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Agility and Resilience in Supply Chains: Investigating Their Roles in Enhancing Financial Performance

Cenk Tufan [1], Şemsettin Çiğdem [2], Yunus Kılıç [3,*] and Gökçen Sayar [4]

[1] Department of Aviation Management, Akdeniz University, Antalya 07070, Turkey; tufancenk1@gmail.com
[2] Department of International Trade and Logistics, Gaziantep University, Gaziantep 27410, Turkey; scigdem@gantep.edu.tr
[3] Department of Insurance, Akdeniz University, Antalya 07070, Turkey
[4] Department of Economics and Finance, Akdeniz University, Antalya 07070, Turkey; gokcensayar@akdeniz.edu.tr
* Correspondence: yunuskilic@akdeniz.edu.tr

Abstract: Business sectors face disruptive challenges such as cash flow problems in finance and material flow problems in supply chain and logistics processes in today's rapidly evolving and uncertain environment. Given these challenges, effective management of resource and material flows by managers has become increasingly complex. Supply chain management is crucial for businesses to sustain competitive market positioning. This study distinctively explores the interplay between supply chain management and the financial performance of manufacturing companies, highlighting the increasingly dynamic and competitive global markets. It scrutinizes the moderating roles of supply chain agility and flexibility in this relationship, offering diverse analytical perspectives. The research methodology involved surveying white-collar employees within these companies. Factor analysis was employed to affirm the scale's validity, and the Hayes model 3 method was utilized to test hypotheses. Our research uncovered intricate interactions between supply chain management, agility, and resilience, underscoring their collective impact on financial performance. The thesis that supply chain management has a substantial impact on financial performance was corroborated by the study's results. The study also emphasizes the moderating impact of supply chain agility in the relationship between financial performance and supply chain management. The results of the study that supply chain resilience moderates the moderating effect of supply chain agility indicate that the interaction between supply chain resilience and supply chain agility may affect the relationship between supply chain management and financial performance if supply chain resilience enhances the resilience of organizations to external challenges. These insights suggest organizations must integrate agility, management, and resilience considerations in their supply chains to optimize performance. This study contributes a novel viewpoint to the literature, providing strategic guidance for managerial decision making.

Keywords: supply chain management; financial performance; supply chain agility; supply chain flexibility; environmental dynamism; Hayes model 3 method

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1. Introduction

The environmental dynamism and uncertainty experienced today cause unexpected and even devastating disruptions and consequences in almost all sectors [1]. For example, a tsunami in Thailand in 2010 destroyed two of Seagate's manufacturing facilities [2]. Accordingly, due to a chain effect of the contraction in the flow of goods, there was a 29% decline in hard disk production globally. This situation caused a significant decrease in the market values and earnings of global businesses such as Hewlett-Packard [3]. Uncertainty was created when the Trump administration imposed a tariff barrier on some products originating from China in 2018, and China responded immediately to this practice, pushing companies to look for new suppliers [4]. The COVID-19 epidemic, which emerged in late

2019, caused the most severe problems in recent history, causing significant losses in the global supply chain, the effects of which are still ongoing [5]. In short, it is necessary to draw attention to how fragile and, at the same time, dynamic the structure of the supply chains is and the uncertainty in the material flow. For this reason, the importance of adapting to possible new situations affecting resource and material flows emerges.

It is easier for managers to regulate the flow of resources and materials when the environmental factors change rate is considered [6]. The main goal in supply chain management is to balance customer demand and the flow of materials, products, and information from the supplier to meet customer demands and needs on time [7]. To achieve this balance, businesses focus on their existing capabilities and leave the tasks outside their capabilities to a third party/external resources. This practice helps to increase supply chain performance and, therefore, financial performance and reduce supply chain costs [8]. This practice also expands supply chains [9,10]. The supply chain expansion increases the possibility of interrupting the flow of resources and materials toward the leading company. Inevitably, such unexpected interruptions will adversely affect the financial performance of companies [11–13]. Some instruments, such as supply chain resilience (SCRES) and supply chain agility (SCA), can appropriately serve supply chain managers to manage such unexpected situations, stabilize the company, and achieve targeted high performance levels [2,14,15]. In summary, it becomes essential for supply chain managers to understand how they can cope with environmental factors that affect their supply chain activities and, therefore, their financial performance [6,16,17].

One of the most crucial strategic instruments used by organizations to participate in competitive market circumstances and strengthen their positions in this environment is supply chain management (SCM) [18]. Companies must manage their supply chain functions effectively to survive in global markets where environmental dynamism and competition increase [19,20]. At this point, SCA is seen as a critical factor in manufacturing companies' ability to carry out supply chain management processes accurately and effectively and increase their financial performance in the long term by quickly responding to changes in customer preferences, threats, and opportunities in the sector through the dynamic capabilities they will develop [4,11,21]. In addition to changes in customer preferences and environmental changes, companies are also vulnerable to interruptions and disruptions that may occur in the supply chain. This situation poses a risk for companies to continue their activities successfully [22].

SCRES refers to the supply chain's ability to cope with unexpected disruptions and interruptions in risky situations. SCRES enables the chain itself and its elements to have the ability to return to their pre-crisis form or to transform into a more suitable formation from a crisis, interruption, or stress situation, that is, to have resilience [23]. Previously, the design of supply chains focused on service optimization and cost reduction, but now, the focus is on resilience [24]. Therefore, being able to demonstrate approaches focused on strength and agility at the same time will positively affect supply chain performance. Companies focused on resilience and agility will increase their competitiveness through quality, service, and time to market; strengthen their leading position in the market; and have superior financial performance [25].

The existing body of literature encompasses studies that examine many viewpoints on supply chain management methodologies and tactics using a comprehensive view. Mason-Jones et al. [26] put forward a different perspective by introducing the term "leagile", which expresses the combination of lean and agile supply chain models. Similarly, Aitken et al. [27] and Martin and Towill [28] stated that lean and agility can be used together to create a supply chain in a competitive context. However, these studies did not consider unforeseen interruptions and disruptions in the supply chain. Therefore, questions remain unanswered about how these negativities will affect the financial performance of manufacturing companies, how the company will respond to these changing conditions, and how it can return to its former balanced state. Considering these shortcomings, our study argues that agility and resilience are critical factors in ensuring financial performance within the

supply chain. Because agility is a crucial element in meeting the demand changes that may occur in the market as quickly as possible, Resilience allows the supply chain to maintain its performance even in the event of potential interruptions in the supply chain.

