The Impact of Sustainable Supply Chain Management and Supply Chain Collaboration on Turkish Firms Performance: Moderator Effect of Uncertainty

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Abstract

Supply Chain-Related Sustainability Cases offer organizations the challenge of enriching environmental, social, and economic performance within supply networks. Firms are increasingly implementing environmental and social dimensions of sustainability. During the implementation, they check the collaboration efforts for getting information outside of the organizations to develop and improve both firm and supply chain performance. Due to drastic changes in the business environment, firms face uncertainty. This study aims to analyze the impact of sustainable supply chain management and collaboration under the supply chain uncertainty on firms' performance. Based on the literature review the conceptual framework was developed. To test the research hypotheses, multi-item scales and survey questionnaires were adopted from prior research. The research is based on a quantitative approach using a questionnaire survey. We obtained 240 usable questionnaires from 112 companies. The Partial Least Square method was used to test the proposed conceptual model. The results show that sustainable supply chain management is positively associated with supply chain performance and supply chain collaboration. Also, we found that supply chain collaboration has a positive effect on supply chain performance. Supply chain performance is positively associated with firm performance. Furthermore, supply chain uncertainty moderates the relationship between collaboration, sustainable supply chain management, and supply chain performance.

Keywords: Sustainability; sustainable supply chain management; supply chain collaboration; performance; uncertainty

Introduction

Since the 1980s, the United Nations called for the construction of an inclusive and sustainable future for humanity and our planet, through the Brundtland Report, defined sustainable development (SD) as encountering the necessity of current generations without sacrificing the capacity of the next generations. Sustainable supply chain management (SSCM) focuses on integrating environmental and social targets into the economic dimension due to regulations and increasing pressure from consumers and the community (Marshall et al., 2015). As a beginning stage for future development, the research on SD could support organizations to build their organizational strategies and their survival in the future. Subsequently, the organizations require formulating the sustainability targets by adjusting together with environmental and social impacts for improving organizational performance. The strategies concerning the business policy towards sustainability should create outcomes via economic gains, environmental procedures, and stakeholder contributions at the same time (Wichaisri and Sopadang, 2018). Companies strategically collaborate with their supply chain partners to establish supply chain productivity and liability and strengthen opportunities remaining outside organizational boundaries. Increasing collaborative activities among organizations lead to improved business and supply chain performance (SCP), such as reduced costs, increased profitability, and business goals are easily accomplished through collaborative supply chains (Ramanathan et al., 2014).

Every business organization in the supply chain that faces uncertainty is trying to immediately improve to become more reliable (Pishvaee and Torabi, 2010). The progress of a company rests on the performance of its supply chain, though it is not sufficient that an individual firm merely acquires a competitive advantage. Supply and demand uncertainty affecting the supply chain greatly that makes on impacts on the performance of production functions. Decisions on supply chain network design focus on the problem of uncertainty and the importance of calculating uncertainty lead researchers to investigate uncertainty in the supply chain relation (Wilding, 1998).

This study focuses on SSCM and helps to better understand the effects of SSCM. Small numbers of studies have examined the influence of SSCM and collaboration on supply chain and firm performance under supply chain uncertainty. Ince and Sahinbey (2015) have started to study the relationship between Supply Chain Collaboration (SCC) and SSCM performance. The authors with current research first aim to analyze the effect of SSCM and collaboration on supply chain and firm performance under the moderator variable effect of supply chain uncertainty, thereby differing from other studies on supply chain management (SCM). Such analysis is necessary for the understanding of the impact of SSCM and SCC on performance.

1. Theoretical Background

The sustainability was used by Schumacher at the beginning of 1972 as "continuity" at the point where "nothing would mean anything economically unless designed for long-term continuity" and was recognized in seminal work "Limits to Growth" (Meadows et al., 1972) modeling the results of the increased number of mankind and bounded ecosystems. Although sustainability is a broad, multi-faced, and highly discussed international level concept, there is no universal definition to it, and the most well-known definition is found in the Brundtland report as an inter-generational philosophy (Abbasi and Nilsson, 2012).

Growing pressure stemming from law and public opinion, the need to become a manufacturer or service provider that protects the environment and market prestige, increasing performance and efficiency of relationships throughout the sustainable supply chain, and the fact that the chain constitutes a key resource of competitive advantage, the implementation of SD, in general, has become a necessity (Gimenez, et al., 2012). Meantime Wichaisri and Sopadang (2018) identify trends of SD as including social dimension to stabilize economic and environmental dimensions and include logistic and lean management to SD.

Today's industrial development, which increasingly threatens Earth's natural resources and the environment, forces people to build a supply chain that provides environmentally-friendly activities and allow social life (Abbasi and Nilsson, 2012). SCM and SD have been addressed in research related matters to environmental management by using various terms including environmentalist purchasing, reverse logistics, reverse supply chain, product management, and environmentalist supply chain. In the supply chain area, a few studies have been linked to the social dimension of SD such as employee systems, the equality of man and woman, prosperity allocation, and equitable wages (Vachon and Mao, 2008). The concept of sustainability has also caused changes in core values and communities for the business world. Sustainable supply chain activities vary the specific structure of supply chains, and its sectoral viewpoints require advanced applications. While some companies attach great importance to environmental issues, others may prioritize social aspects (Walker and Jones, 2012). By focusing on the entire supply chain in the long term, more attention will be paid to the corporate sustainability approach which aims to contribute to the sustainability balance with the relations between the company's arrangement, stakeholders, and sustainability dimensions (Govindan, et al., 2016). Roy et al., (2018) define SSCM as a journey to transform SCM from traditional supply chains. The transformation comprehends five big facets which are an adoption from SCM, gradual upgrades of SCM environment, extending the application, permanence of progress in the course of SSCM elaboration, and concentrating on results of

SSCM. Sustainable supply chain management has been proposed for improving sustainability efficiency in supply chains (Koberg and Longoni, 2019).

