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The detrimental effect of institutional forces on green innovations and customer cooperation

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ABSTRACT

Purpose
This study examines how macro (unpredictable government interventions) and micro (*guanxi*) institutional forces moderate the effect of firms' green innovations on green customer cooperation (GCC) practices.

Design/methodology/approach
Using a randomized experimental vignette method, the research collected data from 240 managers in China's electronics sector, each presented with realistic supply chain scenarios. We used Multiple regression analyses to analyze data and test our hypotheses.

Findings
The findings indicate that government intervention has a negative influence on the relationship between green innovations and the adoption of GCC (when government intervention is high, the impact of green innovations on the adoption is weaker). *Guanxi* negatively moderates this relationship as well: at a high level of *guanxi*, the impact of green innovations on the adoption of GCC is significantly weaker.

Originality/value
Our results highlight the detrimental effects of both macro and micro institutional forces by recognizing their resource-demanding nature. Acknowledging the importance of green customer cooperation practices from a customer-oriented approach, this study extends green innovation and supply chain management literature.

Keywords: green innovations; institutions; *guanxi;* resource orchestration; green customer cooperation, China

1. Introduction

Collaboration between manufacturers and customers in planning and implementing environmentally friendly practices~~- between a manufacturing firm and its customers, i.e.,~~ green customer cooperation (GCC) (Chavez et al., 2016), is crucial for green supply chain management (GSCM). Extant literature suggests that ~~a manufacturer's~~ green innovations, defined as the incorporation of –environmental consideration in products and production processes(Kunapatarawong and Martínez-Ros, 2016), are the prerequisite for GCC (Zhu et al.,

2008). ~~Green innovations refer to the consideration of environmental factors in supply chain management for both products and production processes, to decrease harmful environmental impacts (Kunapatarawong and Martínez-Ros, 2016). Successful implementation of green innovations is a critical step because O~~only manufacturers that have successfully improved their green capacity and resources can respond to customers' environmental needs effectively (Kibbeling et al., 2013)~~, as the . Through the gradual~~ adoption of green innovations builds capabilities ~~, manufacturers would develop sufficient and relevant green knowledge and resources, which are deemed~~ essential for external collaboration like GCC.

Although previous studies have highlighted the importance of GCC, they tend to overlook how institutional forces may affect firms' adoption of GCC. Institutions can affect a company's behaviors (Oliver, 1991), nevertheless, institutional forces are not always overtly obtrusive, such as rules or regulations, but also include the subtler forms of social norms. As such, we suggest that the effect of green innovations in driving GCC can be impacted by various macro and micro institutional forces.

In this study, we focus on China as our research context- a key actor ~~examine the effect of institutional forces on the relationship between green innovations and GCC. We focus this study on China, as the major player~~ in the global battle of climate change, but one with a highly complex institutional environment~~where various resource-demanding institutional forces co-exist, resulting in a complex institutional environment~~. Despite growing international pressure, m~~M~~any Chinese manufacturers ~~still fail to embrace GCC and~~ struggle to implement GCC to keep up with the ever-increasing green standards~~, demanded by international customers and end-users~~. Being the "world's factory", China's rapid economic growth has caused its environmental circumstances to outpace the country's ability to develop at a sustainable level (Birkin et al., 2009). While seven of the ten most polluted cities in the world are located in China, the country pays a high price equivalent to 8% of its annual gross domestic product

(GDP) for environmental issues (Geng et al., 2017). ~~Responding to the call of COP26,~~ GCC offers a potential solution by aligning ~~is a win-win for Chinese~~ manufacturers' sustainability goals with those of ~~and~~ their international customers, ~~customers, resembling a successful collaboration that presumably~~ leads to better business performance in terms of profitability, market advantages, and corporate reputation (Liu et al., 2025; Zhang et al., 2025; Wynstra et al., 2015; Zhao et al., 2008).

