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The impact of relational capital on green supply chain management and financial performance

Abstract

This study empirically investigates the joint effects of relational capital and green supply chain management on financial performance. The hypotheses are empirically tested using structural equation modeling and bootstrap methods based on data collected from 308 manufacturing companies in China. The results show that supplier and customer relational capital improve financial performance indirectly through supplier and customer green management, respectively. Internal relational capital improves financial performance indirectly through internal and supplier green management but has no significant indirect effect through customer green management. The results enrich the literature by providing insights into the synergic effects between relational capital and green supply chain management and by providing empirical evidence of the antecedents and consequences of green supply chain management.

Keywords: Relational capital; Green supply chain management; Financial performance; China

1. Introduction

Environmental protection and the greening of production have become major concerns for manufacturers in both developed countries (Choi et al., 2018; Green et al., 2019; Laari et al., 2018) and developing countries (Yu et al., 2017; Zhu et al., 2007a; Feng et al., 2018; Gopal and Thakkar, 2016; Vanalle et al., 2017). Green manufacturing is now viewed by many firms as essential to global supply chain strategies (Zhu et al., 2007b; Geng et al., 2017; Miroshnychenko et al., 2017), and it is also considered the key to achieving sustainable development (Rao and Holt, 2005). For example, Walmart, an American multinational retail corporation, implemented a packaging scorecard to manage global suppliers. Suppliers are evaluated according to the green quotient of their product packaging, which is based on the product-to-packaging ratio, usage of recycled substances, amount of renewable energy used to manufacture packaging, and emissions related to transportation and manufacturing. Ford, an American multinational automaker, has issued recycling guidelines that require global suppliers to redesign their products to make greater use of recycled materials. For instance, new bumper reinforcements are made from salvaged plastic bumpers, brake pedals and floor mats are made from used tires and spent battery casings are used to make splash shields.

Chinese manufacturers are now adopting green manufacturing to reduce emissions, save energy, and reduce overall environmental impact (Zhu and Sarkis, 2007; Zhu et al., 2013; Yu et al., 2017). For example, China's Ministry of Industry and Information Technology accredited 1,402 green manufacturers and 90 green supply chains from 2017 to 2019 (www.miit.gov.cn). More than 200,000 Chinese companies have become ISO 14001 certified (www.iso.org). Increasing numbers of Chinese companies are realizing that green manufacturing practices must be implemented using a supply chain perspective to achieve environmental goals and obtain competitive advantages (Zhu et al., 2013). Green supply chain management (GSCM) aims to decrease the negative environmental effects of

operations, products, and services. By reducing environmental risks and improving product value, market competitiveness, and brand image, GSCM contributes to environmental and business performance (Chan et al., 2012; Chien and Shih, 2007; Geng et al., 2017; Miroshnychenko et al., 2017; Mitra and Datta, 2014; Rao and Holt, 2005; Yu et al., 2014). GSCM refers to “integrating environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of final product to the consumers as well as end-of-life management of the product after its useful life” (Srivastava, 2007:54). Empirical evidence shows that GSCM is associated with positive environmental and green performance (e.g. Zhu et al., 2007b; Geng et al., 2017; Yu et al., 2017), operational performance (e.g. Yu et al., 2014; Zhu et al., 2013), and economic performance and competitiveness (e.g. Zhu and Sarkis, 2004; Rao and Holt, 2005; Geng et al., 2017). However, researchers have reported mixed findings about the performance outcomes of individual GSCM practices, such as internal environmental management (Zhu and Sarkis, 2007), eco-design (Zhu et al., 2007a), and green purchasing (Eltayeb et al., 2011). In addition, developing eco-friendly supply chains requires commitment and cooperation from supply chain partners (Zhu and Sarkis, 2007; Zhang et al., 2017; Zhu et al., 2013). Motivating suppliers and customers to collaborate and invest resources in green manufacturing has become a key challenge for manufacturers (Yu et al., 2014; Kumar et al., 2019).

Social exchange theory provides a useful perspective for investigating the joint impacts of relational capital and GSCM (Lu et al., 2007; Geng et al., 2017). The theory suggests that supply chain partners exchange resources via a relationship exchange, and the behaviors of a company in a supply chain can be explained by social interactions (Das and Teng, 2002; Yeung et al., 2009). Social exchange theory focuses on the social relations between actors that shape the exchange of resources and benefits (Das and Teng, 2002). Relational capital refers to “trust, obligations, respect, and friendship that actors have developed with each other

through a history of interactions” (Villena et al., 2011:563). It derives from the interactions between different functions in a company (internal relational capital) and from connections with suppliers and customers (supplier and customer relational capital) (Carey et al., 2011). Relational capital plays a crucial role in social exchange because it improves communication, enhances willingness to collaborate, and reduces opportunistic behaviors within supply chains, thus encouraging supply chain members to engage in value-adding co-creation activities (Carey et al., 2011; Kim and Nguyen, 2018; Zhang et al., 2018). Researchers have argued that relational capital assists supply chain members in sharing knowledge and information about green manufacturing, collaborating on environmental protection, reengineering business processes to reduce carbon emission, and making relationship-specific investments in green technologies and innovations (Lu et al., 2007; Chen and Hung, 2014; Geng et al., 2017).

The objective of this study is to empirically investigate the joint impacts of relational capital and GSCM on financial performance. The findings enrich current knowledge on the antecedents and consequences of supplier, internal, and customer green management and shed light on the synergic effects of relational capital and GSCM on performance outcomes. By linking relational capital with GSCM, the findings also reveal the impacts of relational capital on sustainability and competitive advantages and show how to fully reap the financial benefits of relational capital.

2. Literature review

2.1 Relational capital and green supply chain management

The literature has shown that relational capital can improve operational and firm performance (e.g. Carey et al., 2011; Yeung et al., 2009; Villena et al., 2011; Kim and Nguyen, 2018). Researchers have also argued that the supply chain relationship is positively associated with

green manufacturing and sustainable development. For example, Carter and Carter (1998) suggest that improved relationships and increased coordination with external supply chain members and between internal functions contribute to environmentally friendly purchasing activities. Lu et al. (2007) argue that green supply chains involve a complex social network of relationships between companies. Youn et al. (2013) find that strategic supply chain partnership contributes to GSCM. Chen and Hung (2014) reveal that relational capital facilitates green management by promoting knowledge sharing in environmental collaborations. Luo et al. (2014) point out that relationships help the implementation of GSCM in Chinese manufacturing firms. Woo et al. (2016) indicate that interactions and relationships with suppliers lead to improved buyer-supplier environmental collaboration. Geng et al. (2017) suggest that relational capital promotes the adoption of GSCM by helping companies manage their supply chains while they green their operations. Li and Huang (2017) find that relational capital strengthens the positive relationship between green supply chain practices and green innovation performance. However, there is limited empirical evidence on the distinctive effects of supplier, internal, and customer relational capital on GSCM practices and their joint impacts on financial performance.