As far as is known, research in the literature has yet to examine the relationships between supply chain management, supply chain agility, supply chain resilience, and financial performance of manufacturing companies. When considered in the long term, it is crucial to determine the premises that will increase the financial performance of manufacturing companies to survive by providing a competitive advantage. In this context, we created our research questions as follows:

- What are the antecedents of financial performance from a supply chain perspective? What is its connection with supply chain management?
- What are the distinguishing characteristics of supply chains with agility and resilience? Do agility and resilience practices in supply chains weaken financial performance?

Because Turkey is a bridge connecting the European and Asian continents and the seas surrounding it, it is obvious how vital supply chain management is for the Turkish economy. However, uncertainty, such as that in Turkey, is high. Companies that continue operating where geopolitical, economic, and political conditions change frequently cannot respond promptly because their supply chain practices cannot be successfully managed. Many companies cannot recover or even survive in the long term [29]. For this reason, we decided to research manufacturing companies in Turkey, as it is in a location that reflects the environmental conditions suitable for our subject.

In our literature review, we realized some areas for improvement in how companies should implement supply chain management practices to strengthen their financial performance (FP) by focusing on elements such as supply chain resilience and agility in combating environmental changes. This research was conducted to fill the gaps in the literature and to consider the topics that some researchers suggested to be studied in the future [2,30–32]. Shi and Yu [32] stated in their study that both market-based and accounting-based financial performances are closely related to SCM; in the literature, not much attention is given to the factors that will increase the effects of SCM on FP. Therefore, there is a need for research on this issue. Kale et al. [33] stated that there is a need to conduct studies that will contribute to the literature by drawing companies' attention to the importance of agility and ensuring that they fully understand the concept of agility. Carvalho et al. [30] mentioned that new research is needed to address the possible intermediary and regulatory role of SCA and SCRES between supply chains' operational and financial performances and different variables.

Based on this, the aim of this study, prepared based on dynamic capabilities theory, was to examine the effects of supply chain management practices of manufacturing companies in Turkey on financial performance as well as the interaction of supply chain agility and supply chain resilience and the moderating effect of supply chain resilience on the relationship between these two variables. In this context, a survey was conducted among the white-collar employees of 27 businesses in Türkiye's Top 500 Industrial Enterprises (ISO 500).

This study uniquely addresses manufacturing companies' supply chain management and financial performance. In addition, the interaction of supply chain agility and flexibility in the relationship between these two variables and the regulatory effect of supply chain flexibility are evaluated from different perspectives. In addition, the current research is essential in explaining the background of the success of the performance of manufacturing companies in countries with a collectivist culture, such as Turkey. In this context, the dynamic capabilities theory on which the research is based contributes to the idea by showing the impact of cultural factors in understanding how the dynamic capabilities approach works in practice.

This research gave information about the theoretical background, the research hypotheses were created, and the research model was designed. In the next phase, the scales used in the research are included, and the analyses used to test the hypotheses and their

results are mentioned. In the last section, the results obtained from the examination are evaluated, the study's limitations are noted, and some suggestions are made to academics and sector managers who may want to work on this subject in the future.

2. Literature Review

2.1. Theoretical Framework

According to the resource-based view (RBV), the basis of the competitive advantage of organizations lies in the resources they use to carry out their activities [34,35]. RBV emerged as a theory that focuses on providing a competitive advantage through a firm's capabilities, assets, and strengths, referred to as internal resources [36]. However, it was later argued that having resources for competitive advantage is not enough but must also be complex to substitute, valuable, and rare [37–40]. For example, copyrights and information systems are resources that are difficult to imitate [41]. Afterward, it was stated that to have a sustainable competitive advantage in dynamic environments, it is not enough to have resources that are difficult to replace and that the condition for organizations to achieve long-term success is to develop dynamic capabilities [42–45]. Studies following this view have determined that dynamic capabilities have an essential role in explaining the success of companies operating in dynamic environments [46–49]. Accordingly, some researchers have stated that the power of the dynamic capabilities view to explain performance is higher than that of the resource-based view [50,51].

Dynamic capabilities are the totality of a firm's capabilities to acquire, integrate, and adapt its talents and resources [45]. Companies with dynamic capabilities quickly adapt to dynamic environments thanks to their skills in developing, combining, and distributing their resources in organizational and managerial processes [48,52]. Accordingly, if companies can strategically organize their talents and resources appropriately, they will have a competitive advantage [53]. In this way, company managers will ensure that business objectives are achieved and thus have a high rate of financial growth performance [34].

To make the concept of dynamic capabilities more understandable in the literature, some authors have grouped capabilities into operational and dynamic capabilities [54,55]. Accordingly, while operational capabilities include the actions that the firm routinely performs, dynamic capabilities include higher-level skills [54]. For example, the ability to sense opportunities in the market and create new processes and skills within the company to take advantage of these opportunities is considered a dynamic capability [56]. Teece [57] defined dynamic capabilities as sensing, capturing, and reorganizing abilities necessary to adapt to environmental changes.

Conversely, agility is accepted as a versatile strategy companies use to adapt to changes while improving their ability to discover new ways to capture and benefit from new opportunities [58]. Accordingly, a dynamic capability is an activity model that expresses the organization's efforts to increase its effectiveness by changing its working routines [47].

In this context, some studies in the literature have defined SCRES as a dynamic ability to respond to unexpected disruptions caused by environmental changes and to be prepared for and cope with unforeseen risk situations [59–61]. As a dynamic capability, SCRES enables companies to combat the adverse effects of different risk sources [62].

According to the elucidation provided, this study, grounded in dynamic capabilities theory, posits that the engagement of manufacturing companies in supply chain management activities and the cultivation of their resources and capacities, aligned with dynamic environmental circumstances, will augment the company's financial performance. For this purpose, hypotheses regarding each factor affecting the financial performance of manufacturing companies are presented in the following sections.

2.2. Hypotheses Development

2.2.1. Supply Chain Management (SCM) and Financial Performance (FP)

Over the last few decades, many corporate leaders have come to comprehend the strategic significance of SCM and have acknowledged the distinct competitive advantages

that may be derived from proficiently overseeing the supply chain within an organization. Today, while small- and medium-sized manufacturing enterprises (SMEs) increase their business performance through more efficient supply chain management [63], it has also been a matter of curiosity whether SCM affects FP. While supply chain strategies are complex and have strategic importance in creating and sustaining firms' competitive advantage [64], unsurprisingly, both academics and business professionals show a demand for SCM to be made more financially accountable [32].

