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The Mediating Role of Flexibility and Agility in the Effect of Supply Chain Integration on Firm Performance

Tedarik Zinciri Entegrasyonun Firma Performansına Etkisinde Esnek ve Çevikliğin Aracılık Rolü

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ABSTRACT

Today, the concepts of supply chain integration and agile and flexible supply chain, which affect companies to increase their performance in the face of the change in competition, have come to the fore. The purpose of the current study is to develop a model that reveals the mediating role of agile supply chain and flexible supply chain in the effect of supply chain integration on firm performance, and the hypotheses are tested with the structural equation model (SEM). To this end, the research question of the current study is worded as follows; "Do the flexibility and agility of the supply chain integration have a mediating role in the relationship between the supply chain integration and firm performance?" The population of the study consists of manufacturing companies in the Free Zone and Organized Industrial Zone in the city of Mersin. A total of 238 questionnaires were applied in the current study. As a result of the analysis, it was found that the mediating role of supply chain flexibility and agility exists in the effect of supply chain integration on firm performance.

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Anahtar Kelimeler:

Tedarik Zinciri Entegrasyonu,

Çevik Tedarik Zinciri

Esnek Tedarik Zinciri,

Firma Performansı

ÖZET

Günümüzde firmalar rekabet boyutunun değişmesi karşısında firmalar performanslarını artırmada etki eden tedarik zinciri entegrasyonu, çevik ve esnek tedarik zinciri kavramları ön plana çıkmaktadır. Bu araştırmanın amacı tedarik zinciri entegrasyonun firma performansına etkisinde çevik tedarik zinciri ve esnek tedarik zincirinin aracılık rolünü ortaya çıkaran bir model geliştirilmiş ve hipotezler, yapısal eşitlik modeli (YEM) ile test edilmiştir. Bu çalışmada ortaya konulması gereken problem cümlesi bir soru ifadesi olarak tedarik zinciri entegrasyonu ve firma performansı ilişkisinde tedarik zinciri esnekliğinin ve tedarik zinciri çevikliğinin aracılık rolü var mıdır? Çalışmanın evrenini Mersin ilinde Serbest Bölge ve Organize sanayi bölgesinde imalat firmaları oluşturmaktadır. Bu çalışmada toplam 238 anket uygulanmıştır. Analiz sonucunda tedarik zinciri esnekliği ve çevikliğinin aracılık rolünün, tedarik zinciri entegrasyonun firma performansı üzerindeki etkisinde var olduğu bulgusu elde edilmiştir.

1. INTRODUCTION

Today, businesses have turned to impressions that will provide competitive advantage and increase their performance. The concepts of supply chain integration, agility and flexibility come to the fore in changing the dimension of competition and increasing the performance of companies. The supply chain, which includes suppliers, production companies and distribution channels, has become an important concept for the performance of today's businesses (Erdem, 2007: 9).

Integration can be used to describe a wide variety of structural links between departments and firms. For example, the company may integrate different elements of the company's activities inside or outside the company. These elements can be tangible (such as product flows and measurement) or intangible (such as relationships and information) (Chen et al., 2009: 64). According to Flynn et al. (2010:59), supply chain integration refers to "the extent to which an organization can manage intra- and inter-organizational efforts to achieve effective and efficient flows of products, services, information, money and decisions with the goal of strategically collaborating with its supply chain partners and providing maximum value". According to Chow et al. (1995: 290), integration is not a feature, but the product of a desirable organizational structure as a means of achieving greater logistical performance.

Ayan et al., who investigated supply chain flexibility in a conceptually comprehensive way, made an examination based on the scientific definition of the concept of flexibility. According to Sheffi (2005), flexibility is "the efforts to protect against the unpredictable dangers and problems of the uncertain future and to protect the existence of the businesses that face these dangers" (Ayan et al., 2018: 360; Cf. Sheffi, 2005: 48). Stating that companies use supply chain management to use and coordinate their functions in the most active way, Ayan also mentions the flexibility of the supply chain in the field of business by relating it to risk management (Ayan et al., 2018: 360).

