empirical analysis.

Table 3. Mean, SD, factor loading, Cronbach's alpha, CR and AVE.

Variable	Measurement Items	Loading *	Mean	SD	AVE	CR	Cronbach's Alpha	VIF
ER	ER1	0.871	4.400	0.868	0.543	0.876	0.874	1.270
	ER2	0.782						
	ER3	0.670						
	ER4	0.661						
	ER5	0.683						
	ER6	0.732						

Table 3. *Cont.*

Variable	Measurement Items	Loading *	Mean	SD	AVE	CR	Cronbach's Alpha	VIF
EI	EI1	0.832	4.80	0.747	0.507	0.860	0.859	1.247
	EI2	0.669						
	EI3	0.662						
	EI4	0.735						
	EI5	0.716						
	EI6	0.642						
DE	DE1	0.864	3.390	1.515	0.625	0.833	0.830	2.182
	DE2	0.759						
	DE3	0.742						
FO	FO1	0.847	3.910	1.301	0.646	0.846	0.842	1.750
	FO2	0.807						
	FO3	0.784						
SP	SP1	0.894	4.190	1.917	0.715	0.813	0.810	1.356
	SP2	0.862						
	SP3	0.857						
CN	CLc	0.777	4.350	1.053	0.688	0.898	0.897	1.132
	CLs	0.862						
	CLp	0.822						
	CLr	0.855						
PE	PE1	0.827	4.570	1.041	0.518	0.818	0.814	1.792
	PE2	0.681						
	PE3	0.683						
	PE4	0.715						
OF	OF1	0.878	4.230	1.182	0.587	0.849	0.845	2.138
	OF2	0.702						
	OF3	0.721						
BS	BS1	0.809	4.440	1.008	0.517	0.810	0.806	2.206
	BS2	0.667						
	BS3	0.698						
	BS4	0.695						
QU	QU1	0.855	4.400	1.045	0.571	0.798	0.791	1.539
	QU2	0.714						
	QU3	0.686						
IN	IN1	0.820	4.240	1.247	0.626	0.834	0.832	2.055
	IN2	0.791						
	IN3	0.761						

Note: SD: standard deviation; ER: exploration strategy; EI: exploitation strategy; DE: decentralization; FO: formalization; SP: specialization; CN: collaborative networks; PE: process efficiency; OF: offering flexibility; BS: business synergy; QU: quality; IN: innovation. * All factor loading significant at the $p < 0.01$ level.

Table 4. Inter-construct correlations and discriminate validity.

	CN	SP	FO	DE	EI	ER	IN	QL	BS	OF	PE
Collaborative Networks (CN)	*0.829*										
Specialization (SP)	0.046	*0.846*									
Formalization (FO)	−0.310 *	0.533 *	*0.804*								
Decentralization (DE)	0.163 *	−0.664 *	−0.709 *	*0.791*							
Exploitation (EI)	0.121 *	−0.219 *	−0.228 *	0.392 *	*0.712*						
Exploration (ER)	0.140 *	−0.258 *	−0.255 *	0.352 *	0.224 *	*0.737*					
Innovation (IN)	0.107 *	−0.351 *	−0.264 *	0.524 *	0.362 *	0.428 *	*0.791*				
Quality (QL)	0.102 *	−0.260 *	−0.317 *	0.484 *	0.372 *	0.287 *	0.598 *	*0.756*			
Bus_Synergy (BS)	−0.003	−0.422 *	−0.186 *	0.466 *	0.432 *	0.421 *	0.567 *	0.559 *	*0.720*		
Flexibility (OF)	0.174 *	−0.337 *	−0.235 *	0.487 *	0.366 *	0.437 *	0.694 *	0.570 *	0.728 *	*0.766*	
Process efficiency (PE)	0.115 *	−0.431 *	−0.366 *	0.561 *	0.346 *	0.377 *	0.629 *	0.584 *	0.613 *	0.671 *	*0.729*

Note: (1) The italicized figures along the diagonal are the squared root of AVEs; (2) * $p < 0.05$.

5. Empirical Analysis and Results

To examine the hypotheses, this study constructed structural equation models in Amos 26.0 by the maximum likelihood method. A baseline model was built to examine the main effects (Figure 2), and other models were built to examine the moderating effects by adding the interaction terms, e.g., decentralization*exploration (DE*ER) and decentralization*exploitation (DE*EI) in Model 2a and formalization*exploration (FO*ER) and formalization*exploitation (FO*EI) in Model 2b.