Numerous scholarly publications across several study fields have been published in the academic literature, aiming to explore the financial implications of SCM through the utilization of various research designs [2,65–67]. Most of these studies found a positive relationship between SCM and FP. Examining the impact of supply chain disruptions that cause delays in production and shipment on the welfare of partners, Hendricks and Singhal [68] studied 519 disruption announcements announced between 1989 and 2000. The findings revealed a 10.28% abnormal reduction in shareholder value from supply chain disruption announcements. Disruptions in SCM have been found to harm company value. However, it has been demonstrated that information technology-based SCM systems can yield substantial economic value under certain conditions. These conditions include appropriate targeting, timely implementation, effective management, and the presence of complementary investments [69]. Shi and Yu [32], who examined 49 articles in the literature with the help of content analysis, reported their study results based on the relationship between SCM and FP with two main findings. Firstly, it is essential to note that efficient SCM can enhance both accounting and market-based performance indicators. This is achieved through several means, such as boosting revenue, reducing operational expenses, and improving working capital efficiency. Second, disruptions in SCM cause significant financial losses in short and extended periods. Wang and Sarkis [70], who examined the relationship between integrated sustainable SCM and FP, which includes social and environmental SCM with a different approach, used Bloomberg environmental, social, and governance (ESG) data and return on assets and return on equity data in their study. The findings provided evidence of a positive relationship between the two variables. Anantadjaya et al. [71], who investigated the relationship between SCM, inventory management, and FP, also detected a positive relationship between the variables. Zubairu et al. [72], who wanted to prioritize the relative effects of supply chain strategies on FP with the analytic hierarchy process (AHP), supported the idea that supply chain strategies play an essential role in increasing FP.

Many studies examining the relationship between SCM and FP have concluded that SCM positively affects FP. However, some studies warn that supply chain integration (SCI) may negatively impact FP under certain conditions. Zhao et al. [73], in their findings obtained from survey data collected from 195 companies in China, revealed both positive and negative effects of SCI and showed an inverted-U shape relationship between SCI and FP. So, either too little or too much SCI can negatively affect FP.

Based on the research in the literature on the relationship between SCM and FP, the first hypothesis of the study was produced as follows:

H1. *There is a positive relationship between SCM and FP.*

2.2.2. The Moderating Role of Agility in the Relationship between SCM and FP

Achieving success in supply chains is one of the most essential strategic challenges companies face [74]. Achieving success depends on the integration of supply sides, that is, suppliers, manufacturers, and customers achieving goals such as growth and superior financial performance in the long term [75]. For this reason, in today's business world, companies focus on developing their new approaches at all stages of business development [76].

Supply chain management aims to identify and correct inefficiencies that occur during the supply chain, to predict customer demands, to make the most appropriate resource positioning in proportion to the predictions, and to ensure the effective functioning of the

supply chain by using healthier material, information flow, and financial management methods [77]. In this context, the task of a supply chain is to ensure that the business is agile enough to meet broader customer demands [78]. For this reason, companies use the agile management approach, in which a short period and agility are the main elements in responding quickly to changes in customer needs, expectations, and demand [7,14,79].

Agility in supply chains refers to the degree to which a supply chain can respond to changes in the market, customer preferences, and competitiveness [80,81]. In the context of dynamic capabilities theory, it is a firm's ability to respond to foreign market changes profitably and smoothly [1,82].

Agile supply chains are more market-oriented, as they can better synchronize supply with demand [81]. Shekarian et al. [83] found that supply chain management practices that demonstrate an agile attitude in the face of sudden interruptions and disruptions also improve the speed of responding to such interruptions. They also mentioned that agility responds to rapidly changing segmented markets in a sustainable supply chain performance.

Sadikoglu and Demirkesen [84] stated that an agile supply chain results from the integration of business partners that make it possible for companies to survive in markets that are divided into smaller parts and where the rate of change is high. Thanks to this integration, it has become possible to facilitate the flow of information necessary to deliver products to customers [85]. According to existing literature, there is a consensus that an augmentation in supply chain integration typically yields favorable outcomes for supply chain performance. Incorporating supply chain agility into this partnership enhances the potential for organizations to capitalize on collaborative efforts and improve the operational efficiency of the supply chain [86]. Moreover, some researchers have stated that agility is an important issue that shapes performance [82,87,88].

Having a competitive advantage enables the company to perform better than its competitors and create a permanent position for itself in the market. In other words, it allows the company to always keep its performance at the highest level by developing immunity against rapid changes in the market [89]. Therefore, companies must be proactive rather than reactive to respond quickly and effectively to changes that may occur in complex market conditions and improve their performance [90].

There is a general opinion that agile practices are beneficial in both academic and sectoral contexts [91]. Tallon and Pinsonneault [92], from data obtained from 241 business managers in the U.S., found that agility increases company performance in the long run. Shin et al. [93] stated that agility should be described as a strategic goal and investigated its effects on financial and operational performance. In this study conducted on small- and medium-sized businesses in Korea, it was stated that strategic plans on agility positively affected both financial performance and customer retention. In a study investigating the relationship between agility and supply chain success in Egypt, Hussain et al. [94] found that agility positively affected supply chain success. Clauss et al. [95], as a result of their studies on 432 German businesses, revealed that the strategic agility of companies has a positive effect on firm performance. In a study conducted on 300 supply chain managers in Indonesia, Suradi et al. [96] found that agility mediated the relationship between supply chain management activities and business performance. In a study conducted on 139 supply chain companies in the pharmaceutical industry in Jordan, Omoush [85] concluded that agility partially mediates the relationship between supply chain management and operational performance. Inman and Green [97], in a study on 136 manufacturing companies, examined the mediating role of agility in the relationship between environmental uncertainty and performance. Their results concluded that agility has a mediating role in the relationship between environmental uncertainty and interpretation. In a study that focused on the relationship between environmentally friendly practices and the final product, Salandri et al. [98] found that agility moderates this relationship and affects both sides. Akkaya and Qaisar [82], as a result of their research on SMEs in Turkey and Malaysia, concluded that strategic agility has a regulatory role in the relationship between dynamic capabilities and market performance. Betts and Tadisina [86] researched the connections

between uncertainties in the supply chain, the level of cooperation, and supply chain performance. Agility was used as a moderator variable in the research. According to their results, they concluded that agility causes an increase in the level of collaboration and a more significant impact on supply chain performance.