2.2 Green supply chain management and performance

Although the literature has reported a positive association between GSCM and performance outcomes, studies have adopted different conceptualizations of GSCM and focused on various performance outcomes. For example, Zhu and colleagues conceptualize GSCM as internal green management, green purchasing, cooperation with customers, eco-design, and investment recovery (e.g. Zhu and Sarkis, 2004; Zhu and Sarkis, 2007; Zhu et al., 2007a; Zhu et al., 2013). This conceptualization has been widely adopted and adapted by other researchers. For example, Eltayeb et al. (2011) focus on eco-design, green purchasing, and

reverse logistics; Chan et al. (2012) focus on green purchasing, customer cooperation, and investment recovery; and Geng et al. (2017) conceptualize GSCM as intra-organizational management, supplier integration, eco-design, customer cooperation, and reverse logistics. Other researchers use a supply chain management perspective to argue that GSCM includes internal green management and external (supplier and customer) green management (Zhu et al., 2013; Yang et al., 2013; Yu et al., 2014). However, these studies have focused on various practices. For example, Yang et al. (2013) conceptualize internal green management as green policy, green shipping practices, and green marketing, and external green management as collaboration with suppliers, partners, and customers. Laari et al. (2016) argue that external GSCM includes environmental monitoring and collaboration with suppliers and customers. Petljak et al. (2018) conceptualize internal green management as water and energy management and waste management, and external green management as cooperation with suppliers, green purchasing, and green logistics. Therefore, this study combines the practices proposed by Zhu and colleagues and the supply chain perspective to conceptualize GSCM as internal, supplier, and customer green management (Zhu and Sarkis, 2004; Zhu et al., 2013).

Most empirical studies focus on the impacts of GSCM on operational, environmental, and economic performance and report that GSCM improves performance outcomes in China (e.g., Zhu and Sarkis, 2004; Zhu and Sarkis, 2007; Zhu et al., 2007a; Zhu et al., 2013; Yang et al., 2013; Yu et al., 2014). For example, Zhu et al. (2013) find that GSCM positively affects economic performance through improved environmental and operational performance. Yu et al. (2017) show that green collaboration with suppliers is significantly and positively related to environmental and operational performance. Zhu et al. (2017) report that green purchasing and green innovation improve environmental and economic performance. Feng et al. (2018) find that GSCM leads to better financial performance through improving environmental and operational performance. Although these findings are echoed by studies of

other developed countries (e.g. Yang et al., 2013; Laari et al., 2016; Green et al., 2019) and developing countries (e.g. Rao and Holt, 2005; Vanalle et al., 2017; Famiyeh et al., 2018), some researchers have reported mixed findings on the impacts of individual GSCM practices on performance outcomes. For example, Zhu and Sarkis (2007) report an insignificant relationship between internal environmental management and environmental performance. Zhu et al. (2007a) find that eco-design has no significant effect on performance. Eltayeb et al. (2011) report that green purchasing has no significant effect on performance. Choi et al. (2018) find that cooperation with customers and reverse logistics have no significant impact on manufacturing or marketing performance. Famiyeh et al. (2018) fail to discover a positive relationship between green purchasing and delivery time.

3. Hypotheses development

We argue that supplier relational capital improves financial performance indirectly through supplier green management. Establishing friendly and reciprocal relationships with suppliers that are characterized by mutual trust and respect can incentivize suppliers to follow a manufacturer's lead in implementing green manufacturing (Jabbour et al., 2017; Luthra et al., 2015). Supplier relational capital facilitates close communications and interactions between a manufacturer and suppliers (Zhang et al., 2018). This helps suppliers understand the manufacturer's environmental standards and requirements so that they can provide environmentally friendly materials and components (Liu et al., 2017). At the same time, manufacturers can obtain accurate information on material properties and component specifications, which makes it possible for them to devise environmental criteria for supplier selection and evaluation (Yeung et al., 2009; Zhu et al., 2017). Supplier relational capital also enables manufacturers to perform regular environmental audits to evaluate whether the green practices of suppliers and their partners fulfill the manufacturers' environmental goals (Luo et

al., 2014; Zhang et al., 2017). Therefore, supplier relational capital facilitates collaboration between a manufacturer and suppliers through relationship building and information sharing, which can improve environmentally friendly procurement (e.g. resource conservation, reuse, and recycling) (Carter and Carter, 1998), supply chain social responsibility (Zhang et al., 2017), and environmentally sustainable production and logistics (Mitra and Datta, 2014). Thus, it is important for supplier green management (Luthra et al., 2015; Jabbour et al., 2017).

Supplier green management is increasingly favored by manufacturers as a tool for improving competitiveness and achieving sustainable development (Liu et al., 2017; Woo et al., 2016). Supplier green management can improve the greenness and quality of materials and components. It enables manufacturers and suppliers to jointly decide on environmental management goals and collectively develop solutions for environmental problems and thus to enhance the manufacturer's environmental reputation and market performance (Gavronski et al., 2011; Yu et al., 2017; Yu et al., 2014). Integrating environmental considerations into purchasing processes lays the foundation for the greening of operations, which reduces production costs (Miroshnychenko et al., 2017). Giving suppliers design specifications ensures that the materials and components they provide meet environmental standards and regulations, reducing waste (Rao and Holt, 2005). Regular environmental auditing motivates suppliers to improve production processes to prevent product failures, thus controlling supply chain risks and costs (Lee et al., 2015; Petljak et al., 2018). As a result, supplier green management not only improves brand image and market performance but also reduces production costs by decreasing waste, enhancing financial performance (Chan et al., 2012; Chien and Shih, 2007; Rao and Holt, 2005; Yang et al., 2013). Therefore, we propose the following hypothesis (Figure 1).

H1: Supplier relational capital enhances financial performance through supplier green

management.

=====Insert Figure 1 about here=====

We argue that customer relational capital enhances financial performance indirectly through customer green management. Mutual trust and respect are the basis of cooperation with customers and allow companies to develop long-term relationships with them (Flynn et al., 2010). Such friendly and cooperative partnerships enable customers to follow inter-organizational processes that meet environmental and quality standards and specifications (Srivastava, 2007). Customer relational capital also facilitates speedy interactions and communications with customers, which can inform them about a manufacturer's environmental strategies and objectives and its production processes (Chen and Hung, 2014; Wang and Zhang, 2019). Customers can thus understand the manufacturer's strategies and operations, facilitating cooperation in customer green management. Customer relational capital also helps a manufacturer motivate customers to invest in environmental management practices, such as eco-design, cleaner production, green packaging, and product recycling (Zhu et al., 2013; Carey et al., 2011; Flynn et al., 2010). In addition, partnerships with customers allow a manufacturer to jointly design inter-organizational processes, which facilitates cooperation on product takeback and reverse logistics (Chen and Hung, 2014; Wu et al., 2012). Customer relational capital enables manufacturers and customers to cooperate in the greening of production and supply chain processes, and hence enables customer green management (Carter and Carter, 1998; Wu et al., 2012; Zhang et al., 2018).