Additionally, we consider the competing institutional logics present in China's transitional economy, highlighting how conflicting demands from political control, market innovation, and relational norms further complicate firms' strategic decisions. A particularly salient feature of this context is the prevalence of unpredictable government interventions

~~With a less well-developed legal system, China is characterized by multiple layers of government interventions that can be unpredictable and dominating~~ (Sheth, 2011; Wang et al., 2016b; Ren et al., 2024) and ~~a unique social norm of~~ *guanxi*, a unique social norm ~~which~~ specifies interpersonal ties ~~and social interactions~~ that influence companies' decision-making and behaviors (Yen and Abosag, 2016; Geng et al., 2019). Whilst unpredictable government interventions create a challenging macro-institutional environment, *guanxi's* resource-demanding nature also has an adverse effect on firms' supply chain activities (Gu et al., 2008; Villena et al., 2011). Considering both macro and micro institutional forces, this study examines to what extent the relation between green innovations and GCC is moderated by government interventions and *guanxi* in China. ~~To test this effect, we employed an experimental vignette methodology with 240 Chinese managers.~~

Our findings confirm the detrimental effects of both macro and micro institutional forces on the trajectory from green innovations to GCC. This study makes three key contributions ~~to the green innovation and green supply chain management literature~~. Firstly, we affirm the positive link between ~~our findings show that adopting~~ green innovations and ~~fosters the uptake~~

of green customer collaboration (GCC), framing green innovation not merely as a technical upgrade but as a relational capability that fosters downstream collaboration. This integration helps manufacturers align with customer sustainability expectations and improve the overall effectiveness of GSCM strategies.

highlighting a symbiotic relationship where innovation drives deeper customer engagement. By integrating green technologies, firms not only meet environmental standards but also involve customers in sustainability efforts—key to enabling cooperative green practices and reducing environmental impact. Embedding GCC within the green innovation framework offers insight into how aligning customer interactions can enhance the reach and effectiveness of sustainable supply chain strategies. Secondly, our findings add to the green innovation literature by demonstrating how unpredictable government interventions and *guanxi* as macro and micro-institutional forces can impede the successful implementation of green innovations due to their resource-demanding nature. This insight prompts a reevaluation of institutional dynamics in the strategic management of green innovations in the supply chain.

Thirdly, by moving *guanxi* to the foreground of institutional theory (Schilke, 2018; Zilber, 2016), this study contributes to a richer comprehension of global supply chain dynamics in the context of green innovations (Fine and Hallett, 2014). By linking the adoption of green innovations to enhanced customer cooperation, framing it within the broader institutional context where *guanxi* is under scrutiny, this study also offers theoretical contributions to *guanxi* literature, revealing its dark side to green supply chain management.

2. Theoretical background and hypotheses

2.1. From green innovations to GCC

Green innovations refer to a firm's capacity to deploy internal resources to meet environmental needs that involve organizational, technical, and environmental considerations (Schiederig et al., 2011), aiming to reduce the impact on the environment, while achieving

economic benefits through the adoption of innovations (Song and Yu, 2017). Green innovations can also create cost advantages: by adopting efficient green production techniques, companies can reduce their energy consumption, reducing costs related to energy, input, and waste (Hall and Wagner, 2012). This study focuses on green innovations concerning the product and production process in the different stages of design, production, transportation, and recycling. Developing a GSCM system requires collaboration with customers, whose satisfaction can greatly affect a company's economic and environmental performance. Greater customer orientation is related to superior business performance (Kibbeling et al., 2013), since customer-oriented companies can better understand and interpret market trends and demands. Hence, suppliers should adopt the customer-oriented approach to GCC, focusing on cooperative activities with customers to minimize environmental impact jointly, resulting in better performance for both parties (Lee and Klassen, 2008).

