Governance mechanisms and green customer integration in China: The joint effect of power and environmental uncertainty

Abstract

Drawing on transaction cost economics and social exchange theory, we explore the impact of governance mechanisms on green customer integration and the moderating effects of power and environmental uncertainty. Using data from 206 Chinese manufacturers, we can show that both contractual control and relational norms facilitate green customer integration. Interestingly, the promotional effects of contractual control and relational norms are undermined if manufacturers exert mediated power. Furthermore, the weakened effect of mediated power on the relationship between contractual control and green customer integration is strengthened by demand uncertainty. Conversely, the strengthened impact of non-mediated power on the relational norms–green customer integration relationship is strengthened by demand uncertainty as well as technological uncertainty. This study extends current green supply chain research by revealing that governance mechanisms are antecedent to green customer integration in emerging markets, from the perspective of interfirm relationship management. This study also contributes to transaction cost economics and social exchange theory by revealing how the effectiveness of governance mechanisms on green customer integration varies under different types of power and environmental uncertainty.

1. Introduction

In recent decades, manufacturers in emerging markets have been repeatedly made aware of global environmental concerns and informed by academics and practitioners about the adoption of environmentally friendly programs and the production of green products (Chiou et al., 2011; Dong et al., 2019; Feng et al., 2020; Zhao et al., 2020). For instance, manufacturers in emerging markets are required to produce goods without using hazardous materials (Zhang et al., 2020) and to decrease the negative effect of their production processes on the environment. Therefore, it is vital for these manufacturers to adopt environmentally friendly production practices. To ensure that environmental standards meet market requirements, scholars have strongly advocated for green customer integration (GCI), which facilitates close cooperation between manufacturers and customers to undertake green designs and clean production of sustainable products (Yang et al., 2020; Zhu et al., 2008; Zhang et al., 2020; Zhao et al., 2020).

In previous studies, GCI is mainly treated as a downstream dimension of green supply chain integration, and its individual or synergetic (i.e., interactions with green internal or supplier integration) effects on different kinds of performance (financial, environmental, innovation, etc.) are the focus of attention (e.g., Huo and Han, 2020; Wong et al., 2020; Zhang et al., 2019; Kong et al., 2020). However, other critical elements, such as how GCI is determined in the first place and what boundary conditions underly its formation, are largely ignored. As an outcome of strategic collaboration with customers, GCI is not predetermined, and its extension is likely to depend on manufacturer relationships with customers.

Unlike traditional customer integration, which focuses on information sharing, coordination, and synchronisation with customers in the product flow (Zhao et al., 2008), GCI emphasises whole-process control of the product to minimise environmental disruption for the length of

the pipeline, from concept and design to delivery and aftersales with customers (Du et al., 2018; Feng et al., 2018). Moreover, unlike the unidirectional flow of a product from manufacturer to customer in traditional customer integration, GCI may also contain a reverse-directional flow from customers to manufacturers, such as product recycling or reuse (Zarbakhshnia et al., 2019). As a result, GCI demands both highly efficient and flexible coordination relationships with customers. From the perspective of interfirm relationship management, governance mechanisms are effective in increasing both the efficiency and flexibility of partnerships (Poppo and Zenger, 2002). The literature typically differentiates governance mechanisms as transactional or relational (e.g., Poppo and Zenger, 2002; Liu et al., 2009). As conceptualised by transaction cost economics (TCE), transactional mechanisms emphasise regulating firm behaviours through economic incentives and rationales to effectively increase efficiency (Liu et al., 2009). In contrast, social exchange theory (SET) describes how relational mechanisms tend to influence firm behaviour through social interactions and internal conscientiousness, which benefits flexibility (Yang et al., 2016). Thus, the question naturally arises as to whether different kinds of governance mechanism affect GCI, which after all requires high levels of both efficiency and flexibility.

Furthermore, the effectiveness of governance is contingent on culture, traditions, and the institutional environment, especially in emerging markets (Shou et al., 2016; Zhou et al., 2016). SET posits that the social environment inevitably influences business transactions (Granovetter, 1985). For example, Chinese society is characterised by less legislation and high power distance (Zhao et al., 2008). The impact of power on economic exchanges in China is greater than in Western countries because both the effectiveness and acceptance of power-based behaviours are much higher in high power distance and low legitimacy societies (Hofstede et

al., 2002; Wang and Clegg, 2002). As a result, the effect of a manufacturer's governance mechanisms on GCI will be largely contingent on that manufacturer's relative power over customers. For instance, from the power–dependence theory perspective, if the manufacturer is more powerful in a manufacturer–customer relationship, customers are relatively more dependent on the manufacturer, and accordingly, it is easier for the manufacturer to ask the customer to share information and support its operations (Zhao et al., 2008; Teimoury et al., 2010). Moreover, the moderating effects of mediated power (i.e., reward, sanction, legal legitimacy) and non-mediated power (i.e., possession of information, expertise, and market reputation) on the governance–GCI link are likely to be different. For instance, manufacturers' use of rewards and punishments in mediated power may decrease customers' confidence, hindering the adoption of GCI with governance mechanisms. Non-mediated power, in contrast, represents reasonable persuasion and imperceptible guidance that signals long-term collaboration (Geyskens et al., 1999). Customers' perceptions of manufacturers' non-mediated power may increase their confidence in collaborative activities with manufacturers, such as GCI.

In addition, as emerging markets are characterised by rapid development (Tang, 2018), uncertainty-related problems such as fast technology turnover and inaccurate demand information make it hard for firms to forecast and to design production plans (Yang and Zhao, 2016; Choi and Luo, 2019). As demonstrated by TCE, uncertainty is one of the three major factors that shape the effectiveness of governance mechanisms (Williamson, 1985). Researchers have noted that emerging markets are often distinguished by high levels of environmental uncertainty that induce increased transaction risks and widespread opportunistic behaviour (Li et al., 2010). Therefore, environmental uncertainty is likely to interact with

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power over customers in the governance–GCI relationship. High levels of environmental uncertainty may increase the likelihood that mediated power will result in opportunistic behaviour, which further hinders the effectiveness of governance mechanisms in promoting GCI. In contrast, uncertain environments help non-mediated power to signal an intention to undertake long-term collaboration (Geyskens et al., 1999), an action which will be beneficial to the governance–GCI relationship.

To address the questions outlined above, we draw on TCE and SET to investigate the effects of manufacturer governance mechanisms on GCI. Specifically, we explore the roles of contractual control and relational norms in regulating GCI, and the joint moderating effects of power over customers and environmental uncertainty on the relationship between governance and GCI.

Our study makes three contributions to the literature on green supply chain management in emerging markets. First, by operating through the lens of interfirm relationship management, we broaden the perspective on green supply chain management by exploring whether governance mechanisms are antecedents in the adoption of GCI. Our results show that in emerging markets, both contractual control and relational norms significantly promote GCI. Therefore, our research expands the green supply chain literature by revealing that considerations of GCI should include coordination and safeguarding functions in supply chain relationships, such as contractual control and relational norms.

Second, we propose and empirically confirm the significance of power over customers. Our results suggest that mediated power suppresses the positive effects of contractual control and relational norms on GCI, whereas the moderating effects of non-mediated power are not significant. The results recast the prior argument that mediated powers "disturb" supply chain

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management practices and represent distrust, hindering a firm's willingness to agree to GCI. Third, this study extends the TCE literature by exploring the interactions between environmental uncertainty, power relationships, and governance mechanisms in a firm's GCI. In doing so, we respond to the call from Yang and Zhao (2016) to consider environmental uncertainty in governance mechanisms in emerging markets.

Moreover, our study provides important insights for operation managers in emerging markets. For instance, we recommend that operation managers use governance mechanisms, such as contractual clauses or mutually agreed relational norms, to facilitate collaboration with customers in the adoption of GCI. However, they should be cautious about manufacturers' power over customers and environmental uncertainties because these factors may individually or jointly affect customers' willingness to obey contractual rules and relational norms in the adoption of GCI.

The remainder of this paper is structured as follows: Section 2 describes the theoretical background, while Section 3 presents our hypotheses. Our research method is outlined in section 4, and our analysis and results are shown in section 5. Section 6 discusses the contributions and implications of the study, leading into our conclusions in Section 7.

Theoretical Background

2.1 Green customer integration (GCI)

In the implementation of GCI, manufacturers integrate customers into the promotion of environmentally-friendly products and the adoption of operational practices that minimise adverse effects on the environment (Wu, 2013; Feng et al., 2018; Huo et al., 2020). To do so successfully, manufacturers must effectively and efficiently manage their collaborative relationships with customers by establishing mutual goals, sharing information, making joint

decisions, and solving problems together (Wu, 2013). For instance, customers can share their knowledge about environmental improvements, enabling firms to speed up their learning process and therefore promotes he adoption of green practices (Lau et al., 2010). Indeed, Verona (1999) indicated that customer integration is an effective way to acquire external resources and knowledge from customers. Therefore, firms that take advantage of customer integration are better able to promote green initiatives and improve their performance (Lau et al., 2010).

From a customer-oriented perspective, GCI reflects the joint efforts of manufacturers and their customers to meet the environmental requirements of the market, which ultimately leads to better financial performance by maximising customer satisfaction and loyalty (Palmatier et al., 2007). For instance, firms with customer-orientated supply chain practices tend to perform better financially (Kibbeling et al., 2013) because customer-oriented firms often have a deep understanding of market trends and demands (Deshpandé et al., 1993). Therefore, to remain competitive in this global age, manufacturers ought to adopt customer-oriented practices, such as GCI, to improve both their environmental and financial performance (Cherrafi et al., 2018; Wong et al., 2020). The customer-oriented perspective has received increasing attention in the marketing literature, but its application in the supply chain setting requires further exploration, especially in relation to "green" issues.

