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The Relationship Between Supply Chain Integration and Organizational Performance: The Mediating Role of Supply Chain Resilience in Food Small and Medium-Sized Enterprises in Kerman Industrial Estates

Majid Shakoorian¹, Abbas Babaeinejad^{2*}, Farbod Askarifar³

1. Department of Industrial Management, Ke.C., Islamic Azad University, Kerman, Iran

2. Department of Public Administration, Ke.C., Islamic Azad University, Kerman, Iran

3. Department of Business Management, Ke.C., Islamic Azad University, Kerman, Iran

*Correspondence: abbasbabaei@iau.ac.ir

Abstract

This study aimed to examine the relationship between supply chain integration and organizational performance and to determine the mediating role of supply chain resilience among small and medium-sized food enterprises operating in the industrial estates of Kerman. This applied, quantitative, cross-sectional correlational study was conducted among managers and organizational decision-makers working in food SMEs located in the industrial estates of Kerman, Iran. Using proportionate stratified sampling, 312 questionnaires were distributed, of which 278 valid questionnaires were retained for analysis. Data were collected using a structured questionnaire measuring supply chain integration through internal, supplier, and customer integration, supply chain resilience, and organizational performance. Preliminary analyses were performed in IBM SPSS Statistics, while the measurement and structural models were evaluated using partial least squares structural equation modeling in SmartPLS 4. Reliability, convergent validity, discriminant validity, multicollinearity, explanatory power, predictive relevance, direct effects, and mediation were assessed. Statistical significance was evaluated through bootstrapping with 5,000 resamples at $p < .05$. Supply chain integration had a significant positive effect on supply chain resilience ($\beta = .672$, $p < .001$) and organizational performance ($\beta = .291$, $p < .001$). Supply chain resilience also significantly predicted organizational performance ($\beta = .493$, $p < .001$). The indirect effect of supply chain integration on organizational performance through resilience was significant ($\beta = .331$, $p < .001$, 95% CI [.244, .427]), indicating complementary partial mediation. The total effect of supply chain integration on organizational performance was $\beta = .622$ ($p < .001$). The model explained 45.2% of the variance in supply chain resilience and 52.0% of the variance in organizational performance. Supply chain integration improves organizational performance both directly and indirectly by strengthening supply chain resilience, indicating that coordinated internal processes and closer relationships with suppliers and customers are important strategic mechanisms for improving the adaptability and performance of food SMEs.

Keywords: Supply Chain Integration, Supply Chain Resilience, Organizational Performance, Small and Medium-Sized Enterprises, Food Industry, Kerman



1. Introduction

Contemporary supply chains operate in environments characterized by growing uncertainty, intensified competition, volatile demand, technological transformation, geopolitical tensions, environmental pressures, and recurrent disruptions in the flow of materials, information, finance, and services. Under such conditions, organizations can no longer rely solely on internal efficiency to secure sustainable performance; rather, their ability to coordinate activities across organizational boundaries has become a central determinant of continuity and competitiveness. Supply chain integration has therefore emerged as a critical strategic capability through which firms align internal functions with suppliers and customers, improve information exchange, synchronize planning and operations, reduce fragmentation, and enhance responsiveness to market and environmental changes. Recent evidence has increasingly emphasized that integration is not merely an operational mechanism but an organizational capability that can influence performance through more adaptive and disruption-tolerant supply chain structures. In this regard, organizational ambidexterity and integration have been shown to contribute to stronger performance under supply chain disruptions by facilitating agility and coordinated responses across organizational interfaces ([Rahman et al., 2026](#)). Similarly, contemporary research on manufacturing environments indicates that the development of adaptive supply chain capabilities depends on coordinated organizational structures, leadership, and the ability to combine internal and external resources effectively ([Azizi et al., 2025](#)). These developments have made the relationship between supply chain integration, resilience, and organizational performance an increasingly important issue, particularly for small and medium-sized enterprises (SMEs), which often face substantial resource constraints while remaining highly exposed to external disturbances.

Supply chain integration generally refers to the degree to which an organization strategically coordinates its internal functions and develops collaborative relationships with major external supply chain partners. Its internal dimension concerns cooperation among departments such as purchasing, production, logistics, marketing, and sales, while its external dimensions include coordination with suppliers and customers through information sharing, joint planning, collaborative problem solving, demand synchronization, and aligned operational decisions. Such integration is particularly important because disruptions often propagate through interdependent relationships rather than remaining confined to one firm. When information is fragmented, suppliers are weakly connected to production planning, or customer demand information is not incorporated into operational decisions, uncertainty can be amplified throughout the chain. Conversely, stronger integration can shorten response times, improve visibility, facilitate coordinated resource allocation, and enable firms to respond more effectively to changes in supply and demand. Research on supply chain agility has consistently demonstrated that strategic flexibility and coordinated supply chain capabilities improve firms' ability to respond to market changes and enhance organizational market performance ([Ajike et al., 2024](#)). Likewise, organizational factors affecting supply chain agility and competitive capability show that integrated decision-making and adaptive operational systems constitute important foundations for maintaining competitiveness in uncertain business environments ([Aldhaheri & Ahmad, 2023](#)).

The importance of integration has become even more apparent with the movement toward digitally enabled and interconnected supply chains. The transition toward Supply Chain 4.0 has emphasized real-time information flows, digital connectivity, organizational ambidexterity, and agile coordination among different organizational and supply chain actors. Evidence suggests that technological transformation alone is insufficient unless firms possess organizational structures and cultures capable of translating information into coordinated action ([Alamsjah & Yunus, 2022](#)). In this sense, supply chain integration provides an organizational platform through which technologies, knowledge, and relational resources can be combined to improve responsiveness and continuity. This perspective is also consistent with research emphasizing strategic agility as a prerequisite for sustainable manufacturing development, because firms must continuously coordinate resources, adapt strategies, and respond to environmental change rather than operate through rigid functional structures ([Vishlaghi et al., 2021](#)). The same logic applies to manufacturing sustainability, where agile and coordinated supply chain capabilities enable organizations to address changing operational conditions while maintaining broader organizational objectives ([Al-Zabidi et al., 2021](#); [Rehman et al., 2020](#)).

Although integration can directly support organizational performance, its effects may not occur exclusively through efficiency improvements. One of the most important mechanisms through which integrated supply chains may create value is the development of supply chain resilience. Supply chain resilience refers to the capacity of a supply chain to anticipate, absorb,



respond to, adapt to, and recover from disruptions while preserving critical operational functions and restoring acceptable performance levels. Resilience therefore extends beyond short-term responsiveness and includes preparedness, flexibility, redundancy, adaptive decision-making, relational coordination, and recovery capability. The relational perspective on supply chains suggests that resilience is strengthened when organizations possess high-quality information-processing arrangements and collaborative relationships with supply chain partners. Research in humanitarian supply chains has shown that relational coordination and organizational information-processing capacity are central to the development of agility under uncertainty, demonstrating the importance of shared information, joint action, and interorganizational relationships during disruptive conditions (Dubey et al., 2020). These mechanisms are highly relevant to commercial supply chains because firms confronted with shortages, transport disruptions, demand fluctuations, technological failures, or supplier instability similarly require rapid access to information and coordinated responses across organizational boundaries.