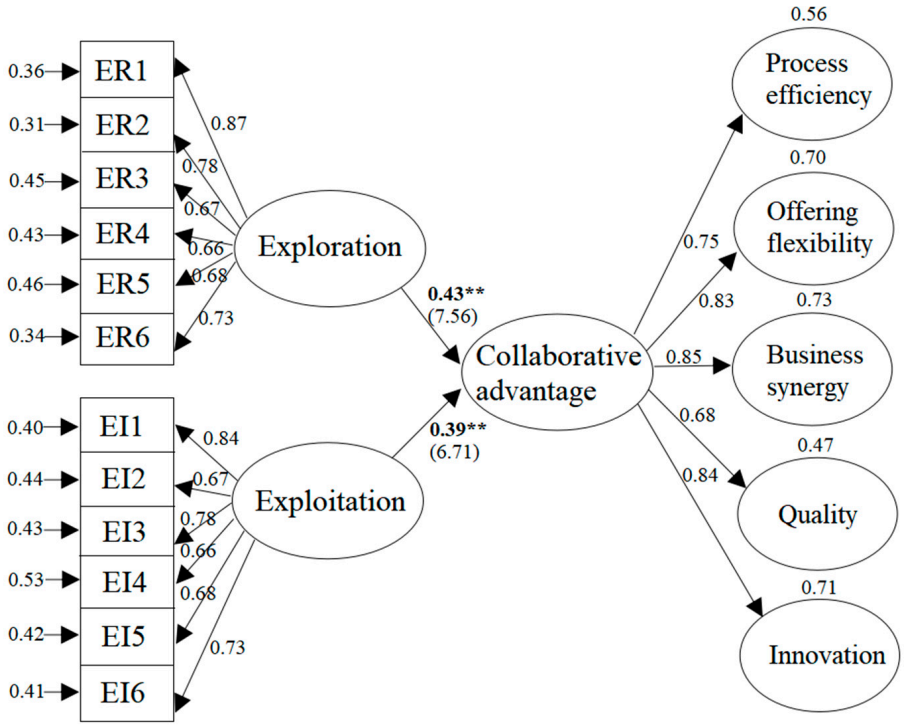

Figure 2. Baseline path analysis for main effects (source: drawn by the authors based on data analysis results). Note: (1) ** path is significant at the $p < 0.01$ level; (2) t-value is in parenthesis; (3) $\chi^2/df = 1.497$, IFI = 0.967, TLI = 0.963, CFI = 0.966, RMSEA = 0.034.

In the baseline model, the effects of the exploration strategy and the exploitation strategy were examined, respectively, with collaborative advantage (CA) as a dependent variable and firm's ownership, size and age as control variables. The values of control variables were transferred to their corresponding natural logarithm value to resolve the skewness problem. As reported in Table 5, the model fitted the data well, with 2/df = 1.497,

IFI = 0.967, TLI = 0.963, CFI = 0.966 and RMSEA = 0.034. The results indicate that the standardized path coefficients (β) are 0.43 (t = 7.56) and 0.39 (t = 6.71), which are all significant at $p < 0.01$. Hypothesis 1a (H1a) and 1b (H1b) were supported. This confirmed that both exploration and exploitation strategies have a positive and significant impact on CA.

Table 5. Estimation of the baseline structural model (main effects).

Item	**Main Effect**
Model fit	**Model 1**
χ^2/d.f	1.497
IFI	0.967
TLI	0.963
CFI	0.966
RMSEA	0.034
Path	**Estimate**
ER→CA	0.430 (7.561)
EI→CA	0.387 (6.714)
Controls	
Age→CA	0.043 (−0.954)
Size→CA	−0.008 (0.182)
Ownership→CA	−0.040 (0.889)
R^2	0.363

Note: t-values are in parentheses.

To examine the moderating effects of organizational structure, the interaction terms of SE (i.e., ER for exploration strategy; EI for exploitation strategy) and organizational structure (i.e., DE for decentralization; FO for formalization; SP for specialization) were added to the baseline model, forming Models 2a, 2b, 2c and Model 3 in Table 6. Similarly, Model 4 was constructed to examine the effect of imbalance (absolute difference) between exploration and exploitation on CA and Models 5a, 5b, 5c were constructed based on the full sample as well as subsamples of SMEs and large firms, where SMEs and large firms were divided according to the 500 employee cut-off in previous studies [4,53] to examine the interaction effects of exploration and exploitation. To avoid the multi-collinearity problem, all the items were mean centered before creating the interaction terms [75]. As reported in Table 6, the path from DE*ER to CA is positive and significant (β = 0.113; t = 1.739; $p < 0.1$), supporting H2a. This confirms the positive moderating effect of decentralization on the impact of the exploration strategy on CA. The path from DE*EI to CA is negative and insignificant (β = −0.042; t = −0.743; $p > 0.1$); thus, H3a is not supported. This may be due to the fact that decentralization expands the firm's access to new resources and knowledge [76], which is emphasized by the exploration strategy, but reduces the management and operational efficiency, which is needed by the exploitation strategy. In the same way, the hypotheses listed in Table 7 for H2b through H5c were tested and most of them were supported, except for H3b and H3c. That means the moderating effects of formalization and specialization on the impact of exploitation on CA are insignificant, although they are still negative as hypothesized. This may be due to the fact that exploitation emphasizes accuracy and serving the current customers [29,30] and formalization does lead to stability, albeit at the expense of efficiency, while specialized firms have more specialists that can better serve the same group of customers, albeit with deficiencies in flexibility and collaboration. Model 5b was built based on a subsample of SMEs, revealing that the interaction effect of exploration and exploitation was positive but insignificant (β = 0.063; t = 1.003; $p > 0.1$); Model 5c indicated a positive and significant interaction effect for large firms (β = 0.133; t = 1.893; $p < 0.1$). H5c was supported.

Table 6. Estimation of the structural models (interaction effects).