2.2 Applying a relationship governance lens to GCI

Firms depend on governance mechanisms to improve the efficiency and flexibility of their partnerships (Liu et al., 2009; Yang et al., 2016). By using one entity's authority, power, or other resources, governance mechanisms can influence another entity's decisions and behaviours toward the fulfilment of mutual gains (Luo, 2007). Specifically, governance can

safeguard parties' interests, foster coordination between exchange partners, and facilitate

adaptation to disturbances from exogenous or endogenous forces (Schepker et al., 2014).

2.2.1   *Transaction cost economics (TCE) and contractual control*

TCE holds a prominent place in the field of interfirm relationship management. Taking the

assumption of bounded rationality and pursuit of self-interest, TCE demonstrates how

exchange hazards, such as asset specificity and uncertainty, influence governance decisions

(Williamson, 1985). According to TCE, as firms are always rationally bounded and self-

interested, they are likely to behave opportunistically in market transactions where an internal

hierarchical authority is absent, resulting in a need for alternative governance mechanisms

(Geyskens et al., 2006; Williamson, 1985). TCE suggests mechanisms to emphasise

monitoring and regulating firm behaviour through stipulating the threat of economic sanctions

and offering incentives in the form of economic rewards (Williamson, 1985; Liu et al., 2009;

Cui et al., 2018). An obvious way to achieve this is to clearly specify relevant clauses in a

mutually agreed-upon contract.

By clearly specifying each side's duties and obligations, contracts manage exchange

relationships by coordinating partners' behaviours and safeguarding firms from their

counterpart's opportunism (Zhou and Poppo, 2010, 864; Lumineau and Malhotra, 2011).

Contracts also establish shared goals, arrange information sharing and interaction (Mayer and

Argyres, 2004), and establish steering committees, consultative meetings, and design processes

to adapt to contingencies (Poppo and Zenger, 2002) between exchange partners. These

initiatives reduce information asymmetry and misunderstanding and at the same time induce

commitment and task fulfilment. Poppo and Zhou (2014) characterised contracts based on

complexity and recurrence, which work together to improve performance by enhancing partners' perceptions of procedural and distributive fairness.

2.2.2 *Social exchange theory (SET) and relational norms*

Unlike TCE, SET emphasises governing transactions through social interactions and socially embedded relationships (Granovetter, 1985; Liu et al., 2009). It proposes that economic actions become progressively involved in social relationships (Granovetter, 1985), which not only meet firms' requirements for social interactions in economic exchanges but also inevitably affect their economic decisions (Uzzi, 1997). Social connections generate standards of expected behaviours that remove incentives for opportunism or malfeasance and lead to shared norms that increase commitment to, and maintenance of, cooperative relationships (Seabright et al., 1992). That is, social exchange logic plug joint benefits and cooperative behaviours into the inner needs of firms, convincing them to engage in normative behaviours by self-enforcing and moral control. The most commonly adopted socially based governance mechanism is relational norms.

Relational norms, which are a combination of solidarity, flexibility, and information sharing, have received the most intensive attention in the framework of relational mechanisms (Heide and John, 1992; Yang et al., 2016). Solidarity represents a belief that partners' interests are highly congruent, that each side brings value to the relationship, and that outcomes can be maximised if all parties work together (Rokkan et al., 2003). It pushes firms from their natural self-centred approach to one that is more significantly focused on joint gains and common responsibilities (Cannon et al., 2000). Information sharing is also critical, as it allows partners to obtain necessary information freely and in a timely manner (Heide and John, 1992), thereby reducing both asymmetry between partners and firm expenditures on information-gathering. In

turn, this helps to increase the quality of decision-making in both organisations and builds trust between the two firms (Liu et al., 2016; Yang et al., 2016). Lastly, flexibility means that partners are better able and more willing to adapt in the face of unforeseen events (Heide and John, 1992). This is extremely important when pursuing joint solutions and mutual goals in dynamic and uncertain environments.

The literature suggests that there are some similarities and connections between transactional and relational mechanisms. While TCE strongly advocates the economic "safeguarding" function of contracts, in practice it is impossible for a contract to codify every possible transaction contingency. Recent studies suggest that for a contract to be effective in situations that are not specified in the contract, the relational capabilities of contracts should be realised –

in terms of coordination, adaptation, building fairness, and creating trust (Poppo and Zhou, 2014; Schepker et al., 2014). Thus, a contract can be considered to contain both transactional and relational features. Likewise, many scholars explain the effects of relational mechanisms from a transactional perspective. For instance, early studies in SET treat social behaviours as goods in an exchange, in order to clarify the relationship between behavioural psychology and economics (Homans, 1958). MacNeil (1980) and Gençtürk and Aulakh (2007) view relational norms as a relational contract in which the norms contain mutually agreed behaviour specifications. That is, we can say that relational mechanisms address a legal and institutional framework in "a socially confined economic structure" (Liu et al., 2009).

2.3 Contingent factors of governance mechanisms

TCE and SET both suggest some important contingent factors that may influence the effectiveness of governance mechanisms. TCE advocates that the main purpose of governance

mechanisms is to reduce transaction costs, which are mainly induced by uncertainty, asset specificity, and transaction frequency (Williamson, 1985). Uncertainty is the most complex of these factors due to its varied sources and its significant effect on business partnerships (Yang et al., 2016). Similarly, SET highlights the important role of social power in business partnerships, as governance is a power-based mechanism to some extent (Luo, 2007). The effectiveness and acceptance of power-based behaviours are inevitably influenced by power disparities between partners (Zhao et al., 2008). As contracts and relational norms have both transactional and relational features, their effectiveness is likely to be influenced simultaneously by power and uncertainty.

2.3.1   Power

Power, which can be defined as the capability of one party to affect the attitudes, decisions, and behaviours of the other, plays a key role in the management of inter-firm relationships (Brown et al., 2009; Luo et al., 2011). Achieving GCI requires a high level of customer coordination in information sharing and joint actions. From the perspective of power–dependence theory, if a manufacturer is more powerful in a manufacturer–customer relationship, the manufacturer has control over resources that customers need and can help customers achieve goals that the customers cannot achieve themselves (Kumar et al., 1995; Auh and Merlo, 2008). Thus, customers are relatively more dependent on the manufacturer, and accordingly, it is easier for the manufacturer to solicit information and request operational support (Zhao et al., 2008; Teimoury et al., 2010). Conversely, if customers are in the superior position, it will be more difficult for the manufacturer to achieve customer compliance. Such impacts of power in economic exchanges are more prominent in societies characterised by high

power distance and low legitimisation, such as China (Hofstede et al., 2002). Thus, it is necessary to explore the moderation effects of power on the link between governance and GCI.

The most commonly recognised typology of power differentiates between mediated (i.e., reward, sanction, legal legitimacy) and non-mediated (i.e., possession of information, expertise, market reputation) examples (Brown et al., 1995). In situations of mediated power, the reinforcements that evoke the less powerful party's decisions or behaviours are external inputs that are owned by the more powerful party. If the less powerful party does not behave as the source party wishes, the more powerful party can use reinforcing behaviours (i.e., providing economic rewards, exerting economic sanction, taking legal action) to exert power (Rezaboklah et al., 2006). Although mediated power can significantly improve the compliance of exchange partners by emphasising immediate rewards and punishments for a partner's compliant or deviant behaviour, it undoubtedly adds tension and pressure to transactions (Frazier and Rody, 1991; Brown et al., 2009). In contrast, the reinforcements of non-mediated power reside with the *less* powerful party. That is, the more powerful party cannot directly force the less powerful party to behave as it wishes; it can only indirectly use its power bases (i.e., possession of information, expertise, market reputation) to guide the less powerful party's attitude, faith, willingness, or conscientiousness to perform certain behaviours (Kim, 2000).

2.3.2 *Environmental uncertainty*

The multidimensional concept of environmental uncertainty refers to the degree of difficulty of accurately predicting changes of various factors in both the general environment and business relationships (Huo et al., 2018). The literature mainly focuses on environmental uncertainty in demand, supply, technology, and the legal system (Yang and Zhao, 2016; Srivastava et al., 2018; Zhao et al., 2018). Demand and supply uncertainty is associated with

micro exchanges between business partners, in which the demand from downstream buyers and supply from upstream suppliers are highly fluctuant (Yang and Zhao, 2016). As the focus of this study is downstream green integration with customers, we therefore exclude supply uncertainty. Technology and legal system uncertainty derive from the macro environment. Technology uncertainty refers to the rapid succession of technologies (Wu, 2013). As a technology-intensive practice, manufacturers' green production depends heavily on the breakthrough and turnover of advanced green technologies. Thus, technology is critical to the implementation of GCI. In contrast, with the increasing worldwide awareness of the importance of environmental protection, regulations concerning green production are typically treated as the external institutional factors of green supply chain integration (Yang et al., 2020). Thus, in this study, we use demand uncertainty and technological uncertainty to jointly portray environmental uncertainty and explore their impacts on the moderating effects of power in the governance–GCI link.

3   Hypotheses

3.1 The impact of governance mechanisms on GCI

We argue that manufacturer contractual control can facilitate customer adoption of GCI. By implementing a contractual control approach, manufacturers are better able to ensure that their customers' roles, obligations, and responsibilities are well fulfilled, which contributes to the promotion of GCI (Zhu and Lai, 2019; Cui et al., 2018). For example, manufacturers can include customers' environmental requirements as a pre-qualification criterion in the contract (such as the green elements in a design) to support GCI (Zhu and Lai, 2019). Moreover, information flows more efficiently between focal firms and their customers under contractual control, which facilitates the sharing of common rules and procedures for the adoption of GCI

(Liu et al., 2009; Cui et al., 2018). Both manufacturers and their customers tend to obey contractual terms and resist opportunism. Contracts coordinate manufacturer–customer collaborations and safeguard participants' investments in the relationship, which effectively reduces transaction costs in the partnership and ultimately promotes GCI (Williamson, 1985; Liu et al., 2009). Therefore, we hypothesise the following:

H1: Contractual control has a positive impact on the adoption of GCI.