The concept of agility is closely related to resilience because agile supply chains can rapidly detect and respond to environmental changes, whereas resilient supply chains combine responsiveness with the capacity to absorb shocks and recover from them. Empirical studies have repeatedly connected agility with superior organizational outcomes. Research in Saudi Arabia has demonstrated a positive relationship between supply chain agility and organizational performance, indicating that organizations capable of reacting quickly to changes are better positioned to maintain performance under uncertain conditions (Alkrait & Almaktoom, 2021). Similar findings have emerged from Iranian industrial contexts. For example, research examining green supply chain agility has suggested that agility can contribute to both competitive advantage and broader organizational agility in industrial firms (Azad, 2020), while studies of manufacturing companies have shown that information technology flexibility and organizational learning can improve performance through the mediating contribution of supply chain agility (Bavarsad et al., 2019). Evidence from green supply chain management research has likewise indicated that environmentally oriented supply chain practices can influence organizational agility, emphasizing the importance of coordinated supply chain structures in improving organizations' adaptive capabilities (Safdari & Rostamzadeh, 2018).

Supply chain agility and resilience are particularly important for manufacturing SMEs because these organizations typically operate with limited financial slack, relatively narrow supplier bases, lower bargaining power, and fewer redundant resources than large firms. Consequently, even comparatively minor disturbances in procurement, transportation, inventory availability, or customer demand can exert disproportionate effects on production continuity and financial performance. Earlier work on SMEs has demonstrated that organizational culture and information technology competence are important contributors to supply chain agility, reinforcing the view that smaller firms require both internal readiness and external coordination to respond effectively to environmental volatility (Malekifar et al., 2014). Market orientation and organizational innovativeness have also been found to enhance supply chain agility, suggesting that firms capable of sensing market changes and integrating new knowledge into organizational processes are better positioned to respond to changing customer and competitive conditions (Yoon et al., 2014). In addition, case-based assessments of supply chain agility in manufacturing organizations have emphasized the importance of systematically evaluating flexibility, responsiveness, and coordination across multiple supply chain functions rather than treating agility as a single operational characteristic (Patel et al., 2017). These findings collectively imply that resilience in SMEs is likely to emerge from a combination of internal coordination, external integration, information capability, and adaptive decision-making.

The relationship between adaptive supply chain capabilities and organizational performance has also been documented in the food industry. Food-sector firms are especially dependent on coordinated supply chain operations because of perishability, quality and safety requirements, fluctuating demand, seasonal inputs, sensitivity to transportation delays, and the need for reliable supplier and distributor relationships. Any disruption in sourcing, processing, storage, or distribution can rapidly affect cost, product quality, customer satisfaction, and market performance. Evidence from an Iranian food company has shown that organizational agility strategies and supply chain agility can positively contribute to organizational performance, illustrating the particular importance of adaptive capabilities in food-sector operations (Hosseini Balaei, 2015). This relationship is likely to be even more critical among small and medium-sized food enterprises, where financial and operational buffers may be limited and disruptions can quickly compromise production schedules or market commitments.



Recent studies have increasingly shifted from viewing resilience simply as a defensive capability toward understanding it as a strategic mechanism that contributes to productivity, innovation, competitiveness, and performance. Sustainable supply chain dynamic capabilities, for example, have been proposed as mediating mechanisms through which sustainable supply chain practices can enhance productivity in small economic enterprises (Ghaedi & Zeraati Foukaliei, 2025). Such findings imply that performance improvements often depend not only on the existence of specific operational practices but also on the organizational capabilities that transform those practices into adaptive outcomes. Similarly, recent work on supply chain configuration and productivity highlights the broader importance of supply chain structure for organizational and sectoral productivity, suggesting that how supply chains are configured and coordinated can have significant performance consequences (Lin & Zhu, 2025). From this perspective, resilience can be interpreted as a dynamic capability through which integrated firms reorganize resources, maintain continuity, and preserve value creation when conditions change.

The rapid expansion of digital technologies has further reinforced this relationship. Automation, artificial intelligence, advanced analytics, smart supply chain technologies, and machine learning are increasingly used to detect risks, improve visibility, evaluate supplier performance, and support faster operational responses. Research on automation and artificial intelligence has emphasized their potential to enhance supply chain productivity through improved decision support, process efficiency, and operational coordination (Onukwulu, 2025). Machine-learning approaches to supplier performance analysis and risk profiling have likewise been proposed as tools for strengthening supply chain resilience by improving the identification and management of supplier-related risks (Kang & Bhawna, 2025). However, technology cannot fully substitute for organizational integration. Digital information generates value only when organizations possess the processes and relationships needed to share, interpret, and act upon that information across functional and organizational boundaries.

This technological perspective is supported by evidence showing that smart supply chain practices can simultaneously strengthen agility and resilience and thereby enhance sustainable business performance (Sharma et al., 2024). Likewise, empirical research on smart supply chains has demonstrated that resilience can contribute to improved operational performance by enabling firms to exploit technological capabilities more effectively and maintain continuity under changing conditions (Ismail & Surjasa, 2024). Industry 4.0 adoption has also been linked to improved supply chain performance through the development of resilience capabilities, particularly under highly disruptive conditions such as those observed during the COVID-19 pandemic (Tortorella et al., 2024). These findings reinforce the proposition that the value of technological and operational integration may be realized partly through stronger resilience, because integrated systems improve visibility and coordination while resilience allows firms to convert those advantages into continuity and performance under uncertainty.

A similar pattern is evident in the relationship between digitalization, resilience, and SME competitiveness. Supply chain digitalization and green supply chain practices have been shown to contribute to resilience, competitiveness, and MSME performance, demonstrating that resilience may serve as a key capability connecting supply chain practices with organizational outcomes (Zainurrafiqi & Gazali, 2024). In emerging-market contexts, artificial intelligence-based supply chain resilience has also been associated with improved firm performance, indicating that resilience increasingly incorporates both relational and technological mechanisms (Mukherjee et al., 2024). Big data adoption provides another example of this capability pathway. Research has shown that the relationship between big data adoption and organizational performance can operate through mechanisms that include innovation, supply chain integration, and resilience, underscoring the interdependence of information resources, integration, and adaptive capacity (Kumar & Raj, 2024). These findings are particularly relevant to SMEs because limited resources make it difficult for them to absorb the full cost of supply chain failures; thus, capabilities that allow firms to use information and relationships more efficiently can have substantial performance implications.

Resilience also interacts with learning and innovation. Manufacturing organizations with stronger absorptive capacity are better able to recognize, assimilate, and apply external knowledge, and recent evidence suggests that supply chain resilience can mediate the effect of absorptive capacity on supply chain innovation performance (Tobing & Santosa, 2025). This finding suggests that resilience should not be treated only as a response to adverse events. Instead, resilient organizations may also be better positioned to learn from disruption, reconfigure resources, adopt new practices, and identify opportunities for innovation. Such a view is compatible with a dynamic capability perspective in which resilience enables firms to maintain stability while



simultaneously adapting their resource base and operational routines. For SMEs, this capacity can be particularly important because survival and growth frequently depend on rapid adjustment rather than on extensive resource reserves.

At the theoretical level, the proposed relationship among integration, resilience, and performance can be explained by the resource-based view, relational view, and dynamic capabilities perspective. Supply chain integration creates relational and informational resources that are difficult to replicate because they emerge from accumulated collaboration, trust, routines, shared knowledge, and coordinated decision-making. These resources can provide firms with superior visibility into supplier conditions, customer requirements, and internal operating constraints. Resilience represents the capability to mobilize and reconfigure these resources when disruptions occur. Organizational performance is therefore expected to improve not simply because firms are integrated, but because integration strengthens their ability to respond effectively when the environment becomes unstable. Systematic reviews of supply chain resilience have increasingly emphasized its relationship with organizational effectiveness and firm performance while also identifying the need for more empirical research examining the mechanisms through which resilience produces performance outcomes in different organizational and geographical contexts (Negi, 2025). Accordingly, testing resilience as a mediating construct can provide greater explanatory depth than examining only the direct relationship between integration and performance.