Supply chain collaboration (SCC) defined as two or more independent organizations for performing mutual goals to work together in their supply chains (Cao and Zhang, 2011). Firms in the supply chain increasingly interact with each other, necessitate collaboration to reach knowledge and expertise to improve innovation, problem-solving, and supply chain performance (SCP) outside their organization (Zacharia, et al., 2011). SCC comprises of the commitment to share intelligence, resources, cost, risk, and profitability by sharing strategic interfaces and effectively meet end-user needs at low costs between independent firms. With collaboration throughout the supply chain, the valuable and rare resources and capabilities, ensure increased competitive advantage and performance of the entire supply chain. As participating members more and more realizing that their singular performance is associated with collaborative performance, hence they become more participatory (Simatupang and Sridharan, 2008; Gold et al., 2010). Collaboration in dynamic market conditions will result in rapid product development processes and it reduced costs, major technical developments, and increased goods quality. Collaboration as a form of extended business organization to create value for customers enables supply chain partners to respond dynamically (Hudnurkar et al., 2014). With collaboration, firms contributing some benefits, share relative capital with supply chain partners, reduction of business costs, improve capacity, and gain (Cao and Zhang, 2011). Some of the organizational theories such as resource-based view, relational view, and social exchange theories can be used to explain SCC. Resource-based view offers using the resources together with the supply chain members as it provides a competitive advantage (Barney et al., 2001). Relational view theory concentrates on "relational rent" which explains collectively achieved profit by the affiliation of partners. SCC is based on the relationship between the chain members that is also explained in The Social exchange theory. Trust in relationship and sustainability creates self-imposed practices of transfers that are triggered by the bilateral gains between the chain members (Um and Kim, 2018).

SCC consists of information sharing, goal congruence, decision synchronization, incentive alignment, resource sharing, collaborative communication, and joint knowledge creation. As part of SCC, information sharing is a process by which organizations exchange consistent and right knowledge on time with its supply chain members. The information flow should be convenient, right, full, classified, operational, tactical, and strategic that helps supply chain partners to the creation of mutual targets and accurate estimation of future (Cao and Zhang, 2011; Rai et al., 2006). Goal Congruence indicates the agreed objectives among the supply chain partners. When the

importance of the supply chain relationship is well recognized by the members, they will be motivated and perform the desired results. For optimizing the benefits of supply chains, decision synchronization helps supply chain members manage choices such as planning and scheduling, stock control management, order shipment, and distribution which results in increased business performance (Simatupang and Sridharan, 2008). Resource sharing is to access and utilization of existing resources between the supply chain partners. The resources are classified like equipment, technology, sites, knowledge, employee capabilities which helps chain members not to purchase these goods and services outside of the chain. Therefore it would save higher costs (Cao and Zhang, 2011). Some of the studies of SCC indicates that resource sharing is one of the important aspects of supply chains. The description of methods like frequency, mode, direction how we communicate relative information between the supply chain partners is identified as Collaborative Communication. Joint Knowledge Creation defines to which collaborative working approach among the supply chain members for establishing the interpretation and reply to the dynamic business climate. When members of the supply chain collaborate, they share costs, risk and in return, they gain the benefits. Incentive alignment is defining the process of these transactions (Cao and Zhang, 2011).

Uncertainty is the difficulty of assigning probabilities to future events or inferring the consequences of decisions accurately (Wong et al., 2011). As being the most difficult problem in managing and controlling mixed networks, uncertainty spreads through the network and directs to disorganized flows and practices that do not increase benefit. The existence of uncertainty brings resolution makers to build safety time, capacity, or stock intermediaries to eliminate weak chain performance that leads to a decline in competitive advantage. Uncertainties that limiting the operational performance at the supply chain level must be systematically combatted (Vorst and Beulens, 2002). Numerous decisions related to industrial production are made under uncertainty which governs market prices of industrial products, raw materials and energy prices, and firms' initiatives regarding compliance with environmental constraints. To be at the market, firms have to broaden their products and propose higher adaptation which causes uncertainty in their supply chain. Sreedevi and Saranga (2017) indicate that uncertainty in the supply chain causes to huge supply chain risk. Supply and manufacturing flexibility support the reduction of supply and production process risks. Supply chain uncertainty means supply chain decision circumstances where the objectives are uncertain and the exact decision is not known due to the decision maker's inadequate expertise and processing capacity regarding the supply chain or its environment, their failure to accurately predict possible control activities regarding supply chain reactions, or the less ascendant

control activities (Vorst and Beulens, 2002). Supply chain uncertainty can be seen anywhere in the global supply chain, and the risk is included in a broader perspective. Supply chain performance (SCP) can be enhanced by reducing uncertainty through better value chain management, such as information sharing and redesigning and improving operational processes with suppliers and customers (Simangunsong et al., 2011).

When encountered with uncertainty which causes weak service levels, high inventories, and frequent stock depletion, firms will aim to cooperate with chain members to create long-term relationships. Carter and Rogers (2008), while asserting the integration of strategic choices on the concept of sustainability, also suggest a framework for the management of uncertainty as an implementation of the programmed degree for sustainability under changing circumstances in practice.