Green innovations resemble a firm's internal green capability, which is essential in offering green values to customers (Kibbeling et al., 2013), hence a prerequisite for GCC (Zhu et al., 2013b). In a study of Chinese manufacturers, Zhu et al. (2013b) show that manufacturers that are capable of initiating eco-designs engage in higher levels of GCC. By showcasing their green track records, these manufacturers stand a better chance to work with their customers in green collaborations, since they are capable and resourceful in green innovations, and knowledgeable in interpreting customers' green expectations and requirements (Melander, 2018).

Recent empirical and synthesis-based research further affirms this connection. Bhatia and Kumar (2022) demonstrate that stakeholder and competitive pressures, mediated by environmental commitment, drive firms to implement Industry 4.0 technologies that enable green process innovation—thereby enhancing supply chain-level cooperation. Ghadge et al. (2022) highlight that digital maturity and green innovation readiness significantly boost customer collaboration outcomes, especially in dynamic market environments. Kareem et al.

(2024), through a systematic literature review, identify green innovation as a foundational driver for building resilience and navigating supply chain tensions in sustainability transitions. Importantly, Li et al. (2022), through a comprehensive meta-analysis of 105 studies, confirm that green innovation has a consistently positive and significant effect on both environmental performance and green collaboration outcomes, thereby validating its centrality to sustainable supply chain strategies.

Accordingly, firms must first have the capability to innovate in a green manner before they can credibly engage and cooperate with customers on environmental initiatives (Kibbeling et al., 2013). Hence, firms with established green innovation are better positioned to respond to and anticipate customer sustainability needs and requirements, thus initiating GCC. Finally, from a strategic preceptive, firms with established green innovations can influence the market and set trends that define customer expectations. This strategic influence often leads to GCC, as customers seek to align with manufacturers that are already sustainability leaders (Melander, 2018). Therefore, we hypothesize:

H1. The adoption of green innovations has a positive impact on the adoption of GCC.

2.2. Institutional forces and GCC

Macro and micro-institutional forces affect managerial practices within organizations and the way they operate in the business environment (Scott, 1987) and continue to evolve over time (D'Aunno et al., 1991). This study focuses on China a major player in the global battle of climate change. China is unique because of its specific culture and its powerful and influential government (Wang et al., 2016b). China's ongoing transition to a market-oriented economy is accompanied by frequent, unpredictable government interventions, i.e. intervention of government officials in business transactions which . can disrupt standard business operations due to their abrupt nature and limited predictability, particularly in developing economies with relatively weak formal institutional structures (Child et al., 2003; Luo et al., 2017).

Consequently, companies in China frequently rely on informal institutions such as guanxi (Geng et al., 2017; Yen and Abosag, 2016 —network-based relationships characterized by reciprocal obligations and trust—to navigate the business environment (Zhu et al., 2013a, b). Specifically, government intervention shapes strategic environmental decisions at a macro level, whereas *guanxi* dictates the effectiveness of these strategies at a micro level through its deep-rooted influence on interpersonal and business relationships.

Building on this, we acknowledge that China's institutional environment is not only characterized by the coexistence of formal and informal forces but also by competing institutional logics. Institutional complexity arises when actors face conflicting prescriptions from different institutional sources (Greenwood et al., 2011). In the Chinese context, firms often experience tensions between the logic of state-led political control and the logic of market-driven innovation, leading to strategic ambiguity (Child et al., 2003; Luo et al., 2017). For example, firms may be pressured to conform to sudden government mandates while simultaneously being expected to pursue competitive, innovation-led growth. This institutional plurality complicates the deployment of green innovation strategies, particularly when firms attempt to extend such initiatives toward downstream GCC. Moreover, *guanxi* adds another layer of complexity, functioning as a relational logic that may conflict with emerging norms of transparency and formal accountability. By explicitly incorporating these dimensions of institutional complexity and logic multiplicity, this study provides a more nuanced understanding of how and why institutional forces may hinder the realization of green innovation outcomes in transitional economies.

While institutional theory provides the overarching lens for this study—allowing us to explore the influence of macro- and micro-institutional forces on organizational practices—we also draw on resource orchestration theory as complementary explanations on how firms

mobilize and deploy internal green capabilities toward external collaborative practices such as GCC.