Despite the expanding literature, several gaps remain. First, a substantial portion of previous research has focused on supply chain agility rather than resilience, even though the two concepts are related but theoretically distinct. Agility principally emphasizes speed and responsiveness, whereas resilience incorporates anticipation, absorption, adaptation, recovery, and continuity. Second, many studies have examined large manufacturing organizations, technology-intensive sectors, automotive companies, healthcare supply chains, energy organizations, or pharmaceutical firms, while food-sector SMEs have received comparatively less attention. Third, existing studies frequently emphasize a single antecedent such as technology, organizational culture, absorptive capacity, green supply chain practices, or leadership, rather than examining how broader supply chain integration contributes to resilience and subsequently to performance. Fourth, there remains a need for context-specific evidence from emerging economies, where SMEs often face institutional uncertainty, financial constraints, infrastructure limitations, supply volatility, and limited access to advanced risk-management systems.

These gaps are particularly relevant in the context of Iranian SMEs. Small and medium-sized industrial firms contribute to employment, regional production, entrepreneurship, and local value creation, yet they frequently operate under conditions of financial limitation, demand uncertainty, volatile input markets, logistics challenges, and restricted access to advanced technologies. Food SMEs additionally face product-specific pressures associated with perishability, food safety, quality consistency, storage requirements, supply seasonality, and sensitivity to transportation delays. Under these conditions, internal coordination alone may be insufficient unless firms are also integrated with suppliers and customers and possess the resilience required to maintain operations when unexpected events occur. The industrial estates of Kerman provide an appropriate context for examining these relationships because they include a concentration of small and medium-sized food enterprises embedded in interconnected supplier, production, distribution, and market relationships. Understanding how integration operates within such firms can therefore provide both theoretical and managerial insights.

The literature also suggests that resilience should be understood as a capability developed through the interaction of organizational, technological, and relational factors. Strategic flexibility strengthens market performance when organizations possess agile mechanisms for translating flexibility into effective action (Ajike et al., 2024); leadership and organizational ambidexterity can foster supply chain agility by improving firms' capacity to balance exploitation and adaptation (Azizi et al., 2025); and smart technologies, digitalization, artificial intelligence, and advanced analytics can strengthen resilience when supported by organizational coordination (Mukherjee et al., 2024; Sharma et al., 2024). Collectively, these findings imply that integration may act as a foundational capability because it connects otherwise fragmented resources and provides the coordination architecture through which resilience can emerge. From a managerial perspective, this distinction is important. If integration improves performance primarily through resilience, managers should invest not only in closer relationships and information exchange but also in mechanisms that convert such integration into preparedness, flexibility, alternative sourcing, rapid decision-making, and recovery capability.

Accordingly, the present study extends prior research by simultaneously examining supply chain integration, supply chain resilience, and organizational performance within a unified explanatory model focused specifically on food SMEs. It



conceptualizes supply chain integration through internal, supplier, and customer dimensions and treats resilience as a mediating organizational capability through which integration can be translated into superior performance. This approach responds to calls for research that moves beyond direct-effect models and clarifies the mechanisms linking supply chain practices to organizational outcomes. It is also consistent with evidence showing that integration and adaptive capabilities play complementary roles in enhancing performance under disruption (Rahman et al., 2026) and with broader research emphasizing that resilient supply chains support organizational effectiveness, competitiveness, and continuity (Negi, 2025). By examining this mechanism in the industrial estates of Kerman, the study contributes context-specific evidence from an underexamined SME setting while offering practical implications for managers seeking to strengthen operational continuity and performance through coordinated supply chain relationships.

Therefore, the aim of this study was to examine the relationship between supply chain integration and organizational performance and to determine the mediating role of supply chain resilience among small and medium-sized food enterprises operating in the industrial estates of Kerman.

2. Methods and Materials

This study employed a quantitative, applied, cross-sectional correlational design to investigate the relationship between supply chain integration and organizational performance and to examine the mediating role of supply chain resilience among small and medium-sized enterprises (SMEs) operating in the food industry in the industrial estates of Kerman, Iran. The conceptual model was developed on the premise that a higher level of integration among internal organizational functions and external supply chain partners strengthens the capacity of firms to anticipate, absorb, respond to, and recover from supply chain disruptions, which may subsequently improve organizational performance. The statistical population consisted of managers, owners, senior executives, production managers, procurement and purchasing managers, logistics managers, supply chain managers, sales managers, and other knowledgeable decision-makers employed in active food-sector SMEs located in the industrial estates of Kerman. To ensure that respondents possessed sufficient knowledge of organizational operations and interorganizational supply chain relationships, participation was limited to individuals who held a managerial or supervisory position, had at least two years of professional experience in the respective enterprise, and were directly involved in at least one activity related to purchasing, production, logistics, supplier relations, distribution, sales, or strategic decision-making. Firms were considered small or medium-sized enterprises according to their organizational size and employment characteristics and were required to have active relationships with both upstream suppliers and downstream customers or distributors. Respondents who had worked in their current organization for less than two years, were not involved in supply chain or organizational decision-making, or submitted substantially incomplete questionnaires were excluded from the final analysis.

A total of 312 questionnaires were distributed among eligible managers and decision-makers using a proportionate stratified sampling procedure followed by random selection within the identified food-industry SMEs. Stratification was used to provide adequate representation of firms with different principal activities, including food processing, packaged foods, beverages, dairy-related production, bakery and cereal products, confectionery, and other food manufacturing activities. Of the 312 distributed questionnaires, 286 were returned. Following data screening, eight questionnaires were excluded because of extensive missing responses, invariant response patterns, or other indications of insufficient response quality. Consequently, 278 valid questionnaires were retained for the final statistical analyses, corresponding to an effective usable response rate of 89.1% of the questionnaires initially distributed. Only one knowledgeable key informant from each participating organizational unit was included whenever multiple responses could have produced substantial duplication of organizational information. Participation was voluntary, and respondents were informed that the collected information would be analyzed exclusively for research purposes. No personally identifying information was required on the questionnaire, confidentiality of responses was emphasized, and participants were informed of their right to discontinue participation at any stage without consequence. The questionnaire was administered after participants had been provided with information concerning the purpose of the study and had indicated their willingness to participate.

Data were collected using a structured self-administered questionnaire consisting of demographic and organizational questions and standardized measures of supply chain integration, supply chain resilience, and organizational performance. The demographic and organizational section obtained information concerning respondents' gender, age, educational level,



managerial position, work experience, enterprise size, years of organizational activity, and principal field of food-industry operation. The substantive part of the questionnaire used a five-point Likert response format ranging from 1 = strongly disagree to 5 = strongly agree. Higher scores represented stronger supply chain integration, greater supply chain resilience, and better perceived organizational performance. Because the unit of analysis was the enterprise, respondents were instructed to answer the substantive questions with reference to the practices and performance of their organization rather than their individual attitudes or personal performance.

Supply chain integration was operationalized as a multidimensional construct encompassing internal integration, supplier integration, and customer integration. Internal integration assessed the extent to which different organizational functions exchanged information, coordinated activities, participated in joint planning, and collaborated in resolving operational and supply chain problems. Supplier integration captured the degree of information exchange, collaborative planning, coordination of procurement and production activities, long-term interaction, and joint problem-solving between the focal enterprise and its principal suppliers. Customer integration assessed the degree to which the firm communicated and coordinated with key customers and distributors, exchanged information concerning demand and market requirements, incorporated customer feedback into operational planning, and collaborated with downstream partners in order fulfillment and service-related activities. Collectively, these dimensions represented the firm's ability to establish coordinated internal processes and interconnected relationships with major upstream and downstream partners. The supply chain integration section contained 15 items, with five items assigned to each of the three dimensions.