Customer green management enables manufacturers to offer environmentally friendly products and reduce the carbon footprints and waste in supply chains (Yang et al., 2013). Products with eco-design and green packaging can improve a manufacturer's environmental reputation, which can attract more consumers and increase sales (Miroshnychenko et al., 2017; Mitra and Datta, 2014). Consumers are willing to pay extra for green products due to

increasing environmental awareness, which increases profit. Moreover, customer green management enables customers to understand a manufacturer's environmental standards and objectives, achieving synergic environmental management in the supply chain (Rao and Holt, 2005; Zhu et al., 2017). Cooperation with customers allows manufacturers to improve product and process designs to reduce energy consumption and waste in supply chains (Chan et al., 2012). In addition, it can improve the efficiency and effectiveness of product takeback and reverse logistics, thus helping a manufacturer reuse and recycle products and materials and ultimately reducing costs (Laari et al., 2016; Yu et al., 2014). At the same time, customer green management, such as environmentally friendly transportation and packaging, can improve logistics and thus improve competitiveness and financial performance (Rao and Holt, 2005). Therefore, we propose the following hypothesis.

H2: Customer relational capital enhances financial performance through customer green management.

We argue that internal relational capital enhances financial performance indirectly through internal green management. Internal relational capital is the lubricant between the functional departments of a company (Yeung et al., 2009). It can encourage employees in different functional departments to cooperate, facilitating total involvement in environmental improvement and mitigation of environmental impacts (Wang and Zhang, 2019). Only when friendly and mutually beneficial relationships are established between functional departments can environmental factors be integrated into all stages of internal operations and decision making, which promotes the establishment of ISO 14000/14001 environmental management systems (Chan et al., 2012; Flynn et al., 2010). Internal relational capital encourages purchasing and production departments to participate in new product development by providing detailed information on product specifications and resource consumption and the environmental impacts of production processes. A manufacturer can thus design products for

reuse, recycle, and recovery of materials and components, and for reduced consumption of materials or energy (Yu et al., 2014; Zhu and Sarkis, 2004). Collaboration between marketing, production, and new product development functions helps a manufacturer recycle and reuse discarded, obsolete, or defective products and materials and recover excess inventory and waste materials (Jabbour et al., 2017).

Internal green management can decrease the use of materials and energy and increase reuse, which can reduce costs and yield economic benefits (Chien and Shih, 2007; Rao and Holt, 2005). Environmental risks can be reduced through total environmental management, thus increasing profitability. Integrating ISO14001 into daily operations helps a manufacturer solve environmental problems by benchmarking and learning, which reduces energy consumption and negative effects on the environment, thus improving its reputation and competitiveness (Mitra and Datta, 2014; Yang et al., 2013). In addition, including environmental factors in product design permits manufacturers to systematically reduce the environmental impacts of products and processes, reducing costs and increasing brand image (Wu et al., 2012). It can also help manufacturers fulfill their environmental responsibilities and burnish their environmental image, thus boosting product sales and increasing income (Yang et al., 2013). Moreover, investment recovery aims to make use of waste products or materials before disposal (Lai et al., 2013). It can help manufacturers reduce the costs of raw materials and compliance, win new customers, and increase revenue (Zhu et al., 2013). Therefore, we propose the following hypothesis.

H3: Internal relational capital enhances financial performance through internal green management.

Internal relational capital also enhances financial performance indirectly through supplier green management. Internal relational capital facilitates a manufacturer's interaction and collaboration with suppliers, improving supplier green management (Chen and Hung, 2014).

Close interactions at multiple levels allow a manufacturer to develop consistent strategies and culture, which help it cooperate with suppliers in developing environmental objectives (Lee et al., 2015). Mutual trust and friendship at multiple levels promote cross-functional cooperation, which ensures that a manufacturer can consistently provide environmental requirements to suppliers (Wang and Zhang, 2019; Zhang et al., 2018). Internal cooperation also ensures that a manufacturer devises consistent environmental criteria for supplier selection, eco-label products, and collaboration with suppliers with ISO 14001 certification (Zhu et al., 2013). Internal relational capital promotes cross-functional teamwork, which can improve the environmental auditing of suppliers' internal management and evaluation of second-tier suppliers' environmentally friendly practices (Wu et al., 2012). As discussed earlier, supplier green management can improve performance by reusing materials, saving energy, and reducing waste (Lai et al., 2013). Therefore, we propose the following hypothesis.

H4: Internal relational capital enhances financial performance through supplier green management.

Moreover, we argue that internal relational capital enhances financial performance indirectly through customer green management. Multi-level interactions between different functions create a cooperative atmosphere that encourages employees to participate in customer green management (Wang and Zhang, 2019). Mutual trust and friendship at multiple levels facilitate cooperation between a manufacturer and customers on eco-design and cleaner production (Zhu and Sarkis, 2004; Zhu et al., 2013). Close interactions at multiple levels also improve the physical and information flows in supply chains, which facilitate reverse logistics (Carter and Carter, 1998; Chen and Hung, 2014). Internal relational capital promotes collaboration between functional departments, which enables a manufacturer to implement consistent environmental strategies in product design, production,

and logistics (Woo et al., 2016; Geng et al., 2017). Such strategies mean that a manufacturer can cooperate with customers to implement green manufacturing practices such as eco-design, cleaner production, and green packaging and transportation (Zhang et al., 2018). Successful cooperation with customers on product takeback and energy consumption reduction also depends on the support and coordination of internal departments (Yang et al., 2013). As discussed earlier, customer green management can not only reduce environmental impacts but also improve manufacturers' competitive advantages (Rao and Holt, 2005). Therefore, we propose the following hypothesis.

H5: Internal relational capital enhances financial performance through customer green management.

4. Research methods

4.1 Sampling and data collection

A postal survey method was used for data collection in this study. The manufacturing company is the unit of analysis. Data were collected from Zhejiang province in China, which is a strong industrial base and has a wide range of manufacturing industries. Zhejiang province has introduced several green manufacturing initiatives and treats GSCM as critical to its industrial development. For example, creating green supply chains is one of the five main components of the *Zhejiang Green Manufacturing System Construction Implementation Plan (2018-2020)*. Zhejiang province has committed itself to establish 100 green workshops and 10 green parks and has built several demonstration projects for GSCM implementation. For example, *Building a Green Supply Chain System for Textile Chemicals*, by the Hangzhou Chuanhua Chemical Company, was selected as the 2018 National Industrial Transformation Project, and *"Five Unified" Green Supply Chain System for Agricultural Products*, by the Eastern Group, won the 2018 Zhejiang Business Innovation Demonstration Award.