GCI requires manufacturers to maintain a whole-process and in-depth collaboration, information sharing, and joint action with customers. The sense of belonging and reciprocity inherent in relational norms promotes customer agreement with manufacturer beliefs and actions, and their willingness to share valuable market information about their needs and organisational resources related to green production (Yang et al., 2016). These resources can be intangible, such as inter-organisational learning and the atmosphere of solidarity that occurs in a collaborative bond ensured by relational forms in general (Rokkan et al., 2003), and are therefore hard to regulate through listing as contractual items. In addition, the solidarity and flexible nature of relational norms more easily allows for adjustments when contingencies occur (Liu et al., 2009). This helps manufacturers to quickly reach a consensus and switch to a new product design or production method in the face of changing customer demands or green regulations. In the long run, these joint actions lead to mutual commitments between manufacturers and customers, encouraging firms and customers to perform their duties spontaneously and work together toward GCI (Seabright et al., 1992; Liu et al., 2016; Yang et al., 2016). Therefore, we hypothesise the following:

H2: Relational norms have a positive impact on the adoption of GCI.

3.2 The moderating effect of power over customers

Consistent with the logic of SET, we posit that manufacturers' mediated power over customers significantly reduces the impact of both contractual control and relational norms on GCI. First, mediated power emphasises immediately rewarding compliance and punishing evasion, regardless of past relations and future long-term development orientation (Brown et al., 1995). Contractual control and relational norms require exchange partners to comply with contractual terms and consciously adjust their own behaviours (Yang et al., 2016). The means of immediate reward and punishment may undermine customer expectations of exchanges and reduce the recurrence of contracts. Customers are likely to perceive that they are only one-time, temporary exchange partners and can be easily replaced if the manufacturer is unwilling to develop a long-term relationship with them. Although governance mechanisms can achieve apparent compliance in customers, they cannot obtain customers' internal sense of identity and belongingness. As a result, customers may shirk contractual terms and relational norms for sharing information, investing resources, and conducting joint actions with the manufacturer (Huo et al., 2019).

Second, manufacturers' use of mediated power forces customers to obey a contract and align with the manufacturers' values, decisions, and strategies, which creates significant tension. This makes firms think that when conflicts occur, their partners will not care about their interests and will take tough actions to protect their own interests (Pfajfar et al., 2015), such as filing lawsuits. The blatant challenge to the autonomous decision-making by customers will inevitably result in resentment and confrontational behaviour on behalf of the consumer and their advocates, inducing transaction costs of monitoring and maladaptation that ultimately undermine the effects of contractual control and relational norms on the adoption of GCI. Therefore, we predict the following:

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H3: The impacts of (a) contractual control and (b) relational norms on GCI are weaker when a manufacturer's mediated power over its customers is high rather than low.

Unlike mediated power, which reacts to the target firm's instant actions, non-mediated power uses reasonable persuasion and suggestive guidance to influence the internal decision-making of the target firm so that it can work toward mutual goals or meet the expectations of the source firm (Payan and Nevin 2006; Brown et al., 2009). One of the benefits of non-mediated power is that it causes a firm to perceive an exchange relationship as beneficial to itself and encourages the firm to internalise itself into the relationship (Geyskens et al., 1999). In the context of manufacturer–customer relationships, non-mediated power from manufacturers conveys trust and signals a long-term outlook to customers. This means customers are more inclined to value the relationship and have faith in the manufacturer's ability and morality, strengthening their belief that they will work together to achieve mutually held goals. In this situation, customers will be more likely to fulfil contractual terms and more willing to work closely with the manufacturer in order to support green practices.

Moreover, the central influential mechanism of non-mediated power is that the target thoroughly processes the source's information, reference, or expertise and accepts them as its own (Payan and McFarland, 2005). Thus, non-mediated power effectively establishes a "relational exchange environment" between partners for reciprocal information sharing, learning, knowledge transfer, negotiation, and discussion for constructive joint problem-solving and flexible adjustments to future contingencies (Jap et al., 1999; Brown et al., 2009). As a result, once manufacturers signal an expectation and willingness to share information and undergo joint action with customers to enhance their green practices via relational norms, non-mediated power helps customers to better understand and internalise manufacturer intentions.

Thus, GCI can receive greater customer support and be implemented more effectively. Accordingly, we propose the following hypothesis:

H4: *The impacts of (a) contractual control and (b) relational norms on GCI are stronger when a manufacturer's non-mediated power over its customers is high rather than low.*

3.3 The moderating role of environmental uncertainty

We assume that the negative moderating effect of mediated power over customers on the governance–GCI link is significantly magnified when environmental uncertainty is high. Specifically, the customer tie is volatile when the manufacturer suffers from demand uncertainty. An unpredictable and turbulent downstream environment implies a failure to obtain timely and effective information from customers (Wu, 2013; Sun et al., 2009). Mediated power that asserts direct intervention in customer decisions and behaviours is unsuitable for dealing with uncertainty (Brown et al., 2009). After all, it generates intense pressure and depletes customer willingness to express production preferences and share useful information on green improvement practices (Jain et al., 2014; Wang et al., 2019). In this situation, neither contractual control nor relational norms can prevent costly customer churn.

Moreover, technological uncertainty reflects a general environment in which unique technologies arise rapidly (Wu, 2013). The manufacturer faces intensive market competition and must act to fulfil its customer orientation by enhancing governance mechanisms (Yang et al., 2016). A manufacturer that suffers from technological uncertainty cannot follow up promptly on technology updates, and instead must resort to contracting terms and relational norms to seek customer knowledge about green technologies (Lau et al., 2010; Zhao et al., 2018). Mediated power imposed in a turbulent environment exacerbates partners' rebelliousness and is overall harmful to trust-building and long-term orientation (Jain et al., 2014). Thus, greater uncertainty in both demand and technology strengthens the negative

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moderating effects of mediated power over customers in the governance mechanisms–GCI link, and we posit the following:

H5a-H5b: The negative moderating effects of mediated power over customers on the impacts of (a) contractual control and (b) relational norms on GCI are stronger when the level of demand uncertainty is high rather than low.

H5c-H5d: The negative moderating effects of mediated power over customers on the impacts of (a) contractual control and (b) relational norms on GCI are stronger when the level of technological uncertainty is high rather than low.

In contrast, non-mediated power incentivises information sharing and promotes an atmosphere of solidarity to address market turbulence (Liu et al., 2010). Demand uncertainty implies that discrepancies between final products and market preferences are inevitable (Zhao et al., 2018). Discontinuity and increasing turbulence will cause customers to panic and lose faith in long-term commitments. Manufacturers that exert non-mediated power enhance trust-building by exchanging information and sharing their expertise with customers (Jain et al., 2014). In this case, non-mediated power, as a gentle force, can better promote the autonomy of customers to make expected decisions that conform to the purpose of governance mechanisms.

In addition, the requirements for new technologies and production revolutions are often unexpected when dominant technologies change rapidly (Wu, 2013). Accompanied by successive innovation and potential costs, technological uncertainty attenuates the initial contract effects and generates transaction risks in manufacturer–customer relationships (Handley et al., 2012). Cutting-edge manufacturers that drive the technological revolution to exert non-mediated power to pass on their values to customers, which motivates the acceptance and adoption of new green technology outcomes. For general manufacturers, unpredictable conditions magnify the benefits of non-mediated power that focus on trust-building and a long-term orientation, facilitating governance mechanisms to drive customer integration for green initiatives. Hence, we propose the following:

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H6a-H6b: *The positive moderating effects of non-mediated power over customers on the impacts of (a) contractual control and (b) relational norms on GCI are stronger when the level of demand uncertainty is high rather than low.*

H6c-H6d: *The positive moderating effects of non-mediated power over customers on the impacts of (a) contractual control and (b) relational norms on GCI are stronger when the level of technological uncertainty is high rather than low.*

4 Method

4.1 Sampling and data collection

As the world's main manufacturing base, China is one of the most promising emerging economies. However, a great number of Chinese manufacturers are suffering from the effects of environmental pollution. It is estimated that during the past 20 years, costs related to environmental pollution and ecological degradation have accounted for 7% to 20% of China's GDP (Li et al., 2019). As a result, many manufacturers have implemented green supply chain practices to minimize pollution damage to the environment. Furthermore, as an important part of the global supply chain, Chinese manufacturers are obliged to take the initiative in green supply chain management. We therefore chose China as our research context.

From August 2017 to May 2018, we collected survey data from Chinese manufacturers. We strategically selected five representative provinces: Shandong, Jiangsu, Guangdong, Henan, and Shaanxi. Guangdong and Jiangsu are in the Pearl River Delta and Yangtze River Delta, respectively, areas with the highest levels of economic development and marketization in China. Shandong is in the Bohai Sea region and is representative of average levels of economic development and marketization in China. Henan and Shaanxi are in the central region and northwest region, respectively, and are in relatively early stages of economic development and market reform. Thus, our sample has firms from highly developed, moderately developed, and under-developed areas. Together, they form a sample that represents the real economic development level of China as a whole (Zhang et al., 2020).

We first obtained a list of more than 1200 firms from local governments. Then, we randomly chose 120 manufacturers in each of the five provinces (600 total). We contacted these companies to ask whether they would be willing to participate in our survey. A key informant, generally holding the position of CEO, vice president, or department manager, was identified in each company. Finally, we sent out the questionnaire accompanied by a cover letter ensuring confidentiality and explaining our research purpose to the 284 companies that agreed to participate. We also suggested to the respondents that they could consult with others if they had difficulty answering any of the questions.