Supply chain resilience was measured through 10 items assessing the enterprise's capability to prepare for, adapt to, respond to, and recover from unexpected interruptions in the flow of materials, information, production, and distribution. The items addressed capabilities such as rapid response to supply chain disturbances, flexibility in reallocating organizational resources, the ability to develop alternative sourcing or operational arrangements, effective coordination during disruptions, continuity of critical activities, adaptation to unexpected changes, and restoration of normal operations after a disruptive event. The construct was conceptualized as an organizational capability rather than merely an absence of disruption; therefore, higher scores indicated a stronger capacity to withstand disturbances and maintain or rapidly restore essential supply chain functions under uncertain operating conditions.

Organizational performance was assessed using 10 items reflecting both operational and market-related dimensions of firm performance. The indicators measured respondents' perceptions of their enterprise's performance relative to major competitors and organizational expectations in areas such as sales growth, market position, customer satisfaction, product and service quality, operational efficiency, productivity, cost control, responsiveness to customers, delivery performance, and overall organizational performance. A perceptual approach was selected because objective financial and operational information was not consistently accessible across privately managed SMEs and because managers with direct knowledge of enterprise activities were able to provide comparable assessments across organizations. To reduce the possible influence of short-term fluctuations, respondents were asked to evaluate general organizational performance over the recent operating period rather than focusing on a single transaction or temporary market condition.

The instrument underwent a systematic assessment of content validity before the main data collection. The initial questionnaire was reviewed by a panel of academic specialists in operations management, supply chain management, and business administration, together with managers familiar with the operational characteristics of food-industry SMEs. The reviewers evaluated the relevance, clarity, comprehensibility, and conceptual correspondence of the items with their intended constructs. Minor wording modifications were made to improve applicability to the context of food SMEs in Kerman without altering the underlying conceptual meaning of the measures. A pilot administration was subsequently conducted with 30 respondents possessing characteristics similar to those of the target population. Pilot responses were used to examine item clarity, completion time, preliminary internal consistency, and potential ambiguity. The pilot participants were not included in the final analytical sample. Internal consistency was considered satisfactory when Cronbach's alpha and composite reliability coefficients were at least .70. In the main analysis, convergent validity was evaluated through standardized indicator loadings and average variance extracted (AVE), with AVE values of at least .50 considered acceptable. Discriminant validity was examined using the heterotrait-monotrait ratio of correlations (HTMT), with values below .85 interpreted as evidence that the latent constructs were empirically distinguishable. These procedures provided a combined assessment of the reliability and construct validity of the measurement model prior to testing the structural relationships.



Data analysis was conducted in two sequential stages consisting of preliminary statistical analysis and structural equation modeling. The completed questionnaires were initially coded and screened for accuracy, missing values, response irregularities, and potential outliers. Descriptive statistics, including frequencies and percentages for categorical variables and means and standard deviations for continuous and composite variables, were used to characterize the respondents and participating enterprises and to summarize the distributions of the principal study constructs. The data were also inspected for missing responses, unusually repetitive answering patterns, and extreme observations before estimation of the measurement and structural models. Correlations among the principal constructs were examined to obtain an initial assessment of the direction and magnitude of the relationships among supply chain integration, supply chain resilience, and organizational performance.

The proposed research model was evaluated using partial least squares structural equation modeling (PLS-SEM), an approach appropriate for examining simultaneous relationships among latent variables and testing indirect effects in mediation models. The analysis was performed using SmartPLS 4, while preliminary data screening and descriptive analyses were conducted using IBM SPSS Statistics. A two-stage analytical procedure was followed. First, the measurement model was evaluated to establish the reliability and validity of the latent constructs. Indicator reliability was examined through outer loadings, with loadings of .70 or higher regarded as desirable, although indicators with moderately lower loadings were retained when their removal did not meaningfully improve composite reliability or content validity. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability, with coefficients of .70 or greater considered acceptable. Convergent validity was established when the AVE for each latent construct reached or exceeded .50. Discriminant validity was assessed primarily through HTMT, using .85 as the conservative threshold. Multicollinearity was evaluated using variance inflation factor (VIF) values, with values below 5 indicating the absence of problematic collinearity.

After satisfactory measurement properties had been established, the structural model was examined to test the hypothesized relationships. Standardized path coefficients were estimated for the effect of supply chain integration on supply chain resilience, the effect of supply chain integration on organizational performance, and the effect of supply chain resilience on organizational performance. The explanatory power of the model was assessed using the coefficient of determination (R^2) for the endogenous constructs, while effect size (f^2) was calculated to determine the relative contribution of each predictor to the explained variance of the corresponding dependent construct. Predictive relevance was additionally assessed using Q^2 where applicable. The statistical significance of direct and indirect effects was evaluated using a nonparametric bootstrapping procedure with 5,000 resamples and two-tailed testing at the .05 significance level. A path was considered statistically significant when its bootstrapped p value was below .05 and the corresponding 95% confidence interval did not include zero.

The mediating role of supply chain resilience was examined by estimating the specific indirect effect of supply chain integration on organizational performance through supply chain resilience. Mediation was considered statistically supported when the bootstrapped confidence interval for the indirect effect excluded zero. The direct effect of supply chain integration on organizational performance was then examined simultaneously with the indirect effect to determine the nature of mediation. A significant indirect effect accompanied by a significant direct effect in the same direction was interpreted as complementary partial mediation, whereas a significant indirect effect with a nonsignificant direct effect was interpreted as indirect-only or full mediation. This procedure made it possible to determine not only whether supply chain integration was associated with organizational performance, but also the extent to which this relationship operated through the development of supply chain resilience. All hypothesis tests were conducted using a two-tailed significance criterion of $p < .05$.

3. Findings and Results

The final analysis was conducted using data obtained from 278 managers and organizational decision-makers employed in small and medium-sized food enterprises operating in the industrial estates of Kerman. Of the respondents, 183 (65.8%) were men and 95 (34.2%) were women. Regarding age, 38 participants (13.7%) were younger than 30 years, 112 (40.3%) were between 30 and 39 years, 91 (32.7%) were between 40 and 49 years, and 37 (13.3%) were 50 years of age or older. In terms of educational attainment, 34 respondents (12.2%) held a diploma or associate degree, 123 (44.2%) held a bachelor's degree, 103 (37.1%) held a master's degree, and 18 (6.5%) held a doctoral degree. Examination of professional experience showed that 57 respondents (20.5%) had between 2 and 5 years of relevant work experience, 86 (30.9%) had between 6 and 10 years, 78 (28.1%) had between 11 and 15 years, and 57 (20.5%) reported more than 15 years of professional experience. With respect to



organizational position, 64 respondents (23.0%) were owners, managing directors, or senior executives, 61 (21.9%) were production managers, 57 (20.5%) were purchasing, procurement, logistics, or supply chain managers, 50 (18.0%) were sales or marketing managers, and 46 (16.5%) occupied other operations-related managerial positions. Of the participating enterprises, 163 (58.6%) were classified as small enterprises and 115 (41.4%) as medium-sized enterprises. The distribution of respondents across managerial functions, organizational sizes, educational categories, and levels of professional experience indicated that the final sample contained participants with sufficient organizational knowledge and direct involvement in supply chain-related decision-making, thereby supporting the appropriateness of the data for evaluating relationships among supply chain integration, supply chain resilience, and organizational performance.