Based on these explanations, the following hypothesis was generated:

H2. *SCA has a regulatory role in the relationship between SCM and FP.*

2.2.3. Interaction of SCA and SCRES in the Relationship between SCM and FP

The supply network is inherently vulnerable to interruptions/disruptions, and the failure of one element in the supply network can cause loss in the entire network. Resilience is the ability of the supply chain to cope with unexpected interruptions/disruptions [99]. Singh et al. [100] defined supply chain resilience as the supply chain's ability to adapt to be prepared for unexpected events, responsiveness to interruptions and disruptions, and the ability to recover by ensuring continuity in operations. The primary purpose of managing supply chain resilience is to prevent slippage towards undesirable situations such as failure. For this reason, there are two main objectives in supply chain resilience [101]:

a. To ensure that the damaged system is restored to its desired state within an optimal period and at an optimal cost level;
b. To reduce the effects of a possible disturbance by changing the effectiveness level of a potential threat.

These issues can be mitigated through acquiring and applying certain aptitudes, including redundancy and agility [102]. Ivanov et al. [103] mentioned the importance of supply chain strategies so that a company can effectively and efficiently implement emergency plans in the face of disruptions and interruptions, thus making the supply chain more resilient.

Since the needs and expectations of customers and consumers will change over time, it becomes crucial for supply chains to adapt to possible changes to respond in line with the market's expectations [6]. Swafford et al. [14] found that a company's supply chain agility reflects how well its markets and suppliers interact. Supply chain agility is conceptualized in existing research as the speed at which a firm's internal supply chain functions adapt to changes in the market. Due to the importance of pace in meeting customer needs and expectations, the efficiency of a supply chain is achieved by reducing product development time, increasing the number of personalized products, and improving delivery performance [104]. In this way, we can respond to customer demands at a higher level with lower costs by using fewer inputs, and on the one hand, business revenues increase, and on the other hand, financial performance increases [105].

In this context, the primary purpose of agility is to respond effectively and quickly to changes that may occur in the market by prioritizing speed [106]. Otherwise, supply chain disruptions and interruptions may occur due to sudden and unexpected changes. From this explanation, it is possible to conclude that the ability to cope with such disruptions and interruptions will also determine supply chain performance [107]. In the literature, some authors have argued that resilient and agile approaches are the way to increase supply chain performance [63,108].

In conclusion, SCM is a process that ensures that the right product reaches the customer at the right place, at the right time, at the right price, without reducing quality, and at the lowest cost [74]. Therefore, it requires integrated execution, cooperation, and harmony of product, material, information, and money flows [109]. The ability to return to the previous state (resilience) in the face of unexpected disruptions and interruptions that may disrupt the harmony in supply chains and the speed, flexibility, adequacy, product diversity, and degree of cooperation (agility) in responding to changes in demand will affect the competitiveness and performance of the supply chain [30,110].

In the light of these explanations, the following hypothesis was produced:

H3. *The interaction of SCA and SCRES in the relationship between SCM and FP modifies the moderator effect of SCA.*

3. Methodology

3.1. Research Design

In this study, a survey was designed to investigate the impact of effective SCM on FP in manufacturing companies as well as the complex moderator role of SCA and SCRES in this effect.

The research model is presented in Figure 1.

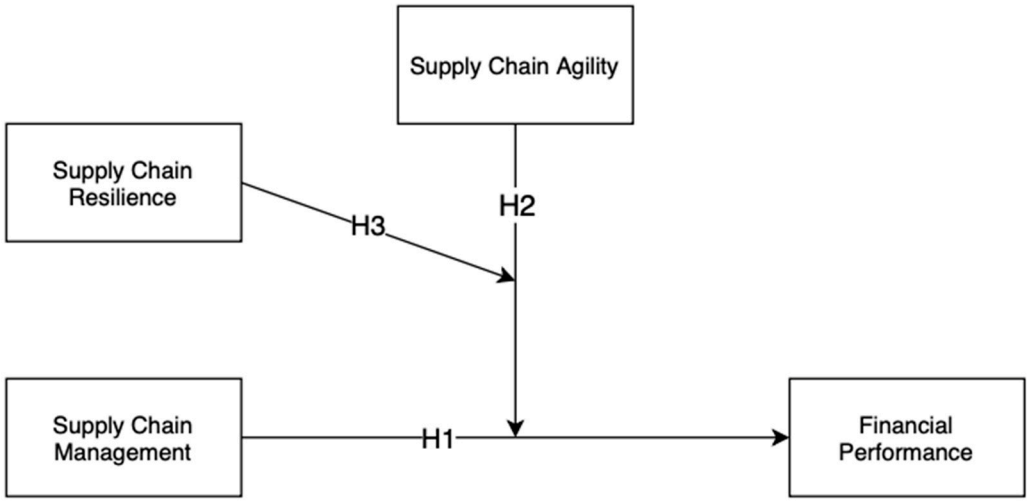

Figure 1. Research Model.

3.2. Data Collection and Sampling

The unit of analysis of this research is manufacturing companies. The research sample consists of white-collar employees of 27 businesses with 250 or more employees operating in the manufacturing sector in Türkiye's Top 500 Industrial Enterprises (ISO 500) in 2021. There were 258 companies that had 250 or more employees on the announced list (https://www.iso500.org.tr/500-big-industrial-institutions-of-turkey, accessed on 5 April 2023). We sent surveys to all of these 258 companies via e-mail. Finally, we received answers from 27 companies.

The human resources managers of the 27 businesses mentioned were contacted by phone and informed about the research. The survey questions were sent to them, and their opinions and suggestions were considered. Subsequently, a survey was sent to the human resources departments of 27 businesses via e-mail. Three hundred and five of the surveys sent garnered a response. *approximatly* 9–12 white-collar employees from each company responded to the survey.

A survey form consisting of two parts was prepared to collect data for this study. The first part of the survey form contains demographic questions about the participants. The second part includes scale items prepared according to a 5-point Likert scale. The convenience sampling method was preferred as the sampling method.

In the analysis, the SCM variable was defined as the independent variable, the SCA and SCRES variables as the moderator variable, and the FP variable as the dependent variable.

To ensure the confidentiality of the personal information of the participants, no questions were asked in the survey form that could reveal the personal data of both the companies and the company officials who answered the survey. The necessary commitment was made to the participants at the beginning of the survey form.

Before starting the research, ethical approval was obtained from Akdeniz University Social and Human Sciences Scientific Research and Publication Ethics Board dated 11 May 2023, numbered 640109.

3.3. Measurement of Variables

The survey form of the research consists of 4 main dimensions and 33 statements. The survey used five descriptive question statements to obtain descriptive data from the participants. Thus, there are 38 expressions in total.