Application flexibility, which is widely used today, is the main feature of flexible production systems. Gupta and Goyal (1989) defined flexibility as the ability of the production system to cope with changing conditions or environmental instability (Gupta and Goyal, 1989: 120). In addition to this definition of flexibility, Benjaafar and Ramakrishnan (1996: 1195) define flexibility as the ability of a system to respond quickly and cost-effectively to changing needs and requirements. In other words, flexibility is responsible for making the production process as versatile as possible (Wahab, 2005: 3773). Slack emphasized that it would be wrong to think of flexibility only at the individual or system level, and emphasized that it would be correct to think it in four areas. He explained that these four areas are the entry of product changes, making different product mixes, adjusting output quantities and changing distribution times (Slack, 1983: 8).

The concept of agility has become a field of study gaining greater importance in manufacturing and supply chain management research because of its importance for managerial practice (Blome et al., 2013: 1296). In order to understand supply chain agility, we first need to clarify the meaning of agility. As agility is a very broad and multidimensional concept, it includes various aspects of an organization and includes supply chain agility as an organizational agility issue (Li et al., 2008: 410). In an environment of change, supply chain agility has become a source not only for competitive differentiation but, in some cases, for the long-term sustainability of an organization. In this context, agility is one of the important points for a business to grow in a competitive market that is constantly and unexpectedly changing, and to be able to respond quickly to rapidly changing markets as a result of the customer-based evaluation of products and services (Yusuf et al., 1999: 36). In addition, agility plays a key role in the successful exploration of competitive bases and services (speed, flexibility, innovation proactivity, quality and profitability) in a rapidly changing market environment through the integration of reconfigurable resources and best practices in a knowledge-rich environment so that customer-focused products can be manufactured (Braunscheidel, 2005: 36).

Profitability indicators such as profitability of capital, the profitability of sales, the profitability of assets, and growth-based financial performance indicators such as growth in sales, assets, capital and market share, and increase in the number of employees were mostly used in firm performance measurements. However, since financial performance measurements cannot measure non-financial performance, the importance of which has increased in recent years, companies have turned to non-financial issues such as employee satisfaction, quality, customer satisfaction, innovation and flexibility. Therefore, it is necessary to measure the results of these actions with non-financial performance indicators. It is emphasized that a healthy company performance measurement is possible by measuring financial and non-financial performance indicators together in a certain balance (Elitaş and Ağca, 2006: 366).

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Muntaka et al. (2007) argue that supply chain integration and supply chain flexibility provide an environment where everyone in the organization can focus their attention on production, cost reduction, quality improvements and environmental uncertainties, and the meaning of the relationship between supply chain integration and supply chain flexibility affects the performance of businesses individually and collectively. However, Muntaka et al. (2017) found that supplier, customer and inter-unit integration, which are the dimensions of supply chain integration, are each related to supply chain flexibility in their research on the effect of supply chain integration and supply chain flexibility on firm performance in Ghana. They concluded that supply chain integration and flexibility are critical components, especially for improving business performance. In this context, Muntaka et al. (2017) emphasized that the impact on business performance is higher in places where supply chain integration and flexibility policies are applied simultaneously (Muntaka et al., 2017: 141). On the other hand, Scannell et al. (2000) found that supplier development, supplier partnership and just-in-time purchasing, which are the result of integration, increase flexibility, and Schoenherr and Swink (2012: 107) also found the significant effect of supplier and customer integration and integration on flexibility.

Supply Chain is the two main dimensions of Integration (Marin-Garcia, Luque and Medina-Lopez, 2013: 425). It is internal integration, which refers to the coordinated management of a company's internal operational activities, and external integration, which refers to the integration of external activities (Sudrajat; 2007: 20). It is internal integration, which refers to the coordinated management of a company's internal operational activities, and external integration, which refers to the integration of external activities (Sudrajat; 2007: 20). Internal integration is the degree to which firms can integrate and collaborate across traditional functional boundaries to provide better customer service, that is, coordination is required within the firm's internal supply chain departments (Chen and Paulraj, 2004: 143:142). In essence, internal integration refers to information sharing between internal functions, strategic cross-functional cooperation and working together (Zhao et al., 2011: 19). External integration refers to the extent to which a firm can collaborate with key supply chain members (customers and suppliers) to transform its organizational strategies, practices, procedures and behaviors into synchronized and manageable processes to fulfill customer requirements (Zhao et al., 2011: 19). ; Chen and Paulraj, 2004: 143). In addition, external integration refers to supplier and customer integration that focuses on developing intense and interactive relationships with suppliers and customers, in this respect, the company expands the scope of integration by integrating with the supplier and customer through information sharing and collaborative relationship (Stevens, 1989: 3)