According to Krause et al. (2018), informants' viability should be determined based on the cognitive perspective of the research question. Key informants can offer an unbiased opinion because they are observers but not necessarily the final decision maker (Krause et al., 2018). If a single informant's cognitive perspective is sufficient for the research question in a study, the study can be based on data from single informant. For instance, in Poppo and Zenger (2002)'s investigation about governance mechanisms from the perspective of interfirm relationship management, the cognitive perspective of the focal firm (the implementer of the governance mechanisms) is essential and sufficient to describe both the form and degree of the governance mechanisms. As a result, a single key informant (in this case, the CEO, vice president, or department manager involved in customer relations) is able to offer a relevant view and we only collected data from the focal firm. Similarly, as our research concept is predominantly experienced and understood by the focal firm, we opted to select a single key informant within each focal firm who was knowledgeable about GCI adoption and the relationship with a given customer (Krause et al., 2018; Montabon et al., 2018). Moreover, we also conducted interviews with 10 randomly selected managers from the sample pool to define

the research scope (Montabon et al., 2018). Finally, we made sure that the selected managers had been working in the company for more than six years to ensure that they had had enough time to develop a relationship with their customers (Montabon et al., 2018).

We received 206 valid questionnaires after several rounds of reminders, yielding a response rate of 34.3%. On average, the respondents had worked in their current positions for 6.2 years. As a result, these participants were eligible to answer the survey questions. We present the profile of respondents' characteristics in Table 1.

[INSERT TABLE 1 ABOUT HERE]

4.2 Questionnaire design and measure development

Measures in English were first selected. Two researchers in operations management translated them into Chinese, and another two researchers then completed back-translations to ensure conceptual equivalence. Several items were reworded after comparing the back-translated measures with the English ones. A pilot test was performed by interviewing executives from 10 randomly selected firms in different industries, including transport, machinery and electrical equipment, and others. These executives were responsible for operations management or supply chain management, and had the required knowledge to answering the questionnaire. Some further modifications were made according to their feedback.

All of the key constructs were measured on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The scale items are presented in Appendix A.

Governance mechanism. Three items measuring contractual control were obtained from Liu et al. (2009) and Li et al. (2010). Five items measuring relational norms were adapted from Griffith and Myers (2005).

Power over customers. Five items measuring mediated power and four items measuring non-mediated power were adapted from Wang et al. (2015). In a dyadic inter-firm relationship, a firm's power over its partner is typically measured from the partner's perspective. In our study, there is no particular dyadic relationship in each individual sample. Thus, it is hard to decide from which customer to measure the manufacturer's power. Furthermore, the manufacturer's power measured from any one customer cannot accurately represent manufacturers' power over customers in general. In light of this, we measured manufacturer's power over customers as a relative power comparison of customers' power over the manufacturer from the manufacturer's perspective.

Environmental uncertainty. Both demand uncertainty and technological uncertainty were assessed using three items adopted from Wu (2013).

GCI. We measured *GCI* using six items adopted from Wu (2013) and Vachon and Klassen (2008).

Control variables. We included firm size, firm age, longevity of relationship, industry type, sample location, competitive intensity and transaction-specific investment as control variables. We measured firm size using the natural log of the number of employees. Firm age was assessed using the natural log of number of years since the firm was founded. We evaluated relationship longevity using the natural log of the number of years since the commercial relationship was established. We measured industry type with a dummy variable equal to 1 for high-polluting industries. Sample location was measured using four dummy variables, with Henan as the baseline. We assessed competitive intensity using four items adopted from Bode et al. (2011), and we measured transaction-specific investment using four items adapted from Liu et al. (2009).

4.3 Non-response bias and common-method variance

We first examined non-response bias by comparing the responding companies with the non-responding companies. *T*-test results reveal non-significant differences between the two groups in terms of number of employees and annual sales ($p > 0.1$). Further, we used ANOVA to evaluate the differences between early and late respondents. A chi-square test indicates that there are no significant differences in the constructs ($p > 0.1$). Thus, we conclude that there is no serious non-response bias.

The threat of common method variance (CMV) was reduced by using distinct instructions for each construct and placing them into different parts of the questionnaire (Liu et al., 2016). Further, we measured the constructs by applying 3–6 items, and the items used to assess one construct were different in content (Liu et al., 2016; Zhao et al., 2011). Third, an exploratory factor analysis (EFA) revealed 10 factors with eigenvalues greater than one. The cumulative explaining variance is 75.9%, and the first factor only explains 17.5% of the variance. Hence, CMV is not an issue (Podsakoff et al., 2012). Fourth, we assessed CMV by comparing three models: the one-factor model, the confirmatory factor analysis (CFA) model, and the method model (Liu et al., 2016; Zhao et al., 2011). The fit indices of the one-factor model are worse ($\chi^2/df = 5888.05/819 = 7.189$; RMSEA = 0.20; CFI = 0.44; NNFI = 0.41; SRMR = 0.18) than those of the CFA model ($\chi^2/df = 1596.79/774 = 2.063$; RMSEA = 0.077; CFI = 0.92; NNFI = 0.91; SRMR = 0.082). Although the method model marginally improves the fit indices of the CFA model (ΔCFI = 0.03, ΔNNFI = 0.03), the common factor only explains 5.0% of the total variance. Furthermore, the factor loadings are still significant, indicating the robustness of the CFA model (Liu et al., 2016; Paulraj et al., 2008). Finally, following the suggestions of Lindel and Whiteney (2001), we selected social desirability bias as a marker variable to check the

CMV. The correlations were adjusted by the lowest positive correlation between the marker variable and focal variables ($r = 0.019$). As depicted in Table 3, significant correlations were still significant after they were adjusted. Hence, the influence of CMV is not significant.

4.4 Reliability and validity

We used CFA to assess the unidimensionality of our constructs. The fit indices of the CFA model are satisfactory ($\chi^2/df = 1596.79/774 = 2.063$; RMSEA = 0.077; CFI = 0.92; NNFI = 0.91; SRMR = 0.082) (Hair et al., 2006). Further, the squared multiple correlation (R^2) of each measure exceeds the threshold value of 0.30 (Liu et al., 2016). Hence, the unidimensionality of this study is good. We examined reliability using Cronbach's alpha and composite reliability (CR). As presented in Table 2, Cronbach's alpha and the CR of each construct are greater than the widely accepted critical value of 0.70 (Hair et al., 2006), indicating that the constructs in this study have sufficient reliability.

We developed measurement items by referring to previous studies related to green supply chain management, carefully synthesizing and evaluating existing construct scales, and performing an iterative procedure followed by a pilot test. Hence, we are confident that content validity is ensured (Zhao et al., 2011). The results in Table 2 reveal that the standardized factor loading of each item is above 0.60 and significant ($p < 0.001$), confirming convergent validity (Hair et al., 2006). Moreover, the average variance extracted (AVE) values of all the constructs exceed the threshold value of 0.50, which provides further evidence of adequate convergent validity. Discriminant validity was assessed by comparing the square root of AVE of each construct with correlations between the construct and others. As shown in Table 3, the square root of AVE for each construct is higher than the shared variance between constructs. Hence, discriminant validity is confirmed. Further, the unconstrained CFA model was compared with

constrained models for all possible pairs of constructs. We fixed the correlation between the paired constructs at 1.0 in the constrained model. All of the chi-square differences are significant ($p < 0.001$), indicating good discriminant validity.

[INSERT TABLES 2 and 3 ABOUT HERE]

5. Data Analysis and Results

5.1 Analysis results

We used skewness and kurtosis to assess the normality of each measurement (Liu et al., 2016). The absolute values of skewness (<0.90) and kurtosis (<1.20) suggest that the requirements of the normality test are met. We also evaluated the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test of sphericity. The results for the KMO measure and the Bartlett test of sphericity are 0.785 and 6605.543, respectively ($p < 0.001$) (Paulraj et al., 2008). Hence, our measures follow a normal distribution, and our hypotheses can be tested using hierarchical regression analysis. Table 3 shows that each inter-construct correlation is smaller than the cut-off value of 0.60. Moreover, variance inflation factors of predictor variables are lower than 10. Therefore, we can conclude that there is no serious multicollinearity.

We used hierarchical moderated regression analysis to test our hypotheses. This approach is appropriate for confirming that the dependent variable (GCI) is jointly affected by the interactions of the predictors (governance mechanism) and the moderators (power and environmental uncertainty) (Feng et al., 2019; Tsai and Yang, 2013). The regression analysis results are summarised in Table 4. We mean-centred the predictors and moderators before creating the interaction term to mitigate the possible influence of multicollinearity.

[INSERT TABLE 4 ABOUT HERE]

H1 predicts that contractual control is positively related to GCI. The impact of contractual control on GCI is significantly positive ($\beta = 0.121$, $p < 0.1$), providing support for H1. Moving on, H2 assumes that relational norms are positively related to the adoption of GCI. The impact of relational norms on GCI is significantly positive ($\beta = 0.159$, $p < 0.05$). Thus, H2 is also supported.

H3 hypothesises that mediated power negatively moderates the impacts of contractual control and relational norms on GCI. Our results indicate that mediated power weakens the positive relationship between contractual control and green customer integration ($\beta = -0.138$, $p < 0.1$). Thus, H3a is supported. Moreover, the results for Model 3 suggest that the coefficient of the interaction term between relational norms and mediated power is significantly negative ($\beta = -0.156$, $p < 0.05$). Hence, H3b is also supported. We also plotted simple slope graphs (Figures 2 and 3). As you can see in Figure 2, this suggests that the relationship between contractual control and GCI is negative when mediated power is high ($\beta = -0.055$, $p > 0.1$) and conversely positive when mediated power is low ($\beta = 0.254$, $p < 0.05$). These results provide further support for H3a. This continues in Figure 3, which reveals that the relationship between relational norms and GCI is negative when mediated power is high ($\beta = -0.039$, $p > 0.1$) and positive when mediated power is low ($\beta = 0.332$, $p < 0.01$), thus further supporting H3b.