The supply chain management scale developed by Omoush [85] consists of four sub-dimensions and sixteen statements. The sub-dimensions of the supply chain management scale are collaboration with suppliers (ALL), customer relationship management (CRM), logistics (LOG), and information flow and information sharing (INF).

Supply Chain Agility Scale: It was developed by Kim and Chai [111] and consists of a single dimension and eight statements.

Supply Chain Resilience Scale was developed by Ambulkar et al. [112] and consists of a single dimension and four expressions.

The Financial Performance Scale was developed by Powell and Dent-Micallef [113] and consists of a single dimension and five statements.

All items were scored using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scale items are given in Appendix A.

3.4. Data Analysis Techniques

The collected data were analyzed using Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and the Hayes PROCESS MACRO. EFA was employed to assess the construct validity of each scale and determine the number of factors to retain. CFA was used to test the goodness of fit of the assumed model. The Hayes method was used to test the relationships between variables and the proposed hypotheses.

Exploratory factor analysis is included in many statistical software packages and is widely used in numerous studies.

Translating items from the original language to a new one is crucial in research. Failure to accurately translate the meanings of items from the original scale can lead to errors in scale scores. This semantic shift can form a different structure from the actual scale [114]. Therefore, ensuring that the item translation process is accurately executed before commencing the analysis in an adaptation study is essential. A consistently conducted translation process is crucial to mitigate potential structural differences arising from this semantic shift. Consequently, conducting EFA and CFA in adaptation studies is vital.

In conducting EFA, essential procedures include examining whether the sample size is sufficient, selecting the factor extraction method, examining the Kaiser–Meyer–Olkin (KMO) and Bartlett tests, scrutinizing factor loadings, selecting the factor rotation method, naming the factors, and reporting the total explained variance ratios. For the adequacy of the sample size for EFA, a KMO greater than 0.50 and a significant Bartlett test are expected [115].

The Hayes-moderated moderation analysis method was employed to test the hypotheses. Moderated moderation analysis is a statistical technique researchers use to understand how the effects of independent variables interact. This analysis reveals complex interactions among relationships by examining situations where the primary moderator variable alters the impact of the secondary moderator variable. This method is commonly used in social sciences and behavioral research to understand relationships and interactions better. It enables researchers to comprehensively assess the nature of relationships that emerge under specific conditions, addressing this complexity and offering a more nuanced perspective (Model 3: [116]).

4. Results

In this section, first, the demographic characteristics of the participants are presented. Subsequently, the EFA, CFA, and hypothesis testing results are presented in tables.

4.1. Descriptive Statistics of the Sample

According to demographic data, 64% of the participants in the study were male, and 42 of them were between the ages of 25–35. Furthermore, 79.6% of the participants had a bachelor's degree, and 49.0% of the companies they work for had a sectoral background between 11–20 years. Additionally, 36.5 participants had worked in their companies for 6–9 years, and 39.7 had over ten years of work experience.

The demographic characteristics of the sample are shown in Table 1.

Table 1. Demographic Characteristics.

	Groups	**N**	**%**
Gender	Male	195	64
	Female	110	36
Age	Less than 25	19	6.2
	25–35	128	42
	36–45	116	38
	45+	42	13.8
Education	High school	24	7.9
	Bachelor	243	80
	Master	38	12.5
Sectoral history of the company	1–5 years	14	4.6
	6–10 years	68	22.2
	11–20 years	149	49
	20 years+	74	24.2
Time at work	1–2 years	68	22.2
	3-5 years	82	26.8
	6–9 years	111	36.5
	10 years+	44	14.5
Total work experience	1–2 years	28	9
	3–5 years	62	20.2
	6–9 years	94	30.8
	10 years+	121	40
TOTAL		305	100

According to Table 1, the study sample consists of 305 participants, with 64% male and 36% female. Age distribution shows 6.2% under 25, 42% between 25 and 35, 38% between 36 and 45, and 13.8% over 45. Regarding education, 7.9% had a high school education, 79.6% held a bachelor's degree, and 12.5% had a master's degree. In terms of the sectoral history of their companies, 4.6% worked in companies with 1–5 years of history, 22.2% in companies with 6–10 years, 49% in companies with 11–20 years, and 24.2% in companies with over 20 years. For time at work, 22.2% had been at their current job for 1–2 years, 26.8% for 3–5 years, 36.5% for 6–9 years, and 14.5% for over 10 years. Total work experience shows 9.1% with 1–2 years, 20.3% with 3–5 years, 30.9% with 6–9 years, and 39.7% with more than 10 years of experience. In the next stage, exploratory factor analysis was performed on the collected data.

4.2. Exploratory Factor Analysis Results

Before performing CFA analysis, EFA was performed as the first step to test the validity of the scales. The findings are shown in Table 2.

Table 2. EFA Results.

		Item	Factor Loading	Mean	Std. Dev.
Supply Chain Management	ALL	ALL1	0.893	4.666	0.585
		ALL2	0.916	4.656	0.598
		ALL3	0.887	4.639	0.597
		ALL4	Removed due to low factor loading		
	CRM	CRM1	0.885	4.479	0.623
		CRM2	0.900	4.489	0.613
		CRM3	0.914	4.475	0.618
		CRM4	0.705	4.449	0.663
	LOG	LOG1	0.906	4.226	0.511
		LOG2	0.878	4.216	0.518
		LOG3	0.908	4.252	0.505
		LOG4	Removed due to low factor loading		
Information Sharing		INF1	0.879	4.230	0.730
		INF2	0.920	4.249	0.732
		INF3	0.920	4.243	0.726
		INF4	Removed due to low factor loading		
Supply Chain Resilience		SCRES1	0.819	3.836	0.963
		SCRES2	0.869	3.534	1.016
		SCRES3	0.829	3.666	0.977
		SCRES4	0.766	3.633	0.954
Supply Chain Agility		SCA1	Removed due to low factor loading		
		SCA2	0.790	4.482	0.689
		SCA3	0.707	4.498	0.669
		SCA4	0.916	4.502	0.689
		SCA5	Removed due to low factor loading		
		SCA6	0.893	4.4918	0.703
		SCA7	Removed due to low factor loading		
		SCA8	0.877	4.4918	0.689
Financial Performance		FP1	0.834	4.410	0.643
		FP2	0.815	4.410	0.663
		FP3	0.892	4.390	0.680
		FP4	Removed due to low factor loading		
		FP5	0.889	4.364	0.731

SCM: KMO: 0.701, chi-square: 3023.896, df: 78, sig.: 0.000, total variance explained: 82.23%; SCRES: KMO: 0.802, chi-square: 512.736, df: 6, sig.: 0.000, total variance explained: 68.65%; SCA: KMO: 0.855, chi-square: 971.031, df: 10, sig.: 0.000, total variance explained: 70.59%; FP: KMO: 0.819, chi-square: 1004.723, df: 6, sig.: 0.000, total variance explained: 74.39%.

