

THE ROLE OF COLLABORATIVE ADVANTAGE FOR ANALYZING THE EFFECT OF SUPPLY CHAIN COLLABORATION ON FIRM PERFORMANCE

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Abstract:

Collaboration plays a critical role in a globalized, rapidly changing and competitive world, as the resources of an individual company are limited to compete with the challenges of the era. Supply chain collaboration is defined as a partnership process where two or more autonomous firms work closely to plan and execute supply chain operations towards common goals and mutual benefits. Supply chain collaboration results in collaborative advantage, the strategic benefits gained over competitors through supply chain partnering, and these both increase firm performance of the partners. In this research, the effect of supply chain collaboration on firm performance has been investigated by distributing a survey to Turkish companies which have been responded by 150. The role of collaborative advantage in this relation has also been measured. The results of the research suggest that there is a positive correlation between supply chain collaboration and collaborative advantage. The results also prove that supply chain collaboration positively affects firm performance. It is also proven that the mediator role of collaborative advantage on the effect of supply chain collaboration on firm performance is statistically significant.

Keywords: *Supply chain collaboration, Collaborative advantage, Firm performance*

1. Introduction

Improvements in supply chain have gained more importance as customer's demands have increased to purchase better quality products with a cheaper price. It's obvious that these improvements are not independent from the environment of the company. Companies have to align their processes according to the requirements of the market and the outer world. They have searched for collaboration possibilities with their supply chain partners in order to improve the efficiency of their operations and to respond the market requirements quickly. Open innovation is a paradigm change starting in 1990's and open innovation relationship can be extended to the customers, supply resources, universities and independent research companies/experts and competitors (Karabulut; 2015). Supply chain collaboration provides network, partnership and mechanism for supply chain innovations (Liao & Kuo; 2014). The literature studies show that supply chain collaboration has positive impacts on firm performance. Stank et al (2001) mentions that the collaboration within the company as well as outside the company has positive effects on company performance. Inter-organizational collaboration also creates competitive advantage (Jap, 1999).

This study begins with background part where literature studies are presented about supply chain collaboration, collaborative advantage and firm performance. Background section is followed by hypothesis development part where arguments are developed. The research methodology, introduced after hypothesis development part, explains the measures and the samples. The data is analyzed by Baron and Kenney method and confirmed by Sobel test. In the final part, discussions and implications are presented and the study concludes with the suggestions for future research.

2. Background

The studies about supply chain collaboration began in 1990's. The examples for these studies are VMI (Vendor-managed Inventory), CPFR (Collaborative Planning Forecasting and Replenishment), continuous replenishment, e-collaboration systems. Wal-Mart has made a planning and forecasting collaboration with the supplier Warner-Lambert, and as a result achieved an improvement in the stock level from 87% to 98%, a shorter lead time from 21 days to 11 days, more accurate sales orders and 8,5 million USD increase in sales. Similarly, General Electric (GE) has made collaboration with the retailers and switched to order based production and full truck orders, which resulted in the reduced inventory costs for all parties, 12 % reduction in delivery costs and more profitable sales (Simatupang & Sridharan, 2005).

Supply chain collaboration is an active participation of all supply chain partners in order to achieve common goals (Liao & Kuo; 2014; s.296). In other words, it's the joint work of two autonomous firms working jointly to plan and execute supply chain operations by achieving higher gains than they would have by themselves (Simatupang & Sridharan, 2002). Lambert et al. (1999) define supply chain collaboration as the level of relationship in which supply chain partners share risks and benefits in order to reach a higher performance that they would have by acting themselves. Supply chain collaboration can also be defined as the close and long terms relationships where supply chain partners share information, resources and risks in order to achieve common goals (Bowersox, Closs, & Stank, 2003) (Golicic, Fogginn, & Mentzer, 2003).