Manufacturing companies were randomly selected from the China Telecom Yellow Pages for Zhejiang province. We contacted the manufacturers by telephone to invite them to participate. Those that accepted the invitation were asked for the contact information of potential respondents. Questionnaires were then sent out by mail, along with a return envelope and a letter indicating the purpose and potential value of the survey. To reflect the actual situation of the manufacturers, respondents were required to have a comprehensive understanding of green manufacturing and supply chain management. The manufacturers' general manager, chairman, CEO, and senior managers responsible for operations and supply chain management were chosen as suitable participants. To improve the response rate, participants were contacted by phone or email before the questionnaire was sent out. Two weeks after sending the questionnaire, we contacted the respondents by phone or email to answer any questions they had about the questionnaire. If the questionnaire had not been received, it was promptly reissued.

With the assistance of our industry contacts, we distributed 450 questionnaires, and received 340 responses. After data cleaning, there were 308 valid questionnaires, an effective response rate of 68.4%. The profile of the sample companies is provided in Table 1. Table 2 provides the demographic information on the respondents.

=====*Insert Table 1 and Table 2 about here*=====

4.2 Measures

The measures were adapted from the literature, and the questionnaire was designed in English. We used the back-translation method to develop the Chinese questionnaire. First, an operations management professor translated the English version of the questionnaire into Chinese, and then another professor translated this Chinese version into English. Finally, a third professor compared the back-translated questionnaire with the original, and the differences were discussed. The questionnaire was pre-tested by 20 managers and one

operations management professor. They were asked to fill out the questionnaire, and the researchers provided assistance if they encountered any difficulty. The research team then discussed the questions face-to-face with them after they filled out the questionnaire and clarified the questionnaire as necessary. When any confusion arose, the questions were reworded. The questionnaire was refined based on the feedback and comments. It was then pilot-tested in a training workshop organized by the Zhejiang province government before its full-scale launch. The participants were middle and top managers specializing in supply chain and environmental management. The questionnaire was filled out by 120 participants. We then calculated the Cronbach's alpha values for each construct and adjusted the measurement items accordingly to ensure the reliability and internal consistency of the constructs.

A multiple-item 7-point Likert-type scale was used to measure the constructs. Following Carey et al. (2011) and Villena et al. (2011), we measured supplier/internal/customer relational capital in the aspects of interaction, trust, respect, friendship, and reciprocal relationship using five items. The respondents were asked to indicate the extent to which the statements described their companies' relationship with the major suppliers / between different functions / with major customers (1 = "Strongly disagree"; 7 = "Strongly agree"). We measured GSCM following the studies by Zhu and Sarkis (2004) and Zhu et al. (2013). Specifically, supplier green management was gauged using seven items regarding environmental cooperation, green purchasing, environmental auditing, and supplier selection. The respondents were asked to indicate the levels of these activities implemented between their companies and the major suppliers (1 = "Not at all"; 7 = "Very extensive"). Internal green management was measured in three aspects (total environmental management, eco-design, and investment recovery) using seven items. The respondents were asked to indicate the levels of these activities implemented within their companies (1 = "Not at all"; 7 = "Very extensive"). Customer green management was measured based on cooperation with

customers in cleaner production, eco-design, green packaging, and product recycling using seven items. The respondents were asked to indicate the levels of these activities implemented between their companies and the major customers (1 = “Not at all”; 7 = “Very extensive”). In this study, a major supplier/customer is one that contributes most to the purchases/sales of the focal company (Yu and Huo, 2018). Financial performance captures a company’s growth and profit. Based on the study of Flynn et al. (2010), this study measures financial performance using five items: growth in profit, return on investment, growth in return on investment, return on sales, and growth in return on sales. The respondents were asked to evaluate the performance of the companies relative to their major competitors (1 = “Much worse”; 7 = “Much better”). The measurement scales are presented in the Appendix.

Compared with small companies, large companies have more resources and greater power in supply chains and hence may have better financial performance (Zhang et al., 2018). The industry environment may also influence companies’ performance (Flynn et al., 2010). Therefore, company size and industry were used as control variables. Size was measured by the number of employees using a 5-point Likert scale (1 = “100-199”; 5 = “5,000 or more”), and industry was measured using four dummy variables to represent the five industries (Table 1). We collected information about company size and industry from the questionnaire.

4.3 Non-response and common method bias

We collected the profiles of the companies that did not answer the questionnaire through public channels such as their official websites and the Bureau of Industry and Commerce. T-tests were conducted on the responding and non-responding companies for industry, age, and number of employees. The results show that there was no significant difference. Therefore, non-response bias is not a serious issue in this study.

We used the technique of controlling for the effects of an unmeasured latent method factor

to evaluate common method bias (Podsakoff et al., 2003). Specifically, we built two confirmatory factor analysis (CFA) models. A measurement model (Model A) was constructed using CFA. In the model, the items for supplier/internal/customer relational capital, supplier/internal/customer green management, and financial performance were directly linked to the corresponding constructs. The covariance between the constructs was freely estimated. The fit indices are $\chi^2(758) = 1002.421$, RMSEA = 0.032, NNFI = 0.972, CFI = 0.974, and SRMR=0.039, which are better than the cut-off values suggested by Hu and Bentler (1999). In Model B, items were loaded on their corresponding constructs (like Model A) and on a latent common method variance factor. The significance of the structural parameters was examined in both models. The results show that the model fit indices of Model B only marginally improve over Model A (i.e., Δ RMSEA = 0.003, Δ SRMR = 0.003, Δ NNFI = 0.006, and Δ CFI = 0.006). There are no significant changes in item loadings, and the item loadings are significant in both models. Therefore, common method bias is not a serious issue in this study.

4.4 Reliability and validity

The reliability of the constructs was assessed by Cronbach's alpha and composite reliability. Table 3 shows that the Cronbach's alpha coefficients range from 0.834 to 0.963, and the composite reliabilities range from 0.836 to 0.963. Thus, the measurement items are reliable (Fornell and Larcker, 1981).

Convergent validity was evaluated by CFA and average variance extraction (AVE) (Fornell and Larcker, 1981). Table 3 reports the factor loadings of the CFA analysis. The results show that they range from 0.651 to 0.935, and the T-values range from 12.307 to 21.694. In addition, the AVE values range from 0.506 to 0.839. These indicate that the scale has good convergent validity (Fornell and Larcker, 1981). Table 4 shows the descriptive

statistics, which reveal that the square root of the AVE value of the focal construct is larger than the correlation coefficients with other constructs. Therefore, the scale has good discriminant validity (Fornell and Larcker, 1981).