Items	**Interaction Effects**							
Model fit	**Model 2a**	**Model 2b**	**Model 2c**	**Model 3**	**Model 4**	**Model 5a**	**Model 5b**	**Model 5c**
χ^2/d.f	1.414	1.581	1.516	1.634	1.745	1.443	1.167	1.322
IFI	0.958	0.943	0.952	0.939	0.947	0.968	0.980	0.937
TLI	0.953	0.936	0.947	0.933	0.941	0.964	0.977	0.929
CFI	0.957	0.942	0.951	0.939	0.946	0.967	0.979	0.936
RMSEA	0.031	0.037	0.035	0.038	0.042	0.032	0.027	0.040
Path	**Estimate**	**Estimate**	**Estimate**	**Estimate**	**Estimate**	**Estimate**	**Estimate**	**Estimate**
DE*ER→CA	0.113 (1.739)							
DE*EI→CA	−0.042 (−0.743)							
FO*ER→CA		−0.158 (−2.516)						
FO*EI→CA		−0.066 (−1.045)						
SP*ER→CA			−0.121 (−2.204)					
SP*EI→CA			−0.036 (−0.683)					
CN*ER→CA				0.145 (2.126)				
CN*EI→CA				0.130 (2.143)				
|ER-EI|→CA					−0.081 (−1.789)			
ER*EI→CA						0.089 (2.005)	0.063 (1.003)	0.133 (1.893)
Controls								
Age→CA	−0.062 (−1.399)	−0.044 (−1.029)	−0.030 (−0.743)	−0.040 (−0.916)	−0.039 (−0.870)	−0.041 (−0.922)	−0.092 (−1.466)	0.005 (0.071)
Size→CA	0.104 (2.647)	0.047 (1.086)	0.104 (2.529)	−0.061 (−1.379)	−0.015 (−0.327)	−0.010 (−0.216)	−0.075 (−1.194)	0.202 (2.707)
Ownnership→CA	0.038 (0.982)	0.057 (1.319)	0.061 (1.504)	0.050 (1.124)	0.055 (1.234)	0.049 (1.109)	0.012 (0.198)	0.063 (0.923)
$\mathbf{R^2}$	0.569	0.432	0.504	0.394	0.455	0.371	0.307	0.345
$\mathbf{\Delta R^2}$	0.206	0.069	0.141	0.031	0.092	0.008	-	-

Note: t-values are in parentheses.

Table 7. Results of the hypothesis tests.

Hypothesis	**Result**
H1a. The exploration strategy has a positive and significant impact on CA.	Supported
H1b. The exploitation strategy has a positive and significant impact on CA.	Supported
H2a. Decentralization positively moderates the impact of the exploration strategy on CA.	Supported
H3a. Decentralization positively moderates the impact of the exploitation strategy on CA.	Not supported
H2b. Formalization negatively moderates the impact of the exploration strategy on CA.	Supported
H3b. Formalization negatively moderates the impact of the exploitation strategy on CA.	Not supported
H2c. Specialization negatively moderates the impact of the exploration strategy on CA.	Supported
H3c. Specialization negatively moderates the impact of the exploitation strategy on CA.	Not supported
H4a. Collaborative networks positively moderate the impact of the exploration strategy on CA.	Supported
H4b. Collaborative networks positively moderate the impact of the exploitation strategy on CA.	Supported
H5a. There is a positive interaction effect between exploration and exploitation strategies on CA.	Supported
H5b. The imbalance between exploration and exploitation strategies negatively impacts CA.	Supported
H5c. Firm size positively moderates the interaction effect of exploration and exploitation strategies on CA.	Supported

5.1. Ad Hoc Analysis

While the positive interaction effect between exploration and exploitation strategies on CA has been validated and an imbalance between the two would decrease the CA, it raises another key question, namely, how to balance the two strategies to achieve strategic ambidexterity. In practice, ambidexterity is thought to be hard to reach or ineffective in some conditions [77,78]. However, there are some studies in the literature that have provided valuable ideas. For example, Lavie et al. (2011) and Voss and Voss (2013) recommend balancing exploration and exploitation strategies across functional domains rather than

within a single activity domain to avoid conflicts in resource allocation [79]. On that basis, this study classifies the collaborative networks into vertical and horizontal collaboration based on different resource attributes and functional domains. Vertical collaboration with suppliers and customers is mainly for the functional domain of production and marketing (P&M), while horizontal collaboration with competitors, universities and research institutes is for research and development (R&D). In line with a previous study [80], this study examined three types of strategic interactions, namely (1) pure exploration or pure exploitation across the two domains, (2) within-function ambidexterity (i.e., balance exploration and exploitation within a single domain) and (3) cross-functional ambidexterity (i.e., balance two strategies across two domains). The results in Table 8 indicate that the interaction effect of exploration and exploitation strategies on CA remains significantly effective only when it is performed across functional domains ($\beta = 0.082$; $t = 1.896$; $p < 0.1$).

Table 8. Ad hoc analysis results.

Main Effects	**Estimate**
ER→CA	0.430 (7.191)
EI→CA	0.387 (5.853)
R&D exploration	−0.056 (−1.307)
P&M exploration	0.104 (2.397)
R&D exploitation	0.095 (2.202)
P&M exploitation	0.008 (0.191)
Strategic interactions	
(1) Pure strategic emphasis	
R&D exploration*P&M exploration	−0.036 (−0.846)
R&D exploitation*P&M exploitation	0.026 (0.597)
(2) Within-function ambidexterity	
R&D exploration*R&D exploitation	0.070 (1.637)
P&M exploration*P&M exploitation	−0.033 (−0.782)
(3) Cross-functional ambidexterity	
R&D exploration*P&M exploitation	0.082 (1.896)
R&D exploitation*R&D exploration	
Controls	
Age→CA	−0.043 (−1.009)
Size→CA	−0.057 (−1.333)
Ownership→CA	0.048 (1.130)
$\mathbf{R^2}$	0.428

Note: (1) R&D: research and development; P&M: production and marketing; (2) t-values are in parentheses.