[INSERT FIGURES 2 and 3 ABOUT HERE]

H4 proposes that non-mediated power positively moderates the impacts of contractual control and relational norms on GCI. Our results suggest that the coefficient for the interaction term between contractual control and non-mediated power is non-significant ($\beta = 0.101$, $p > 0.1$). Thus, H4a is not supported. The results for Model 3 also suggest that the coefficient for

the interaction term between relational norms and non-mediated power is non-significant (β = 0.089, $p > 0.1$), indicating that H4b is not supported.

H5 predicts that the negative moderating effects of mediated power will be strengthened by environmental uncertainty. The results for Model 4 show that the three-way interaction of contractual control, mediated power, and demand uncertainty is significant (β = -0.174, $p < 0.05$). This reveals that the moderating effect of mediated power on the link between contractual control and GCI is stronger under high demand uncertainty. Thus, H5a is supported. The results for Model 4 also show that the three-way interaction of relational norms, mediated power, and demand uncertainty is not significant (β = -0.094, $p > 0.1$). This suggests that the moderating effect of mediated power on the link between relational norms and GCI is not significantly affected by demand uncertainty. Hence, H5b is not supported. Moreover, the results for Model 5 suggest that both the three-way interaction between contractual control, mediated power, and technological uncertainty (β = -0.116, $p > 0.1$) and the three-way interaction between relational norms, mediated power, and technological uncertainty ($\beta = 0.066$, $p > 0.1$) are not significant. Thus, hypotheses H5c and H5d are not supported.

Figure 4 shows that the moderating effect of mediated power on the relationship between contractual control and GCI is not significant when demand uncertainty is low. The influence of contractual control on GCI is positive and significant when mediated power is low (β = 0.213, $p < 0.05$), and it increases marginally when mediated power is high ($\beta = 0.280$, $p < 0.05$). However, mediated power negatively and significantly moderates the relationship between contractual control and GCI under a high level of demand uncertainty. The impact of contractual control on GCI is significantly positive when mediated power is low ($\beta = 0.301$, p

< 0.01), and it becomes significantly negative when mediated power is high (β = -0.410, $p <$ 0.01). These results provide further support for H5a.

[INSERT FIGURE 4 ABOUT HERE]

H6 proposes that the positive moderating effects of non-mediated power are strengthened by environmental uncertainty. The results for Model 4 suggest that the three-way interaction of contractual control, non-mediated power, and demand uncertainty is not significant ($\beta = 0.105$, $p > 0.1$). Thus, hypothesis H6a is not supported. The three-way interaction of relational norms, non-mediated power, and demand uncertainty is significant ($\beta = 0.161$, $p < 0.05$), which suggests that the moderating effect of non-mediated power on the link between relational norms and GCI is strengthened by demand uncertainty. Hence, H6b is supported. Moreover, the three-way interaction of contractual control, non-mediated power, and technological uncertainty is not significant ($\beta = -0.025$, $p > 0.1$), while the three-way interaction of relational norms, non-mediated power, and technological uncertainty is significant ($\beta = 0.265$, $p < 0.05$). Thus, H6c is not supported, but H6d is supported.

Figure 5 shows that the moderating effect of non-mediated power on the relationship between relational norms and GCI is negative when demand uncertainty is low. The impact of relational norms on GCI is insignificant when the level of non-mediated power is low ($\beta = 0.106$, $p > 0.1$), and it is still insignificant but becomes weaker when the level of non-mediated power is high ($\beta = 0.063$, $p > 0.1$). However, the moderating effect of non-mediated power on the relationship between relational norms and GCI is positive when demand uncertainty is high. The impact of relational norms on GCI is significantly negative when mediated power is low ($\beta = -0.175$, $p < 0.1$), and it becomes significantly positive when mediated power is high ($\beta = 0.548$, $p < 0.001$). These results provide further support for H6b.

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Figure 6 shows that the moderating effect of non-mediated power on the relationship between relational norms and GCI is negative when technological uncertainty is low. The influence of relational norms on GCI is positive and significant when non-mediated power is low ($\beta = 0.168$, $p < 0.1$), and it becomes non-significant when non-mediated power is high ($\beta = 0.089$, $p > 0.1$). However, the moderating effect of non-mediated power on the relationship between relational norms and GCI is positive when technological uncertainty is high. The impact of relational norms on GCI is significantly negative when non-mediated power is low ($\beta = -0.631$, $p < 0.001$) and becomes significantly positive when non-mediated power is high ($\beta = 0.550$, $p < 0.001$). These results provide further support for H6d.

We followed Dawson and Richter's (2006) procedure to conduct a slope difference test for three-way interaction effects. As shown in Table 5, the slope difference between the high mediated power/low demand uncertainty and low mediated power/low demand uncertainty groups is insignificant ($p > 0.1$), while the slope difference between the high mediated power/high demand uncertainty and low mediated power/high demand uncertainty groups is significantly negative ($p < 0.01$). These results provide further support for H5a. The slope difference between the high non-mediated power/low demand uncertainty and low non-mediated power/low demand uncertainty groups is insignificant ($p > 0.1$), while the slope difference between the high non-mediated power/high demand uncertainty and low non-mediated power/high demand uncertainty groups is significantly positive ($p < 0.001$). These results provide further support for H6b. The slope difference between the high non-mediated power/low technological uncertainty and low non-mediated power/low technological

uncertainty groups is insignificant ($p > 0.1$), while the slope difference between the high non-mediated power/high technological uncertainty and low non-mediated power/high technological uncertainty groups is significantly positive ($p < 0.001$). These results provide further support for H6d.

[INSERT TABLE 5 ABOUT HERE]

5.2 Robustness check

We also conducted path analysis using LISREL 8.80 to revalidate our findings. As shown in Figure 7, the SEM results are qualitatively consistent with our main analysis in Table 4 (i.e., they provide the same support for our hypotheses), which suggests that our findings are robust.

[INSERT FIGURE 7 ABOUT HERE]

5   Discussion and Implications

Drawing on TCE and SET, we investigated the direct and contingent impacts of contractual control and relational norms in governing manufacturers' GCI. Our findings have several implications for both scholars and practitioners.

6.1 Theoretical implications

This study makes several important contributions to the literature. First, it extends green supply chain research by revealing that governance mechanisms are antecedent to GCI in emerging markets. Most existing green supply chain integration studies focus on the different dimensions of integration (e.g., Du et al., 2018; Zhao et al., 2020; Huo et al., 2020) and their individual or joint effects on different types of performance (e.g., Jabbour et al., 2017; Zhang et al., 2019; Wong et al., 2020). However, this means that the actual formation of green supply chain integration is largely unaddressed. From the perspective of inter-firm relationship management, we focus on two types of governance mechanisms—contractual control and

relational norms—and argue that if GCI entails whole-process joint action and information sharing with customers, it should be regulated and safeguarded by governance mechanisms, which are essential to increase cooperation efficiency and maintain flexibility (Liu et al., 2009). The empirical findings strongly support our argument: contractual control and relational norms both significantly promote manufacturers' GCI in emerging markets.

Compared with traditional CI, GCI involves whole-process collaboration and a bi-directional flow of product with customers in cases of product recycling and reuse (Zarbakhshnia et al., 2019). Thus, GCI requires greater efficiency and flexibility in a manufacturer's partnership with its customers. From the perspective of interfirm relationship management, TCE suggests enhancing partnership efficiency by specifying cooperation clauses and economic incentives in a clear contract ex-ante (Williamson, 1985). SET implies that by nurturing an internal sense of belonging and solidarity, relational norms promote firms to consciously make adjustments and provide help to partners, thereby contributing to flexibility contributes to flexibility (Yang et l., 2016). Thus, it is necessary to investigate the effects of contractual control and relational norms on GCI through the lens of interfirm relationship management. Our study enriches the research on green supply chain integration by illustrating the vital role of governance mechanisms play in GCI.

Second, this study enriches SET research by showing that mediated power suppresses the promotional effects of contractual control and relational norms on GCI, which recasts prior views of mediated power as "bad" supply chain management practices (e.g., Brown et al., 1995; Benton and Maloni, 2005; Zhao et al., 2008). From the social perspective, mediated power signals an invasion of partner autonomy (Brown et al., 1995). For customer relationships with detailed contractual clauses, customer duties and obligations in their green integration process

with the manufacturer are clearly defined. The use of mediated power by suppliers to either reward customer compliance or punish customer violations is seen as a signal of distrust in customer fulfilment of their side of the contract. As such, GCI is difficult to achieve and the effect of contractual control will be diminished. Similarly, for customer relationships characterised by relational norms, suppliers' use of mediated power confuses customers about manufacturer willingness to work closely and flexibly for mutual gain. When customers perceive future collaboration and manufacturer support as uncertain or conditional, their motivation to integrate green practices with the manufacturer is unsurprisingly likely to be limited.