Even though supply chain collaboration and supply chain integration have been used interchangeably in the beginning of the studies, they have different meanings. Integration implies a unique, integrated and central management whereas collaboration covers combined management and relational tools (Nyaga, Whipple, & Lynch, 2010).

Initial studies on supply chain collaboration focus more on process integration and give less importance to the creation of information and communication factors (Simatupang & Sridharan, 2005). However, problems on the communication cause misunderstandings and conflicts among the supply chain partners and are regarded as the failures of collaborations (Tuten & Urban, 2001). Communication is a glue that keeps supply chain together by means of balanced, two-sided, multi-level contacts and messages (Chen & Paulraj, 2004) (Mohr & Nevin, 1990).

There are three levels of collaboration named as vertical, horizontal and lateral (Simatupang & Sridharan, 2002). Vertical collaboration refers to the collaboration with the suppliers and the customers in the chain and covers the manufacturers, distributors, carriers and the retailers. Horizontal collaboration, on the other hand, covers the information and resource sharing of the competitors and the parties that are not linked with the firm in order to have joint benefits (Badea, Prostean, Goncalves, & Allaoui, 2014, s. 119). Lateral collaboration aims to gain more flexibility by sharing the capabilities in both vertically and horizontally.

The results of the collaboration change by the duration. For example, short term benefits are that the meeting of the needs of all the supply chain partners whereas in the long run, the gains are serving to customers in a better way by creating common plans and improvements (Simatupang & Sridharan, 2002).

Supply chain collaboration provides cost reduction and increase in revenues (Lee, Padmanabdan, & Whang, 1997). It allows supply chain partners to respond to the changing demands and meeting the needs of the customers by flexible options (Simatupang & Sridharan, 2005). Decision and incentive alignment affect the responsiveness of the firm (Fisher, 1997). Supply chain collaboration allows a company to benefit the market opportunities (Uzzi, 1997). The collaboration among the supply chain partners can also result in the new product ideas (Kalwani & Narayandas, 1995). The companies that share their resources can create joint competitive advantage. Production lead time and capacity utilization are also positively affected by supply chain collaboration (Ramanathan, 2014). Handfield (2002) and Sheu et al (2006) suggest that supply chain collaboration reduces purchasing costs and increases the competitive advantage of the firm by reducing costs. Supply chain collaboration results in flexibility, efficiency, competitive advantage and reduction of risks (Nyaga, Whipple, & Lynch, 2010). Çağlıyan's (1999) study with Turkish companies proves that collaborative firms have better firm performance.

The dimensions of supply chain collaboration are information sharing, goal congruence, decision synchronization, incentive alignment, resource sharing, collaborative communication and joint knowledge creation. Information sharing can be defined as the partners' sharing of market trends, new technologies, new process management information to create value (Liao & Kuo, 2014). It can also be defined as a company's level of sharing the relevant, confidential, accurate and complete information with its supply chain partners (Angeles & Nath, 2001) (Cagliano,

Caniato, & Spina, 2003) (Sheu, Yen, & Chae, 2006). Information sharing is the heart (Lamming, 1996), nerve center (Chopra & Meindl, 2001), lifeblood (Stuart & McCutcheon, 1996), essential ingredient (Min, et al, 2005), key requirement (Sheu, Yen, & Chae, 2006) and foundation (Lee & Whang, 2001) of supply chain collaboration. The aim of information is to keep up-to-date information about expectations, future plans and promotions and it needs transparency (Badea, Prosteian, Goncalves, & Allaoui, 2014). Confidentiality, timing and accuracy of information sharing are also important for information sharing and the communication should be two ways. Depending on the facilities and systems provided technology, thousands of messages are transferred in seconds, preventing the errors in transmission. The contracts established taking the interactions of the users in the chain will facilitate the e-trade and allow companies using different systems to work jointly (Manthou, Vlachopoulou, & Folinas, 2004).