Table 2 illustrates the factor loadings, means, and standard deviations for items under various constructs related to supply chain management. Under the Alliance construct, items ALL1, ALL2, and ALL3 have high factor loadings above 0.88, with means around 4.66 and a standard deviation of approximately 0.59, while ALL4 was removed due to low factor loading. The CRM construct includes items CRM1, CRM2, CRM3, and CRM4, with factor loadings ranging from 0.705 to 0.914, means around 4.48, and standard deviations

from 0.613 to 0.663. For the Logistics construct, items LOG1, LOG2, and LOG3 have factor loadings above 0.87, means around 4.23, and standard deviations near 0.51, with LOG4 removed. Information Sharing includes items INF1, INF2, and INF3 with factor loadings above 0.87, means around 4.24, and standard deviations around 0.73, with INF4 removed. dolphin choir Resilience has items SCRES1 to SCRES4, with factor loadings ranging from 0.766 to 0.869, means between 3.534 and 3.836, and standard deviations from 0.954 to 1.016. The Supply Chain Agility construct includes items SCA2, SCA3, SCA4, SCA6, and SCA8, with factor loadings from 0.707 to 0.916, means around 4.49, and standard deviations between 0.669 and 0.703, with SCA1, SCA5, and SCA7 removed. Financial Performance includes items FP1, FP2, FP3, and FP5, with factor loadings above 0.815, means around 4.39, and standard deviations from 0.643 to 0.731, with FP4 removed. The Kaiser–Meyer–Olkin (KMO) values and chi-square statistics for these constructs indicate good sampling adequacy and significant results, with total variance explained ranging from 68.65% to 82.23%. As a result of EFA, it was determined that the factor loadings for all scales were sufficient. KMO values were determined as KMO > 0.70. The Bartlett tests were significant.

4.3. Confirmatory Factor Analysis Results

In the second stage, CFA was conducted for the construct validity of the scales. The findings are presented in Table 3.

Table 3. CFA Goodness-of-Fit Values.

Variable	χ^2	df	χ^2/df	GFI	CFI	NFI	TLI	RMSEA
Criterion			≤5	≥0.85	≥0.90	≥0.90	≥0.90	≤0.08
SCM	161.318	56	2.881	0.924	0.965	0.948	0.951	0.079
SCRES	0.50	1	0.50	1.000	1.000	1.000	1.011	0.000
SCA	11.616	4	2.904	0.985	0.992	0.988	0.980	0.079
FP	0.581	2	0.290	0.999	1.000	0.999	1.004	0.000

The CFA results indicated that the scales met the acceptable criteria for goodness of fit.

The AVE and CR values were calculated to test the component validity and the factor loadings obtained from the CFA results. A reliability analysis was also conducted, and Cronbach's alpha coefficient values were examined. The findings are presented in Table 4.

Table 4. Reliability Results.

Variable	AVE	CR	Cronbach's Alpha
SCM	0.78	0.97	0.810
SCRES	0.67	0.89	0.847
SCA	0.71	0.92	0.912
FP	0.78	0.93	0.918

In the calculations, AVE was computed by dividing the sum of λ^2, representing the factor loadings, by the number of items. CR was calculated using the following formula: (Sum of the squares of λ)/(Sum of the squares of λ + 1 − Sum of λ^2). As AVE > 0.50, CR > 0.70, and Cronbach's alpha > 0.70, it was determined that the scales are reliable.

4.4. Hayes Process Macro Model 3 Results

This section illustrates the relationships between variables in the analysis. The dependent variable was defined as "FP", and the effects of the "SCM", "SCA", and "SCRES" variables on "FP" were examined. Additionally, conditional effects were analyzed based on different values of the "SCR" variable for the interactions (Int_1, Int_2, Int_3, and Int_4)

between independent variables. The effects of the independent variable vary depending on the values of "SCA" and "SCRES".

Table 5 displays the overall performance of the utilized model. The model's R-squared value was 0.1642, indicating that the independent variables (SCM, SCA, and SCRES) account for 16.42% of the variance in the dependent variable (FP). The model's F value is 8.3328, with a *p*-value of 0.0000, demonstrating the statistical significance of the model and indicating that at least one independent variable significantly affects the dependent variable.

Table 5. Model Summary.

R	R-sq	MSE	F	df1	df2	*p*
0.4052	0.1642	0.2545	8.3328	7	297	0.000

Table 6 illustrates the impact of each independent variable (SCM, SCA, and SCRES) on the dependent variable (FP). The coefficient for SCM was calculated as 37.5993, with a *p*-value of 0.0096, indicating a significant effect of SCM on FP. The coefficient for SCA was 8.0088, with a *p*-value of 0.0154, a significant effect of SCA on FP. The coefficient for SCRES was 9.7585, with a *p*-value of 0.0119, demonstrating a significant effect of SCRES on FP. Product terms used to examine interactions between variables were found to be statistically significant based on the analysis results. The *p*-values for these terms are 0.0214, 0.0167, 0.0190, and 0.0258, respectively. These results indicate that these product terms have additional effects on "FP".

Table 6. Model Coefficients.

	Coefficient	Std. Error	t-Value	*p*-Value	LLCI	ULCI
Constant	−35.5105	14.2898	−2.4850	0.0135	−63.6326	−7.3884
SCM	37.5993	14.4203	2.6074	0.0096	9.2205	65.9782
SCA	8.0088	3.2869	2.4366	0.0154	1.5403	14.4773
Int_1	−7.5983	3.2861	−2.3123	0.0214	−14.0653	−1.1314
SCRES	9.7585	3.8571	2.5300	0.0119	2.1678	17.3492
Int_2	−9.4181	3.9118	−2.4076	0.0167	−17.1165	−1.7197
Int_3	−2.1015	0.8910	−2.3585	0.0190	−3.8550	−0.3480
Int_4	2.0026	0.8936	2.2410	0.0258	0.2440	3.7611

According to the analysis results as shown in Table 7, conditional effects were observed for the "SCRES" at different values. When the "SCRES" has a value of 2.3757, the SCA * SCRES interaction has a statistically significant effect of −2.8409. However, the effect is not statistically significant when the "SCRES" is 3.2050. These results indicate that the impact of the independent variable can vary depending on different values of the "SCRES" variable.

