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Research Article

Top Management Pledge, An Essential Component of Sustainable Manufacturer-Customer Relationships

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ABSTRACT

This study reviews the role of top management commitment in realizing sustainability goals in interfirm and supply chain relationships. Next, the study employs the resource-based view of the firm to implicate top management commitment as a moderator of influences of green innovation practices on customer cooperation. Using survey design methodology, we collected data from different 181 ISO 14001certified Turkish manufacturing firms. We tested the proposed hypotheses by using the hierarchical multivariate regression approach. The direct effect of top management commitment on green process innovation is significant, while its effect on green managerial innovation is insignificant. However, the results show that manufacturer-customer relationships support top management commitment as a positive moderator of the relationship between green innovation practices and customer cooperation. Our results underscore the vital role played by top management in the firm's efforts to accomplish sustainability objectives and enhance interfirm cooperation. Further, the study contributes to the literature by revising the available literature on the different roles of top management commitment in green supply chains and business relationships.

KEYWORDS

Top management commitment, green innovation, customer cooperation, the moderating effect, green supply chain practices

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1. Introduction

Top managers increasingly direct resources and energy toward achieving triple bottom line performance (Sarkis et al., 2019; Ghobadian et al., 2020). Cooperation enables supply chain partner firms to advance sustainability objectives (Melander, 2017; Seuring & Müller, 2008). Sony's leadership, for instance, collaborates with key suppliers to adopt green technologies with the aim of reducing its carbon footprint to zero by 2050. In the absence of such commitments, however, prospects for interfirm cooperation wane (Graves et al., 2019) and complicate efforts to achieve sustainability objectives (Gunasekaran & Ngai, 2008).

Top management commitment is important to achieving triple bottom line objectives in interfirm relationships and supply chains and (Burki & Dahlstrom, 2017; Zhu et al., 2012; Tseng et al., 2013). Reliable top management pledges integrate sustainability initiatives into a firm's business strategies and operations (Zhu et al., 2016). A lack of support from senior managers stymies e-procurement imple-

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mentation (Gunasekaran & Ngai, 2008) and reduces the effectiveness of collaborating partners' efforts to pursue sustainable initiatives (Walls & Berrone, 2017). When top managers support green goals with supply chain partners (Cheng, 2011), they encourage integration and enhance inter-firm co-operation (Wu, 2013). Hence, top management commitment is critical to reinforcing decisions regarding sustainable supply chain practices and advancing close interfirm collaboration in supply chains (Wang et al., 2017; Dubey et al., 2018).

Managerial commitments integrate many supply chain elements to ensure the provision of final goods addresses customers' desired sustainability standards and needs (Abdallah & Al-Ghwayeen, 2020; Lin et al., 2010). Firms exhibit a growing determination to implement green innovations that reduce their carbon footprints (Wu, 2017). Since sustainability is more meaningfully applied at the supply chain level than at the firm-level, it is essential to examine how managerial practice influences interim cooperation. Top managements' efforts to foster innovation are the vital to achieving cooperation and sustainability in supply chains (Li et al., 2017; Delgado-Ceballos et al., 2012). This action provides the organizational support and resources necessary to achieve innovations (Wong et al., 2013) and to fulfill the requirements of important supply chain partners (i.e., customers and suppliers) (Wong et al., 2013; Gualandris & Kalchschmidt, 2014). Despite the importance of managerial commitments and innovation practices on interfirm cooperation, scant research has examined these factors simultaneously.

The purpose of this study is to examine the effects of top management commitment on the level of customer cooperation in manufacturer-customer relationships. We integrate the resource-based view (Barney, 1991; Bakar & Ahmad, 2010) to examine effects of top management commitment. The resource-based view of the firm focuses on firm-level factors and proposes that organizations cultivate competencies from their existing resources and capabilities (Chahal et al., 2020). Accordingly, the commitments of top management to environmental objectives create value through resource integration and customer-centric value co-creation (Lin et al., 2010). Firms commit substantial financial resources to green innovation (Li et al., 2017) to achieve better resource management that can secure viable competitive advantages and provide more effective opportunities for supply chain collaboration.

Manufacturers continuously adapt to external pressures (Zhu et al., 2012) to embrace new ecological measures that satisfy customer requirements and governmental regulations. To varying degrees, they commit to sustainability and develop innovations that enhance interfirm cooperation, yet the literature offers limited insight into these topics from a manufacturer's perspective. Hence, the first research question of this study is to examine the effect of top management commitment and green innovations on customer cooperation. Since the sustainability thrust of top management and innovation often work in tandem, it is germane to consider the interaction among these factors. Research has examined the role of top management commitment on supply chain performance, yet prior studies lack consensus concerning the moderating effects of managerial commitments. Therefore, the second research question of this study is to investigate the moderating role of top management commitment on the relationship between green innovations and customer cooperation.

Our results contribute to the sustainability literature by providing empirical evidence to show that top management commitment and green innovations are important factors in achieving customer cooperation objectives in green manufacturer-customer relationships. Furthermore, our study demonstrates that relationship between green innovations and customer cooperation is contingent on top management commitment. This study also extends the resource-based view by underlining that firms with green tangible and unique resources offer a maintainable source of competitive advantages for green business relationships.