One of the other benefits of supply chain collaboration is the “collaborative advantage”. Collaborative advantage is a relational view of intercompany competitive advantage (Dyer & Singh, 1998). It expresses the addition of the common benefits created by the gathering, exchange and improvement of the resources to the collaborating partners (Dyer & Singh, 1998). It's the joint competitive advantage focusing on the joint value creation (Cao & Zhang, 2011). The studies by Mentzer et al. (2001), Stank et al. (2001) and Manthou (2004) state that the collaborating partners gain more benefits than they would have if they operated by themselves. According to Jap (2001), collaborative advantage is the joint competitive advantage. It is also defined as the benefit gained over the competitors by supply chain collaboration (Cao & Zhang, 2011, s. 166). Vangen and Huxham (2003) define collaborative advantage as the synergic results achieved by companies by collaborative activities rather than individual actions. The studies of Jap (1999) show that collaboration increases common benefits, and provides that the partners gain more benefits than they would have if they acted alone. The creation of the collaborative advantage may be ruined if the collaborating partners search for their own goals rather than the common goals, as the effects of actions on supply chain partners will be neglected (Chopra & Meindl, 2007).

In their studies, Cao and Zhang (2010) have proven that collaborative advantage directly improves firm performance. Min et al (2005) state that the business synergies are not seen immediately but the possible long term benefits are strategic and attractive.

There are five dimensions of collaborative advantage named as process efficiency, offering flexibility, business synergy, quality and innovation. The process efficiency is defined as the level of cost advantage of the collaborative process compared to the processes of their competitors (Bagchi & Skjoett-Larsen, 2005). It may cover joint decision making processes. Process efficiency is one of the success criteria and the profitability indicators (Cao & Zhang, 2011, s. 167). The second dimension, offering flexibility is the extent to which one company's supply chain network supports the launch of new product and services depending on the environmental changes. It can also be named as customer responsiveness. Business synergy can be defined as the extent to which supply chain partners unite their complementary and relevant resources in order to gain extraordinary benefits (Cao & Zhang, 2011). According to Ansoff (1998), this relationship results in more returns to the resources than the resources alone. This joint result is provided by physical resources like production equipment and by non-visible resources like technology expertise, customer knowledge and company culture (Itami & Roehl, 1987). Quality is defined as the extent that a company offers quality products that create value together with its supply chain partners (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006). A higher market share and profitability are expected from the companies who can quickly offer quality products and innovations to customer needs. The last dimension of collaborative advantage, innovation, is defined as the degree that the supply chain partners work together to develop new products, services and processes. As the product life cycles have shortened due to competition, there is a need for companies to innovate more frequently. The companies that have good relations with their supply chain partners can improve their skills for product and process developments (Kaufman, Wood, & Theyel, 2000).

Firm performance, which is the independent variable in this study, is defined as how well a firm accomplishes its financial goals compared to the competitors (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006). There are many tools to measure firm performance like return on investment (ROI), return on sales, and increase in revenues, cash flow and market share. In this research, the firm performance has been measured as one component through the survey.

3. Hypothesis Development

Based on the literature research presented in the previous section, this study aims to answer the following questions: Is collaborative advantage affected by supply chain collaboration? Does collaborative advantage affect firm performance? Is firm performance affected by supply chain collaboration? Does collaborative advantage have a mediator role in the relation between supply chain collaboration and firm performance? To be able to analyze these questions, below hypotheses have been developed.

Hypothesis 1: Supply chain collaboration positively affects collaborative advantage

Hypothesis 2: Collaborative advantage positively affects firm performance.

Hypothesis 3: Firm performance is positively affected by supply chain collaboration.

Hypothesis 4: Collaborative advantage has a mediator role in the effect of supply chain collaboration on firm performance.