Table 7. Conditional Effects of the SCRES.

SCRES	Effect	F	df1	df2	*p*
2.3757	−2.8409	5.5222	1	297	0.0194
3.205	−1.1803	4.2911	1	297	0.0392
3.7815	−0.0256	0.0036	1	297	0.952

Table 8 shows the effect of the interaction between the SCA and SCRES variables. The table presents each combination's moderation effect (Effect) and the relevant statistics (Standard Error, t-value, *p*-value, LLCI, and ULCI).

Table 8. Moderation Effect.

SCA	SCRES	Effect	Std. Error	t-Value	*p*-Value	LLCI	ULCI
3.8714	2.3757	4.2267	0.9132	4.6285	0.0000	2.4296	6.0239
3.8714	3.2050	2.8456	0.5319	5.3496	0.0000	1.7988	3.8924
3.8714	3.7815	1.8854	0.5932	3.1782	0.0016	0.7179	3.0528
4.5522	2.3757	2.2925	0.7635	3.0027	0.0029	0.7900	3.7950
4.5522	3.2050	2.0421	0.5517	3.7011	0.0003	0.9562	3.1279
4.5522	3.7815	1.8679	0.6834	2.7333	0.0066	0.5230	3.2128
4.7945	2.3757	1.6041	0.9058	1.7708	0.0776	−0.1786	3.3867
4.7945	3.2050	1.7560	0.6202	2.8313	0.0050	0.5355	2.9766
4.7945	3.7815	1.8617	0.7407	2.5135	0.0125	0.4041	3.3193
3.8714	3.2050	2.8456	0.5319	5.3496	0.0000	1.7988	3.8924

For example, when the value of SCA is 3.8714, and the value of SCRES is 2.3757, the moderation effect was calculated as 4.2267. The standard error is 0.9132, the t-value is 4.6285, and the *p*-value is 0.0000, indicating the statistical significance of the moderation effect. The LLCI and ULCI range from 2.4296 to 6.0239. Similarly, when the value of SCA is 3.8714, and the value of SCRES is 3.2050, the moderation effect was calculated as 2.8456, statistically significant, with a *p*-value of 0.0000. The LLCI and ULCI range from 1.7988 to 3.8924.

Furthermore, when the value of SCA is 4.7945, and the value of SCRES is 2.3757, the moderation effect was calculated as 1.6041. This effect is not statistically significant, as the *p*-value is 0.0776, above the significance level of 0.05. The LLCI and ULCI range from 0.1786 to 3.3867.

These results indicate that SCRES moderates the relationship between SCA and FP. The analysis results reveal that SCM directly affects FP, SCA moderates the relationship between SCM and FP, and SCRES moderates the moderation effect of SCA.

The interaction of SCA and SCRES is demonstrated in Figure 2.

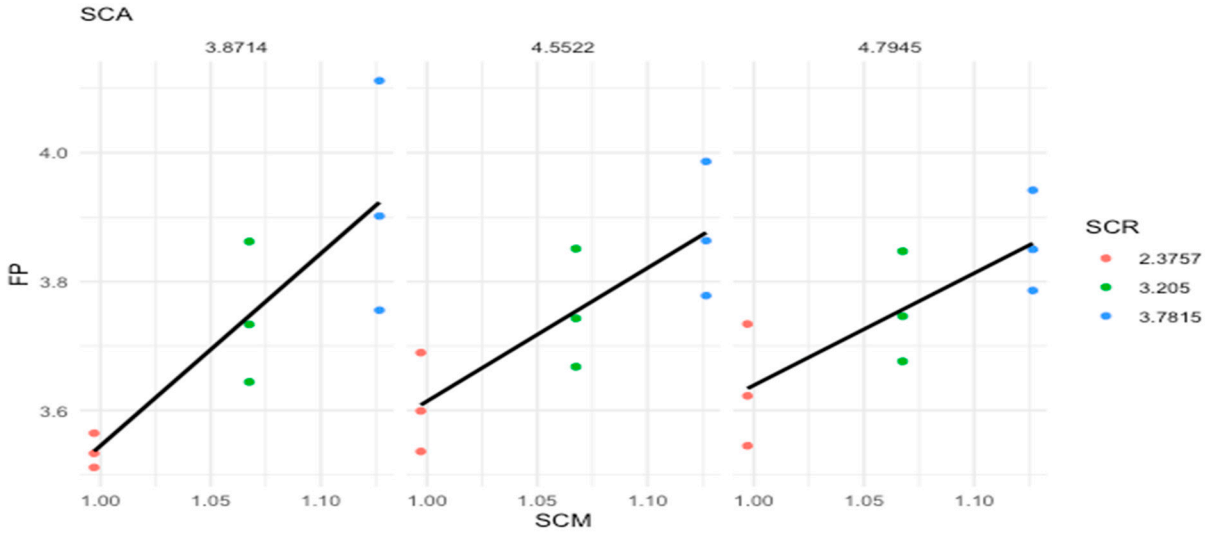

Figure 2. Moderation Effect.

Table 9 presents the results of the test(s) of highest-order unconditional interaction(s). The R-squared change value for the SCM * SCA * SCRES interaction is 0.0141, with an F-value of 5.0221 and respective degrees of freedom df1 = 1.0 and df2 = 297.0. The *p*-value

of this test is 0.0258, indicating that the SCM * SCA * SCRES interaction is significant, as it is below the 0.05 significance level.

Table 9. Test(s) of highest order unconditional interaction(s).

Interaction	Change in R-Square	F-Value	df1	df2	*p*-Value
SCM * SCA * SCRES	0.0141	5.0221	1.0	297.0	0.0258

Based on these results, we can evaluate our hypotheses as follows: It was observed that SCM has a positive effect on FP, confirming Hypothesis 1. The SCM variable positively affects FP (effect = 37.5993, $p < 0.01$). This result supports our hypothesis, suggesting that the impact of SCM on FP is statistically significant and that an increase in SCM is associated with an increase in financial performance. Additionally, it was observed that SCA moderates the interaction between SCM and FP, and SCRES moderates the moderation effect of SCA on this interaction. The term "Int_1" in the table represents the interaction between SCM and SCA. According to the analysis results, the "Int_1" term is statistically significant ($p < 0.05$), indicating that SCA moderates the effect of SCM on FP.

Furthermore, "Int_2" represents the triple interaction between SCM, SCRES, and SCA. This term was statistically significant ($p < 0.05$), indicating that SCRES moderates the interaction between SCM and FP mediated by SCA. This also supports Hypotheses 2 and 3.