However, we found that the proposed positive moderating effects of non-mediated power on the relationship between contractual control and GCI, and between relational norms and GCI, were non-significant. One possible reason for the non-significant relationship may lie in the fact that although non-mediated power gently influences the target's internal intention to cope with the power source, it also produces conflict in supply chain relationships (Frazier and Rody, 1991). In line with SET, when non-mediated power prevails, a trusting, open relationship with frequent communication is fostered (Anderson and Narus, 1990). Partners are motivated to express their disagreements, criticisms, and preferences freely with the aim of better problem-solving and stronger relationships (Frazier and Rody, 1991). More functional conflicts are associated with frequent expressions of disagreements and criticisms. The restraining effect of conflict on firms' compliance behaviour may offset some of the enhancing effects of non-mediated power on the effectiveness of contractual control and relational norms. Alternatively, the lack of significant moderating effects may be ascribed to the data source. As indicated by Frazier and Summers (1984), it takes a long time for non-mediated power to work effectively.

We collected performance data six months after collecting other behavioural constructs, but the data for non-mediated power and GCI were collected at the same time. Therefore, a longer time lag may be needed for non-mediated power to exert significant effects.

The third contribution of this study is our extension of the existing TCE literature concerning the interactions between power, environmental uncertainty, and governance mechanisms in green supply chains. TCE treats uncertainty as a main source of transaction hazards that increase transaction costs (Williamson, 1985). Thus, it is necessary for studies of governance to embrace environmental uncertainty, as the initial purpose of governance is to minimise transaction costs – which TCE suggests are normally a consequence of environmental uncertainty (Yang and Zhao, 2016). A positive perspective suggests that supply chain partners will be more integrated into the appearance of demand uncertainty as they want to communicate frequently and cooperate closely to better adapt to demand changes (Yang and Zhao, 2016). In contrast, other researchers posit that firms prefer to maintain high flexibility so that they can quickly and economically change to a more appropriate partner, which undermines integration (Balakrishnan and Wernerfeit, 1986; Oosterhuis et al., 2011). In this study, we propose that environmental uncertainty may also influence the moderating effects of manufacturer power over customers. Consistent with this proposition, our results indicate the presence of significant moderating relationships. In particular, demand uncertainty negatively moderates the effect of mediated power over customers on the impact of contractual control on GCI. We argue that as downstream uncertainty indicates high unpredictability and insufficient information from customers, intensive information sharing, and flexible adaption are needed. Mediated power induces tension and pressure while signalling distrust to customers. Thus, as

demand uncertainty and mediated power increase, fewer customers comply with contractual terms.

Moreover, although the positive moderating effect of non-mediated power on the relationship between relational norms and GCI is non-significant, two interactions: non-mediated power and demand uncertainty, and non-mediated power and technological uncertainty, positively and significantly moderate the relationship between relational norms and GCI. As indicated previously, the non-significant moderating effect of non-mediated power may lie in partners' ability to freely disagree with and criticise one another. However, when environmental factors (i.e., demand and technology) are highly volatile, firms are likely to be uncertain even about their own strategies and preferences. In this situation, apparent conflicts between customers and manufacturers decline and mutual negotiation and joint trials increase. Customers tend to maintain open communication with the manufacturer and give more solidarity and flexibility to their GCI relationship with the manufacturer to jointly overcome the negative effects of external uncertainties. As a result, the effect of relational norms is amplified.

6.2 Managerial implications

The findings of this study also generate important insights for manufacturers developing GCI in emerging markets. First, when working with customers to establish GCI, manufacturers are encouraged to align with customers using explicit contractual clauses or mutually agreed relational norms. Further, when applying these governance mechanisms, manufacturers in emerging markets are advised to pay attention to their use of power over customers. With more mediated power, meting out rewards and punishments of customer behaviours in too quick or too harsh a manner will be treated as a signal of distrust and a circumvention of decision-

making autonomy by customers. This in turn makes it less likely for customers to obey contractual rules and behavioural norms when implementing green integration with manufacturers. Even though our empirical results do not support the positive moderating effects of non-mediated power on the effectiveness of contractual control and relational norms, manufacturers' managers should view non-mediated power as an important facilitator; it may take time for non-mediated power to show its influence, which is not examined in this study (Frazier and Summers, 1984). For instance, when Lenovo, the world's largest PC manufacturer, initiated its "Just for green" strategy in China, the firm used two strategies to secure customer cooperation in downstream recycling. On one hand, Lenovo signed contracts with customers concerning recycling policy, procedure, and requirements to make customers pay attention to environmental protection. On the other hand, Lenovo gradually signalled the value of energy saving, duplex print, full usage of consumables and so on to customers, thereby seeking to influence customer attitudes towards the firm's green practices. During this process, Lenovo abstained from using its superior position in the supply chain to force customers to comply with its green strategy. Instead, Lenovo used its expertise, information technology, and good practices of environmental protection to help customers to transfer from a pure sales relationship to one that included sales, recycling and a conscious agreement with Lenovo's new greener values.

Moreover, managers in emerging markets should be aware that the moderating effects of mediated and non-mediated power are contingent on the extent of uncertainty in the external environment, particularly uncertainty in terms of demand and technology. The negatively significant moderating effect of demand uncertainty on the negative moderating effect of the influence of contractual control on GCI implies that when customer demands are turbulent,

unstable, or difficult to predict, managers need to realise that their continuous use of mediated power will cause more harm than good to their green integration practice with customers. Under these conditions, responsiveness, flexibility, and reciprocity are needed, which are after all contradictory to the atmosphere and procedures induced by mediated power.

Our results show that the non-significant positive moderating effects of non-mediated power will become significant when demand uncertainty and technological uncertainty is high rather than low. This suggests that when customer demands and technology are highly turbulent, manufacturers in emerging markets should use more of their specialised knowledge, unique expertise, or market-leading reputation in green practice to gradually guide customers' internal attitudes toward green integration. This will help to enhance the promotional effects of governance mechanisms. In contrast, when customer demands are predictable or technology is relatively mature in the market, allocating resources to other areas such as learning, managerial support, or business ties may be a better choice.

Take the manufacturing plant of Federal-Mogul Friction (an automotive OEM manufacturer that specialised in friction products) in Wuhan for instance. After the global spread of the Covid-19 pandemic in the spring of 2020, it faced highly turbulent demand due to unpredictable nature of lockdowns across different areas worldwide. As suggested by the firm's general manager in our interview, under this circumstance, the use of rewards and sanctions wouldn't achieve the desired result, as customers are likely to exaggerate their difficulties and needs in order to get help and avoid punishment of demand backlog from Federal-Mogul Friction. Instead, Federal-Mogul Friction strengthened their real-time communication with customers and used their expertise to guarantee the quality of their supplies, to help customers get through such difficulties. The company also changed from producing a large quantity of relatively few

varieties to small batches of a larger number of varieties, even though this required sacrificing some production efficiency, to better serve their customers' changing needs. These non-mediated influencing behaviours greatly aroused customer recognition and gratitude towards Federal-Mogul Friction and ultimately resulted in greater cooperation and support for the firm's strategies.

6 Conclusion

While scholars and practitioners advocate that highly efficient and flexible partnerships with customers are prerequisites for implementing GCI, there are actually few studies of the effects of governance mechanisms – the main means of improving the efficiency and flexibility of interfirm relationships – on GCI. Our study contributes to green supply chain management literature by empirically supporting the vital roles of contractual control and relational norms in promoting GCI. Further, we show how the governance–GCI link varies with two important contingent variables suggested by TCE and SET. Our empirical evidence based on survey data from 206 Chinese manufacturing firms shows that both contractual control and relational norms can enhance GCI in China. The promotional effects of these norms in emerging markets is undermined by manufacturers exerting mediated power over their customers. Further, the weakened effect of mediated power on the relationship between contractual control and green customer integration is strengthened by demand uncertainty, while the strengthened effect of non-mediated power on the relationship between relational norms and green customer integration is additionally strengthened by technological uncertainty. Although our empirical analysis is based on data from only one country, China, the results are applicable and relevant to many other countries because China is the centre of global manufacturing. It is the only country in the world in which all the industrial categories stipulated by the United Nations are

represented. The added value of China's manufacturing industry in 2018 was $4 trillion USD, more than the sum of the United States ($2.17 trillion USD), Japan ($1.01 trillion USD), and Germany ($805.4 billion USD) combined. China plays a key role in the world's supply chain, and its supply chain practices are therefore relevant to many other countries, especially the vast number of developing countries.

Although this study makes significant contributions to both theory and practice, it is inevitably constrained by several limitations, which call for future research. The first extension of this study is a longitudinal follow up. We argue that non-mediated power can enhance the effectiveness of contractual control and relational norms in promoting GCI. As it takes time for non-mediated power to demonstrate influence, longitudinal proof is needed to empirically validate its effect. Second, GCI is dyadic in nature, and its antecedents may be distinct in different regions. Our data from the manufacturers only offer unilateral perceptions. To document bilateral interactions and better understand the impacts of governance mechanisms, power, and environmental uncertainty on GCI, it is necessary to obtain dyadic data from more firms. A future study could compare effects across distinct regions. In addition, as customers' geographic location may affect GCI, this should be considered when investigating the antecedents of GCI.

The third limitation relates to the fact that we only considered GCI in the conceptual model, leaving green supplier integration and green internal integration unexamined. As the literature reports that the different dimensions of green integration are of nearly equal importance (Du et al., 2018; Wu, 2013), future efforts could meaningfully address each facet of green integration and compare the results in different dimensions of the supply chain. Fourth, due to the difficulty of collecting data from customers, we measured the manufacturer's power over customers as

the relative power comparison of customers' power over the manufacturer from the manufacturer's point of view. According to Brown et al. (1995), it is better to assess manufacturer power as reported by customers in manufacturer–customer dyads. However, according to seminal papers on asymmetric power relations (e.g., Emerson, 1962; Kumar et al., 1995), power is defined and measured from a relative comparison perspective. That is, the more powerful firm A is relative to firm B, the less powerful firm B is relative to firm A. Thus, our measurement approach should not be considered a fatal flaw of this study. We encourage scholars to undertake future endeavours to capture manufacturer power from the perspective of their counterparts. Fifth, similarly, since both the dependent and independent variables are measured by self-reported data from the same informants – the manufacturers – the problem of endogeneity is inevitable. Unfortunately, we do not have sufficient instrument variables in the data set to solve this issue. Therefore, future verification by either well inclusion of instrument variables or model re-examination by panel data are thus needed.