6. Conclusions and Implications

This study contributes significantly to the literature by applying strategic entrepreneurship (SE) to the supply chain innovation research and specifically sheds light on the key issue of how to promote sustainable supply chain innovation from the perspective of CA. Through a comprehensive interdisciplinary theoretical analysis and an in-depth empirical investigation based on 432 manufacturing firms in China, this study has addressed the research questions and objectives designed in the beginning. Firstly, both exploration and exploitation strategies have positive and significant impacts on CA, but different organizational structures may enhance or weaken this impact. For instance, the positive impact of the exploration strategy on CA is enhanced in decentralized firms but weakened in formalized and specialized firms. Additionally, there is a positive moderating effect of collaborative networks on the impact of SE on CA. However, collaboration with different supply chain partners, such as vertical collaboration with suppliers and customers or horizontal collaboration with competitors and research institutes, will bring about different types of resources and thus result in different effects on the achievement of a CA and supply chain innovation. These are the contingent effects of organizational structure and collaborative networks. From this, the first two research questions were addressed.

Secondly, the empirical study shows that there is a positive interaction effect between exploration and exploitation strategies in terms of CA. However, different firms, such as SMEs and large firms, have different resources and capabilities. Strategic ambidexterity can be achieved by overcoming internal competition for resources based on the firm's circumstances, and by achieving a balance between exploration and exploitation strategies through the allocation of resources in different functional domains, such as across R&D and production and marketing areas. This responds to the third research question. In all, all of these findings provide important implications from both theoretical and managerial perspectives.

6.1. Theoretical Implications

This study fills the gap by applying SE in the research of CA in the supply chain context. Previous studies have examined the interactions between SE and collaborative innovation [20] and validated the positive effect of collaborative activities on sustainable supply chain innovation [2,3]. However, the issue of how to build a dynamic collaborative relationship with a CA has been neglected. Therefore, this study explores the underlying mechanisms of how SE can be deployed to achieve a CA and thus promote sustainable supply chain innovation, and has developed an integrated theoretical model to address these issues.

Instead of partially stressing the importance of supply chain collaboration, this study focuses on the establishment of a CA. Based on the empirical results of H1a and H1b in Section 5, it is confirmed that both exploration and exploitation strategies under SE have a positive impact on CA. However, the effective implementation of the strategy is influenced by numerous factors. Drawing on the strategy–structure–performance (SSP) paradigm, this study has identified the organizational structure as one of the key factors influencing the impact of SE on CA. Specifically, a decentralized structure enhances the positive impact of the exploration strategy on CA, but a formalized or specialized one has the contrary effect. As shown in H2a to H3c, formalization and specialization negatively moderate the positive impacts of exploration strategy on CA. These results are in line with previous studies in the literature [50,51]. Furthermore, this study draws on the extended resource-based view (RBV) to validate the role of collaborative networks. Having verified the positive interaction effect between exploration and exploitation strategies, this study addresses another key question, namely, how to balance the two strategies to further improve the CA. The ad hoc analysis in Section 5.1 reveals that the interaction of exploration and exploitation needs to be executed across different functional domains; otherwise, the positive interaction effect will be diminished or reversed. In light of the above, this study takes a comprehensive view by examining the contingent effects of organizational structure and collaborative networks, as well as the interaction effect of exploration and exploitation strategies.

6.2. Managerial Implications

This study provides important implications for practitioners as it promotes a dynamic and contingent view on supply chain collaboration. Firstly, the achievement of a CA needs to stem from supportive strategies, structures and leadership. As proposed in the conceptual model in Section 3.1 and examined in the empirical analysis in Section 5, both exploration and exploitation strategies have a positive impact on CA. Since SE is ambidextrous on both exploration and exploitation strategies [43], the first managerial implication is to develop SE in firms for achieving a CA. Secondly, each strategy needs to be followed by an appropriate organizational structure to ensure its successful implementation. As shown in Table 7, H2a, H2b and H2c are all supported. This result provides a second managerial implication that CA can be further improved through alignment between strategy and organizational structure. This is consistent with previous research that found that maintaining dynamism facilitates supply chain resilience and sustainability [81,82]. Thirdly, as examined in H4a and H4b, collaborative networks have a positive moderating

effect on the impact of SE on CA. These encourage firms to expand their network of collaboration and maintain a sustainable supply chain to achieve a CA.

In addition, the relationship between exploration and exploitation strategies and the mechanism for balancing the two strategies is another key issue in this study. Firstly, traditionally, a firm's resources are usually considered constant, so exploration and exploitation may hinder each other [35], whereas this study validates a positive interaction effect of the two strategies to achieve a CA. In the context of collaboration, firms can cross organizational boundaries to gain network resources, thus breaking through resource constraints. Therefore, as suggested by the results of H5a and H5b, firms need to balance exploration and exploitation strategies and avoid the imbalance of the two. Secondly, as shown in H5c, the interaction effect of exploration and exploitation differs in SMEs and in large firms. This requires versatile management capabilities and expertise that might be lacking in SMEs [55]. Additionally, SMEs may not be able to establish separate organization units to focus on exploration and exploitation, respectively, as large firms do [5]. This implies that SMEs and large firms need to adopt different strategies to balance exploration and exploitation. For example, in the case that interaction effect in SMEs is not significant, SMEs may adopt a temporal separation approach, which means balancing the two over time. Large firms, on the other hand, need to balance the two strategies across different functional domains, such as across the domains of R&D and production and marketing.

7. Limitations and Future Research Directions

Although this study provides a comprehensive analysis of the research questions, there are some limitations that could serve as directions for future research. Firstly, in order to exclude the possible impact of the external environment, such as impacts from culture and policy, this study surveyed geographically adjacent regions. Future research can take into consideration other regions and research contexts. Secondly, the empirical data in this study were selected from across industries. Considering the differences in industry attributes, future research could conduct longitudinal investigations within a specific industry. Thirdly, there is a high degree of complexity from strategy development to implementation, and managers play a key role in properly balancing different strategies. However, it is not realistic to expect every manager to be a multifaceted leader. Future research could explore the impact of leadership on strategy and what leadership styles are most needed under different strategies. Finally, digitization has become a global trend, and it is recommended that the role of sustainability and the digital transition is considered in future research on supply chain innovation.