The remainder of the paper focuses on addressing these research questions. Section 2 reviews the role of managerial commitment to interfirm relationships and green supply chains, describes the conceptual model,

and presents the hypotheses. Section 3 describes the research method including the data collection process, measures, and construct validity. Section 4 presents the empirical results. Section 5 concludes the paper with a discussion of the findings, their theoretical and managerial implications, the limitations of the study, and avenues for future research.

2. Literature and Hypotheses

2.1. ***The Role of Top Management Commitment***

Top management commitment and customer cooperation are regarded as soft or behavioral green practices (Liu et al., 2020; Feng et al., 2018), whereas green innovations are referred to as hard or technical green practices. Green behavioral practices focus on people and relationships such as management commitment and cooperation with customers and suppliers. Green innovations are technologically and operationally-driven practices such as sustainable product development, sustainable process technologies and environmental management systems that diminish negative ecological effects of business activities (Liu et al., 2020; Cho et al., 2017). Top management commitment is a green behavioral practice defined as the solid commitment by a firm's senior managers towards adopting and implementing environmentally friendly procedures and processes to achieve sustainability targets (Chiou et al., 2011; Burki et al., 2018). Customer cooperation is also a green behavioral practice and refers to an exchange partner's concern and concrete actions to work with partners to achieve sustainability results (Sancha et al., 2019).

We incorporate two types of green innovation - green managerial innovation and green process innovation. Green managerial innovation (GMI) focuses on the internal efficiency of green management practices in a firm. It includes actions initiated to redesign and refine existing operations, products, and services to reduce their impact on the environment. In contrast, green process innovation (GPI) refers to specific improvements in manufacturing methods and processes that optimize the use of resources and diminish the impact of harmful pollution on the environment (Burki & Dahlstrom, 2017; Tseng et al., 2013). Chen et al. (2006) recognize that effective green innovations enable firms to develop competitive advantages that are difficult to duplicate.

A firm's superior internal resources (i.e., human and technological capital) provide competitive benefits (Junfeng & Wei-Ping, 2017). When firms develop specific in-house resources and capabilities regarding their environmental actions, they create unique competitive advantages (Hart, 1995; Aragon-Correa & Hiz, 2016). Hence, top management commitment and green innovations are the critical elements in supporting green supply chains as they provide unique resources for maintaining a dynamic, competitive advantage.

An organization reflects the attitude or image of its top managers (Snyder et al., 2018). Top managers are decision makers (Van Doorn et al., 2013), and their influence plays a critical role in the strategic decisions taken by their firms (Van Der Vegt et al., 2010). Senior management formulates and executes decisions related to internal and external business challenges that significantly impact organizational outcomes and strategies (Finkelstein & Mooney, 2003). When a firm's senior management provides sufficient resources to an initiative, it is reflected directly in its strategic actions. For example, implementing sustainable practices offer a business a unique distinction from its rivals and provides strategic and competitive advantages (Delmas, 2001). The firm that enacts top management initiatives and implements sustainable business enables green practices to become a reality (Sarkis et al., 2010). Under the resource-based view, management initiatives provide unique competitive advantages in the supply chain.

Graves et al. (2019) emphasize that environmental and sustainability issues only become essential for a firm when they are supported by top management (Yu et al., 2020). When there is weak management support for green the prospects for cooperation between business partners is diminished (Graves et al., 2019). Sustainability initiatives require managerial commitment (Burki & Dahlstrom, 2017) to green innovations that provide better opportunities for collaboration between supply chain partners. It is difficult for firms to

take a green or sustainable approach without managerial support because this is critical in making strategic decisions regarding green supply chain practices and managing external customer pressures (Wang et al., 2017; Menguc et al., 2010).

Top management commitment encourages the adoption of green innovations that lead to ecological cooperation and environmental performance between supply chain partners. Nevertheless, sparse literature identifies the role of top managerial commitment in achieving better customer cooperation in green supply chain management. Table 1 provides an overview of the moderating and mediating roles of top management commitment in previous research.

The Table 1 illustrates that a few supply chains studies have examined the moderating role of top management support for the ecological goals of a firm, especially with regard to the relationship between green innovations and customer cooperation. Solid commitment of top management attains mutual goals that have a positive effect on customer cooperation and adoption of green innovations (Dubey et al., 2018; Cheng, 2011). Li et al. (2017) identifies a strong interdependence among green supply chain practices such as top management commitment, green innovations, and customer cooperation (Liu et al., 2020). From the resource-based view, proficient in-house green expertise provides unique competitive advantages for the practice of sustainable supply chain management. Green innovations and top management commitment are essential practices that are critical in developing customer cooperation in green supply chains. Prior research has neglected to examine how green technological and behavioral- innovations collectively affect customer cooperation in manufacturer-customer supply chains. This study, however, develops a theoretical framework (see Figure 1) examining the direct effect of top management commitment and green innovations on customer cooperation.