The research model, developed by the literature review and the hypotheses, can be seen in Figure 1 as follows:

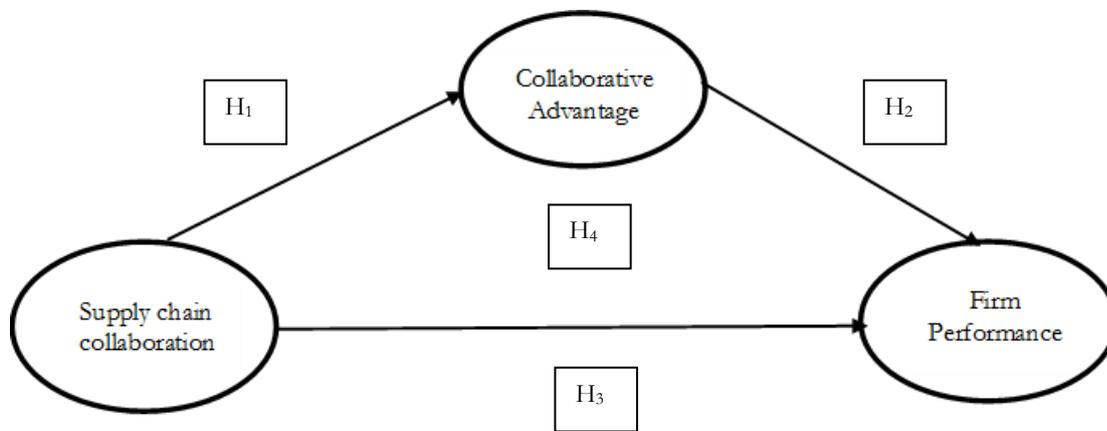


Figure 1. Conceptual Model

4. Research Methods

4.1. Measures and Sampling

In order to find answers to the questions identified in previous section, a questionnaire with Likert-5-scale was formed. In the questionnaire, the scale developed by Cao and Zhang (2010) by analyzing the literature reviews for supply chain collaboration and collaborative advantage, has been used. In order to measure the firm performance, Akgün et al.'s (2007) scale which they have developed from Ellinger et al.'s (2002) has been used. The questionnaire was sent to 210 companies operating in various cities in Turkey and 150 questionnaires were answered.

4.2 Construct Validity and Reliability

In order to make a correct evaluation, Principal Component Analysis, which is used to express many variables by using a few main variables, has been made. There have been question reductions for collaborative advantage and supply chain collaboration variables.

The results for collaborative advantage can be seen in Table 1. Kaiser-Meyer-Olkin value of the analysis is 0,744 showing that Principle Factor Analysis can be made. Bartlett's Test of Sphericity test has a p value smaller than 0,05, which also means that the data is suitable for Principle Factor Analysis.

Table 1. Factor Analysis Results for Collaborative Advantage

Factor Name	Statement	Factor Weight	% of Variance	Reliability (Cronbach α)
Innovation	54. Our firm with supply chain partners has time-to-market lower than industry average	,905	%25,276	0,896
	52. Our firm with supply chain partners introduces new products and services to market quickly.	,882		
	53. Our firms with supply chain partners has rapid products development.	,861		
	55. Our firms with supply chain partners innovates frequently.	,691		
Quality	48. Our firms with supply chain partners offers products that are highly reliable	,935	% 23,260	0,934
	49. Our firms with supply chain partners offers products that are highly durable	,920		
	50. Our firms with supply chain partners offers high quality products to our customers.	,897		
Business Synergy	44. Our firm and supply chain partners have integrated IT Infrastructure and IT resources	,915	% 17,729	0,788
	45. Our firm and supply chain partners have integrated knowledge bases and know-how.	,857		
	46. Our firm and supply chain partners have integrated marketing efforts	,679		

Process Efficiency	37. Our firm with supply chain partners meets productivity standards in comparison with industry norms.	,806	% 13,655	0,629
	38. Our firm with supply chain partners meets on-time delivery standards in comparison with industry norms.	,726		
	Total		%79,92	
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	,744		
	Bartlett's Test of Sphericity Approx. Chi-Square	1193,429		
	sd	66		
	p	,000		

Table 2 shows the results for supply chain collaboration. Kaiser-Meyer-Olkin value of the analysis is 0,776 which also shows that Principle Factor Analysis can be made. Bartlett's Test of Sphericity test for supply chain collaboration also has a p value smaller than 0,05, which also means that the data is suitable for Principle Factor Analysis.