2.2.1. Government interventions

Substantial involvement and intervention of government officials in business transactions are prevalent in developing countries (Wang et al., 2016b). Despite the country's economic growth, the Chinese government remains complex, characterized by multiple layers of controls (central, regional, and local governments), complex social norms, and a less well-established and less-transparent legal system (Wang et al., 2016b). These complexities frequently result in unpredictable government interventions, posing considerable challenges for businesses (Wang et al., 2016a). Local governments exercise significant policy discretion, often enforcing business directions or imposing heavy taxation on non-compliant firms, leading to substantial risks, including potential bankruptcies. (Zhou and Poppo, 2010).

Recent studies highlight how such institutional complexity and unpredictability hinder firms' ability to effectively mobilize resources for green innovation and long-term sustainability practices. For instance, Kareem et al. (2024) argue that in environments of overlapping institutional logics and crises, firms face conflicting demands that challenge consistent environmental strategy execution. Similarly, Khan (2021) emphasizes that policy instability and unclear regulatory enforcement reduce firms' commitment to long-horizon green process innovation, especially in emerging economies. Li et al. (2022) further illustrate that market-based green incentives may not be effectively transmitted through fragmented local governance structures, reducing firms' willingness to extend innovations toward collaborative supply chain practices. This policy volatility limits the strategic use of green innovation as a relational capability for supply chain collaboration. Suchek et al. (2021) also highlight that circular economy transitions—closely tied to green innovation—require coherent government

direction and long-term policy stability to overcome organizational inertia and enable systemic collaboration.

In this study, we argue that unpredictable government interventions weaken the positive relationship between green innovations and the adoption of GCC for three reasons. First, government interventions in China are often unpredictable and difficult to verify or control (Luo et al., 2012), leading firms to view them as political hazards that hinder effective decision-making (Wang et al., 2016a). Additionally, local governments tend to prioritise short-term economic growth over long-term environmental sustainability (Luo et al., 2017).

Second, long-term environmental collaboration requires a stable and predictable institutional environment. Frequent, sudden, and unpredictable government interventions, proposed by local or regional governments, often create environmental uncertainty, making companies less willing to commit to long-term environmental collaborations (Wang et al., 2016a). Whilst GCC requires continuous effort and time to generate benefits for manufacturers and their customers, unpredictable interventions discourage manufacturers from allocating green resources and efforts that are critical for facilitating successful GCC (Sirmon et al., 2007). Therefore, companies are more likely to be conservative in their green innovations, reducing risk but maximizing short-term profits.

Third, unpredictable government interventions may also reduce businesses' confidence and dampen their commitment to allocate resources for GCC. For instance, a sudden change in the requirements to conserve energy and reduce emissions may be proposed by an individual local government officer based on an impulsive decision, rather than through careful central planning, supported and enforced by laws and regulations (Luk et al., 2008). Such uncertainty is counterproductive to the promotion of GCC and may dissuade Chinese manufacturers from regarding government interventions as positive mechanisms that provide regulatory and financial guidance. Consequently, when manufacturers have doubts about the legitimacy, they

are unlikely to orchestrate resources to extend their green innovations to GCC (Wang et al., 2016a). Thus, we hypothesize:

H2. Government interventions weaken the relationship between green innovations and the adoption of GCC.

2.2.2. *Guanxi*

Guanxi is a Chinese cultural-specific construct that explains human relationships and network norms in China (Yen et al., 2017). Derived from Confucius' values, *guanxi* development, and exchanges are largely practiced amongst business firms through favor exchanges, trust building, and emotional bonding over time to promote business success, networking, relationship enhancement, and effective collaborations (Yen et al., 2011; Yen and Barnes, 2011).