=====Insert Table 3 and Table 4 about here=====

5. Analyses and results

Structural equation modeling (SEM) with the maximum likelihood method was used to test the research model. As empirical evidence shows that relational capital is positively associated with firm performance (Carey et al., 2011; Yeung et al., 2009; Villena et al., 2011; Kim and Nguyen, 2018), we controlled the direct impacts of supplier, internal, and customer relational capital on financial performance when testing the model. The results of the structural model are shown in Figure 2. The fit indices ($\chi^2(975) = 1487.038$, RMSEA = 0.041, NNFI = 0.944, CFI = 0.947, and SRMR = 0.086) are better than the cut-off values suggested by Hu and Bentler (1999). Thus, the model is acceptable. The findings reveal that the effects of the control variables (i.e., size and industries) are not significant. Moreover, we find that the direct impacts of supplier, internal, and customer relational capital on financial performance are not significant. The results show that supplier relational capital is positively and significantly associated with supplier green management ($b = 0.336$, $p < 0.001$). Customer relational capital is positively and significantly associated with customer green management ($b = 0.321$, $p < 0.001$). Internal relational capital significantly enhances supplier ($b = 0.358$, $p < 0.001$), internal ($b = 0.607$, $p < 0.001$), and customer ($b = 0.378$, $p < 0.001$) green management. Supplier ($b = 0.265$, $p < 0.001$), internal ($b = 0.308$, $p < 0.001$), and customer ($b = 0.172$, $p < 0.05$) green management are positively and significantly associated with financial performance.

=====Insert Figure 2 about here=====

We further used the bootstrap method to examine the direct effects of relational capital

on financial performance and the indirect effects of relational capital on financial performance through GSCM (Preacher and Hayes, 2008). After 5,000 bootstrapped resamples, the results show that the direct impact of supplier relational capital on financial performance is -0.174 and the bias-corrected 95% confidence interval is [-0.415, 0.032]; the direct impact of internal relational capital on financial performance is 0.133 and the bias-corrected 95% confidence interval is [-0.117, 0.391]; and the direct impact of customer relational capital on financial performance is -0.040 and the bias-corrected 95% confidence interval is [-0.415, 0.032]. Due to the inclusion of zero in the confidence interval, the direct effects of supplier, internal, and customer relational capital on financial performance are not significant (Preacher and Hayes, 2008). We also find that the indirect effect of supplier relational capital on financial performance is 0.124 and the bias-corrected 95% confidence interval is [0.035, 0.275]; the indirect effect of internal relational capital on financial performance is 0.365 and the bias-corrected 95% confidence interval is [0.199, 0.578]; and the indirect effect of customer relational capital on financial performance is 0.050 and the bias-corrected 95% confidence interval is [0.002, 0.123]. Therefore, the indirect effects of supplier, internal, and customer relational capital on financial performance are significant. To further investigate the indirect effects of internal relational capital on financial performance through internal, supplier, and customer green management, we conducted a bootstrap mediation analysis using the SPSS PROCESS (Hayes, 2013). The results are reported in Table 5. The results are consistent with the findings from the bootstrap and SEM method. We find that the indirect effect of supplier relational capital on financial performance through supplier green management is 0.270 and the bias-corrected 95% confidence interval is [0.150, 0.392]; and the indirect effect of customer relational capital on financial performance through customer green management is 0.171 and the bias-corrected 95% confidence interval is [0.084, 0.271]. Therefore, H1 and H2 are supported. In addition, the indirect effect of internal relational

capital on financial performance through supplier green management is 0.098 and the bias-corrected 95% confidence interval is [0.019, 0.193]; that through internal green management is 0.129 and the bias-corrected 95% confidence interval is [0.038, 0.228]; and that through customer green management is 0.076 and the bias-corrected 95% confidence interval is [-0.005, 0.176]. Therefore, H3 and H4 are supported, whereas H5 is not supported.

=====Insert Table 5 about here=====

6. Discussion

The findings reveal that supplier green management fully mediates the impact of supplier relational capital on financial performance. This result is consistent with the existing empirical evidence on the positive impact of supplier green management on performance outcomes (e.g. Zhu et al., 2007b; Eltayeb et al., 2011; Yu et al., 2017) and with the social exchange theory, which holds that relational capital facilitates resource exchange and collaboration in a supply chain (Das and Teng, 2002). Our finding further reveals that supplier green management carries the effects of supplier relational capital on financial performance. Therefore, building trust and friendship and maintaining close interactions with suppliers do not necessarily lead to improved financial performance. A manufacturer must materialize the relational capital by motivating suppliers to cooperate and invest in green manufacturing practices (Yeung et al., 2009; Zhang et al., 2018). Supplier relational capital can improve physical and information flows and facilitate the exchange of knowledge and resources in supply chains (Wang and Zhang, 2019; Carey et al., 2011). The value of the knowledge and resources depends on how they are applied in implementing and improving supply chain processes such as supplier green management (Geng et al., 2017). Therefore, if a manufacturer does not adopt supplier green management, it cannot fully capture the positive effect of supplier relational capital on financial performance.

We also find that customer green management fully mediates the impact of customer

relational capital on financial performance. This finding is consistent with previous results on the positive relationship between environmental management and performance outcomes (e.g. Youn et al., 2013; Chen and Hung, 2014; Luo et al., 2014) and corroborates the argument that social relations promote customer cooperation (Laari et al., 2016; Geng et al., 2017). The findings further reveal that the impact of customer relational capital on financial performance is transmitted through cooperation with customers on green product design, production, and logistics. Relational capital facilitates the exchange of knowledge and information between a manufacturer and customers about environmental management strategies and operational practices and processes (Carey et al., 2011). However, the knowledge and information may not directly bring about improved financial performance if they are not applied to transform the operations and processes in downstream supply chains (Villena et al., 2011; Zhang et al., 2018). Therefore, cooperation with customers in implementing green manufacturing practices enables a manufacturer to realize the value of knowledge and information about sustainable development (Li and Huang, 2017; Kim and Nguyen, 2018) and hence strengthens the impact of customer relational capital on financial performance.

The results show that internal and supplier green management mediate the impact of internal relational capital on financial performance, whereas the indirect effect of internal relational capital on financial performance through customer green management is not significant. These findings reveal that supplier, internal, and customer green management play different roles in transmitting the impact of relational capital on financial performance. Relational capital at multiple levels between functional departments allows a manufacturer to develop consistent environmental strategies and objectives to guide internal operations and collaboration with suppliers (Youn et al., 2013 Villena et al., 2011). Environmental strategies thus improve performance by means of internal green management. Unless practices such as the ISO 14000/14001 environmental management system, investment recovery, and