2.2. *Top Management Commitment and Customer Cooperation*

Wong et al. (2013) advocate for close integration with customers as a means for improving operational performance and enhancing the effectiveness of environmental solutions. For instance, cooperation between green supply chain partners acts as a critical element in improving economic performance (Tseng & Chiu, 2013; Zhu et al., 2013). Close cooperation of top managers with their supply chain partners is critical to implementing green supply chain practices. A number of studies (Hoejmose et al., 2012; Cuerva et al., 2014; Shin & Thai, 2015; Wu, 2017; Kim & Wemmerlöv, 2015) identify customer cooperation, environmental awareness, and environmental innovation as factors that yield improved economic and environmental performance. Customer pressure and top management commitment positively affect green practices and buyer-seller collaboration (Yen, 2018). Fulfilling customers' needs is vital for successful supply chains.

Under the resource-based view (Barney, 1991), developing and maintaining strong customer cooperation in green supply chains demands that partner firms have legitimate internal resources (i.e., top management commitment). In competitive markets, environmental pressures from customers encourages senior managers to address sustainability concerns (Ye et al., 2013). Dubey et al. (2018) indicate that close relationships with supply chain partners enables managers to develop sustainable supply chains. This commitment to sustainability by top management demonstrates that they will comply with customer demands by adhering to the regulatory measures necessary for achieving sustainability objectives (Huang et al., 2016). When top management demonstrates their full commitment to sustainability, they engender closer customer cooperation (Colwell & Joshi, 2013). Hence, we propose:

Hypothesis 1 . *Top management commitment has a positive association with customer cooperation.*

2.3. *Green Innovations and Customer Cooperation*

The environmental commitment of companies motivates green innovations (Chen et al., 2017). The greening of supply chains requires the adoption of innovations that enhance operational efficiency, minimize waste, and improve economic efficiency. For example, firms adopt green manufacturing innovations that allow them to produce sustainable products that deliver

Table 1. The Role of Top Management Commitment (TMC)

Study	Role of TMC	Main variabes	Research context	Findings
1. Banerjee et al. (2003)	Mediator	DVs: Top management commitment, external and internal environmental orientations, and environmental corporate and marketing strategies. IVs: Public concern, regulatory forces, and competitive advantage	243 US marketing managers and dividing industry type into high environmental impact [HEI] and moderate environmentalimpact [MEI] groups	Except a few paths, our findings provide strong support for the mediating role played by TMC. The study found that the moderating role of TMC was higher in the HEIgroup than in the MEI group.
2. Colwell and Joshi (2013)	Moderator	DVs*: Corporate environmental responsiveness, organizational performance IV**: Institutional pressure.	199 Canadian firms engaged in eco-friendly initiatives.	High TMC moderates the relationship between institutional pressures and corporate environmental responsiveness.
3. Dai et al. (2014)	Mediator	DVs: Environmental monitoring of suppliers, Supplier involvement in green product development, environmental collaborative planning with suppliers; IVs: Competitive Pressure, stakeholder Pressure.	230 supply chain management professionals from the United States.	As a mediator, TMC positively mediates the relationships between IVs (rival pressure and stakeholder pressure) and DVs (the three dimensions of green supply chain management).
4. Luo et al. (2017)	Mediator	DV: Organizational response towards low carbon emissions in a supply chain. IVs: Institutional pressures (coercive, normative and mimetic).	176 senior managers from five India sectors: cement, newsprint, steel, aluminum and petroleum.	TMC has a significant positive mediating effect on the relationship between coercive and mimetic pressures and low carbon emissions in a supply chain.

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Table 1 continued

5. Yen (2018)	Mediator	DV: Customer pressure, green collaboration pressure. IVs: Competitor pressure, regulatory pressure, green investment pressure.	221 purchasing managers of listed Taiwanese electronics firms.	MC mediates the relationships between competitor pressure, regulatory pressure and buyer-supplier green collaboration.
6. Cao and Chen (2019)	Moderator	DV: Green innovation strategy IVs: Policy pressure, market pressure, innovation resources, innovation capability	327 respondents from the most polluting manufacturing enterprises in China.	Strong TMC to environmental awareness positively moderates the relationship between market pressure, innovation resources and green innovation strategy.
7. Dubey et al. (2019)	Mediator	DV: Supplier relationship management (SRM). IVs: Coercive pressure, normative pressure, mimetic pressure.	210 supply chain managers from Indian sustainable industries.	TMC positively mediates the effect of external institutional pressures on SRM.
8. Wijethilake and Lama (2019)	Moderator	DV: Sustainability risk management (SRM) IV: Sustainability core values (SCV).	175 top managers in local or multinational companies in Sri Lanka.	TMC positively moderates the relationship between SRM and SCV.
9. Bag and Gupta (2019)	Moderator	DVs: Reverse logistics adaptation, remanufacturing operational performance, firm performance. IV: Availability of green human capital.	250 respondents from two South African automobile associations.	TMC has a positive moderating effect on availability of green human capital, adoption of reverse logistics and remanufacturing operational performance.
10. Graves et al. (2019)	Moderator	DV: Employee's pro-environmental behaviors (PEBs); IVs: Immediate manager's environmental leadership (IMEB), employee's motivation, top management commitment to sustainability	152 professionals and mangers enrolled in university-sponsored management development programs in Russia.	Strong TMC to sustainability has a negative significant moderating effect on the relationships between passive-avoidant leadership and PEBs.