Table 1. Descriptive Statistics and Correlations Among the Main Study Variables

Variable	Mean	SD	Skewness	Kurtosis	1	2	3	4	5
1. Internal integration	3.78	0.66	-0.41	-0.18	1.00				
2. Supplier integration	3.65	0.71	-0.32	-0.27	.63**	1.00			
3. Customer integration	3.69	0.68	-0.37	-0.21	.61**	.59**	1.00		
4. Supply chain resilience	3.58	0.69	-0.29	-0.34	.55**	.59**	.57**	1.00	
5. Organizational performance	3.66	0.63	-0.36	-0.15	.51**	.54**	.53**	.69**	1.00

As shown in Table 1, the mean values of all principal study variables were above the theoretical midpoint of 3.00 on the five-point response scale, indicating that respondents generally perceived moderate-to-high levels of supply chain integration, resilience, and organizational performance within their enterprises. Internal integration had the highest mean among the three supply chain integration dimensions ($M = 3.78$, $SD = 0.66$), suggesting that coordination and information sharing across internal organizational functions were relatively well established. Customer integration had a mean of 3.69 ($SD = 0.68$), whereas supplier integration had a slightly lower mean of 3.65 ($SD = 0.71$). Supply chain resilience demonstrated a mean of 3.58 ($SD = 0.69$), indicating that the participating enterprises generally perceived themselves as having a moderate capacity to adapt to and recover from disruptions, although resilience was somewhat less developed than internal coordination. Organizational performance had a mean of 3.66 ($SD = 0.63$). The skewness values ranged from -0.41 to -0.29 and the kurtosis values ranged from -0.34 to -0.15, indicating no substantial departure from distributional symmetry and no evidence of severe univariate non-normality. All bivariate correlations were positive and statistically significant at $p < .01$. The relationships among the three dimensions of supply chain integration ranged from $r = .59$ to $r = .63$, demonstrating meaningful convergence without indicating excessive redundancy. Supply chain resilience was positively correlated with internal integration ($r = .55$), supplier integration ($r = .59$), and customer integration ($r = .57$). Organizational performance was also positively associated with internal integration ($r = .51$), supplier integration ($r = .54$), and customer integration ($r = .53$). The strongest zero-order relationship was observed between supply chain resilience and organizational performance ($r = .69$, $p < .01$), providing preliminary evidence that enterprises possessing stronger adaptive and recovery capabilities tended to report superior organizational performance. Because none of the correlations approached levels that would indicate problematic construct overlap, the results supported proceeding with measurement and structural model evaluation.

Table 2. Reliability and Convergent Validity of the Measurement Model

Construct	Number of Items	Standardized Loading Range	Cronbach's α	ρ_A	Composite Reliability	AVE
Internal integration	5	.742–.867	.884	.889	.916	.687
Supplier integration	5	.728–.881	.892	.897	.921	.700
Customer integration	5	.751–.874	.887	.891	.918	.692
Supply chain resilience	10	.711–.863	.924	.929	.936	.594
Organizational performance	10	.719–.858	.918	.922	.932	.579
Supply chain integration, higher-order construct	3 dimensions	.821–.903	.889	.896	.931	.819

The measurement model results reported in Table 2 demonstrated satisfactory indicator reliability, internal consistency reliability, and convergent validity for all study constructs. Standardized factor loadings for internal integration ranged from .742 to .867, supplier integration from .728 to .881, customer integration from .751 to .874, supply chain resilience from .711 to .863, and organizational performance from .719 to .858. Accordingly, all retained indicators exceeded the commonly recommended loading level of approximately .70, indicating that each item shared a substantial proportion of its variance with



its designated latent construct. Cronbach's alpha coefficients ranged from .884 for internal integration to .924 for supply chain resilience, substantially exceeding the minimum criterion of .70 and demonstrating strong internal consistency. Comparable results were obtained for rho_A, which ranged from .889 to .929, and composite reliability, which ranged from .916 to .936 for the first-order constructs. The higher-order supply chain integration construct, represented by internal, supplier, and customer integration, also demonstrated strong reliability, with a composite reliability coefficient of .931. The average variance extracted values for all first-order constructs exceeded the required .50 threshold, ranging from .579 for organizational performance to .700 for supplier integration. Supply chain resilience had an AVE of .594, while organizational performance had an AVE of .579, indicating that their indicators collectively explained more than half of the variance associated with their intended latent variables. The higher-order supply chain integration construct produced an AVE of .819, further confirming that the three dimensions were strong representations of the overall integration construct. Taken together, the results indicated that the measurement scales possessed adequate reliability and convergent validity and therefore provided a statistically appropriate basis for evaluating discriminant validity and the hypothesized structural relationships.

Table 3. Heterotrait–Monotrait Ratios for Assessment of Discriminant Validity

Construct	1	2	3	4	5
1. Internal integration	—				
2. Supplier integration	.716	—			
3. Customer integration	.694	.671	—		
4. Supply chain resilience	.622	.658	.641	—	
5. Organizational performance	.584	.611	.603	.774	—

Table 3 presents the results of the heterotrait–monotrait ratio of correlations used to assess discriminant validity among the latent constructs. All HTMT coefficients were below the conservative threshold of .85. The HTMT value between internal integration and supplier integration was .716, while the value between internal integration and customer integration was .694 and that between supplier integration and customer integration was .671. These results showed that although the three dimensions were related components of the broader supply chain integration construct, they retained adequate empirical distinctiveness. The HTMT coefficients between supply chain resilience and the three integration dimensions ranged from .622 to .658, further indicating that resilience represented a theoretically and empirically distinct organizational capability rather than merely another manifestation of integration. The HTMT values between organizational performance and the three integration dimensions ranged from .584 to .611. The largest HTMT coefficient in the model was observed between supply chain resilience and organizational performance (.774); however, this value remained below .85 and therefore did not indicate an unacceptable degree of construct overlap. Consequently, discriminant validity was established for all constructs. In conjunction with the satisfactory reliability and convergent validity results presented in Table 2, these findings indicated that the measurement model adequately distinguished among integration, resilience, and performance and supported further evaluation of the structural model.

Before hypothesis testing, collinearity diagnostics were examined for the predictor constructs included in the structural equations. The variance inflation factor values for the structural model ranged from 1.00 to 1.82, remaining well below the conservative threshold of 5.00 and also below the more restrictive threshold of 3.30. Thus, no problematic multicollinearity was identified among the predictors. Model fit was additionally evaluated using the standardized root mean square residual, which was SRMR = .061, indicating an acceptable discrepancy between the observed and model-implied correlation matrices. The normed fit index was NFI = .912, providing additional support for the adequacy of the proposed model. The structural model explained 45.2% of the variance in supply chain resilience ($R^2 = .452$) and 52.0% of the variance in organizational performance ($R^2 = .520$). These values indicated moderate-to-substantial explanatory power, particularly given the behavioral and organizational nature of the constructs under investigation. The corresponding predictive relevance coefficients were $Q^2 = .321$ for supply chain resilience and $Q^2 = .382$ for organizational performance, both exceeding zero by a substantial margin and therefore providing evidence that the structural model had meaningful out-of-sample predictive relevance for the two endogenous constructs.