Supply chain flexibility refers to the firm's ability to construct and manage the supply chain in collaboration with its supply chain partners to respond quickly, effectively and efficiently. In this context, it is emphasized that having a flexible supply chain provides a significant competitive advantage, including both creating customer value (i.e. delivery, product variety and service) and the company's ability to outperform its competitors in financial performance (Liao, 2006: 16). Beamon (1999: 290) identified three types of performance measures that are essential components in any supply chain performance measurement system: resource, output and flexibility. In addition, Beamon (1999: 284) emphasized that the flexibility used in supply chain analysis can measure a system's ability to adapt to volume and timing fluctuations resulting from suppliers, manufacturers, and customers. In this context, by emphasizing the importance of product performance on the basis of the information, it has been stated that there are important points to be considered such as having a flexible supply chain, creating customer value and outperforming competitors in the financial performance.

In the world of global competition, supply chains focus on dynamics in changing markets with a competitive advantage such as changing products, low costs, short life cycles and offering products with better quality. Supply chain agility is defined as an externally focused competency related to speed at the business level. According to Gunasekaran (2001:28), agility is dynamic and open-ended because it requires constant attention and importance to organizational performance, the value of products and services, and the ever-changing context of customer opportunities. Agility is used to quickly respond to changes in the market environment and for competitive advantage through the ability to use a key resource and knowledge (Kuruppalil, 2008: 113). According to Lee (2004: 4), agility is important because in many industries agility is an important consideration as both demand and supply fluctuate faster and more widely than before, and most supply chains cope with costs, but agile ones respond both faster and more cost-effectively. In the study conducted by Tallon and Pinsonneault (2011), it was revealed that agility has positive effects on firm performance, and they also examined a network where agility mediates the relationship between compliance and firm performance, and the findings showed that agility fully mediates the relationship between compliance and firm performance (Tallon and Pinsonneault, 2011: 479). In addition, Yusuf et al. (2004) stated in their research that agile chain and agile supply chain performance increase

the competitive advantage performance of the firm, and also emphasized that agile chain has a stronger effect on competitiveness (Yusuf et al., 2004: 385). The concept of supply chain agility also refers to a complicated situation in terms of coordination and integration between different channel members throughout the supply chain (Yıldız and Çetindaş, 2019: 880). Appropriately and properly managed supplier connections can reduce costs, increase the competitiveness of the business with improved information networks and lead to profitability. The most appropriate selection of suitable suppliers according to the requirements of the business is important for the management of the relations with suppliers. The production schedules, stock levels, product development costs of the suppliers and timely delivery of products and services can directly affect the financial situation and profitability of companies. In addition, supplier performance has a significant impact on the productivity, quality and competitiveness of the enterprise (Chen and Pauraj, 2004: 134).

In light of the literature review, the following hypotheses were developed for the current study:

H_1: Supply chain integration has a positive effect on supply chain flexibility.

H_2: Supply chain flexibility has a positive effect on firm performance.

H_3: Supply chain integration has a positive effect on firm performance.

H_4: Supply chain integration has a positive effect on supply chain agility.

H_5: Supply chain agility has a positive effect on firm performance.

H_6: Supply chain flexibility has a mediating role in the effect of supply chain integration on firm performance.

H_7: Supply chain agility has a mediating role in the effect of supply chain integration on firm performance.

3. METHODOLOGY

In this study, the following model was developed to determine the mediating role of agile supply chain and flexible supply chain in the effect of supply chain integration on firm performance.

The structural scheme and hypotheses of the research model are given in Figure 1.