eco-design are implemented, it is difficult to achieve environmental objectives (Miroshnychenko et al., 2017; Luthra et al., 2015), and hence the value of internal relational capital cannot be realized. Similarly, green purchasing and supplier management practices are essential for a manufacturer to benefit from supplier interaction and cooperation (Yu et al., 2017; Kumar et al., 2019). If a manufacturer does not use environmental criteria in supplier selection, evaluation, and auditing and in purchasing decisions, the supplier management interface developed through internal relational capital cannot improve inter-organizational processes (Zhu and Sarkis, 2007; Gopal and Thakkar, 2016). Hence, supplier green management is also crucial for the impact of internal relational capital on financial performance. Although the findings show that internal relational capital improves customer green management, which then improves financial performance, customer green management does not mediate the impact of internal relational capital on financial performance. Customer green management focuses on cooperation with customers to integrate green practices into product design, production, and logistics processes (Srivastava, 2007; Zhu and Sarkis, 2004). Although internal relational capital can lead to a consistent environmental strategy and interface for cooperation with customers (Carter and Carter, 1998; Woo et al., 2016), the effectiveness of the cooperation is determined by customer relational capital. As a result, customer green management does not affect the impact of internal relational capital on financial performance. In addition, supplier and customer green management have different focuses. The former mainly concerns a manufacturer's purchasing and supplier management practices; the latter mainly involves cooperation between a manufacturer and customers in implementing green practices (Zhu and Sarkis, 2004; Zhu et al., 2013). Therefore, the manufacturer plays a significant role in the implementation of supplier green management, whereas the efficacy of customer green management is jointly determined by the manufacturer and customers. As a result, the impact of internal relational capital on financial

performance is mediated by supplier green management, not by customer green management.

7. Managerial implications

These findings show how Chinese manufacturers can gain competitive advantages through exploiting the joint effects of supply chain relational capital and GSCM. First, we suggest that manufacturers build relational capital with suppliers to implement supplier green management (Youn et al., 2013). For example, we recommend that manufacturers hold regular and frequent meetings with suppliers and use information systems to share information with them about green manufacturing (Villena et al., 2011). Training should be provided to employees to develop a culture of respect in supplier management. Relationship-specific investments, such as supplier sustainability development, help build trust between suppliers (Liu et al., 2017). Formal and informal social activities, such as seminars, workshops, and parties, should be organized to develop friendships with suppliers (Zhang et al., 2018). The findings also reveal that supplier green management improves financial performance and mediates the impacts of supplier relational capital. We thus recommend that manufacturers implement supplier green management at the same time to reap the benefits of supplier relational capital and supplier green management. For example, we suggest that they use environmental criteria in supplier selection and evaluation and purchase eco-labeled products (Zhu and Sarkis, 2004; Lee et al., 2015). Manufacturers should also provide environment requirements to suppliers and collaborate with them to develop environmental objectives (Gopal and Thakkar, 2016).

Second, we suggest that manufacturers build customer relational capital to cooperate with customers on green operations (Geng et al., 2017). For example, we suggest that manufacturers develop formal inter-organizational processes to maintain close relations with customers and use information systems to share information and knowledge related to

product design, production, and logistics with customers (Chan et al., 2012). We also recommend manufacturers involve customers in internal operations and invest in customer relationship management to build trust. Training should be provided to employees to develop a culture of respect in customer relationship management. Formal and informal social activities, such as exhibitions, training, and parties, should be organized to develop friendships with customers (Carey et al., 2011). We also find that customer green management improves financial performance and mediates the impacts of customer relational capital. We thus recommend that manufacturers implement customer green management and build customer relational capital at the same time to capture their synergic effects. For example, we suggest that they cooperate with customers to implement eco-design, cleaner production, green packaging and logistics, and product takeback (Zhu and Sarkis, 2004; Zhu et al., 2013).

Third, we suggest that manufacturers develop internal relational capital for implementing internal, supplier, and customer green management. For example, we recommend that manufacturers use multi-functional teams and cross-functional meetings to enable employees to work closely together when implementing green manufacturing projects (Yu and Huo, 2018). Intra-organizational processes and information systems should be created to facilitate information sharing between functional departments (Zhang et al., 2018). Fair evaluation and feedback and rewards systems should be developed to build trust between employees. Manufacturers should also establish a culture of respect through training and creating a safe, healthy, and happy workplace. Formal and informal social activities, such as training, seminars, and parties, should be organized to establish friendship between employees. We also find that internal green management increases the impacts of internal relational capital on financial performance. We thus suggest that manufacturers adopt internal green management when developing internal relational capital. For example, we suggest that

manufacturers establish ISO 14000/14001 environmental management systems and involve every department in environmental improvement and mitigating environmental impacts (Zhu and Sarkis, 2004; Gopal and Thakkar, 2016). We recommend that manufacturers focus on designing products for reduced consumption of material and energy and for reuse, recycling, and recovery of materials and components (Zhu et al., 2017). Marketing and production departments should collaborate to sell scrap or used materials and excess inventory and materials (Zhu et al., 2013). Moreover, the findings reveal that supplier green management mediates the impact of internal relational capital, and hence we suggest that manufacturers implement supplier green management when investing in internal relational capital.

8. Conclusions

This study contributes to the literature in two ways. First, it enhances knowledge on the impact of supplier, internal, and customer green management on performance outcomes (e.g. Wu et al., 2012; Carter and Carter, 1998; Ehergott et al., 2013; Geng et al., 2017). The findings provide empirical evidence that supplier, internal, and customer green management are positively associated with financial performance, revealing that implementing GSCM enables a manufacturer to gain competitive advantages (Green et al., 2019; Laari et al., 2016). It also provides a potential explanation of previous mixed results on the impacts of GSCM practices on performance outcomes by revealing that manufacturers must implement supplier, internal, and customer green management together, instead of adopting individual practices piecemeal (Eltayeb et al., 2011; Choi et al., 2018; Famiyeh et al., 2018). In addition, our study links supplier, internal, and customer relational capital with GSCM, thus enhancing current understandings of the antecedents of GSCM (Kumar et al., 2019). The results show that internal relational capital improves internal green management, that supplier and internal relational capital are positively associated with supplier green management, and that

customer and internal relational capital improve customer green management. The results provide empirical evidence on the distinctive effects of supplier, internal, and customer relational capital on supplier, internal, and customer green management. We also show that internal relational capital plays a critical role in building GSCM. The findings thus extend existing knowledge on the consequences of relational capital and shed light on how to motivate suppliers and customers to invest in GSCM.

Second, this study reveals that GSCM mediates the impact of relational capital on financial performance. The findings provide a potential explanation of previous mixed results on the impacts of relational capital on performance outcomes (e.g. Carey et al., 2011; Villena et al., 2011). We find that supplier/customer relational capital improves financial performance indirectly, through supplier/customer green management, respectively. Moreover, the findings reveal that internal relational capital improves financial performance indirectly through supplier and internal green management, but not through customer green management. These findings reveal the distinctive effects of supplier, internal, and customer green management in transmitting the effects of relational capital. The study thus provides a holistic picture of the complex interrelationships between relational capital and GSCM (Woo et al., 2016; Geng et al., 2017) and insight into the synergic effects between GSCM and relational capital on performance outcomes. Therefore, the findings enhance current understandings of how GSCM contributes to financial performance by revealing that GSCM not only directly improves performance but also affects the impacts of relational capital.