Continued on next page

Table 1 continued

11. Kumari and Patil (2019)	Mediator	DV: Sustainable industrial ecosystem (IE); IVs: Institutional pressures (coercive pressure, normative pressure, and mimetic pressure).	200 top and medium level managers from Maharashtra Sugar industrial state, India.	TMC positively mediates the relationships between institutional pressures and sustainable IE.
12. Kitsis and Chen (2021)	Mediator	DV: Green operations (GOs); IVs: Stakeholder pressure (SP) and top management commitment (TMC).	A sample of 206 US firms, collected by utilizing online panel of Critical Mix.	TMC strongly mediates the relationship between stakeholder pressures and green operations.
13. Patel et al. (2022)	Moderator	DV: Energy efficiency, Environmental performance, environmental performance, and top management commitment IVs: Energy management practices (EMPs), environmental and financial performance.	594 useable responses from manufacturing EMEs located in Gujarat, India.	TMC moderates the relationship between EMPs and energy efficiency, as well as the relationship between energy efficiency and environmental performance.
14. Bukhari et al. (2022)	Moderator	DV: Green banking adoption IVs: Stakeholder pressures-customer pressure, competitor pressure and community pressure.	212 bank branch managers placed in the top five urban cities in of Pakistan	As a moderator, TMC significantly moderates the relationship between the three types of stakeholder pressures and green banking adoption.

*DV/DVs denote dependent variables; **IV/IVs denote independent variables

financial benefits (Abdullah et al., 2016).

By reducing the negative impact of their operations on the environment, green innovations improve the operational performance of companies (Vanalle et al., 2017). Aboelmaged and Hashem (2019) suggest that adoption of green innovations enhance the abilities to collaborate (cf. Awan and Yousaf, 2019).

Green innovations are essential components of a firm's internal green supply chain activities. When supply chain firms take a proactive approach to environmental issues, they willingly embrace the required green innovations and processes (Chen et al., 2012). Adopting green innovations also provide business firms with the opportunity to improve their brand image and reputation, enhance their capability to manage customer pressure for sustainable business practices and enhance their attractiveness to new customers (Mu et al., 2009; Zailani et al., 2015).

Green innovations are essential to improve compliance with environmental regulations (Chen et al., 2006), which also creates business opportunities (Gladwin et al., 1995). Green innovations create a win-win situation for firms to both improve their corporate image and provide productive opportunities (Porter & Van Der Linde, 1995). When firms utilize their distinct knowledge to develop economically-oriented green innovations, they boost their competitive advantage and environmental performance (Scarpellini et al., 2017). Green managerial and process innovations therefore underscore a firm's resources and capabilities in green supply chain management.

From a resource-based view (Chahal et al., 2020), adopting and implementing green innovations requires substantial investment and continuous upgradation efforts by supply chain firms to maintain their unique and competitive advantages. By managing their assets and capabilities, firms can devise strategies that provide them with opportunities for greater competitiveness (Barney, 1991). Environmental capabilities built on green innovations improve competitiveness and build barriers to market entry for competitors. When firms adopt and implement green innovations for enduring competitive advantage, they become an integral part of business practices through continuous and incremental improvements. Green managerial and process innovations allow firms to renew and reinvent internal capabilities that provide them with a competitive position in a given market and supply chain.

Green process innovation (GPI) diminishes the environmental impact of manufacturing processes by taking concrete measures such as energy saving, pollution prevention, and waste recycling (Qi et al., 2012) to produce ecologically-friendly products (Abdullah et al., 2016). The primary purpose of GPI is to reduce energy consumption, pollution, waste and environmental toxicity (Chen et al., 2006). In addition, GPI also results in reduced production costs, quality improvements and flexibility. The increasing environmental awareness of consumers positively affects market demand for environmentally-friendly products and encourages firms to improve their green innovation performance (Huang et al., 2016) by modifying their manufacturing processes (Lin et al., 2014). GPI helps businesses modify their manufacturing processes to produce environmentally-friendly products and reduce environmental pollution (Lin et al., 2019). Enhanced GPI also encourages firms to set more stringent environmental targets, such as energy-saving in production processes (Tsai, 2009).

Green supply chains help businesses to take advantage of opportunities to improve operational performance and reduce their environmental impact (Vanalle et al., 2017). When a firm adopts GPI in its manufacturing system, it reduces the resources used in production processes, cuts energy consumption, and boosts efficient production equipment employing innovative, cleaner technologies (Van Den Berg et al., 2013). GPI reduces production waste, improves a firm's environmental performance, cuts resource and production costs, and demonstrates to customers the environmental commitment of the firm. Green manufacturing studies (e.g., Govindan et al. , 2016) show the positive effects of top management commitment on GPI and customer cooperation. Lower levels of production waste led to better resource utilization, reduced production costs, and stronger commercial relationships