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Appendix A. Measurement Items

AA. Strategic Entrepreneurship (Siren et al., 2012) [70]

Exploration

ER1. My firm actively seeks new ideas that are imaginative and creative.
ER2. My firm's success is built on its ability to identify and exploit new possibilities in products, services, technologies and processes.
ER3. My firm produces innovative products and services.
ER4. My firm seeks to meet the customers' needs in a creative way.
ER5. My firm is bold in creating new markets with great intensity.

ER6.My firm is actively targeting new customer segments.
Exploitation
EI1. My firm is committed to improving the level of quality and efficiency.
EI2. My firm is constantly improving the stability of our products and services.
EI3. My firm emphasizes the improvement of the automation level in the operations.
EI4. My firm constantly conducts satisfaction surveys on existing customers.
EI5. My firm strives to adjust our offer to maintain the satisfaction of our current customers.
EI6. My firm pays more focus to our existing customer base.
BB. Organization Structure (Olson et al., 2005) [49]
Decentralization
DE1. Front-line managers have the flexibility to decide how to get the work done.
DE2. Front-line managers have a lot of autonomy.
DE3. Important decisions are often made locally instead of centrally.
Formalization
FO1. Our employees usually do things in a step-by-step manner.
FO2. Our employees are often stressed when following the procedures to complete a job.
FO3. Our employees are used to looking to the same person for answers on a variety of issues.
Specialization
SP1. My firm has many "specialist" employees and they only perform a narrow range of activities.
SP2. Most of the employees in my firm are generalists (reverse coding) working in various jobs.
SP3. My firm expects the employees to be experts in their field of responsibility only.
CC. Collaborative Networks (Tsai, 2009) [61]
CN1. The extent of collaboration with suppliers.
CN2. The extent of collaboration with customers.
CN3. The extent of collaboration with competitors.
CN4. The extent of collaboration with research institutes and universities.
DD. Collaborative Advantage (Cao and Zhang, 2011; Cinelli et al., 2019; Kumar et al., 2021; Mende et al., 2021) [5,67–69]
Process efficiency
PE1. Compared to industry norms, my firm has achieved agreed unit costs with supply chain partners.
PE2. Compared to industry norms, my firm meets productivity standards with supply chain partners.
PE3. Compared to industry norms, my firm meets the delivery time requirements with supply chain partners.
PE4. Compared to industry norms, my firm works with supply chain partners to meet inventory (finished goods) requirements.
Offering flexibility
OF1. Compared to industry norms, my firm works with supply chain partners to efficiently deliver a variety of products and services.
OF2. Compared to industry norms, my firm works with supply chain partners to quickly deliver customized products and services with different features.
OF3. Compared to industry norms, my firm works with supply chain partners to efficiently meet the volume requirements of different customers.
OF4. Compared to industry norms, my firm works with supply chain partners to respond well to the customers.
Business synergy
BS1. My firm and supply chain partners are open in interaction and have aligned infrastructures of IT.
BS2. My firm and supply chain partners have aligned knowledge bases and have prepared for collaborative learning.

BS3. My firm and supply chain partners have aligned marketing efforts.
BS4. My firm and supply chain partners have aligned production systems.
Quality
QU1. My firm and supply chain partners provide highly reliable products.
QU2. My firm and supply chain partners provide highly durable products.
QU3. My firm and supply chain partners work together to improve product quality.
Innovation
IN1. My firm works with supply chain partners to analyze common innovation activities and launch new products and services quickly.
IN2. My firm works with supply chain partners to develop new products faster than competitors.
IN3. My firm works with supply chain partners to innovate frequently.