This study has four main limitations, which open avenues for future research. First, the hypotheses were tested using a cross-sectional survey. A longitudinal study design with objective data, such as annual company reports, could be used to validate the findings and establish causality. Second, we focused on the joint impacts of relational capital and GSCM. Researchers have argued that other types of social capital, such as cognitive and structural

capital, can also influence collaboration in supply chains (Carey et al., 2011; Villena et al., 2011). Future studies could empirically investigate how different dimensions of social capital (relational, cognitive, and structural capital) jointly influence GSCM and performance outcomes. Third, the joint effects of relational capital and GSCM may be affected by contextual factors. Future studies could take a contingency perspective to explore the effects of moderating factors (e.g. business and institutional environment, strategic orientation and supply chain characteristics) on the relationship between relational capital and GSCM. Fourth, this study was based on data collected using a single respondent approach, which is a limitation. Future studies could collect data from multiple respondents for different sections of the questionnaire.

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Appendix: Measurement items

Relational capital

Supplier relational capital

The relationship with the major supplier is characterized by:

SRC01: close interactions at multiple levels.

SRC02: mutual trust at multiple levels.
SRC03: mutual respect at multiple levels.
SRC04: mutual friendship at multiple levels.
SRC05: high levels of reciprocity.

Internal relational capital

The relationship between different functions is characterized by:

IRC01: close interactions at multiple levels.
IRC02: mutual trust at multiple levels.
IRC03: mutual respect at multiple levels.
IRC04: mutual friendship at multiple levels.
IRC05: high levels of reciprocity.

Customer relational capital

The relationship with the major customer is characterized by:

CRC01: close interactions at multiple levels.
CRC02: mutual trust at multiple levels.
CRC03: mutual respect at multiple levels.
CRC04: mutual friendship at multiple levels.
CRC05: high levels of reciprocity.

Green supply chain management

Supplier green management

SGM01: Providing design specifications to the major supplier, including environmental requirements for purchased items.
SGM02: Cooperation with the major supplier for environmental objectives.
SGM03: Environmental audit for the major supplier's internal management.
SGM04: Supplier's ISO 14001 certification.
SGM05: Second-tier supplier environmentally friendly practice evaluation.
SGM06: Purchasing eco-labeling products.
SGM07: Selecting the major supplier using environmental criteria.

Internal green management

IGM01: Total involvement in environmental improvements.
IGM02: ISO 14000/14001 environmental management systems exist.
IGM03: Cross-functional cooperation for mitigating environmental impacts.
IGM04: Design of products for reduced consumption of material or energy.
IGM05: Design of products for reuse, recycling, and recovery of materials and components.
IGM06: Investment recovery (sale) of excess inventory or materials.
IGM07: Sale of scrap or used materials.

Customer green management

CGM01: Cooperation with the major customer on eco-design.
CGM02: Cooperation with the major customer on cleaner production.
CGM03: Cooperation with the major customer on green packaging.
CGM04: Cooperation with the major customer on using less energy during product transportation.
CGM05: Adopting third-party logistics.
CGM06: Cooperation with the major customer on product takeback.
CGM07: Cooperation with the major customer on reverse logistics relationships.

Financial performance

FP01: Growth in profit.

FP02: Return on investment.

FP03: Growth in return on investment.

FP04: Return on sales.

FP05: Growth in return on sales.

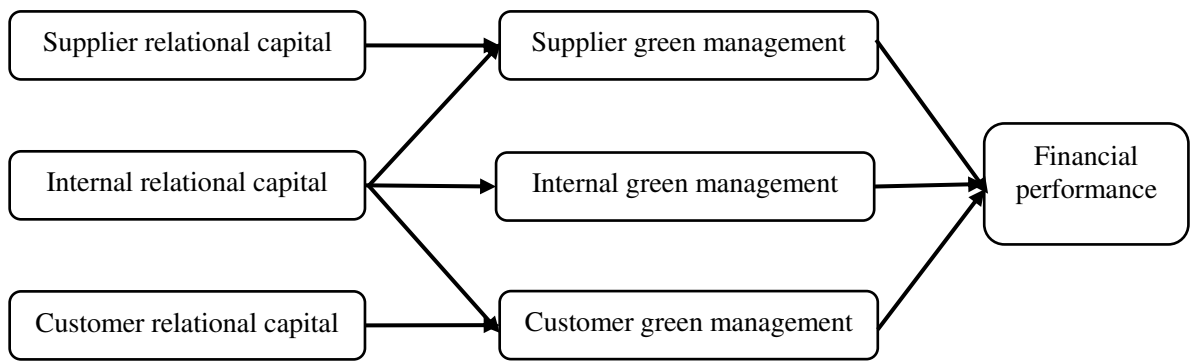
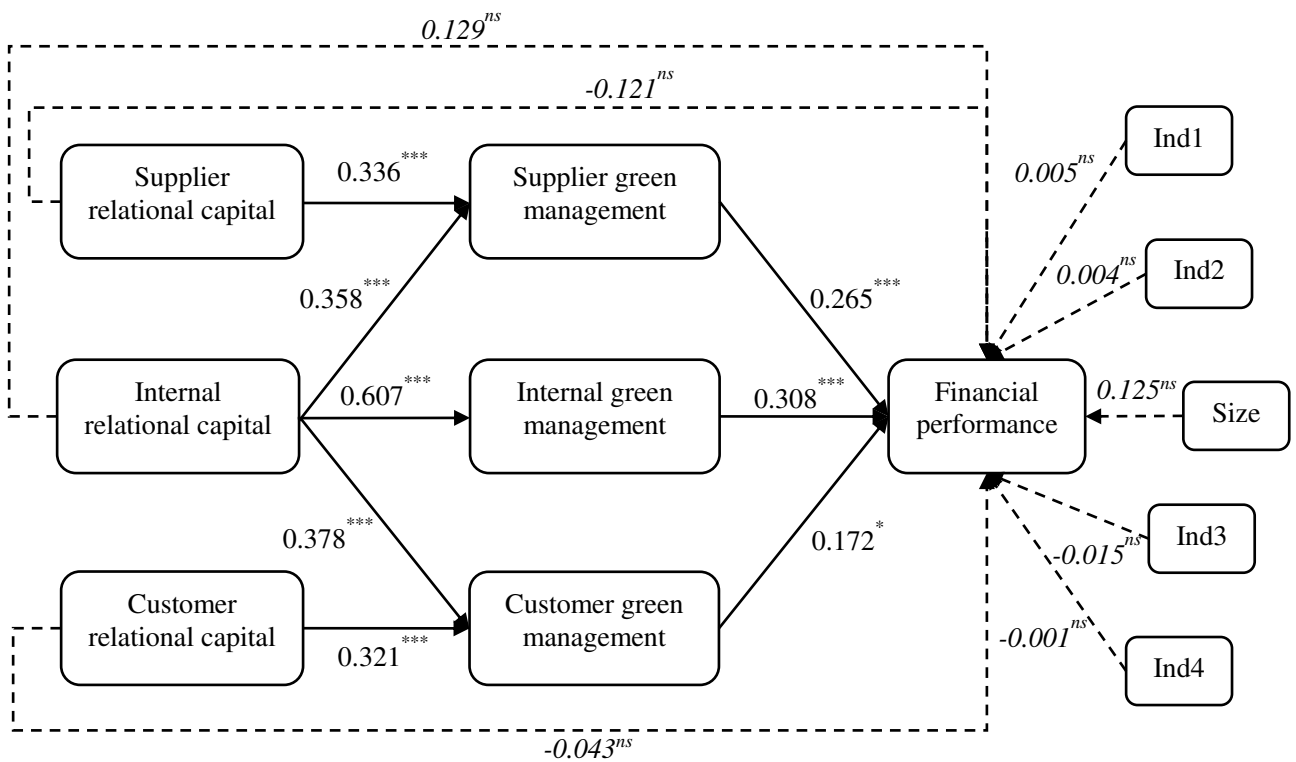