Table 2. Factor Analysis Results for Supply Chain Collaboration

Factor Name	Statement	Factor Weight	% of Variance	Reliability (Cronbach α)
Information sharing	1. Our firm with supply chain partners exchange relevant information	0,847	% 19,324	0,856
	2. Our firm with supply chain partners exchange timely information	0,844		
	3. Our firm with supply chain partners exchange accurate information.	0,833		
	4. Our firm with supply chain partners exchange complete information	0,806		
Synchronizasyonu	12. Our firms with supply chain partners jointly develop demand forecasts	0,890	% 17,781	0,872

	13. Our firms with supply chain partners jointly manage inventory	0,810		
	14. Our firms with supply chain partners jointly plan on product assortment	0,781		
	11. Our firms with supply chain partners jointly pln promotion events	0,768		
Joint Knowledge Creation	32. Our firm and supply chain partners jointly assimilate and apply relevant knowledge	0,917	% 14,492	0,845
	31. Our firm and supply chain partners jointly search and acquire new and relevant knowledge	0,822		
	33. Our firm and supply chain partners jointly identify customer needs	0,632		
Goal Congruence	9. Our firm and supply chain partners agree that our own goals can be achieved through working toward the goals of the supply chain	0,862	% 13,456	0,806
	8. Our firm and supply chain partners have agreements on the importance of improvements that benefit the supply chain as a whole.	0,857		
	10. Our firm and supply chain partners jointly layout collaboration implementation plans to achieve the goals of the supply chain.	0,552		
	7. Our firm and supply chain partners have agreement on the importance of collaboration across the supply chain	0,548		
Resource Sh	24. Our firm and supply chain partners share equipments (e.g. computers, networks, machines)	0,865	% 10,870	0,791

	25. Our firm and supply chain partners pool financial and non-financial resources (e.g. time, Money, trainig)	0,812		
	Total		% 75,922	
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy		,776	
	Bartlett's Test of Sphericity Approx. Chi-Square		1550,325	
	sd		136	
	p		,000	

Cronbach's alpha values for each dimension of both supply chain collaboration and collaborative advantage show a high internal consistency. 79,92 % of collaborative advantage is explained by the variables and this is 75,922 % for supply chain collaboration.

4.3 Test of Hypotheses

The hypotheses have been tested by means of multiple linear regression analysis. The Baron and Kenny (1986) method has been used to measure the mediator effect. According to the Baron and Kenny method, the below conditions must be present for a variable to be named as a mediator:

1. A change in the independent variable causes the mediator variable to change.
2. A change in the mediator variable causes the dependent variable to change.
3. When the mediator and the independent variables are included to the analysis together, the influence of independent variable on dependent variable to decrease or completely disappear. (Baron & Kenny, 1986)

Before making an analysis using Baron and Kenny method, significant correlation among the variables should be secured by hierarchical regression. In Table 3, the correlation results according to Pearson correlation coefficient for all three variables can be seen. The results show that there is a significant correlation among the variables.

Table 3. Correlations among all variables

Variables	1	2	3
SCC	-	-	-
CA	,731**	-	-
FP	,233**	,435**	-

** Correlation is significant at the 0.01 level (2-tailed).

Note: SCC: Supply Chain Collaboration, CA: Collaborative Advantage, FP: Firm Performance

As correlation prerequisite is proven, Baron and Kenny analysis can be made. In order to make the analysis, 3 models with the below details have been established.