Sixth, we only examine the direct impact of the governance mechanism on GCI. However, governance mechanisms may interact with each other and affect opportunism and trust, which subsequently influence GCI (e.g., Huo et al., 2016; Lai et al., 2013; Zhou and Xu, 2012). Thus, future studies should explore how interactions between different governance mechanisms influence GCI and how governance mechanisms affect GCI through intermediary variables such as opportunism and trust. Finally, to measure environmental uncertainty, we only include demand uncertainty and technological uncertainty. As a multidimensional concept, other dimensions such as supply volatility and legal unenforceability should also be investigated as facets of uncertainty (e.g., Lee, 2002; Yang and Zhao, 2016). It will be fruitful to consider more environmental uncertainty dimensions and evaluate the differences in their moderating effects.

Appendix A. List of measurement items

Contractual control (Liu et al., 2009; Li et al., 2010)

CC1: Our relationship with our major customer is governed primarily by written contracts

CC2: We have formal agreements that detail the obligations and rights of our company and our major customer

CC3: The contract precisely defines the role/responsibilities of our company and our major customer

Relational norms (Griffith and Myers, 2005)

RN1: In the relationship with our major customer, we keep each other informed about events or changes that may affect the other party

RN2: We and our major customer have established good contact with each other to avoid possible misunderstandings

RN3: We and our major customer are consistent with each other's expectations

RN4: We believed that our major customer is willing to cooperate to work out solutions if some unexpected situations arise

RN5: We and our major customer expect to be able to make adjustments in the ongoing relationship to cope with changing circumstances

Mediated power (Wang et al., 2015)

MP1: Our major customer must comply even if our requirements are beyond the contract

MP2: Our major customer cannot gain special treatment if it does not meet our requests

MP3: We usually suggest that we will take action to reduce our major customer's profit if it does not meet our requests

MP4: We will not give our major customer necessary service if it does not meet our requests

MP5: Our major customer avoids many difficulties as it meets our request

Non-mediated power (Wang et al., 2015)

NMP1: We convinced our major customer that it makes sense to follow our suggestions

NMP2: Our business expertise enabled us to give our major customer appropriate suggestions

NMP3: We usually give good advice to our major customer

NMP4: Our major customer did what we anticipated because we had largely congruent business philosophies

Demand uncertainty (Wu, 2013)

DU1: It is difficult to precisely assess customer needs for environmental products

DU2: Anticipating demand for environmental products is frequently inaccurate

DU3: It is difficult to predict customers' future preferences for environmental products

Technological uncertainty (Wu, 2013)

TU1: It is difficult to obtain the latest green manufacturing technologies because of rapid technological changes

TU2: It is difficult to implement green manufacturing technologies because of their high degree of technological complexity

TU3: Many new environmental materials and manufacturing technologies are introduced in rapid succession

Green customer integration (Wu, 2013; Vachon and Klassen, 2008)

GCI1: Achieving environmental goals collectively

GCI2: Developing a mutual understanding of responsibilities regarding environmental performance

GCI3: Working together to reduce environmental impact of our activities

GCI4: Conducting joint planning to anticipate and resolve environmental-related problems

GCI5: Making joint decisions about ways to reduce the environmental impact of our products/services

GCI6: Accumulating and sharing environmental knowledge

Competitive intensity (Bode et al., 2011)

CI1: The business climate for the final product(s) is very competitive

CI2: Anything that one competitor can offer, others can readily match

CI3: Competition in this industry is cutthroat

CI4: Winning in this marketplace is a tough battle

Transaction-specific investment (Liu et al., 2009)

TSI1: We have made significant investments in training our major customer's employees

TSI2: We do a lot to help our major customer become a more efficient and effective customer

TSI3: We specifically designed and developed programs to enhance our major customer's overall business

TSI4: We have made a substantial investment in shipping and distribution facilities tailored for our major customer

Social desirability bias (Hays et al., 1989)

SDB1: I am always courteous even to people who are disagreeable (reversed item)

SDB2: There have been occasions when I took advantage of someone

SDB3: I sometimes try to get even rather than forgive and forget

SDB4: I sometimes feel resentful when I don't get my way

SDB5: No matter who I am talking to, I am always a good listener (reversed item)

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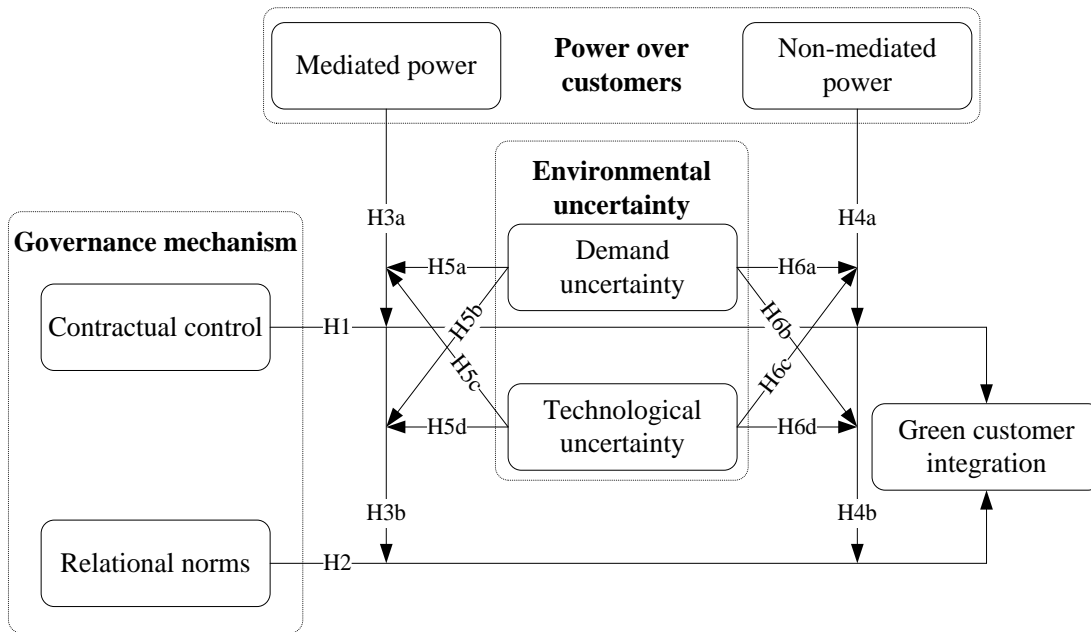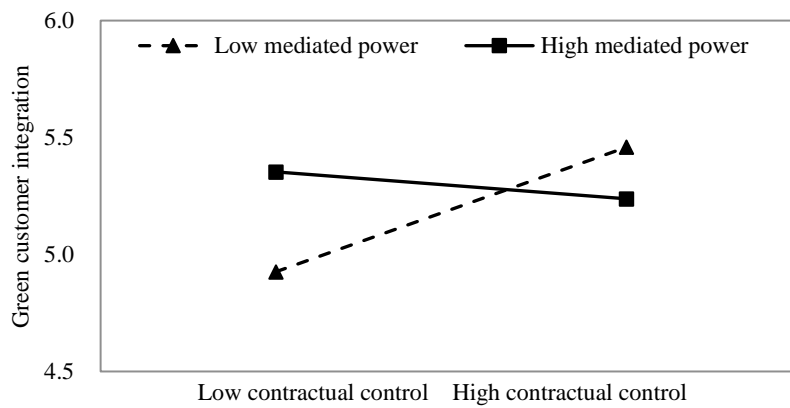
Figure 1 Conceptual model

Figure 2 Contractual control and green customer integration: the moderating role of mediated power
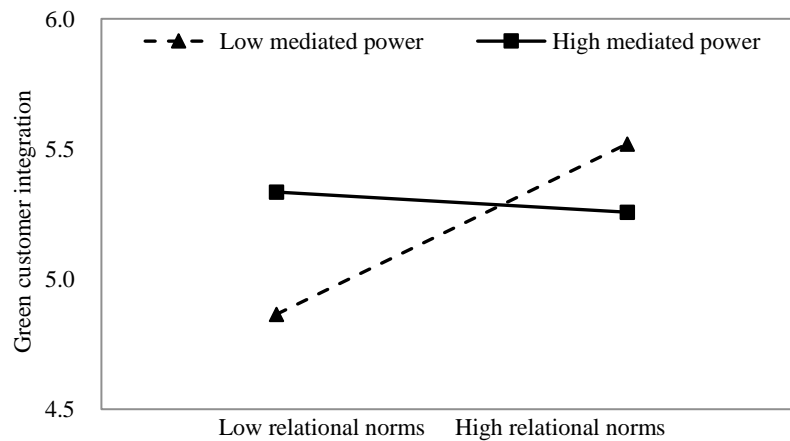