2. Hypothesis Development

Relationship between Sustainable Supply Chain Management and Supply Chain Performance

Environmental activities are linked to firm performance, and the positive effects of environmental purchasing activities on firm performance are addressed by managers (Carter and Rogers, 2008). The environmental dimension has been analyzed in various studies in the context of green SCM, and the relationship of this dimension to performance has been evaluated separately. Over such applications like reduction in the costs of procured ingredients, energy utilization, response and waste of removal costs, and fines for environmental accidents can provide positive economic improvements. The associated negative economic performance results are in the form of an increase in investments, costs for operation, training, and purchasing of environment-friendly materials (Zhu et al., 2012). Geng et al., (2017) indicate that the field of manufacturing, company capacity, ISO qualification, and export direction moderate several of the green SCM practice-performance relationships. Conducting environmental purchasing and collaborating with customers will lead to improvements in the company's environmental performance, while there will be economic and operational improvements arising from attempts targeting returns from investments in the environment which also results in competitive position (Zhu et al., 2012). While green SCM contributes to improved environmental performance as a complement to other advanced management practices, the cost of investments made in the environment, in the long run, may have uncertain effects on commercial performance due to the deferred emergence of profitability resulting from environment-friendly product perceptions.

Since customer response due to the emergence of a social non-conformity in the supply chain and impacts the profitability of competing

firms, economic incentives should be offered for social responsibility investments. Determinants such as purchasers' ethical disposition, social environment, and consumer perceptions of the product's functions against social value affect supply chain social responsibility strategies, while proactive investments increase the firm's competitive advantage and economic performance (Xia, et al., 2015). To prevent production problems throughout the supply chain, firms focus on suppliers' compliance with business ethics guidelines and develop supplier sustainability criteria to improve overall supplier performance.

The measurement of the impacts of social programs on performance causes very different and conflicting results due to the suggestion of complicated structures. Employee involvement and training can lead to a reduction of practices that are likely dangerous to the environment. As a consequence of the application of such social programs, an improvement in environmental performance can be observed (Marshall et al., 2015). Social programs such as projects that support the public will improve firms' performance by increasing their social reputation and sales volumes. Although the examples show the short-term negative effects of social programs, in the long term they will reduce responsibility costs related to natural deterioration, conformity with regulations, insecure operations, application of hazardous ingredients, creating hazardous disposals, and health and safety problems. As companies learn about their short- and long-term gains and losses, social programs will be brought into use by organizations on a wider scale (Gimenez et al., 2012). In the guidance of these arguments:

H1: SSCM is positively related to SCP.

Relationship between Supply Chain Collaboration and Supply Chain Performance

In general, SCC affects performance associated with the three dimensions of sustainability, and improve environmental performance via new flows and information exchange. Sustainability relationships through SCC will directly impact the performance of firms in the supply chain. Companies can make use of cutting business expenditures, the construction of core competitiveness, utilizing opportunities to ensure learning and creating knowledge, and improving their competitive positions through SCC to increase the sharing of resources and information among important suppliers and valuable customers. SCC will thus contribute significantly to improve SCP (Reefke and Sundaram, 2017).

Exchanging up-to-date information that is created jointly, replenishment and supply synchronization will eliminate the costly bullwhip effect by reducing excess inventory, and enhance common novelties by

strengthening business synergy and quality. SCC as a function of sharing rare resources among supply chain partners and value creation and collaborative processes has a positive effect on the triple bottom line of company performance (Cao and Zhang, 2011).

Collaboration among participating supply chain members helps to explore better ideas for superior performance and to compare practices in other business supply chains. The comparison will help to implement the necessary improvements to identify high-standard buyer missions and operations and to attain or surmount these measures. Firms that collaborate with purposes such as sales, on-time delivery, and inventory reduction will experience better performance results (Simatupang and Sridharan, 2008). The strong collaboration promotes awareness and the assessment of strong functional orientations, thereby supporting their development as a necessary ingredient for essential competencies. The ability to collaborate reduces inefficient decisions while bridging downstream and upstream suppliers to client-related work. The work of Panahifar et al., (2018) support the earlier studies related to the positive influence of effective collaborations in the enhanced association between the member of chain for this reason company performance. Supply chain collaboration by way of information sharing like applying Collaborative Planning Forecasting and Replenishment and Vendor Managed Inventory has given advantages to business associates from various features including enhancement of forecasting precision, improved consumer service quality, and solid relationship among partners. Successful collaboration within supply chain members has positive impacts on a company's sales increase, customer contentment, and general operational performance. Therefore, we state the following hypothesis:

H2: SCC is positively related to SCP.

Relationship between Supply Chain Collaboration and Sustainable Supply Chain Management

With the collaboration paradigm, cooperation between partners in SSCM is critical. Supplier supervision and collaboration with suppliers positively affect environmental performance and corporate social responsibility. Companies need to implement collaborative practices to improve sustainability in supply networks (Gimenez et al., 2012). Organizations in the environmentally collaborative supply chains set common environmental goals, share environmental plans, and reduce pollution and other environmental impacts. Environmental collaboration can possess a significant affirmative effect on both production and environmental results in finding solutions to environmental challenges and complementary common environmental planning activities. Through the sharing of relevant

information and innovative processes with close relationships between supply chain members can also provide improved environmental performance (Vachon and Klassen, 2008).