References

1. Jimenez-Jimenez, D.; Martínez-Costa, M.; Rodriguez, C.S. The mediating role of supply chain collaboration on the relationship between information technology and innovation. *J. Knowl. Manag.* **2018**, *23*, 548–567. [CrossRef]
2. Shan, H.; Li, Y.; Shi, J. Influence of Supply Chain Collaborative Innovation on Sustainable Development of Supply Chain: A Study on Chinese Enterprises. *Sustainability* **2020**, *12*, 2978. [CrossRef]
3. Lee, D. Implementation of Collaborative Activities for Sustainable Supply Chain Innovation: An Analysis of the Firm Size Effect. *Sustainability* **2019**, *11*, 3026. [CrossRef]
4. Huang, Y.; Han, W.; Macbeth, D.K. The complexity of collaboration in supply chain networks. *Supply Chain Manag. Int. J.* **2020**, *25*, 393–410. [CrossRef]
5. Cao, M.; Zhang, Q. Supply chain collaboration: Impact on collaborative advantage and firm performance. *J. Oper. Manag.* **2011**, *29*, 163–180. [CrossRef]
6. Han, W.; Huang, Y.; Macbeth, D. Performance measurement of cross-culture supply chain partnership: A case study in the Chinese automotive industry. *Int. J. Prod. Res.* **2018**, *56*, 2437–2451. [CrossRef]
7. Limoubpratum, C.; Shee, H.; Ahsan, K. Sustainable distribution through coopetition strategy. *Int. J. Logist. Res. Appl.* **2015**, *18*, 424–441. [CrossRef]
8. Bryson, J.M.; Ackermann, F.; Eden, C. Discovering Collaborative Advantage: The Contributions of Goal Categories and Visual Strategy Mapping. *Public Adm. Rev.* **2016**, *76*, 912–925. [CrossRef]
9. Mulyana, M.; Wasitowati, W. The improvement of collaborative networks to increase small and medium enterprises (SMEs) performance. *Serbian J. Manag.* **2021**, *16*, 213–229. [CrossRef]
10. Li, R.; Peng, C.; Koo, B.; Zhang, G.; Yang, H. Obtaining sustainable competitive advantage through collaborative dual innovation: Empirical analysis based on mature enterprises in eastern China. *Technol. Anal. Strat. Manag.* **2021**, *33*, 685–699. [CrossRef]
11. Verweij, S.; Satheesh, S.A. In search of the collaborative advantage of public-private partnerships: A comparative analysis of Dutch transport infrastructure projects. *Public Adm. Rev.* **2023**, *83*, 679–690. [CrossRef]
12. Barratt, M. Understanding the meaning of collaboration in the supply chain. *Supply Chain Manag. Int. J.* **2004**, *9*, 30–42. [CrossRef]
13. Becker, M.C.; Knudsen, T.; Swedberg, R. Schumpeter's theory of economic development: 100 years of development. *J. Evol. Econ.* **2012**, *22*, 917–933. [CrossRef]
14. Ireland, R.D.; Hitt, M.A.; Sirmon, D.G. A model of strategic entrepreneurship: The construct and its dimensions. *J. Manag.* **2003**, *29*, 963–989.
15. Farida, F.A.; Hermanto, Y.B.; Paulus, A.L.; Leylasari, H.T. Strategic Entrepreneurship Mindset, Strategic Entrepreneurship Leadership, and Entrepreneurial Value Creation of SMEs in East Java, Indonesia: A Strategic Entrepreneurship Perspective. *Sustainability* **2022**, *14*, 10321. [CrossRef]
16. Schindehutte, M.; Morris, M.H. Advancing strategic entrepreneurship research: The role of complexity science in shifting the paradigm. *Entrep. Theory Pract.* **2009**, *33*, 241–276. [CrossRef]
17. Hitt, M.A.; Ireland, R.D.; Sirmon, D.G.; Trahms, C.A. Strategic entrepreneurship: Creating value for individuals, organizations, and society. *Acad. Manag. Perspect.* **2011**, *25*, 57–75.
18. Kyrgidou, L.P.; Hughes, M. Strategic entrepreneurship: Origins, core elements and research directions. *Eur. Bus. Rev.* **2010**, *22*, 43–63. [CrossRef]
19. Ketchen, D.J., Jr.; Ireland, R.D.; Snow, C.C. Strategic entrepreneurship, collaborative innovation, and wealth creation. *Strateg. Entrep. J.* **2007**, *1*, 371–385. [CrossRef]
20. Tsai, I.; Lei, H.S. The importance and satisfaction of collaborative innovation for strategic entrepreneurship. *Eurasia J. Math. Sci. Technol. Educ.* **2016**, *12*, 569–582. [CrossRef]
21. Tipu, S.A.A.; Fantazy, K. Exploring the relationships of strategic entrepreneurship and social capital to sustainable supply chain management and organizational performance. *Int. J. Prod. Perform. Manag.* **2018**, *67*, 2046–2070. [CrossRef]
22. Estrada-Cruz, M.; Rodriguez-Hernández, N.; Verdú-Jover, A.J.; Gómez-Gras, J.M. The effect of competitive intensity on the relationship between strategic entrepreneurship and organizational results. *Int. Entrep. Manag. J.* **2022**, *18*, 1–24. [CrossRef]