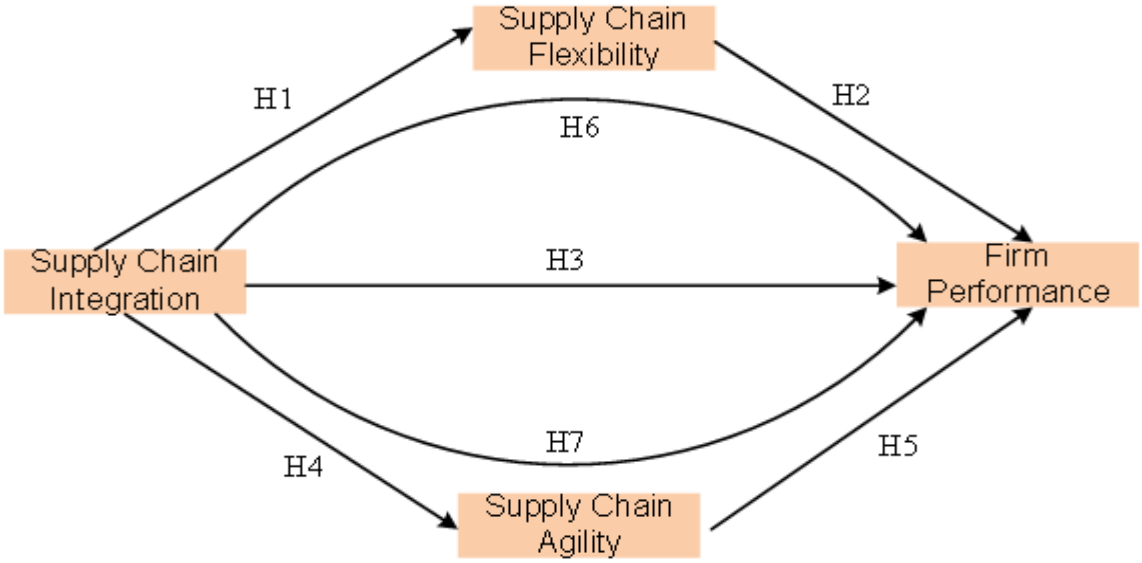

Figure 1. Structural scheme of the research model

In general terms, considering the principle that the research universe is similar in terms of field of activity and size in terms of research methodology, the universe of the research has been determined as Mersin Free Zone and Mersin Organized Industrial Zone companies operating in the manufacturing sector in Mersin.

The universe of the research is 217 companies in the organized industrial zone (according to the information obtained from the corporate website: https://www.mesbas.com.tr/firmalar.html, Access date: February 2020), 70

companies in the Free Zone (according to the information obtained from the corporate website). According to: http://www.mtosb.org.tr/firmalar/, Access date: February 2020), a total of 287 companies. The simple random sampling method was used as the sampling method. According to the framework and limitations of the study, it was deemed appropriate to have a sample size of 95% confidence level and 5% sensitivity level.

The data of the study were collected with the questionnaire method. The first part of the questionnaire included items to elicit information about the companies such as how long the firm has been operating, the number of employees, and the sector in which they operate. The second part of the questionnaire consists of scales related to the variables expressed in the research problem. The scales are in the form of a five-point Likert scale.

The scale of supply chain integration from the study of Wong, Boon-ittb, and Wong (2011) was used in the current study. The Firm performance scale developed on the basis of the study by Yıldız and Çetindaş (2019) called "The mediating role of supply chain agility in the effect of strategic resource use on firm performance" was thought to be appropriate for the current study. For the agile and flexible supply chain scale, the scales used by Um et al. (2017) were capitalized on.

4. FINDINGS

Table 1. The Cronbach Alpha Coefficients of the Scales Used in the Study and their Sub-Dimensions and CFA Findings for the Structural Validity of the Scales Used in the Study

Scales	CMIN/df	GFI	CFI	TLI	RMSEA	Number of Items	Cronbach Alpha
Critical Values	**<5**	**<0.90**	**<0.90**	**<0.90**	**<0.08**		
Supply Chain Integration	1.983	0.945	0.983	0.973	0.064	12	0.937
Agile Supply Chain	2.119	0.982	0.949	0.872	0.069	6	0.965
Flexible Supply Chain	1.598	0.992	0.997	0.988	0.050	5	0.850
Firma Performance	1.703	0.963	0.994	0.991	0.054	9	0.971

The Cronbach alpha coefficients for the scales and dimensions used in the questionnaire are given in Table 1. According to the findings obtained, it is seen that the reliability of the scales is high.