Social practices do not make noticeable contributions to reducing costs, but they do not cause cost increases either. Environment-friendly practices reduce costs and improve operational performance positively while no direct effect of collaboration is seen on social performance and sustainable supplier collaboration. By focusing on suppliers, logistics, and retailers, SCC is a significant factor in ensuring that the supply chains of companies can ensure environmental sustainability, achieve business objectives, and combat the pressures from stakeholders. Sustainability investments will provide satisfactory results through sustainable supplier collaboration (Ramanathan et al., 2014).

Companies need to build complicated internal capabilities to capitalize on sustainability collaboration with suppliers and customers. These capabilities have a conclusive effect on market and sustainability performance. For clear performance developments over sustainable production, collaboration with the supply and demand ends must be considered in sustainability problems (Ramanathan et al., 2014). Through collaboration that plays a central part in adapting socially responsible applications to the supply chain, firms can ensure that excessive inventory is eliminated, an increase in sales is achieved, customer services are improved, products are developed, and uncertain high demand for a specific product can be met. As a result, the following hypothesis has been developed:

H3: SCC is positively related to SSCM.

Relationship between Supply Chain Performance and Firm Performance

SCM practices are strongly connected to the financial and market performance of selected purchasing and customer relationship practices when the exchange among suppliers and firm performance, and SCM activities have a positive impact on firm performance. SCM has been a basic ingredient of competitive policy for enhancing organizational efficiency and profitability. Members throughout the supply chains must commit to common objectives such as customer's content and enhanced competitiveness. SCM programs will ensure the planning and control of functions and inter-organizational processes, as well as a greater completed supply chain integration in which participating firms can obtain the expected level of return and financial benefits in their investments. With leading the strengthening of the competing advantage for both firm and supply chain through strengthening customer value and satisfaction, supply chain practices will increase the profitability of the supply chain and its members (Mentzer, et al., 2001). The importance of

evaluating output in the supply chain is recognized by most of the companies who use their supply chain performance evaluation models based on their needs (Mohammed, 2020). High-level SCM practices result in a strengthened competitive position and enhanced organizational results. At the same time, competitive advantage has a direct and positive impact on organizational performance. Through a correct transit of supply chains under today's competitive conditions, firms are adapting their supply chain practices to minimize supply chain expenditure and to protect competing benefits (Cao and Zhang, 2011). The hypothesis we will use for performance relationships is as follows;

H4: SCP is positively related to Firm Performance.

Moderating Role of Supply Chain Uncertainty

Moderating Role of Supply Chain Uncertainty Reducing or eliminating uncertainty in supply chain decision-making processes will significantly improve SCP by ensuring control (Vorst and Beulens, 2002). Simangunsong et al. (2011) determined that strategies to be developed for combating sources of uncertainty would cause expected variations in important performance measures. Uncertainty in the context of lead times, inventory, quality, customer services, and flexibility affects SCP, and members of supply chains with a good performance history may benefit when the level of uncertainty increases and consumer demand changes (Bhatnagar and Sohal, 2005). Uncertainty in the supply chain will positively impact the performance of the supply chain under dynamic environmental conditions. Supplier/customer integration, delivery, and flexibility performance will strengthen under high environmental uncertainty (Wong et al., 2011). The following hypotheses are formed when considering the relations between firms' cooperation under uncertainty and SSCM:

H5: The supply chain uncertainty moderates the relationship between SCC and SCP.
H6: The supply chain uncertainty moderates the relationship between SSCM and SCP.

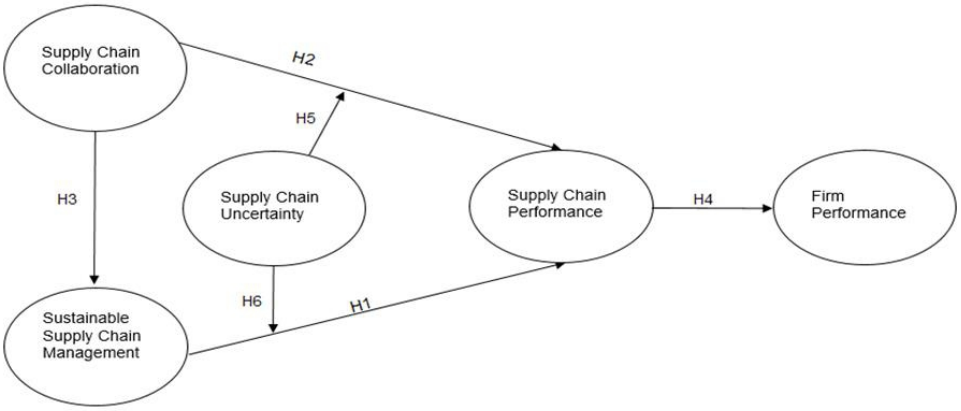

Figure 1: Research Model

3. Research Methodology

3.1 Measures

To test the research hypotheses, multi-item scales were adopted from prior researches. 5-point Likert scales were used to measure all constructs. The questionnaire items are given in the appendix.

SSCM scale was adapted from Zhu et al., (2007) and Marshall et al., (2015). How firms implement SSCM was ascertained by asking six questions about the environmental dimension, eight questions about economic dimension, and nine questions about the social dimension.

Following the study of Cao and Zhang (2011), SCC is operationalized as a multidimensional construct that has seven dimensions: information sharing, matching of goals, concurrence of decision, incentive harmonization, resource sharing, cooperative communication, and common knowledge formation.