Extant research tends to discuss *guanxi* as a positive factor that facilitates relationships with business counterparts. For instance, Barnes et al. (2011) suggest that companies with deep guanxi ties can gain privileged access to business opportunities and critical market intelligence when operating in Chinese markets, positioning *guanxi* as a localised strategic tool. Yen et al. (2017) show that two of *guanxi's* sub-dimensions, affections and trust, can significantly reduce both emotional and task conflict in Sino–U.S. business relationships, with similar findings echoed by Li et al. (2021), where *guanxi* serves as a moderator that counters the negative effect from task conflicts to long-term relationship orientation. In addition, Abosag et al. (2021) reveal that Chinese buyers' *guanxi* with U.S. suppliers significantly lessens their switching intention, opportunistic behavior, and the perceived levels of conflict in Sino-US relationships.

However, *guanxi* also has a dark side mainly, because of its resource and time-demanding nature (Gu et al., 2008; Villena et al., 2011). For instance, an essential practice in building and maintaining *guanxi* is favor exchanges between partners, which follows key principles: favors are banked, not immediately returned; returns must be morally justified; and delayed favors

grow in value (e.g. Yen et al., 2011; Yen et al., 2017; Li et al., 2020). The act of favor exchanges not only creates favoritism and unfair competition in the market (Kang et al., 2024) but also demands firm resources as well as an effective distribution and management of those resources (Kipnis, 1997; Yen et al., 2011; Chen and Kuo, 2024). These favor exchanges can monopolize the attention and effort required to drive change and improve business collaboration (Noordhoff et al., 2011). In addition, *guanxi* highlights exclusivity and selectiveness. Firms are not encouraged to seek collaborations with new members outside their existing *guanxi* networks, which prevents them from developing their capabilities (Opper et al., 2017). The overemphasis on securing relations only within existing *guanxi* networks often limits firms in approaching and identifying new opportunities and embracing innovations. Acknowledging the dark side of *guanxi*, we argue that *guanxi* can be considered a detrimental institutional force that weakens the impact of green innovations on GCC.

Firstly, *guanxi* is established at an interpersonal level, not an inter-organizational level (Geng et al., 2017). This means that efforts and resources dedicated to improving *guanxi* through favor exchanges with individuals at the counterpart firms may not guarantee preferable business outcomes. Because of its informal nature, *guanxi* lacks enforceability and assurance (Luo et al., 2012). The returns on investment in a *guanxi* tie also have a temporal gap (Su and Littlefield, 2001), which increases risk when managers attempt to employ their *guanxi* with customers in driving GCC. That is, a temporal delay can impact the timely implementation and effectiveness of sustainability initiatives within the GCC framework.

Secondly, reciprocal obligation, the key practice in building and enhancing *guanxi*, often comes with the obligation that a favor must be returned upon request (Yen et al., 2011; Yen et al., 2017; Ameyaw et al., 2022). Such reciprocal exchange of favors often demands resource reallocation, thus constraining optimal decision-making (Abosag et al., 2021). For example, rather than dedicating efforts to developing green products and processes, manufacturers may

be forced to go for the not-so-green but cheaper option, as requested by, for example, the customer's procurement manager as a returning favor. Such obligations can lower the manufacturing firm's motivation to extend green innovations to GCC (Villena et al., 2011). Similar findings have been observed by Ren et al. (2024), an over reliance on guanxi may have a negative effect on employees' innovative behavior. Moreover, a high level of reciprocity can create unnecessary emotional baggage, which may cloud the manufacturing firm's judgment in driving GCC, and take away resources that could have been invested in adopting GCC (Sirmon et al., 2007; Sirmon et al., 2011).

Thirdly, a closer *guanxi* tie between the manufacturer's manager and their counterpart may lead to collective blindness and opportunistic behavior, due to favoritism (Chen and Kuo, 2024). For instance, the counterpart manager may be less critical in reviewing the green standard required from the supplier. Such reduction in the control mechanism is never beneficial, and is subject to malfeasance in business collaborations and supply chain management (Villena et al., 2011). This creates inertia and can dampen the manufacturer's motivation to dedicate resources to extend green innovations to GCC, which may lead to further opportunistic behavior in reducing the green standard required, counterproductive to driving GSCM. Based on the above arguments we hypothesize the following:

H3. Guanxi between the manufacturing company's manager and customers' procurement manager weakens the relationship between green innovations and the adoption of GCC.