When the CFA findings for the structural validity of the scales used in the current study are examined in Table 1, it is seen that all the scales have acceptable goodness-of-fit values.

Table 2. Statistical Information about the Companies Participating in the Study

Sectors in which they operate	Frequency	Percentage
Food	65	27.3
Textile	33	13.9
Metal	24	10.1
Chemistry-Pharmaceutical	18	7.6
Others	98	41.1
Capital structure of the companies		
With domestic capital	205	86.1

Domestic-Foreign partnership	24	10.1
With foreign capital	9	3.8
Number of employees of the companies		
1-50 people	145	60.9
51-100 people	46	19.3
101 people and more	47	19.7
How long the companies have been operating		
1-5 years	53	22.3
6-15 years	110	46.2
16 years and more	75	31.5
Total	**238**	**100**

The distribution of the participating companies across the sectors in which they operate is given in Table 2. According to the findings, 27.3% of the participating companies are companies operating in the food sector.

The distribution of the participating companies by capital structure is given in Table 2. According to the findings, 86.1% of the participating companies are companies with domestic capital, 10.1% with domestic-foreign partnerships and 3.8% with foreign capital.

The distribution of the participating companies according to the number of employees is given in Table 2. According to the findings, 60.9% of the participating companies have 1-50 employees, 19.3% have 51-100 employees and 19.7% have 101 or more employees.

The distribution of the participating companies according to how long they have been operating is given in Table 2. According to the findings, 22.3% of the participating companies have been operating for 1-5 years, 46.2% for 6-15 years and 31.5% for 16 years and more.

Table 3. Distribution Statistics of the General Application

Scales/dimensions	Mean	Std. Deviation	Skewness	Kurtosis
Customer integration	3.16	0.857	0.131	-0.454
Internal integration	3.22	0.966	0.037	-0.774
Supplier integration	3.34	1.070	0.043	-1.029
Supply chain integration	3.24	0.852	0.116	-0.825
Agile supply chain	3.24	1.099	0.024	-1.099
Flexible supply chain	3.17	0.794	-0.002	-0.540
Customer performance	3.22	1.159	0.107	-1.167
Financial performance	3.27	0.998	0.158	-0.851
Firm performance	3.24	1.058	0.125	-1.099

In the current study, the suitability of the scale and its sub-dimensions to the normal distribution was examined with the Q-Q plot method and it was decided that it was suitable for the normal distribution.

Table 4. Goodness-of-Fit Coefficients for the SEM Model

Goodness-of-fit criterion	SEM goodness-of-fit coefficients
CMIN/DF	1.949
GFI	0.920
CFI	0.916
RMSEA	0.063

SEM model was established for the Mediating Role of Uncertainty of Flexibility and Agility in the Effect of Supply Chain Integration on Firm Performance. The goodness-of-fit coefficients found for the model are given in Table 4. According to these values, the model satisfies the fit criteria.

Table 5. Investigation of the Mediating Role of Agile Supply Chain and Flexible Supply Chain in the Effect of Supply Chain Integration on Firm Performance

		Firm performance	Flexible supply chain	Agile supply chain
Direct effect	Supply chain integration	0.599 (p=0.000)	0.037 (p=0.118)	0.385(p=0.024)
	Flexible supply chain	0.345 (p=0.000)		
	Agile supply chain	0.975 (p=0.000)		
Mediating effect	Supply chain integration	0.388		
	Flexible supply chain			
	Agile supply chain			
Total effect	Supply chain integration	0.987	0.037	0.385
	Flexible supply chain	0.345		
	Agile supply chain	0.975		

In the analysis of the research model, the findings regarding the mediating role of flexible supply chain and agile supply chain in the effect of supply chain integration on firm performance are given in Table 5. According to the analysis, the effects of supply chain integration, flexible supply chain and agile supply chain on firm performance, the effect of supply chain integration on flexible supply chain were found to be statistically insignificant and the effect of supply chain integration on agile supply chain was found to be statistically significant. When the effect coefficients are examined, it is seen that all coefficients are positive. When the total effect coefficients are examined, it is expected that 1 unit increase in supply chain integration will lead to 0.987 unit increase in firm performance, 0.037 unit increase in flexible supply chain and 0.385 unit increase in the agile supply chain. However, as can be seen from the fact that the effect coefficient is statistically insignificant (p=0.118>0.05), the effect of supply chain integration on the flexible supply chain is statistically insignificant and has a very low numerical value.