Table 4. Structural Model Results and Mediation Analysis

Hypothesized Relationship	β	SE	t	p	95% Bootstrapped CI	f ²	Result
Supply chain integration → Supply chain resilience	.672	.042	16.000	<.001	[.586, .747]	.825	Supported
Supply chain integration → Organizational performance	.291	.061	4.770	<.001	[.172, .410]	.112	Supported
Supply chain resilience → Organizational performance	.493	.058	8.500	<.001	[.377, .603]	.287	Supported
Supply chain integration → Supply chain resilience → Organizational performance	.331	.047	7.043	<.001	[.244, .427]	—	Mediation supported
Total effect: Supply chain integration → Organizational performance	.622	.044	14.136	<.001	[.533, .703]	—	Significant

As shown in Table 4, all hypothesized direct relationships were positive and statistically significant. Supply chain integration exerted a strong positive effect on supply chain resilience ($\beta = .672$, $SE = .042$, $t = 16.000$, $p < .001$, 95% CI [.586, .747]), demonstrating that enterprises characterized by greater coordination among internal units and stronger integration with suppliers and customers were significantly more capable of responding to and recovering from supply chain disruptions. The effect size for this relationship was large ($f^2 = .825$), showing that supply chain integration made a substantial contribution to explaining differences in resilience among the participating SMEs. Supply chain integration also had a significant direct effect on organizational performance ($\beta = .291$, $SE = .061$, $t = 4.770$, $p < .001$, 95% CI [.172, .410]). Although this direct path was smaller than the effect on resilience, it remained statistically and practically meaningful, with an effect size of $f^2 = .112$. This finding indicated that stronger integration could improve performance directly through enhanced coordination, information exchange, synchronized activities, and closer relationships with supply chain partners. Supply chain resilience, in turn, had a relatively strong positive effect on organizational performance ($\beta = .493$, $SE = .058$, $t = 8.500$, $p < .001$, 95% CI [.377, .603]), with an effect size of $f^2 = .287$. Thus, enterprises that were better able to adapt to unexpected disruptions, maintain continuity, reorganize resources, and restore normal operations exhibited significantly higher levels of perceived organizational performance.

The mediation analysis provided direct support for the central mediating mechanism proposed in the study. The specific indirect effect of supply chain integration on organizational performance through supply chain resilience was positive and statistically significant ($\beta = .331$, $SE = .047$, $t = 7.043$, $p < .001$). The 95% bootstrapped confidence interval for the indirect effect ranged from .244 to .427 and did not include zero, thereby confirming the statistical significance of the mediation pathway. At the same time, the direct effect of supply chain integration on organizational performance remained significant after supply chain resilience was included in the structural model ($\beta = .291$, $p < .001$). Because both the direct and indirect effects were statistically significant and operated in the same positive direction, the mediation pattern was classified as complementary partial mediation. This result demonstrated that supply chain integration enhanced organizational performance through two mechanisms: a direct mechanism through improved coordination and relational alignment across supply chain activities and an indirect mechanism in which stronger integration first improved the resilience capability of the enterprise, which subsequently contributed to higher performance. The total effect of supply chain integration on organizational performance was substantial and statistically significant ($\beta = .622$, $SE = .044$, $t = 14.136$, $p < .001$, 95% CI [.533, .703]), demonstrating the overall importance of integration for SME performance. Calculation of the proportion mediated indicated that approximately 53.2% of the total effect of supply chain integration on organizational performance was transmitted through supply chain resilience (.331/.622), whereas the remaining proportion reflected the direct pathway. Therefore, resilience accounted for slightly more than half of the overall association between integration and performance, highlighting its central explanatory role in the proposed model.

Further interpretation of the structural coefficients demonstrated a theoretically coherent sequence in which supply chain integration represented an important antecedent of organizational resilience, while resilience served as an immediate capability contributing to organizational outcomes. The relatively large coefficient linking integration to resilience ($\beta = .672$) suggested that coordination with suppliers, customers, and internal organizational functions was particularly important for establishing the informational visibility, resource flexibility, collaborative problem-solving capacity, and responsiveness required under disruptive conditions. The substantial resilience-to-performance coefficient ($\beta = .493$) further indicated that resilience was not merely a defensive capability directed toward risk mitigation; rather, it was closely associated with the ability of food SMEs to preserve operational efficiency, customer responsiveness, delivery reliability, competitive position, and overall organizational



performance. The simultaneous significance of the direct integration-to-performance path indicated, however, that resilience did not completely account for the benefits of integration. Supply chain integration also appeared to contribute directly to performance by reducing coordination deficiencies, facilitating information sharing, aligning organizational activities with market requirements, and improving relationships with key suppliers and customers.

The coefficient of determination for supply chain resilience ($R^2 = .452$) indicated that supply chain integration alone explained 45.2% of the variance in resilience. This level of explanatory power was substantial for a single major organizational antecedent and supported the proposition that resilience in SMEs is closely dependent on the quality of relationships and coordination established throughout the supply chain. The R^2 value of .520 for organizational performance indicated that supply chain integration and supply chain resilience jointly accounted for 52.0% of the observed variance in organizational performance. Thus, slightly more than half of the differences in performance across the participating food SMEs could be explained by the two primary constructs incorporated in the proposed model. The remaining variance was likely attributable to other organizational and environmental factors outside the scope of the current model, such as technological capability, competitive intensity, managerial competence, financial resources, market turbulence, innovation capacity, and broader macroeconomic conditions. Nevertheless, the amount of variance explained by the model indicated that integration and resilience represented highly relevant determinants of organizational performance in the context examined.

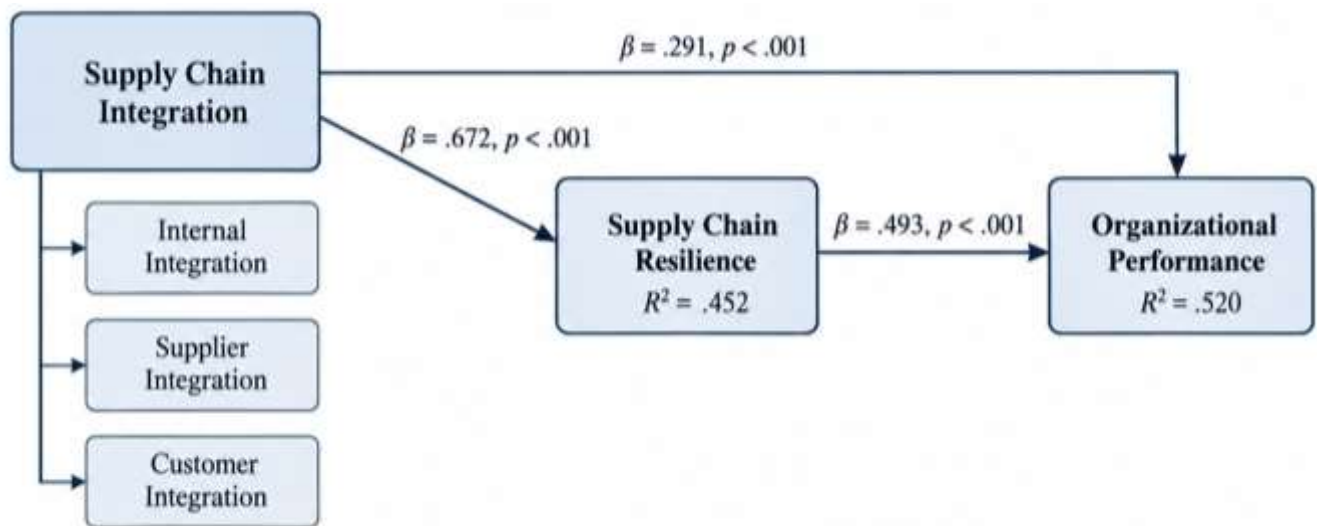


Figure 1. Structural Model of the Relationships Among Supply Chain Integration, Supply Chain Resilience, and Organizational Performance

The structural model summarized in Figure 1 illustrates the overall pattern of relationships identified in the analysis. Supply chain integration was positively associated with supply chain resilience through a standardized path coefficient of $\beta = .672$, while supply chain resilience positively predicted organizational performance with a standardized coefficient of $\beta = .493$. A significant direct path from supply chain integration to organizational performance was also retained in the final model ($\beta = .291$). The coexistence of these statistically significant direct and indirect paths demonstrates that supply chain resilience partially transmitted the positive influence of integration to organizational performance. In substantive terms, the model indicates that SMEs capable of coordinating their internal functions and maintaining integrated relationships with suppliers and customers are more likely to develop the flexibility, preparedness, adaptive capacity, and recovery capability necessary to withstand supply chain disturbances. These resilience capabilities subsequently contribute to superior organizational outcomes. At the same time, integration produces additional performance advantages independently of resilience, confirming that closer supply chain relationships and internal coordination represent direct as well as resilience-mediated sources of organizational performance. Overall, the empirical findings supported the proposed conceptual model and demonstrated that supply chain resilience constitutes an important explanatory mechanism linking supply chain integration with organizational performance among small and medium-sized food enterprises operating in the industrial estates of Kerman.