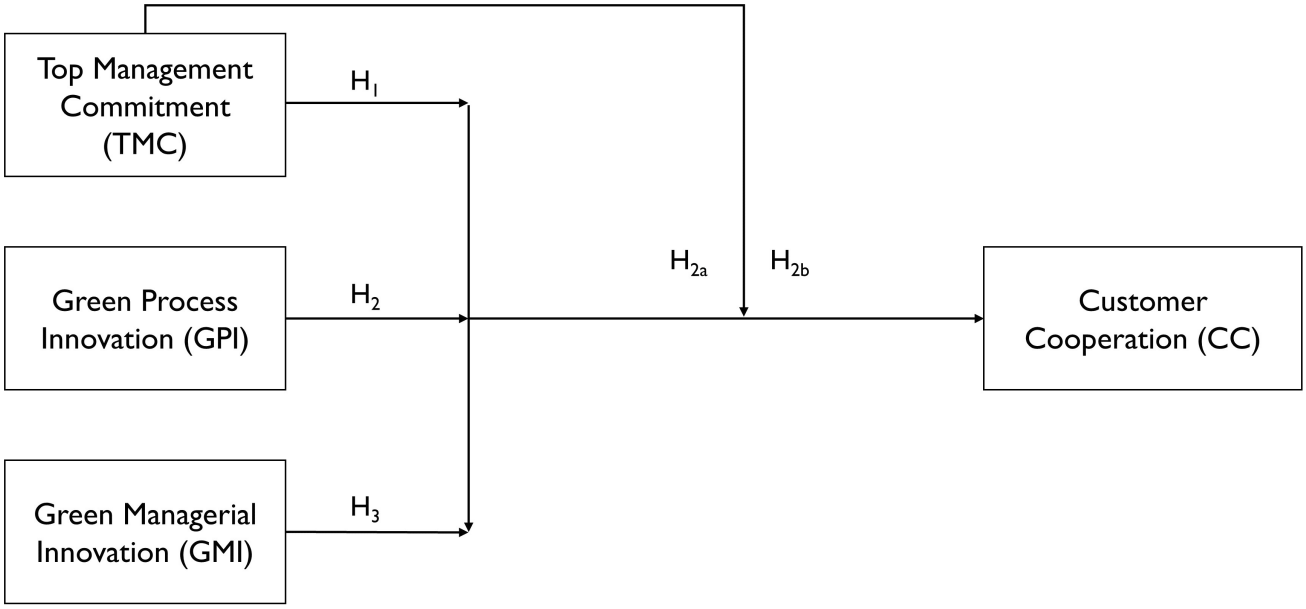

Figure 1. Research model

between supply chain partners. Hence, we hypothesize:

Hypothesis 2. *Green process innovation is positively associated with customer cooperation.*

Green managerial innovation (GMI) provides the necessary internal restructuring in a firm's production operations to achieve sustainability objectives (Tseng et al., 2013). GMI also involves implementing environmental criteria that improve the sustainability of a firm's products (Kung et al., 2012). For example, implementing an internal environmental management system such as ISO 14001 allows a firm to minimize water, electricity, gas, and petrol usage. This innovation focuses on enhancing a firm's managerial aptitude to focus on internal environmental issues such as procedural knowledge and skills, specific processes, and profitability (Chen, 2008). When firms adopt GMI, they demonstrate that they are serious in implementing environmental management systems and reducing hazardous emissions and waste to their strategic supply chain partners. Yu and Huo (2019) shows that GMI positively raises a firm's environmental orientation. When these innovations signal customers regarding a commitment to environmental concerns, customers are more inclined to work more closely with the innovative manufacturer. Hence, we hypothesize:

Hypothesis 3. *Green managerial innovation is positively associated with customer cooperation.*

2.4. *The Moderating Effect of Top Management Commitment*

Binding agreements between supply chain partners are essential for managing environmental issues. The role of senior managers is vital in achieving environmentally-related objectives (Lo et al., 2018). Top management commitment is also a key factor in supporting and improving GPI. For instance, when senior managers assure green processes, it positively affects green supply chain activities (Tachizawa et al., 2015). Graves et al. (2019) illustrate that senior managerial commitment to sustainability has a positive effect on the environmental behavior of the firm.

Managerial emphasis on ecological concerns increases green innovations and positively impacts the performance and competitiveness of a firm. Managerial commitment is also a vital catalyst of green innovations that improves competitiveness, provides economic benefits, and improves functioning

of the supply chain (Huang et al., 2016; Zailani et al., 2015). Manufacturing firms utilize GPI as a resource conservation tool by employing innovative, cleaner technologies in production processes to reduce resource and energy consumption (Van Den Berg et al., 2013). Top management commitment is key to closer collaboration with suppliers in managing sustainability issues (Stonkute & Vveinhardt, 2016). Furthermore, greener manufacturing adopts GPI measures, reducing energy consumption, pollution, and industrial waste. As a result, top management commitment helps to realize competitive advantages by augmenting environmental performance and building strong customer cooperation (Cheng, 2011; El-Kassar & Singh, 2019). Hence, we propose:

Hypothesis 4a. *Top management commitment positively moderates the relationship between green process innovations and customer cooperation.*