Since the effect of supply chain integration on flexible supply chain and the effect of the flexible supply chain on firm performance were found to be statistically significant, it is statistically accepted that flexible supply chain has a mediating role in the effect of supply chain integration on firm performance.

Since the effect of supply chain on the agile supply chain and the effect of the agile supply chain on firm performance were found to be statistically significant, it is statistically accepted that the agile supply chain has a mediating role in the effect of supply chain integration on firm performance.

According to these results, H_2, H_3, H_4, H_5 and H_7 hypotheses were accepted and H_1 and H_6 hypotheses were not accepted.

5. DISCUSSION AND CONCLUSION

In the current study, the mediating role of agility and flexibility in the effect of supply chain integration on firm performance was investigated. The model design was made by assuming that agile supply chain (Sambamurthy et al., 2003, Hitt et al., 1998) and flexible supply chain (Gerwin, 1993; Upton, 1997) play a mediating role in the effect of supply chain integration on firm performance. In this respect, the research model is considered both as an original model and as a model with beneficial results for the sector.

When the findings of the current study regarding company information are evaluated, it is seen that the participating companies are largely operating in the food (27.3%) and textile (13.9%) sectors and the majority of them have domestic capital (86.1%) in terms of capital structure. It is seen that 60.9% of the companies have 1-50 employees, 22.3% of them have been operating for 1-5 years and 46.2% for 6-15 years.

The effects of supply chain integration, flexible supply chain and agile supply chain on firm performance, the effect of supply chain integration on flexible supply chain were found to be statistically insignificant and the effect of supply chain integration on agile supply chain was found to be statistically significant. When the total effect coefficients are examined, it is expected that 1 unit increase in supply chain integration will lead to 0.987 unit increase in firm performance, 0.037 unit increase in flexible supply chain and 0.385 unit increase in the agile supply chain.

An important finding obtained in the study is that although the effect of the flexible supply chain on firm performance was found to be statistically significant, since the effect of supply chain integration on flexible supply chain was found to be statistically insignificant, flexible supply chain did not have a mediating role in the effect of supply chain integration on firm performance.

However, since the effect of supply chain integration on the flexible supply chain was found to be statistically insignificant and the effect of the flexible supply chain on firm performance was found to be statistically significant, it was observed that the flexible supply chain does not have a mediating role in the effect of supply chain integration on firm performance. On the other hand, since the effect of the supply chain on the agile supply chain and the effect of the agile supply chain on the firm performance were found to be statistically significant, it is statistically accepted that the agile supply chain has a mediating role in the effect of supply chain integration on firm performance.

When the study is evaluated in terms of its contribution to the literature:

In the study, the structural model of the interaction between supply chain integration, agile supply chain, flexible supply chain and firm performance is revealed. Both the model itself and the statistical significance of the model are important contributions to the relevant literature.

This study is a study that contributes to the literature by including 3 variables in the model together. In addition, it is a more important contribution to the literature that it creates a comprehensive effect model by including the interaction between the independent variables in the model.

It was revealed that agile supply chain and flexible supply chain are effective parameters in improving supply chain integration and company performance, which is an important goal for a company.

The findings obtained in the study offer an important solution to the performance problem of companies. According to the findings obtained with the structural equation model, how much an improvement in any variable will improve performance is presented within the framework of statistical evidence.

In the current study, a structural model for effect analysis is presented by taking agile supply chain and flexible supply chain that affect firm performance and supply chain integration. This study was conducted within the context of quantitative data analysis. Qualitative data analysis can also be used as a method so that the performance and the factors affecting it can be analyzed from a different perspective within the framework of the stakeholders' own statements.

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