4. Discussion and Conclusion

The present study examined the relationship between supply chain integration and organizational performance and assessed the mediating role of supply chain resilience among small and medium-sized food enterprises operating in the industrial estates of Kerman. The findings demonstrated that supply chain integration had a strong and statistically significant positive effect on supply chain resilience, that supply chain integration had a significant direct positive effect on organizational performance, and that supply chain resilience had a significant positive effect on organizational performance. In addition, the indirect effect of supply chain integration on organizational performance through supply chain resilience was significant, while the direct effect remained significant after inclusion of the mediator. This pattern indicated complementary partial mediation. In practical terms, the findings suggest that food SMEs with stronger internal coordination and closer integration with suppliers and customers are more capable of developing resilience, and that this resilience subsequently contributes to improved organizational performance. At the same time, integration also improves performance through mechanisms other than resilience, including enhanced information exchange, coordination efficiency, reduced operational fragmentation, and closer alignment between organizational activities and external market requirements.

The first major finding was the significant positive effect of supply chain integration on supply chain resilience. The standardized coefficient for this relationship was relatively strong, indicating that integration represented an important antecedent of resilience in the participating food SMEs. This result is theoretically consistent with the relational and information-processing views of supply chain management. Resilience depends heavily on the quality, speed, and accuracy of information available to decision-makers during periods of disturbance. When internal departments are integrated and suppliers and customers are closely connected to organizational planning and decision-making, firms are more likely to identify emerging risks, coordinate rapid responses, redistribute resources, and develop alternative courses of action. This interpretation is supported by previous research demonstrating that relational coordination and information-processing capabilities strengthen supply chain agility under uncertain conditions (Dubey et al., 2020). Likewise, studies emphasizing agility and sustainability have shown that coordinated supply chain structures help organizations adapt more effectively to operational changes and disruptions (Al-Zabidi et al., 2021; Rehman et al., 2020). The current findings therefore extend prior work by showing that these mechanisms are also relevant to the development of resilience among small and medium-sized food enterprises.

The positive integration–resilience relationship can also be explained by the fact that integrated supply chains provide greater visibility across organizational boundaries. Internal integration enables purchasing, production, logistics, sales, and other functions to share information and coordinate decisions rather than respond independently to operational problems. Supplier integration helps firms gain earlier awareness of shortages, delivery problems, quality concerns, and production constraints, while customer integration improves understanding of demand fluctuations and market priorities. Together, these mechanisms reduce uncertainty and improve the speed and quality of response. This explanation is compatible with evidence showing that digitally enabled supply chains require coordination and organizational alignment to transform technological connectivity into agility and adaptive performance (Alamsjah & Yunus, 2022). Similarly, research on smart supply chains has shown that technological and organizational integration can support both agility and resilience when firms are able to convert information into coordinated action (Sharma et al., 2024). Thus, the current results suggest that resilience should not be viewed as an isolated capability; rather, it develops partly from the quality of coordination and relational embeddedness throughout the supply chain.

The findings also revealed a significant direct effect of supply chain integration on organizational performance. This result indicates that enterprises with stronger integration across internal functions, suppliers, and customers tend to achieve higher levels of operational and market performance. Several mechanisms may explain this association. Integration can improve planning accuracy, reduce duplication of activities, minimize communication delays, strengthen supplier reliability, improve responsiveness to customer needs, and enhance alignment between procurement, production, logistics, and sales. These improvements can translate into lower operating costs, higher delivery reliability, better product quality, stronger customer satisfaction, and improved competitive performance. The finding is consistent with previous studies linking supply chain agility and coordination with organizational performance. For example, a positive relationship between supply chain agility and organizational performance has been reported in Saudi organizations (Alkrait & Almaktoom, 2021). Similarly, studies in



Iranian manufacturing contexts have shown that organizational learning, technological flexibility, and supply chain agility can contribute to higher organizational performance (Bavarsad et al., 2019). Evidence from the food industry has also demonstrated that organizational and supply chain agility can improve organizational performance, supporting the applicability of these relationships to food-sector firms (Hosseini Balaei, 2015).

The direct integration–performance relationship is also supported by studies emphasizing strategic flexibility and market responsiveness. Supply chain integration allows firms to coordinate strategic and operational decisions more effectively when customer requirements or competitive conditions change. In such situations, the ability to synchronize resources and activities across organizational boundaries can prevent delays and improve market responsiveness. Previous research has demonstrated that strategic flexibility contributes to market performance when supported by agile supply chain capabilities (Ajike et al., 2024). In addition, organizational factors that strengthen supply chain agility have been associated with improved competitive capability (Aldhaheeri & Ahmad, 2023). These findings align closely with the present results because integration can be understood as one of the organizational mechanisms that converts strategic flexibility and information access into coordinated action. For SMEs, where resources are typically more constrained, the efficiency benefits of integration may be especially important because duplication, delays, and supply disruptions can impose proportionally greater costs than in larger firms.

Another central finding was the significant positive relationship between supply chain resilience and organizational performance. The relatively strong coefficient observed for this path indicates that resilience represents a major performance-enhancing capability among food SMEs. Resilient firms are better able to maintain critical activities during disruptions, adapt to changing supply and demand conditions, recover more rapidly from operational disturbances, and preserve relationships with customers and suppliers. Such capabilities can directly influence performance by reducing downtime, stabilizing production, protecting revenue, and maintaining customer trust. This result is consistent with a growing body of research identifying resilience as an important predictor of firm effectiveness and performance (Negi, 2025). It also aligns with evidence showing that artificial intelligence-based resilience can improve firm performance in emerging markets by strengthening risk identification, adaptive decision-making, and continuity (Mukherjee et al., 2024). Similarly, research on smart supply chains has shown that resilience can improve operational performance when supported by appropriate technologies and coordinated supply chain processes (Ismail & Surjasa, 2024).

The positive effect of resilience on performance is particularly understandable in the food industry. Food enterprises frequently operate under time-sensitive conditions because of perishability, quality requirements, variable demand, storage limitations, and transportation dependence. When supply chain disruptions occur, delays can rapidly lead to waste, inventory losses, production interruptions, and deterioration in customer service. Resilient organizations are more capable of mitigating these consequences through rapid resource reallocation, alternative sourcing, flexible production arrangements, and coordinated recovery. The importance of such capabilities has been demonstrated in studies examining the mediating role of resilience in translating technology and Industry 4.0 adoption into supply chain performance (Tortorella et al., 2024). Likewise, the combination of smart supply chain capabilities, agility, and resilience has been associated with enhanced sustainable business performance (Sharma et al., 2024). The findings of the present study therefore reinforce the argument that resilience creates value not only by helping firms survive disruptions but also by enabling them to preserve operational efficiency and competitive position under unstable conditions.

The mediation analysis represents one of the most important contributions of the study. Supply chain resilience significantly mediated the relationship between supply chain integration and organizational performance, accounting for a substantial proportion of the total effect. Because the direct relationship between integration and performance remained significant after resilience was entered into the model, the mediation was partial rather than complete. This finding indicates that integration affects performance through at least two pathways. First, integration directly improves operational coordination and market alignment. Second, integration enhances resilience, which in turn improves performance. This result is consistent with dynamic capability theory, which suggests that organizational resources and relationships generate superior outcomes when firms possess the capability to reconfigure and mobilize them under changing conditions. In this study, supply chain integration can be interpreted as providing relational and informational resources, while resilience represents the dynamic capability through which those resources are transformed into continuity, adaptability, and performance.