Research also implicates managerial commitment as essential to fostering deep collaborations with supply chain partners to improve sustainable supply chain practices (Dubey et al., 2018). Business leaders have a strong awareness of the technological changes that help them maintain their competitive advantages in areas such as sustainability and green innovation. When firms maintain their competitiveness in the market, it positively affects environmental awareness and fosters better performance between supply chain partners (Dubey et al., 2017). Top management commitment to sustainability encourages firms to adopt managerial approaches for credible green innovations that would provide better customer cooperation El-Kassar and Singh (2019). The support of top executives is critical in making the necessary adaptations and decisions (Gholami et al., 2013) for green supply chain management practices and supplier collaboration. Yen and Yen (2012) argue that top management commitment to green managerial issues and the necessary collaboration with partners bolsters a firm's green purchasing policies and the adoption of environmental standards. When top management focuses on making green innovations, it improves the functioning of the environmental management system and leads to better cooperation with customers (Huang et al., 2016). Based on the above arguments, we propose:

Hypothesis 4b. *Top management commitment positively moderates the relationship between green managerial innovation and customer cooperation.*

3. Methodology

3.1. ***Data***

To test our model empirically, we collected cross-sectional data from ISO 14001certified manufacturing firms in Turkey. We used Izmir Chamber of Commerce (Turkey) directory to select a sample of respondent firms. To ensure that the chosen firms met our criteria, we contacted them via telephone, and when we considered it necessary, also visited them. All the selected manufacturing firms had ISO 14000 series certification, demonstrating a more robust commitment towards sustainability, and adopting green initiatives. The participating firms are from the textile, electronics, auto manufacturing, chemical, food, and other manufacturing industries. The manufacturing processes of these industries produce more than an average amount of industrial environmental pollution.

We employed two bilingual Turkish academicians to translate our questionnaire into Turkish. We made the necessary modifications (Craig and Douglas, 2005, p. 254-257) to maintain the conceptual equivalence. Then, business managers and academicians reviewed the final revised version. They reported no ambiguities regarding the language and structure of the questionnaire. Finally, we sent the questionnaire to two hundred and fifty (250) selected Turkish manufacturing firms. We applied the key informant approach to collect data. All respondents worked at decision-making levels in their respective manufacturing firms, had valid work experience and good knowledge of environment management processes. The unit of analysis is the relationship between these manufacturing firms and their most important customers.

To overcome apprehensions manufacturers firms may have about misappropriation of information or breaches of confidentiality regarding their customers, we involved local industrial connections. The international make-up of the project's academic collaborators further reduced any distrust that participating

firms may have felt during data collection. Ultimately, we received 181 useable responses, providing a 72% response rate. Table 2 illustrate the characteristics of the selected firms.

Table 2. Turkish Respondent Firms' Profile

Industry Category	Firms
Textile	55
Electronics	31
Auto Parts Manufacturing	15
Medical Equipment	12
Chemical Products	10
Food Products	08
Energy Products	05
Others	45
Total Firms	181
Size (Number of employees)	**% Age**
1-20	31.3
21-50	32.9
51-100	16.8
101-500	12.9
>500	6.1
Total	100
Time (years doing business together)	**% Age**
1-5	52.5
6-20	44.2
20-30	3.3
Total	100

3.2. *Measures*

This study adopted all measures from the existing literature (see Table 3). Using previous studies (Zhu & Sarkis, 2004; Hoejmose et al., 2012), we selected and modified four items to measure top management commitment. These items reported the commitment levels of top and senior management to sustainable practices. Items for measuring green process innovation (GPI) and green managerial innovation (GMI) were adopted from previous studies (Chen, 2008; Chiou et al., 2011). Process innovation items report energy saving and pollution prevention processes, whereas managerial innovation items report the redesign of processes and products to reduce environmental impact. We modified four items from previous studies to measure customer cooperation (Zhu & Sarkis, 2004). The respondents reported the level of cooperation with their key customers regarding sustainable practices.

We measured all the items on a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). We also incorporated firm size and time duration as control variables in our theoretical model to check its robustness. Firm size represents the number of full-time employees, and time duration characterizes the number of years a manufacturing firm has been involved in the manufacturing business. The model incorporated the natural logarithm of these two variables.

3.3. *Validation of Constructs*

To validate our model, we followed the procedures outlined by Anderson and Gerbing (1988). First, we carried out an explorative factor analysis that proposed a reasonable statistical fit. All the respective items loaded on their respective constructs (each respective item loading ≥ 0.5) and all had eigenvalues ≥ 1.00, fulfilling the convergent validity criterion. Next, we estimated the four-factor measurement model using AMOS 26. The measurement model's goodness-of-fit-indices (see Table 3) indicate an acceptable fit to the survey data (χ^2/df=1.78, GFI=0.92, IFI=0.97, TLI=0.96. CFI=0.97, and RMSEA=0.06). Each construct's composite reliability (CR) and average variance extracted (AVE) exceeded the recommended value of 0.07 and 0.50, respectively, providing further evidence of strong convergent validity. The square roots of all the constructs' AVEs are greater than the correlation among all constructs, suggesting discriminant validity among constructs (Fornell & Larcker, 1981).