5. Conclusions and Discussion

This study investigated the relationships among supply chain management (SCM), financial performance (FP), supply chain agility (SCA), and supply chain resilience (SCRES). Additionally, the study sought to explore the potential moderating effects of supply chain agility and supply chain resilience in this relationship. The study's findings support the hypothesis that supply chain management significantly impacts financial performance. Through the lens of dynamic capability theory and compared with the literature, our finding of a positive relationship between SCM and FP has also been supported in previous studies in the literature [32,69–72]. Organizations where SCM is managed effectively tend to perform better. This is associated with organizations optimizing their supply chain processes, using resources efficiently, and gaining competitive advantage. This also entails the prompt acknowledgment of the capacity to discern alterations, patterns, and prospects in the surroundings and the ability to promptly reconfigure team members to efficiently execute tasks and swiftly adjust to changing circumstances [117]. Furthermore, the attainment of financial performance will be facilitated by establishing a strategic, expansive, and all-encompassing networking capability with suppliers and distributors.

The study also highlights the moderating role of supply chain agility in the association between supply chain management and financial performance. This finding highlights the complexity of the relationship between supply chain management and performance. SCA can strengthen or weaken the impact of SCM on FP by enabling organizations to adapt to changing market conditions. This highlights the importance of organizations developing flexibility, innovation, and responsiveness.

Similarly, the findings that SCRES moderates the moderating effect of SCA suggest that if SCRES increases the resilience of organizations to external challenges, the interaction of SCRES with SCA may influence the relationship between SCM and FP. If SCRES is implemented effectively, organizations become more resilient to external challenges, which can increase the positive relationship between SCM and FP. However, when SCRES is adequately applied, this interaction may be more vital or negatively affected. According to this conclusion, organizations must maintain SCRES as a strategic advantage to support supply chain resilience. SCRES can provide organizations with resilience to external shocks or crises, thus strengthening or weakening the interaction between SCA, SCM, and FP.

In conclusion, the results of the analysis revealed complex interactions between SCM, SCA, and SCRES and the effects of these variables on FP. These findings emphasize that

organizations should consider supply chain agility, management, and resilience factors to achieve performance. This study offers a new perspective to the literature and guides managers in their strategic decisions.

We can list the essential contributions of the findings of this study to the literature as follows:

- This study highlights the interdependent nature of SCM, SCA, and SCRES in achieving financial performance. Organizations need to consider all three factors for a holistic approach;
- The research provides a comprehensive framework for manufacturing companies, emphasizing the importance of both SCA and SCRES for maximizing the benefits of effective SCM practices;
- Our findings contribute to the existing body of knowledge by demonstrating the moderating roles of SCA and SCRES. This enriches the understanding of how these capabilities influence financial performance in manufacturing contexts;
- The research offers valuable insights for managers in making strategic decisions regarding supply chain management, agility, and resilience to achieve optimal financial outcomes.

Limitations and Recommendations for the Future Studies

Although utmost care was taken regarding the reliability and validity of the study, some things could be improved regarding this issue. Although web-based surveys offer some convenience benefits to practitioners, they may also have some features that may cause possible bias, such as nonresponse bias, common method bias, and coverage error [118]. To reduce these effects of prejudice, several initiatives were taken to ensure the validity and reliability of the study by applying appropriate statistical tests. As a result, we obtained the necessary proof that the data analysis results from the survey used in this study were not significantly affected.

Since the information obtained from this study reflects research conducted on the employees of 27 companies operating in the manufacturing sector in Türkiye's Top 500 Industrial Enterprises (ISO 500), it would not be correct to generalize these results to the entire manufacturing sector and other sectors. Researchers who will work in this field in the future can conduct new studies by adding moderator, mediator, or different variables to the model used in this research; by running the model used in this research on other sectors; or by using data obtained from different logistics and supply chain activities in the model used. The data collecting processes and generalizability of the sample to the population challenges also should be taken into consideration for future research.

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

MEASUREMENT INSTRUMENTS	
SUPPLY CHAIN MANAGEMENT	
Collaboration with suppliers	
ALL1	The company confirms communication openness with the basic suppliers.
ALL2	The company deals with its suppliers based on the partnership.
ALL3	The company works to engage the basic suppliers in process of developing its products and services.
ALL4	The company's strategy depends on building good relationships with the basic suppliers.
Customer Relationship Management	
CRM1	Customer satisfaction is a good which the company seeks for.
CRM2	In the company there is a specialized division for the customer's service.
CRM3	The company deals with the customers notes and complaints in an appropriate way.
CRM4	The company keeps a complete database about the customers.
Logistics	
LOG1	Does the company respond to the orders from time of receiving the order and during its transportation and till handling the bill and receiving the financial merits?
LOG2	Is there a system in the company for accuracy and complete orders—the absence of returned orders?
LOG3	Logistics management in the company includes planning, scheduling the productions, and monitoring them.
LOG4	Logistic management includes all planning and implementation levels (The Executive and Tactical Strategy).
Flow Information and Knowledge Sharing	
INF1	The company possesses an electronic system to speed up the information exchange internally.
INF2	The company uses the electronic networks for exchanging information with the customers.
INF3	The company uses the electronic networks to exchange information with the suppliers.
INF4	The company shares the knowledge and the information with the suppliers in building its plans.
SUPPLY CHAIN AGILITY	
SCA1	Our supply chain is able to respond to changes in demand without overstock or lost sales.
SCA2	Our supply chain is capable of forecasting market demand and responding to real market demand.
SCA3	Joint planning with suppliers is important in purchasing, production, and logistics.
SCA4	Information integration with suppliers, logistic service providers, and customers in the supply chain is important.
SCA5	Improving our level of customer service is a high priority.
SCA6	Improving delivery reliability is a high priority.
SCA7	Improving responsiveness to changing market needs is a high priority.
SCA8	Inventory and demand levels are visible throughout the supply chain
RESILIENCE	
SCRES1	We are able to cope with changes brought by the supply chain disruption.
SCRES2	We are able to adapt to supply chain disruption easily.
SCRES3	We are able to provide a quick response to supply chain disruption.
SCRES4	We are able to maintain high situational awareness at all times.
FINANCIAL PERFORMANCE	
FP1	Over the past three years, our financial performance has been outstanding.
FP2	Over the past three years, our financial performance has exceeded our competitors'.
FP3	Over the past three years, our sales growth has been outstanding.
FP4	Over the past three years, we have been more profitable than our competitors.
FP5	Over the past three years, our sales growth has exceeded our competitors'.

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