Supply chain uncertainty and SCP constructs were adopted from Bhatnagar and Sohal (2005). Finally, we obtained the firm performance scale from Ellinger, et al., (2002), where firm performance was assessed relative to the achievement of organizational goals.

3.2 Sampling

Since the questionnaires were originally in English, it was translated into Turkish to ease respondents' comprehension. As suggested by Bhalla and Lin (1987), we used the back-translation method to adopt the linguistic equivalence of the two versions. A draft questionnaire evaluated and revised in discussions with potential key informants.

As explained before, this research examines the impacts of SCC and SSCM on SCP and firm performance. We used a random sampling scheme from the firms located in the Marmara region where the main part of the

Turkish economy for all types of industries operates. Based on data from the report of the Turkish Statistical Institute, 2008, 54% of manufacturing companies are located in this region. The questionnaires submitted to the companies by the option of face-to-face, fax, e-mail, or onsite survey (Cobanoglu et al., 2001). To increase the chances of getting the maximum number of responses among the 200 firms who had adopted a supply chain system. We received 240 usable questionnaires from 112 firms. In the sample, the respondents were functional/department managers (40%), project/product managers (32%), president (25%), and the owners of the company (3%). The primary industries in which the responding firms operate were the following: machinery and manufacturing (%19), information technologies (%14), communication (%10), automotive (% 27), energy (%8), and other (%22).

3.3 Common Method Variance Assessment

Since we collected the data from a single source, common method bias may affect the relationships between the variables and is a potential threat to the validity of the study. The Harmon one-factor test is used to investigate the common method bias problem (Podsakoff and Organ, 1986). The results of the test have shown that the common method variance does not pose any serious problem. More than one factor with an eigenvalue of 1 was identified and the first factor has 30.39 % of the total variance explained.

4. Research Results

4.1 Measurement Validity and Reliability

To evaluate the construct validity of the measurement items, a similar approach suggested by Kleijnen et al., (2007) was used. The reliability of the constructs was assessed through Composite Scale Reliability (CR) and Average Variance Extracted (AVE) by estimating a null model with no structural relationships (Chin, 1998a).

The partial least squares (PLS) has been extensively used in business research fields recently. Researchers who use the PLS assert that it measures research models with applying small samples with no strict distribution assumptions and can model both reflective and formative constructs within the same research model (Peng and Lai, 2012). PLS, made known by Wold in the 1960s (Wold, 1966), was recently stimulated by Chin (Chin, 1998a,b; Chin et al., 2003). PLS assesses the scope to which one part of the research model estimates values in other parts of the research model. Hence, PLS is prediction-oriented (Fornell and Bookstein, 1982; Vinzi et al., 2010). Due to small number of sample size in this research, the authors prefer to use PLS approach for measuring the composite reliabilities. For all measures, PLS-based composite reliabilities were above the cut-off value of 0.70, and AVE

values were greater than or close to the threshold levels suggested by Fornell and Larcker (1981).

The convergent validity was evaluated by inspecting the standardized loadings of the measures (Chin, 1998a), and the standardized loadings of measures exceeded 0.50 (see Appendix). Next, discriminant validity was assessed by using the square root of AVE for each construct Fornell and Larcker (1981). The square root of AVE for each construct is greater than the correlations between pairs of constructs (see Table 1). These results show that all constructs have satisfactory discriminant validity.

4.2 Hypothesis Testing

The PLS method was used to test the model. The PLS avoids multiple linearities and measurement errors while investigating the causality between research structures. Fornell and Bookstein, (1982) indicate that PLS is a powerful analytical tool due to the smallest demands on sample size and residual distributions. Also, importance is given to the simplification of model specification and interpretation (Chin, 1998a). Since the unit of analysis was the firm, before the hypothesis testing, it was necessary to aggregate the question items of the respondents in each firm. Table 1 and Table 2 below indicate the results of the analysis.

To assess the structural model, the R2, beta coefficients, and corresponding t-values via bootstrapping procedure. Besides, we looked at the Q2 (predictive relevance) and the f2 (effect sizes). First, the research hypotheses were evaluated. SSCM ($\beta = 0.31$, $p < 0.01$) and SCC ($\beta = .11$, $p < .10$) is positively related to SCP. Therefore, we concluded that H1 and H2 are supported. SCC has a significant positive impact on SSCM ($\beta = .67$, $p < .01$), so H3 is supported. SCP has a significant statistical association with firm performance ($\beta = 0.45$, $p < 0.01$), supporting H4.

This study hypothesized that supply chain uncertainty has a moderation effect on the relationships between SCC and SCP, and SSCM and SCP. Moderation analysis is conducted by PLS product-indicator approach. According to Henseler and Fassott (2010), PLS can provide a more precise evaluation of moderator effects by accounting for the error that attenuates the estimated relationships. To test the moderating effect, SCC (predictor), SSCM (predictor), and supply chain uncertainty (moderator) were multiplied to create an interaction construct (SCC x supply chain uncertainty, and SSCM x supply chain uncertainty) to predict SCP. As Table 2 shows, the moderator effect on the relationship between SCC and SCP was significant ($\beta = -0.13$; $p < 0.10$). This result shows that supply chain uncertainty moderates the relationships between SCC and SCP. Hence, H5 was also supported. Also, as shown in Table 2, the path coefficients for the effect of the moderator effect on the relationship between SSCM and SCP was significant ($\beta = 0.19$; $p < 0.01$).

This indicates that supply chain uncertainty moderates the relationships between SSCM and SCP. Hence, H6 was also supported.