Common method variance issues arise when primary data are collected from a single vantage point. To reduce the effects of this bias, we placed the dependent and independent variables into separated parts of the questionnaire and guaranteed respondent anonymity (Podsakoff et al., 2003). Application of Harman's one-factor test indicated that a single factor accounted for only 41% of the total variance. These measures suggest that the common method has a limited influence on the model. Next, we tested common method bias by using common latent factor (CLF) method. Under this method, we regress all the items

of the constructs on a single common latent factor and estimated common variance as the square of the common factor of each path. As a preventive measure for common method bias, the common latent factor was retained while imputing latent variables. The common heuristic of our model's CLF is 31%, which is below the maximum threshold of 50% (Eichhorn, 2014).

4. Empirical Analysis and Findings

4.1. *Hierarchical Multivariate Regression Approach*

Consistent with prior research (e.g., Um and Kim, 2019; Dubey et al., 2015), we applied hierarchical regression to test our hypotheses. We mean-centered the interacting terms to limit collinearity associated with interaction effects. The highest VIF score is 1.46 indicates that multicollinearity is not a serious matter. Table 4 shows descriptive statistics and the correlation matrix whereas Table 5 provides the estimated coefficients and results of significance testing. In the first step of the hierarchical regression, we added the control variables (Model 1). In the next step, we introduced the moderating variable and independent variables (Model 2). Finally, we added the block of interaction inn Model 3, i.e., top management commitment's moderating effects on the relationships between green innovations and customer cooperation. The empirical results supported H1 (β=0.164, p<0.05), showing a positive relationship between top management commitment and customer cooperation. As proposed, our statistical results show a significantly positive relationship between green process innovation (GPI) and customer cooperation (β=0.288, p < 0.001), supporting H2. However, the relationship between top management commitment (TMC) and customer cooperation (H3) is statistically insignificant.

Our results suggest top management commitment positively moderates the relationship between green process innovation and customer cooperation (β = 0.123, p < 0.01) and green managerial innovation and customer cooperation (β = 0.105, p < 0.05). These results supporting H4a and H4b.

5. Discussion and Conclusion

The objective of this study has been to examine effects of top management commitment on the level of customer cooperation in manufacturer-customer relationships. The first research question related this objective has been to examine the effect of top management commitment and green innovations on customer cooperation. The results underline the significance of top management commitment and green process innovation as key antecedents in developing closer customer collaboration in green supply chains. By contrast, the data suggest that green managerial innovation may not necessarily lead to customer collaboration. Green managerial innovation is an essential part of internal environmental management for business firms adopting and pursuing green supply chain management practices. These innovations demonstrate a firm's seriousness about its sustainability efforts, which can further translate into competitive advantages. It also suggests that green managerial innovation acts as a subtle antecedent for closer sustainability cooperation between supply chain partners and demonstrates that senior management is focused on long term sustainability goals. Previous studies (Chiou et al., 2011) have also reported a significant direct effect of managerial innovation on process innovation, yet an insignificant direct impact on achieving sustainability performance in supply chains. Nevertheless, green managerial and green process innovations demonstrate the sustainability commitment of manufacturing firms in developing closer cooperation in green supply chains.

The second research question of this study has been to investigate the moderating role of top management commitment on the relationship between green innovations and customer cooperation. Our results suggest top management commitment positively moderates the relationship between green managerial innovation and cooperation as well as the relationship between green process innovation and cooperation. The commitment of top and senior managers positively influences green managerial innovation. Continuous support from top management ensures compliance with environmental regulations

Table 3. Construct Measures and CFA Results

Constructs	Items of the constructs
Customer Cooperation (CC) α = 0.82, CR = 0,826, AVE= 0.545 Source: Zhu and Sarkis , 2004	Our firm cooperates closely with this customer to implement green sustainable practices. Our firm cooperates closely with this customer on green packaging. Our firm cooperates closely with this customer to achieve green handling procedures. Our firm cooperates closely with this customer to evaluate green sustainable practices.
Top Management Commitment (TMC) α = 0.87, CR = 0,881, AVE= 0.656 Sources: Zhu and Sarkis, 2004 ; Hoejmose et al., 2012	Our firm's top management strongly support efforts to develop sustainable practices. Our firm's top management consider sustainable practices to be a vital part of corporate strategy. Our firm's top managers strongly implement sustainable practices during procurement procedures. Our firm's senior management strongly support efforts to improve sustainable practices.
Green Process Innovation (GPI) α = 0.93, CR = 0,930, AVE= 0.815 Sources: Chen , 2008 ; Chiou et al., 2011	Our firm has taken measures to lower the consumption of water, electricity, gas, and petrol during the production or disposal process. Our firm has taken measures to recycle, reuse and remanufacture materials or parts. Our firm has taken measures to achieve savings in the usage of energy, water and waste.
Green Managerial Innovation (GMI) α = 0.68, CR = 0,716, AVE= 0.571 Sources: Chen , 2008 ; Chiou et al. , 2011	Our firm has redesigned operational and production processes to meet internal environmental efficiency targets. Our firm has redesigned and improved products and services to meet new environmental criteria.
Firm Size	The number of fulltime workers employed by the manufacturing firm (natural logarithm).
Time Duration	The number of years the manufacturer has been doing business with the focal customer (natural logarithm).

and improves existing and new internal environmental criteria, enhancing customer cooperation in green supply chains. Furthermore, green managerial innovation supports environmental compliance demanded by governments or supply chain partners. Top management commitment has a lower moderating effect on the relationship between green process innovation and customer cooperation.