The mediation finding is strongly supported by recent empirical evidence. Research has shown that resilience can function as an intermediate mechanism connecting organizational or technological capabilities with performance outcomes. For example, supply chain resilience has been found to mediate the relationship between absorptive capacity and supply chain innovation performance in manufacturing firms (Tobing & Santosa, 2025). Similarly, big data adoption has been linked to organizational performance through the mediating mechanisms of innovation, supply chain integration, and resilience (Kumar & Raj, 2024). Research on MSMEs has also demonstrated that digitalization and green supply chain practices can enhance competitiveness and performance through supply chain resilience (Zainurrafiqi & Gazali, 2024). These studies collectively support the present finding that resilience constitutes a mechanism through which upstream organizational capabilities and practices are converted into performance outcomes.

The current results are also consistent with recent work emphasizing the combined roles of integration and agility under disruptive conditions. Organizational ambidexterity has been shown to enhance performance when firms are able to integrate resources and maintain agility during supply chain disruptions (Rahman et al., 2026). Although agility and resilience are not identical constructs, both involve adaptive responses to uncertainty, and the present findings suggest that integration provides an important foundation for developing such adaptive capabilities. Similarly, research on transformational leadership and organizational ambidexterity has shown that firms can strengthen supply chain agility through improved organizational coordination and flexibility (Azizi et al., 2025). These studies support the broader interpretation that organizational performance under uncertain conditions depends not simply on having resources, but on the ability to coordinate and reconfigure those resources rapidly.

The findings also highlight the importance of knowledge, innovation, and technological capability in reinforcing the relationships observed in the model. Research on SME agility has shown that information technology competence and organizational culture can significantly contribute to adaptive supply chain capability (Malekifar et al., 2014). Market orientation and innovativeness have likewise been linked to stronger supply chain agility (Yoon et al., 2014). These findings help explain why integration may enhance resilience: integrated firms are better able to exchange knowledge, disseminate market information, and coordinate innovation-related decisions. More recent research has further shown that machine learning can strengthen resilience by improving supplier risk profiling and performance assessment (Kang & Bhawna, 2025), while automation and artificial intelligence can improve supply chain productivity through enhanced decision support and process efficiency (Onukwulu, 2025). The present findings suggest that such technological capabilities are likely to be most effective when embedded in integrated organizational and interorganizational structures.

The results also correspond with studies examining green and sustainable supply chain practices. Green supply chain management has been associated with enhanced organizational agility in Iranian industrial settings (Safdari & Rostamzadeh, 2018), while green supply chain agility has been linked to competitive advantage and broader organizational agility (Azad, 2020). Sustainable supply chain dynamic capabilities have also been identified as mechanisms through which supply chain practices can improve productivity in small economic enterprises (Ghaedi & Zeraati Foukaliei, 2025). These findings reinforce the idea that adaptive capability is a crucial link between supply chain practices and performance. In the present study, resilience fulfilled this role by transmitting a substantial portion of the effect of integration to organizational performance.

The overall model explained a considerable proportion of variance in both supply chain resilience and organizational performance, indicating that the proposed framework had meaningful explanatory power. This is important because organizational performance is inherently multidetermined, especially in SMEs. Factors such as financial resources, leadership quality, technology adoption, innovation, market turbulence, competitive intensity, and institutional conditions may all contribute to organizational outcomes. Nevertheless, the finding that integration and resilience together explained more than half of the variance in organizational performance underscores their strategic importance. Research on supply chain configuration has similarly emphasized the importance of supply chain structure in explaining productivity outcomes (Lin & Zhu, 2025), while empirical studies of agile manufacturing systems have shown that structured evaluation and coordination of supply chain capabilities are essential for improved organizational effectiveness (Patel et al., 2017). Therefore, the present



findings provide further evidence that supply chain architecture and adaptive capability should be treated as central components of organizational strategy rather than purely operational concerns.

The context of food SMEs in Kerman further strengthens the practical significance of the findings. Smaller food manufacturers often face fluctuating input availability, limited supplier alternatives, transportation constraints, demand uncertainty, and financial limitations. Their dependence on timely material flows makes them particularly vulnerable to disruptions. In such circumstances, integration can reduce uncertainty by improving visibility and coordination, while resilience can reduce the consequences of disturbances when they occur. The positive direct and indirect effects observed in this study suggest that SMEs should not view integration only as a means of reducing transaction costs or improving routine efficiency. Instead, integrated relationships with suppliers and customers should also be considered a strategic resource for building adaptive capacity. This interpretation is consistent with the broader shift in the supply chain literature from efficiency-centered models toward approaches that emphasize resilience, agility, innovation, and continuity.

Several limitations should be considered when interpreting the findings. First, the study used a cross-sectional design, meaning that the relationships among supply chain integration, resilience, and organizational performance were examined at a single point in time; therefore, although the structural model was theoretically grounded, strict causal conclusions cannot be drawn. Second, the study relied on self-reported questionnaire data provided by managers and organizational decision-makers, which may introduce perceptual bias, social desirability bias, or common method variance. Third, organizational performance was measured using perceptual indicators rather than audited financial or operational data because comparable objective information was not consistently available across the participating SMEs. Fourth, the study was geographically limited to small and medium-sized food enterprises operating in the industrial estates of Kerman, and the findings may therefore not be directly generalizable to large firms, other industrial sectors, or enterprises operating in different economic and institutional environments. Finally, although the model explained a substantial proportion of variance in resilience and performance, other potentially relevant variables, such as technological capability, environmental uncertainty, leadership style, financial flexibility, innovation capability, supply chain complexity, and supplier concentration, were not included in the model.

Future studies should employ longitudinal designs to examine how supply chain integration and resilience evolve over time and to provide stronger evidence regarding the direction of causal relationships. Researchers could also replicate the model in other provinces, industries, and organizational contexts to evaluate the generalizability of the findings and to compare whether the magnitude of the structural relationships differs across sectors. Future studies may incorporate objective performance indicators, such as sales growth, delivery reliability, inventory turnover, production downtime, market share, or profitability, alongside perceptual measures. It would also be valuable to investigate additional mediators and moderators, including supply chain agility, digital maturity, organizational ambidexterity, innovation capability, environmental uncertainty, technological readiness, supplier dependency, and leadership style. Comparative studies between small, medium-sized, and large firms could identify whether organizational size changes the value of integration and resilience. In addition, future research could examine the separate effects of internal, supplier, and customer integration on distinct dimensions of resilience, such as preparedness, resistance, response speed, adaptation, and recovery, instead of modeling integration and resilience only as higher-order constructs.

Managers of food SMEs should strengthen supply chain integration as a strategic priority rather than treating coordination as a routine administrative activity. Internal departments should share timely information on purchasing, inventory, production, sales, and logistics, and key suppliers and customers should be incorporated into planning and problem-solving processes whenever possible. Managers should establish mechanisms for early identification of supply disruptions, develop alternative supplier and transportation options, define contingency procedures, and regularly assess critical dependencies across the supply chain. Digital tools for information sharing, demand monitoring, supplier evaluation, and inventory visibility should be adopted in proportion to the firm's resources and operational needs. Firms should also conduct periodic disruption simulations and resilience assessments to identify vulnerabilities before crises occur. Because the findings show that resilience explains a substantial part of the relationship between integration and performance, managers should ensure that closer collaboration with supply chain partners is explicitly translated into preparedness, flexibility, rapid response, and recovery capability rather than being limited to routine information exchange or transactional coordination.



Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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