23. Hoang, H.; Rothaermel, F.T. Leveraging internal and external experience: Exploration, exploitation, and R&D project performance. *Strat. Manag. J.* **2010**, *31*, 734–758. [CrossRef]
24. Shi, X.; Su, L.; Cui, A.P. A meta-analytic study on exploration and exploitation. *J. Bus. Ind. Mark.* **2020**, *35*, 97–115. [CrossRef]
25. Hitt, M.A.; Ireland, R.D.; Camp, S.M.; Sexton, D.L. Guest Editors' Introduction to the Special Issue Strategic Entrepreneurship: Entrepreneurial Strategies for Wealth Creation. *Strateg. Manag. J.* **2001**, *22*, 479–491. [CrossRef]
26. Luu, T.D. Fostering strategic entrepreneurship of SMEs: The role of organisational change forces. *Manag. Decis.* **2023**, *61*, 695–719. [CrossRef]
27. Mazzei, M.J. Strategic entrepreneurship: Content, process, context, and outcomes. *Int. Entrep. Manag. J.* **2018**, *14*, 657–670. [CrossRef]
28. Clauss, T.; Kraus, S.; Kallinger, F.L.; Bican, P.M.; Brem, A.; Kailer, N. Organizational ambidexterity and competitive advantage: The role of strategic agility in the exploration-exploitation paradox. *J. Innov. Knowl.* **2021**, *6*, 203–213. [CrossRef]
29. March, J.G. Exploration and exploitation in organizational learning. *Organ. Sci.* **1991**, *2*, 71–87. [CrossRef]
30. Teece, D.J. Dynamic capabilities and entrepreneurial management in large organizations: Toward a theory of the (entrepreneurial) firm. *Eur. Econ. Rev.* **2016**, *86*, 202–216. [CrossRef]
31. Christopher, M. The agile supply chain: Competing in volatile markets. *Ind. Mark. Manag.* **2000**, *29*, 37–44. [CrossRef]
32. Govindan, K.; Hasanagic, M. A systematic review on drivers, barriers, and practices towards circular economy: A supply chain perspective. *Int. J. Prod. Res.* **2018**, *56*, 278–311. [CrossRef]
33. Gao, D.; Xu, Z.; Ruan, Y.Z.; Lu, H. From a systematic literature review to integrated definition for sustainable supply chain innovation (SSCI). *J. Clean. Prod.* **2017**, *142*, 1518–1538. [CrossRef]
34. Nilsson, F.; Göransson, M. Critical factors for the realization of sustainable supply chain innovations—Model development based on a systematic literature review. *J. Clean. Prod.* **2021**, *296*, 126471. [CrossRef]
35. Costa, J.; Matias, J.C.O. Open Innovation 4.0 as an Enhancer of Sustainable Innovation Ecosystems. *Sustainability* **2020**, *12*, 8112. [CrossRef]
36. Kunnapapdeelert, S.; Pitchayadejanant, K. Analyzing the effect of supply chain strategies and collaboration on performance improvement using MIMIC model. *Int. J. Ind. Eng. Manag.* **2021**, *12*, 216–225. [CrossRef]
37. Abbate, S.; Centobelli, P.; Cerchione, R. The digital and sustainable transition of the agri-food sector. *Technol. Forecast. Soc. Chang.* **2023**, *187*, 122222. [CrossRef]
38. Abbate, S.; Centobelli, P.; Cerchione, R.; Giardino, G.; Passaro, R. Coming out the egg: Assessing the benefits of circular economy strategies in agri-food industry. *J. Clean. Prod.* **2023**, *385*, 135665. [CrossRef]
39. Abbate, S.; Centobelli, P.; Cerchione, R. From Fast to Slow: An Exploratory Analysis of Circular Business Models in the Italian Apparel Industry. *Int. J. Prod. Econ.* **2023**, *260*, 108824. [CrossRef]
40. Kadlubek, M. Supply chain in the strategic approach with the aspect of quality. *Int. J. Qual. Res.* **2022**, *16*, 1255–1268. [CrossRef]
41. Vangen, S.; Huxham, C. Achieving collaborative advantage: Understanding the challenge and making it happen. *Strat. Dir.* **2006**, *22*, 3–5. [CrossRef]
42. Shee, H.; Miah, S.J.; Fairfield, L.; Pujawan, N. The impact of cloud-enabled process integration on supply chain performance and firm sustainability: The moderating role of top management. *Supply Chain Manag. Int. J.* **2018**, *23*, 500–517. [CrossRef]
43. Carvalho, N.L.; Mendes, J.V.; Akim, E.K.; Mergulhão, R.C.; Vieira, J.G.V. Supply chain collaboration: Differing perspectives of Brazilian companies. *Int. J. Logist. Manag.* **2021**, *32*, 118–137. [CrossRef]
44. Kanter, R.M. Collaborative advantage: The Art of Alliances. *Harv. Bus. Rev.* **1994**, *72*, 96–108.
45. Lasker, R.D.; Weiss, E.S.; Miller, R. Partnership synergy: A practical framework for studying and strengthening the collaborative advantage. *Milbank Q.* **2001**, *79*, 179. [CrossRef] [PubMed]
46. Fawcett, S.E.; Fawcett, A.M.; Knemeyer, A.M.; Brockhaus, S.; Webb, G.S. Overcoming the collaborative challenge: Commitment as a super-ordinate enabler of value co-creation. *Int. J. Phys. Distrib. Logist. Manag.* **2021**, *51*, 1022–1047. [CrossRef]
47. Banchuen, P.; Sadler, I.; Shee, H. Supply chain collaboration aligns order-winning strategy with business outcomes. *IIMB Manag. Rev.* **2017**, *29*, 109–121. [CrossRef]
48. Nakano, M.; Lau, A.K. A systematic review on supply chain risk management: Using the strategy-structure-process-performance framework. *Int. J. Logist. Res. Appl.* **2020**, *23*, 443–473. [CrossRef]
49. Olson, E.M.; Slater, S.F.; Hult, G.T.M. The performance implications of fit among business strategy, marketing organization structure, and strategic behavior. *J. Mark.* **2005**, *69*, 49–65. [CrossRef]
50. Barney, J. Firm Resources and Sustained Competitive Advantage. *J. Manag.* **1991**, *17*, 99–120. [CrossRef]
51. Gueler, M.S.; Schneider, S. The resource-based view in business ecosystems: A perspective on the determinants of a valuable resource and capability. *J. Bus. Res.* **2021**, *133*, 158–169. [CrossRef]
52. Bedford, D.S.; Bisbe, J.; Sweeney, B. Performance measurement systems as generators of cognitive conflict in ambidextrous firms. *Account. Organ. Soc.* **2019**, *72*, 21–37. [CrossRef]
53. Deligianni, I.; Voudouris, I.; Lioukas, S. Do effectuation processes shape the relationship between product diversification and performance in new ventures? *Entrep. Theory Pract.* **2017**, *41*, 349–377. [CrossRef]
54. Kraus, S.; Breier, M.; Jones, P.; Hughes, M. Individual entrepreneurial orientation and intrapreneurship in the public sector. *Int. Entrep. Manag. J.* **2019**, *15*, 1247–1268. [CrossRef]
55. Hill, S.A.; Birkinshaw, J. Ambidexterity and survival in corporate venture units. *J. Manag.* **2014**, *40*, 1899–1931. [CrossRef]