Moreover, SSCM and SCC explains 39,6% of variance in SCP (R2 = 0.396), SCC explains 43,6% of variance in SSCM (R2 = 0.436). Also, SCP explains 20.8% of variance in firm performance (R2 = 0.208). The R2 values are higher than or close to the recommended threshold (Cohen,1988). Therefore, we concluded that we have a substantial model.

Table 1: Descriptive Statistics and Correlations of the Constructs

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Environment	(0.80)												
2	Economic	0.57**	(0.8)											
3	Social	0.63**	0.52**	(0.75)										
4	Information sharing	0.43**	0.24**	0.60**	(0.89)									
5	Goal congruence	0.51**	0.39**	0.63**	0.68**	(0.82)								
6	Decision synchronization	0.36**	0.35**	0.55**	0.37**	0.56**	(0.79)							
7	Incentive alignment	0.33**	0.38**	0.61**	0.39**	0.49**	0.73**	(0.79)						
8	Resource sharing	0.43**	0.36**	0.62**	0.40**	0.49**	0.62**	0.69**	(0.79)					
9	Collaborative communication	0.33**	0.27**	0.43**	0.49**	0.58**	0.40**	0.43**	0.48**	(0.82)				
10	Joint knowledge creation	0.27**	0.27**	0.54**	0.41**	0.51**	0.58**	0.63**	0.63**	0.54**	(0.84)			
11	Supply chain performance	0.46**	0.37**	0.52**	0.45**	0.48**	0.40**	0.34**	0.41**	0.40**	0.43**	(0.78)		
12	Firm performance	0.41**	0.33**	0.40**	0.20**	0.35**	0.33**	0.29**	0.28**	0.26**	0.34**	0.46**	(0.81)	
13	Supply chain uncertainty	0.47**	0.43**	0.46**	0.44**	0.51**	0.38**	0.34**	0.34**	0.48**	0.45**	0.55**	0.46**	(0.74)
	Mean	3.62	3.20	3.22	3.64	3.65	3.10	3.09	3,15	3.60	3.19	3.74	3.42	3.65
	Standard deviation	0.87	0.91	0.88	0.88	0.83	0.86	0.90	0,84	0.82	0.88	0.75	0.88	0.73
	Cronbach alpha	0.89	0.83	0.91	0.91	0.88	0.85	0.8	0.79	0.76	0.86	0.94	0.94	0.88
	Composite reliability	0.91	0.89	0.92	0.94	0.91	0.89	0.89	0.86	0.86	0.90	0.95	0.95	0.90
	Average variance extracted	0.64	0.67	0.56	0.80	0.67	0.63	0.63	0.62	0.67	0.70	0.62	0.66	0.55

*p < 0.05, **p < 0.01

Notes: Numbers on diagonals indicate the square root of average variance extracted (AVE).

No correlation is greater than the corresponding square root of AVE.

Next, we looked at the f2 that shows the size of an effect. To show the full picture both substantive significance (f2) and statistical significance (p) have to be reported. According to the guidelines of Cohen's (1988), the threshold values of the effect size (f2) are 0.02 for small effects, 0.15 for medium effects, and 0.35 for large effects As it can be seen in Table 2, all relationships had a medium effect. In addition to R2 and f2, Q2 was used to evaluate the model. Q2 indicates how well data can be reconstructed empirically using the model with estimated parameters. If the Q2 greater than 0, then the model has predictive relevance, otherwise the model lacks predictive relevance. Our results indicate that Q2 for endogenous variables have an acceptable predictive relevance.

Table 2: Hypothesis Testing Results

Hypothesis	**Beta**	**t-value**	**Results**	**f^2**
H1: SSCM → SCP	0.31***	3.69	Supported	0.174
H2: SCC → SCP	0.11*	1.3	Supported	0.055
H3: SCC → SSCM	0.67***	8.58	Supported	0.436
H4: SCP → Firm performance	0.45***	5.62	Supported	0.208
H5: SCC * Supply chain uncertainty → SCP	-0.13*	-1.58	Supported	0.036
H6: SSCM*Supply chain uncertainty → SCP	0.19***	2.21	Supported	0.021
Fit Measures	**Endogenous construct**		**R^2**	**Q^2**
	SSCM		0.436	0.288
	SCP		0.396	0.243
	Firm performance		0.208	0.15

*p< 0.1, **p < 0.05, ***p < 0.01.

Discussion and Conclusion

This work empirically showed that SSCM is important to strengthen SCP. Corporate social responsibility positively correlates with environmental supply development which has a positive impact on participant firms' financial performance and competitive advantage. Corporate forces, morality, and values of society impact the competence of every company. For being competitive, supply chains apply environmental programs including green process and product design, green technologies, storing, and logistics. These programs support organizations for having an environmentalist brand image and brand equity, which facilitate customer demand and cost reduction and direct to have better economic results which will additionally reinforce organization. Xia et al., (2015) suggest that pro-active investments addressing social responsibility in the supply chain may strengthen the firm's competitive advantage. Organizations aiming to improve supply chain and performance can follow different implementations of SSCM based on their strategic objectives and the operational conditions in which they exist. Tseng et al., (2019) find that social development was the foundation of leverage and to assist economic advantages, environmental effects, that could intensify financial performance. Social development in supply chain management can

develop interaction in development. Economic benefits facilitate to preserve costs, like transactional costs and communication costs; rapidly react to business changes; reinforce engagement, and strengthen collaboration within supply chain members. Organizations increase sustainable performance by increased productivity and efficiency in SSCM performance; for instance, reverse logistics have a substantial impact on the environment when reusing materials, which can decrease the detrimental impacts on the environment (Turrisi et al., 2013). According to Kot (2018), most of the studies in the literature were developed for large enterprises and his study indicated that SME's sector positions in the area of SSCM much better than large companies. SME's have long term relationship which facilitates shorter delivery time and increased level of customer expectations. These companies have also ambition to reduce the waste level which helps to improve the environmental side of SSCM. This dimension has a high impact on the financial and economic side of SSCM. The result of the study shows that all of the sustainability domains were very substantial in the supply chain management practices of the studied SMEs.