Figure 1. Conceptual framework



Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns: not significant; Ind1: Building materials, rubber, and plastics; Ind2: Chemicals, textiles, and apparel; Ind3: Electronics and electrical; Ind4: Food, beverage, and medical

Figure 2. Structural model results

Table 1. Profiles of sample companies

	Percentage
<i>Industry</i>	
Building materials, rubber, and plastics	16.9
Chemicals, textiles, and apparel	15.6
Electronics and electrical	17.5
Food, beverage, and medical	17.5
Metal, mechanical, and engineering	32.5
<i>Age of company</i>	
1-5 years	8.4
6-10 years	24.7
11-15 years	23.7
16-20 years	20.5
21-30 years	14.3
31 years or more	8.4
<i>Number of employees</i>	
100-199	18.8
200-499	36.7
500-999	21.8
1,000-4,999	16.9
5,000 or more	5.8
<i>Sales (in RMB)</i>	
5-10 million	1.3
10-20 million	11.7
20-50 million	18.8
50 million-1 billion	24.0
1 billion or more	44.2

Table 2. Respondent characteristics

Position	% of respondents	Years in current position	% of respondents
Top manager	37.6	1-3 years	15.6
Middle manager	59.8	4-6 years	34.4
Other	2.6	7-12 years	36.4
		More than 12 years	13.6

Note: Top manager: chairman, general manager, and CEO. Middle manager: operations manager, supply chain manager, and other functional managers.

Table 3. Confirmatory factor analysis

Item	Loading	T-value	Cronbach's α	Composite reliability	Average variance extracted
Supplier relational capital					
SRC1	0.795	15.591	0.834	0.836	0.506
SRC2	0.677	12.556			
SRC3	0.705	13.242			
SRC4	0.697	13.052			
SRC5	0.674	12.479			
Internal relational capital					
IRC1	0.808	16.568	0.882	0.887	0.613
IRC2	0.809	16.598			
IRC3	0.818	16.891			
IRC4	0.816	16.840			
IRC5	0.651	12.307			
Customer relational capital					
CRC1	0.906	20.500	0.963	0.963	0.839
CRC2	0.914	20.835			
CRC3	0.916	20.909			
CRC4	0.935	21.694			
CRC5	0.908	20.577			
Supplier green management					
SGM1	0.854	18.526	0.948	0.948	0.724
SGM2	0.808	16.994			
SGM3	0.880	19.470			
SGM4	0.818	17.313			
SGM5	0.867	18.990			
SGM6	0.880	19.434			
SGM7	0.846	18.257			
Internal green management					
IGM1	0.669	12.728	0.879	0.881	0.515
IGM2	0.702	13.557			
IGM3	0.703	13.575			
IGM4	0.736	14.466			
IGM5	0.760	15.128			
IGM6	0.669	12.718			
IGM7	0.778	15.657			
Customer green management					
CGM1	0.850	18.340	0.940	0.941	0.695
CGM2	0.810	17.007			
CGM3	0.816	17.196			
CGM4	0.847	18.221			
CGM5	0.847	18.228			
CGM6	0.854	18.474			
CGM7	0.809	16.974			
Financial performance					
FP1	0.827	17.415	0.920	0.921	0.699
FP2	0.851	18.209			
FP3	0.860	18.498			
FP4	0.820	17.187			

Note: SRC - supplier relational capital; IRC - internal relational capital; CRC - customer relational capital; SGM - supplier green management; IGM - internal green management; CGM - customer green management; FP - financial performance.

Table 4. Correlations, mean, and standard deviation

Variable	SRC	IRC	CRC	SGM	IGM	CGM	FP
Supplier relational capital (SRC)	<i>0.707</i>						
Internal relational capital (IRC)	0.370***	<i>0.787</i>					
Customer relational capital (CRC)	0.349***	0.482***	<i>0.917</i>				
Supplier green management (SGM)	0.442***	0.436***	0.465***	<i>0.854</i>			
Internal green management (IGM)	0.428***	0.497***	0.541***	0.490***	<i>0.721</i>		
Customer green management (CGM)	0.374***	0.460***	0.498***	0.471***	0.513***	<i>0.837</i>	
Financial performance (FP)	0.212***	0.388***	0.340***	0.446***	0.476***	0.425***	<i>0.837</i>
Size	-0.069	0.012	0.120	0.034	0.063	0.069	0.130
Building materials, rubber, and plastics	-0.073	-0.037	-0.041	-0.081	-0.056	0.003	-0.017
Chemicals, textiles, and apparel	-0.006	-0.008	0.045	0.043	-0.042	0.018	-0.001
Electronics and electrical	0.108*	0.100*	0.080	0.016	0.107*	0.078	0.024
Food, beverage, and medical	0.027	-0.032	-0.072	0.046	-0.062	-0.061	-0.038
Mean	5.507	5.458	4.978	4.999	5.360	5.091	4.918
Std. deviation	0.776	1.008	1.072	1.325	0.945	1.189	1.083

Note: The square root of the average variance extracted is shown on the diagonal in bold and italics; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Table 5. The indirect effects of relational capital on financial performance through GSCM

	Indirect effect	Bias-corrected 95% confidence interval		Hypothesis testing
		Lower bound	Upper bound	
H1: SRC→SGM→FP	0.270	0.150	0.392	Supported
H2: CRC→CGM→FP	0.171	0.084	0.271	Supported
H3: IRC→IGM→FP	0.129	0.038	0.228	Supported
H4: IRC→SGM→FP	0.098	0.019	0.193	Supported
H5: IRC→CGM→FP	0.076	-0.005	0.176	Not supported

Note: SRC - supplier relational capital; IRC - internal relational capital; CRC - customer relational capital; SGM - supplier green management; IGM - internal green management; CGM - customer green management; FP - financial performance.