Model 1: $FP = \beta_0 + \beta_1.SCC + \varepsilon$ (Hypothesis 3)

Model 2: $CA = \beta_0 + \beta_2.SCC + \varepsilon$ (Hypothesis 1)

Model 3: $FP = \beta_0 + \beta_1.SCC + \beta_2.CA + \varepsilon$ (Hypothesis 2 and 4)

When the models are tested, below results are received:

Table 4. Coefficients

	Model 1	Model 2	Model 3
β_1	0,233*	-	-0,184
β_2	-	0,731*	0,570
R2	0,054	0,535	0,205
Adjusted R2	0,048	0,531	0,194
F	8,461*	170,018*	18,971

* significant at 5% level

According to these results received by Baron and Kenney analysis, H1, H2, H3 and H4 hypotheses are accepted. Supply chain collaboration affects collaborative advantage in a positive way. Firm performance is also positively affected by supply chain collaboration. Collaborative advantage has a mediator role on the effect of supply chain collaboration on firm performance.

R2 value is also positively affected meaning that more of the variance in firm performance can be explained by the mediator variable.

In order to make verify the Baron and Kenney results, the Sobel test was also run. Sobel test is one of the methods used for measuring the mediator effect (Sobel, 1982). The results of Sobel test verify the Baron and Kenney method results. Sobel test results can be seen in Table 2. Therefore, the mediator role of collaborative advantage on the effect of supply chain collaboration on firm performance is proven.

Table 5. Sobel test results

The mediator effect of collaborative advantage	Z value	Standard error	p
Supply chain collaboration → collaborative advantage → firm performance	4.39618182	0.10606022	0.00001102

5. Discussion and Implications

The study results throw that firm performance is positively affected by supply chain collaboration. This result is in line with the literature information (Lee, Padmanabdan, & Whang (1997); Simatupang & Sridharan (2005); (Fisher, 1997); Uzzi (1997); Kalwani & Narayandas (1995); Ramanathan (2014); Handfield (2002); Sheu et al (2006); Nyaga, Whipple, & Lynch (2010); Çağlıyan (1999)). Another result of the study is that supply chain collaboration has a positive impact on collaborative advantage which also proves the literature research (Cao & Zhang (2011), Mentzer et al. (2001); Stank et al. (2001); Manthou (2004); Vangen and Huxham (2003); Jap (1999); Chopra & Meindl (2007), Cao and Zhang (2010); Min et al (2005)).

Another result of the study is that, the mediator role of collaborative advantage on the effect of supply chain collaboration on firm performance is statistically significant. This means that the relation between supply chain collaboration and firm performance is more significant, when the mediator variable collaborative advantage is in place.

As a managerial implication, these results show that companies should participate in collaborations where collaborative advantage can be created; and when they are in collaboration, they have to achieve the common goals of collaboration instead of the individual targets of the company. These conditions will affect the firm performance in a positive way. The selection of the partner that the company will collaborate is critical. Therefore, the managers should pursue the ways that helps to select the best collaborating partner.

6. Constraints and further research

The survey for this study has been distributed to 210 companies in various cities of Turkey and 150 responses have been received. Further research can be made by a larger number of respondents, which will increase the size of the sampling and the relation of supply chain collaboration, collaborative advantage and firm performance can be analyzed for a larger group in Turkey.

Besides, the questionnaire has been sent to only one person in each company resulting in a constraint of unique resource tendency. Further research can be held by taking the questionnaire results from more than one person in the company, by directing independent variable questions and dependent variable questions to different people in the company.

7. Conclusion

This study reveals that supply chain collaboration has a positive effect on collaborative advantage and also firm performance. Firm performance is also positively affected by collaborative advantage. When the mediator role of collaborative advantage in the effect of supply chain collaboration on firm performance has been analyzed, the results show that the mediator effect of collaborative advantage is statistically significant. As a managerial implication, companies have to collaborate with supply chain partners by which they gain more collaborative advantage, so that the collaboration partners can have better firm performance results.

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