5.1. ***Theoretical Contributions***

Employing the resource-based view, this study investigated firm-level factors critical in cultivating green resources and capabilities by business organizations and supply chain partners. Our study contributes in several ways to the green practices and sustainable management literature. First, it provides a comprehensive review of the mediating and moderating roles of top management commitment, a key antecedent

Table 4. Descriptive Statistics and Correlations Matrix (n = 181)

Constructs	1	2	3	4	5	6	7	8
1. Customer Cooperation (CC)	**0.74** *							
2. Top Management Commitment (TMC)	.367	**0.81***						
3. Green Process Innovation (GPI)	.560	.429	**0.90***					
4. Green Managerial Innovation (GMI)	.153	.160	.204	**0.76***				
5. GPI*TMC	.192	-.316	.046	.053	1.00			
6. GMI*TMC	.189	.037	.044	-.290	.212	1.00		
7. Log Size	.306	.256	.311	.191	.230	.004	1.00	
8. Log Time	.136	.261	.211	-.029	-.021	.093	.316	1.00
Mean	2.719	0.000	0.000	0.000	0.687	0.174	3.915	1.720
Std. D	0.909	1.049	1.337	1.044	1.320	1.235	1.341	0.783

*Bold values are the square roots of the constructs' AVEs

Table 5. Hierarchical Multivariate Regression, Dependent Variable: Customer Cooperation

	Model 1	Model 2	Model 3
Constant	1.857	2.414	2.463
Log Size	0.198***	0.096*	0.059
Log Time	0.050	-0.041	-0.045
Predictors			
TMC		0.093+	0.164**
GPI		0.318***	0.288***
GMI		0.010+	0.044+
TMC*GPI			0.123**
TMC*GMI			0.105*
R^2	0.095	0.342	0.397
Change R^2		0.247	0.055
Model F value	9.373	18.225	16.287

Final Model R^2(Adjusted) = 0.373, F (7, 173) = 16.287 at p<0.000; ***p< 0.001, **p<0.01, *p<0.05, +p<0.1.

for expediting green innovations and accomplishing sustainability objectives. Second, the study's moderating effects show that top management commitment moderates the relationship between green innovations (both process and managerial) and customer cooperation in supply chain relationships. Previous studies have somehow neglected to examine the role of top management commitment in these vital supply chain relationships. In our study, the moderating effect of top management commitment on green managerial innovation and customer cooperation relationships is noteworthy, as the direct effect of green managerial innovation on customer cooperation is insignificant. A more substantial moderating effect of top management commitment on green managerial innovation accentuates top management's dynamic capability and leadership role in facilitating proactive green innovations that are important for pursuing stronger customer cooperation (Chen et al., 2012). Third, this study provides empirical support for the role of top management commitment as a critical antecedent for the relationship between green innovation and

customer cooperation.

5.2. *Managerial Implications*

Senior managers can improve supply chain sustainability goals by pursuing green innovations with their collaboration partners. The empirical results of this study suggest that if top management commitment is present, supply chain partners are equally likely to pursue green innovations (both process and managerial). This may also be due to other factors, but more effective persuasion by top managers' results in better and more sustainable cooperation between supply chain partners. Accordingly, our study strengthens the argument that commitment by top managers is an important antecedent in achieving sustainable objectives and customer cooperation in green supply chains. When business managers develop closer customer cooperation, it provides them with sustainable competitive advantages.

To conclude, our results provide beneficial insights for policymakers and managers in designing environmental regulations. It is important to consider the long-term impact and possible implications of environmental regulations on manufacturers as they may affect the long-term efficacy of green supply chains. Green processes and managerial innovations are essential for developing trustworthy managerial and marketing practices; however, top management's active role plays a critical role in delivering quality sustainable goals. Business firms need unique and latest technologies to realize sustainable green operations. Firms' green investments can remain fruitless unless top management's hands-on commitments ensure that green pledges are fulfilled. The dynamic role of top management to accomplish environmentally friendly practices would also help the firm formulate policies that would strengthen the link with green supply chain stakeholders and support sustainability recognition. The credibility of top managers guarantees organizational authenticity in pursuing green marketing and supply chain goals.

6. Limitations and Further Research

The limitations in our study present opportunities for additional research. First, we only collected data from manufacturers. In future studies, we recommend data collection from both sides of the supply chain dyad. We also recommended collecting data from top tier and lower management levels to compare the approach and implementation challenges in developing cooperation between supply chain partners. Second, this research only measures customer cooperation. Future research should also measure the impact of customer cooperation on triple bottom line parameters. Finally, this study tested the research model with cross-sectional data. Testing the model with longitudinal data would provide a more dynamic picture and verify the theoretical rationale regarding the direct effect of top management commitment, green innovations, and the moderating effect of top management commitment on customer cooperation. The results would provide evidence of causal relationships between these constructs. Further studies should also investigate these relationships in other research contexts to support this study's findings. Future researchers should select other moderators (e.g., green innovations) and investigate their effect on the relationship between customer cooperation and triple bottom line performance in green supply chains.

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