Figure 3 Relational norms and green customer integration: the moderating role of mediated power
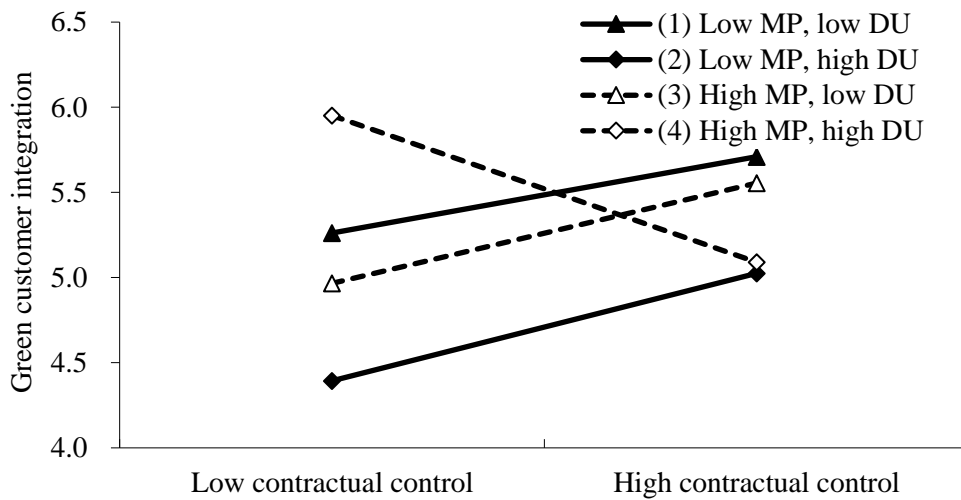
Figure 4 Three-way interaction effect of contractual control, mediated power and demand uncertainty on green customer integration
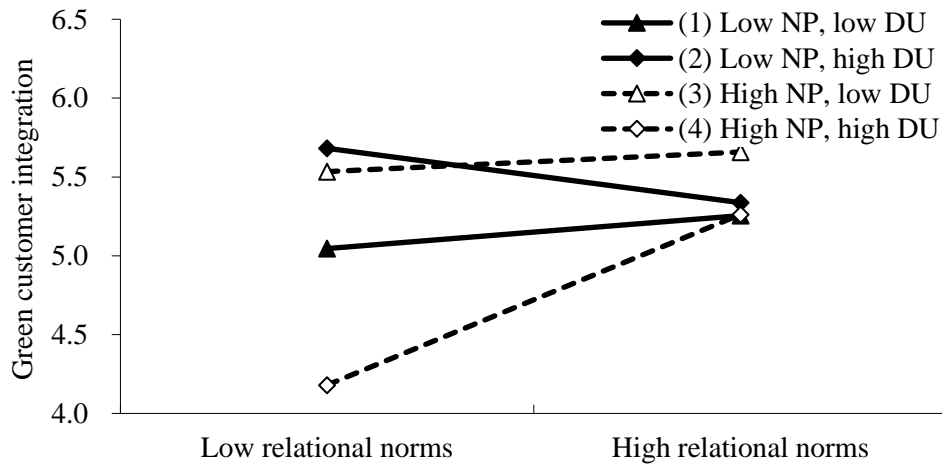

Figure 5 Three-way interaction effect of relational norms, non-mediated power and demand uncertainty on green customer integration
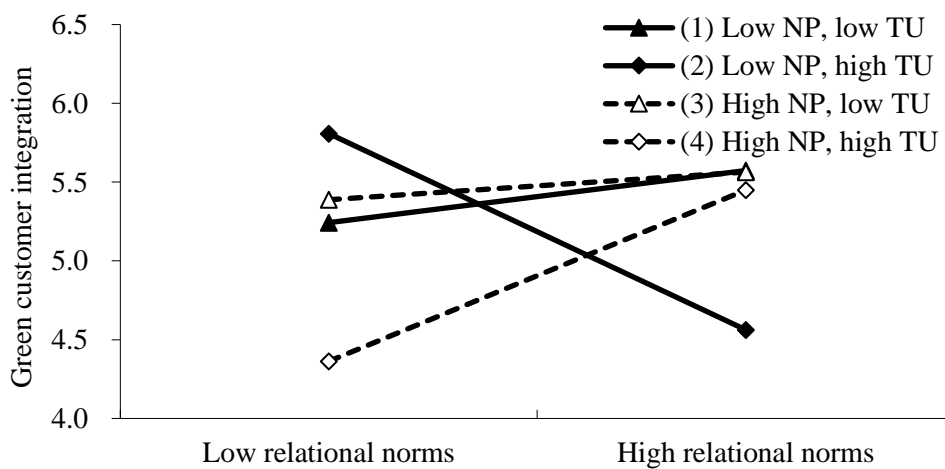

Figure 6 Three-way interaction effect of relational norms, non-mediated power and technological uncertainty on green customer integration
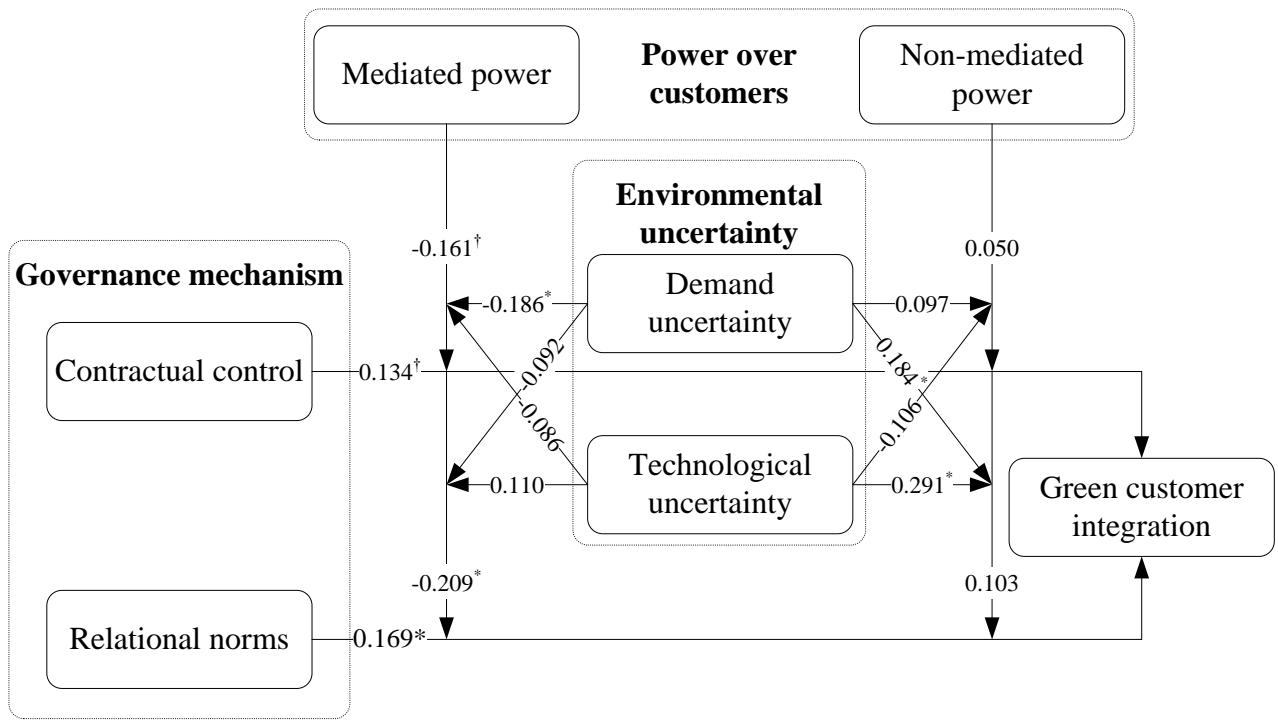
Figure 7 Path analysis results

Table 1 Profile of respondents ($N = 206$)

Characteristics of respondents	Number of firms	Percentage (%)
Positions of informants		
President/CEO/Vice president	20	9.7
Senior managers	57	27.7
Middle-level managers	125	60.7
Low-level managers	4	1.9
Industries		
Chemical and pharmaceutical	21	10.2
Rubber, plastics and non-metallic mineral	27	13.1
Metal	14	6.8
Machinery	18	8.7
Transport	22	10.7
Electrical machinery and equipment	30	14.6
Communication and computers related	45	21.8
Instruments and related	8	3.9
Others	21	10.2
Number of employees		
< 100	30	14.6
100-299	34	16.5
300-999	34	16.5
1000-1999	27	13.1
2000-4999	37	18.0
> 5000	44	21.3
Ownership types		
State-owned	83	40.3
Privately-owned	76	36.9
Foreign-invested	47	22.8

Table 2 CFA results ($N = 206$)

Constructs	Item code	Factor loading	α	CR	AVE
Contractual control	CC1	0.80	0.899	0.903	0.757
	CC2	0.97			
	CC3	0.83			
Relational norms	RN1	0.63	0.840	0.844	0.521
	RN2	0.79			
	RN3	0.68			
	RN4	0.71			
	RN5	0.79			
Mediated power	MP1	0.65	0.909	0.913	0.679
	MP2	0.87			
	MP3	0.81			
	MP4	0.93			
	MP5	0.83			
Non-mediated power	NMP1	0.65	0.801	0.803	0.505
	NMP2	0.70			
	NMP3	0.75			
	NMP4	0.74			
Demand uncertainty	DU1	0.88	0.918	0.918	0.789
	DU2	0.93			
	DU3	0.85			
Technological uncertainty	TU1	0.71	0.776	0.781	0.544
	TU2	0.81			
	TU3	0.69			
Green customer integration	GCI1	0.75	0.927	0.928	0.683
	GCI2	0.86			
	GCI3	0.86			
	GCI4	0.90			
	GCI5	0.81			
	GCI6	0.76			
Competitive intensity	CI1	0.81	0.891	0.896	0.685
	CI2	0.72			
	CI3	0.97			
	CI4	0.80			
Transaction-specific investment	TSI1	0.90	0.943	0.945	0.811
	TSI2	0.92			
	TSI3	0.93			
	TSI4	0.85			
Social desirability bias	SDB1	0.80	0.869	0.870	0.573
	SDB2	0.76			
	SDB3	0.71			
	SDB4	0.73			

SDB5	0.78