This study also empirically demonstrated that SCC is a critical factor to increase SCP which corresponds with past researches (Cao and Zhang, 2011; Liao et al., 2017). SCC facilitates supply chain members to increase SCP as follows: (1) resource sharing and information sharing enable significant cost decrease in the supply chain operations; (2) goal congruence and decision synchronization provide long term relationships via common interest with key suppliers; (3) collaborative communication can be used to solve issues and respond quickly to marketplace needs; and (4) incentive alignment can substantially maximize proactivity (Ramanathan and Gunasekaran, 2014; Simatupang and Sridharan, 2008; Cao and Zhang, 2011; Scholten and Schilder, 2015). With the study of Um and Kim (2019), similar results are seen in literature which was identified positive relationship within collaboration and performance suggest that customers and suppliers should establish a positive-sum situation which customers and suppliers can mutually profit from. Enduring relationships can not only create common interest as well as enhance the value of co-creation. Therefore organizations are obliged to create proper collaborative actions to protect sharing.

We also empirically demonstrated that SCC is positively related to SSCM, which is consistent with previous studies. Sustainability, which cannot be achieved solely by the efforts of individual companies is moving from the organizational level to the supplier level, and collaboration is becoming one of the important sources. Sustainability-related sources and capabilities that are not easy to replicate by rivals are a source of competitive advantage among organizations. Several studies indicating that strategic partnership practices have positively affected the environmental supply chain capabilities in

strategic purchasing. Recently, researchers have identified collaborations involving environmental sustainability as an effective strategy for enhancing the SCP of supply chain members. The expanding consciousness of the requisite for environmental supply chains has allowed firms to view SCC activities as a key factor that helps to achieve this difficult balance. Taking into account the key factors of SCC, namely suppliers, logistics, and retailers, to improve supply chain environmental sustainability, suggested a conceptual framework of three-level SCC to support organizations for enhancing their level of collaboration between supply chain partners in the context of environmental targets (Ramanathan et al., 2014). Firms realize the significance of the sustainability responsibilities of all stakes in the supply chain for their development and collaborate with SSCM to realize the environmental sustainability of the organizations (Govindan et al., 2016).

Ghicajanu (2014) considers that the performance requirement related to SCM is the value brought to customer, quality, service, and speed; it should provide resolutions and business models that fulfill these requirements at an optimum degree. A positive relationship was found between supply chain management performance and firm performance which corresponds with the research carried out by Lia et al., (2006) and Mentzer et al., (2001). Organizations have been aware of the relationship between these two concepts for a long time and are continuing their application of SCM in their supply chains in various ways.

Last, this study empirically showed that supply chain uncertainty has a moderating effect on the relationship between SSCM, SCC, and SCP, which constitute a new way for the next investigation. Supply chain uncertainty has been found to moderate the relationship between collaboration whereas SCM positively moderating SSCM and supply chain management performance.

This study has some methodological limitations. As in other cross-sectional studies, this research is limited in its contribution and proof of positive causality. The following research should also use longitudinal data to better investigate relationships. Another limitation of this study is that the sample can be extended. The study was conducted with Turkish companies located in the Marmara Region with a certain national character. Readers should be careful when results are generalized for different cultural contexts.

The need for further empirical work is evident, and the model proposed in the work presents an intelligible conceptual basis for the understanding of complex relationships and the integration of additional theories. Future work should be expanded to include different national content so that analysis results can be generalized. Despite the need for theory testing research, longitudinal and case studies must be conducted to understand the mechanisms between SSCM, SCC, supply chain, and firm performance. Supply chain uncertainty from among sources of uncertainty has been used in our study, and

other types of uncertainty, such as environmental uncertainty and system uncertainty as indicated by Pishvaee and Torabi (2010) may be included in future studies.

In the literature, there are distinctive study results that examine the relations between SSCM and SCC, and SCP and firm performance in different conceptual models. This study attempted to examine the conceptual framework of SSCM and SCC under the moderator influence of supply chain uncertainty on SCP and firm performance. This is one of the first attempts in the literature to verify six hypotheses at the same time in a single questionnaire which aims to add some value to the field of SCM.

Managers of supply chain and firms can perform activities to strengthen their implementation of SSCM according to the triple bottom line approach. SSCM activities, especially when there is supply chain uncertainty, can ensure that operations are protected from uncertainties as part of an organization and its supply chain. Also, managers can apply to withstand SSCM practices by increasing SCC in various areas.