56. Bogers, M.; Zobel, A.K.; Afuah, A.; Almirall, E.; Brunswicker, S.; Dahlander, L.; Frederiksen, L.; Gawer, A.; Gruber, M.; Haefliger, S.; et al. The open innovation research landscape: Established perspectives and emerging themes across different levels of analysis. *Ind. Innov.* **2017**, *24*, 8–40. [CrossRef]
57. Dalton, D.R.; Todor, W.D.; Spendolini, M.J.; Fielding, G.J.; Porter, L.W. Organization structure and performance: A critical review. *Acad. Manag. Rev.* **1980**, *5*, 49–64. [CrossRef]
58. Daugherty, P.J.; Chen, H.; Ferrin, B.G. Organizational structure and logistics service innovation. *Int. J. Logist. Manag.* **2011**, *22*, 26–51. [CrossRef]
59. Chu, Z.; Feng, B.; Lai, F. Logistics service innovation by third party logistics providers in China: Aligning guanxi and organizational structure. *Transp. Res. Part E Logist. Transp. Rev.* **2018**, *118*, 291–307. [CrossRef]
60. Najafi-Tavani, S.; Najafi-Tavani, Z.; Naudé, P.; Oghazi, P.; Zeynaloo, E. How collaborative innovation networks affect new product performance: Product innovation capability, process innovation capability, and absorptive capacity. *Ind. Mark. Manag.* **2018**, *73*, 193–205. [CrossRef]
61. Tsai, K. Collaborative networks and product innovation performance: Toward a contingency perspective. *Res. Policy* **2009**, *38*, 765–778. [CrossRef]
62. Sudusinghe, J.I.; Seuring, S. Supply chain collaboration and sustainability performance in circular economy: A systematic literature review. *Int. J. Prod. Econ.* **2022**, *245*, 108402. [CrossRef]
63. Ebben, J.J.; Johnson, A.C. Efficiency, flexibility, or both? Evidence linking strategy to performance in small firms. *Strat. Manag. J.* **2005**, *26*, 1249–1259. [CrossRef]
64. He, Z.-L.; Wong, P.-K. Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organ. Sci.* **2004**, *15*, 481–494. [CrossRef]
65. TheStateCouncilofPRC. Premier Calls for New Progress in Revitalization of NE China. 2021. Available online: Http://english.www.gov.cn/premier/news/202108/24/content_WS6124f540c6d0df57f98df12f.html (accessed on 18 May 2023).
66. Busenitz, L.W.; Gomez, C.; Spencer, J.W. Country institutional profiles: Unlocking entrepreneurial phenomena. *Acad. Manag. J.* **2000**, *43*, 994–1003. [CrossRef]
67. Cinelli, M.; Ferraro, G.; Iovanella, A. Network processes for collaborative innovation. *Int. J. Entrep. Small Bus.* **2019**, *36*, 430–452. [CrossRef]
68. Kumar, G.; Meena, P.; Difrancesco, R.M. How do collaborative culture and capability improve sustainability? *J. Clean. Prod.* **2021**, *291*, 125824. [CrossRef]
69. Mende, S.; Proske, A.; Narciss, S. Individual preparation for collaborative learning: Systematic review and synthesis. *Educ. Psychol.* **2021**, *56*, 29–53. [CrossRef]
70. Sirén, C.A.; Kohtamäki, M.; Kuckertz, A. Exploration and exploitation strategies, profit performance, and the mediating role of strategic learning: Escaping the exploitation trap. *Strat. Entrep. J.* **2012**, *6*, 18–41. [CrossRef]
71. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.-Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef]
72. Flynn, B.B.; Huo, B.; Zhao, X. The impact of supply chain integration on performance: A contingency and configuration approach. *J. Oper. Manag.* **2010**, *28*, 58–71. [CrossRef]
73. Paulraj, A.; Lado, A.A.; Chen, I.J. Inter-organizational communication as a relational competency: Antecedents and performance outcomes in collaborative buyer-supplier relationships. *J. Oper. Manag.* **2008**, *26*, 45–64. [CrossRef]
74. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [CrossRef]
75. Ping, R.A.J. A Parsimonious Estimating Technique for Interaction and Quadratic Latent Variables. *J. Mark. Res.* **1995**, *32*, 336–347. [CrossRef]
76. Christie, A.A.; Joye, M.P.; Watts, R.L. Decentralization of the firm: Theory and evidence. *J. Corp. Finance* **2003**, *9*, 3–36. [CrossRef]
77. Luger, J.; Raisch, S.; Schimmer, M. Dynamic Balancing of Exploration and Exploitation: The Contingent Benefits of Ambidexterity. *Organ. Sci.* **2018**, *29*, 449–470. [CrossRef]
78. Solís-Molina, M.; Hernández-Espallardo, M.; Rodríguez-Orejuela, A. Performance implications of organizational ambidexterity versus specialization in exploitation or exploration: The role of absorptive capacity. *J. Bus. Res.* **2018**, *91*, 181–194. [CrossRef]
79. Lavie, D.; Kang, J.; Rosenkopf, L. Balance Within and Across Domains: The Performance Implications of Exploration and Exploitation in Alliances. *Organ. Sci.* **2011**, *22*, 1517–1538. [CrossRef]
80. Voss, G.B.; Voss, Z.G. Strategic Ambidexterity in Small and Medium-Sized Enterprises: Implementing Exploration and Exploitation in Product and Market Domains. *Organ. Sci.* **2013**, *24*, 1459–1477. [CrossRef]
81. Bag, S.; Gupta, S.; Foropon, C. Examining the role of dynamic remanufacturing capability on supply chain resilience in circular economy. *Manag. Decis.* **2018**, *57*, 863–885. [CrossRef]
82. Zhu, X.; Wu, Y.J. How Does Supply Chain Resilience Affect Supply Chain Performance? The Mediating Effect of Sustainability. *Sustainability* **2022**, *14*, 14626. [CrossRef]