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Appendix
Measures
Factor loadings are shown in parenthesis

Sustainable Supply Chain Management
Environmental Dimension

Our company
- reduced air pollution caused by emissions. (0.82)
- reduced the amount of wastewater. (0.85)
- reduced the amount of solid waste. (0.82)
- reduced the consumption of harmful/hazardous/toxic substances. (0.83)
- reduced the number of environmental accidents. (0.70)
- improved its environmental management system and practices. (0.78)

Economic Dimension
- Our company's material procurement costs have decreased. (0.70)
- Our company's energy consumption costs have decreased. (0.80)
- Our company's waste management charges have decreased. (0.88)
- Our company has reduced the charges paid for the disposal of wastes. (0.87)

Social Dimension
- Our company designs systems for work/family balance with our supply chain partners. (0.78)
- Our company implements occupational health and safety, work standards compliance, and audit systems for our supply chain partners. (0.75)
- Our company helps our supply chain partners acquire OHSAS 18001 or other certifications. (0.72)
- Our company develops systems of professional ethics with our supply chain partners. (0.78)
- Our company and supply chain partners have reduced the health risk that consumers may encounter. (0.62)
- Our company has benefited employees throughout the supply chain. (0.79)
- Our company and supply chain partners have reduced occupational safety and health risks in new products/processes developed over the last two years. (0.78)
- Our company carries out supply chain strategy changes that minimize adverse impacts. (0.73)

- Our company makes supply chain strategy changes where public awareness of social sustainability information (impact on professional ethics/communities) that occurs throughout the company's supply chain is made publicly available. (0.80)
- Our company is making supply chain strategy changes that allow focusing on fair trade throughout the supply chain. (0.77)

Supply Chain Collaboration

Information Sharing

Our company and supply chain partners share

- appropriate information. (0.86)
- the information they obtain with each other promptly. (0.91)
- the right information with each other. (0.90)
- complete information with each other. (0.90)

Matching Goals

Our company and supply chain partners

- have common objectives in the supply chain. (0.72)
- agree on the importance of cooperation throughout the entire supply chain. (0.83)
- agree on the importance of improvements that will benefit the entire supply chain. (0.88)
- agree that our objectives can be achieved by working towards supply chain goals. (0.87)
- organize joint collaboration and implementation plans to achieve their supply chain objectives. (0.80)

Decision Concurrency

Our company and our supply chain partners

- plan promotional activities jointly. (0.74)
- develop demand predictions jointly. (0.82)
- manage stocks jointly. (0.82)
- plan product classification jointly. (0.84)
- work together for solutions. (0.77)

Harmonization of Incentives

Our company and supply chain partners

- develop systems together to evaluate and promote each other's performance (e.g. key performance indices, scorecards, and resulting incentives). (0.76)
- share costs (e.g. losses in order changes). (0.85)
- share earnings (e.g. reduced inventory costs) (0.83)

- share the risks that may arise in the supply chain. (0.85)

Resource Sharing

Our company and supply chain partners

- often use inter-firm teams for process designs and improvements. (0.83)
- appoint personnel to manage collaboration processes. (0.87)
- share technical support. (0.73)
- share equipment (e.g. computers, networks, machines). (0.73)

Collaborative Communication

Our company and our supply chain partners have

- a regular and close communication. (0.83)
- open and bi-directional communication. (0.88)
- many different channels to communicate. (0.76)

Common Knowledge Formation

Our company and supply chain partners

- research and acquire new and related information jointly. (0.81)
- assimilate and implement related information jointly. (0.87)
- define customer demands jointly. (0.83)
- discover new or emerging markets jointly. (0.85)

Supply Chain Uncertainty

- The average delivery time of our suppliers is within the specified target. (0.71)
- Our suppliers' accuracy averages in meeting orders are within the specified target. (0.80)
- Our suppliers' quality averages in meeting orders are within the determined target. (0.79)
- The average working time with our suppliers is within the specified target. (0.75)
- The durations of our company's planned downtimes are within the specified target. (0.76)
- The duration of the unplanned downtime, which significantly affects our company's operations, is within the specified target. (0.71)
- The accuracy average for our company's monthly demand forecasts is within the specified target. (0.70)
- Our company's customer base is within the target size. (0.73)

Firm Performance

- Our company's sales are higher than those of our competitors. (0.85)
- The return on our investments is higher than that of our competitors. (0.81)
- The growth rate in the return on our investments is higher than that of our competitors. (0.84)
- Our profit margin on sales is higher than that of our competitors. (0.78)
- Our market share is higher than that of our competitors. (0.81)
- Or return on equity is higher than that of our competitors. (0.82)
- Our growth rate is higher than that of our competitors. (0.79)
- Our operating revenues are higher than that of our competitors. (0.88)
- Turnover Profitability (Profit/Total Sales) is higher than that of our competitors. (0.85)
- Our company's market value is higher than that of our competitors. (0.72)

Supply Chain Performance

- The delivery times of our company have improved in the last three years. (0.77)
- The delivery time performance of our company is high compared to the industry. (0.79)
- An improvement has been observed in our company's inventory cycles for the last three years. (0.78)
- Our company has a high inventory turnover performance compared to its industry. (0.80)
- An improvement was seen in the inventory level, which has been devalued over the last three years. (0.82)
- An improvement was seen in the stock level, which is devalued according to its industry. (0.82)
- Our company's market entry (product development cycle) performance has improved over the last three years. (0.75)
- Our company's market entry (product development cycle) performance has improved over the last three years. (0.77)
- Our company's defective product ratio has improved in the last three years. (0.77)
- An improvement was seen in our company's defective products ratios according to its industry. (0.79)
- Our company's performance in meeting the orders in the last three years has been high. (0.77)

Our company has a high rate of meeting orders according to its industry. (0.80)