3. Research Methods

We employed hypothetical vignettes, combined with manipulated conditions regarding government interventions and *guanxi,* to test the trajectory from green innovations to GCC. This method is particularly suitable for testing theoretical propositions about causal relationships in a controlled setting, thus providing clarity on how specific variables—macro

and micro institutional forces—affect the relationship between green innovations and GCC. By manipulating these forces within the vignettes, we can directly observe their moderating effects, thereby establishing causality.

3.1 Experimental design and measurements

Experimental vignette methodology (EVM) contains a set of vignettes with a list of survey questions to which participants respond (Aguinis and Bradley, 2014). EVM provides many methodological advantages. First, it helps us develops deep understanding of the decisions and behavior of managers, by simulating complex issues of real-world situations . In addition, EVM provides the advantage of a high degree of control, because each scenario serves as a control for the other scenarios; thus, researchers can assess differences in judgments caused by facts that differ across scenarios (Rungtusanatham et al., 2011).

To ensure construct validity in the experimental vignette design, we operationalized each key variable—green innovation, government intervention, and guanxi—using empirically validated measurement scales. Specifically, the *guanxi* manipulation was grounded in the widely adopted scale developed by Yen et al. (2011), which captures relational closeness, reciprocal obligation, and interpersonal trust between business counterparts. In our vignette, participants were asked to assume the role of a supply chain manager responsible for customer collaboration. The high-*guanxi* condition described frequent social interaction, emotional closeness, mutual favor exchange, and high interpersonal trust with the purchasing manager of the customer firm. Conversely, the low-*guanxi* condition described a more distant, transactional, and uncertain relationship, reflecting weak personal ties and limited trust. This manipulation enables a realistic and contextually grounded simulation of guanxi dynamics in Chinese B2B relationships.

A vignette refers to a short piece of descriptive information about specific levels of independent factors (Rungtusanatham et al., 2011), which in this study include green

innovations (high/low), *guanxi* (high/low), and government intervention (high/low), resulting in a 2 × 2 × 2 model of eight scenarios (see Appendix A). We developed the set of vignettes based on measurements of the variables of interest in previous empirical studies (Rungtusanatham et al., 2011). Each scenario includes an introduction, a 'manipulation' paragraph, and a conclusion. The introduction and conclusion sections are identical in each of the eight scenario versions, to guard against framing effects stemming from the variance (Rungtusanatham et al., 2011). The manipulation paragraph introduces the experimental cues, and therefore, varies across the various combinations of green innovation, government intervention, and *guanxi*. At the end of each scenario, the participant is asked to rate the extent of GCC in the subsection.

We manipulated the green innovation construct based on the level of improvement in existing practices to reduce environmental impact during product design and production using measures developed by Zhu *et al.,* (2017). We also manipulated government intervention to reflect the level of thier intervention in focal companies' business operations based on Child, Chung, and Davies' (2003) scales. Finally, we manipulated *guanxi* to reflect the strength of interpersonal relationships between the manager in the focal company and the procurement manager in the customer company as the business counterpart. Following Rungtusanatham et al. (2011), we used existing measurement scales to develop precise wording for the experimental cues. The *guanxi* construct was described based on Yen et al., (2011) measurement scales. We measured our dependent variable (the adoption of GCC) based on Zhu et al. (2005) and Wu et al. (2012).

The vignettes were first developed in English and then translated into Chinese. Following Brislin's (1986) suggestion, we employed back translation; some of the wordings were revised in the Chinese version to enhance the clarity, readability, and linguistic equivalence. Then, we

sent the Chinese version to five Chinese academics in the field of business and management to double-check for language proficiency.

We employed a cross-sample experiment design where each participant was exposed to only one scenario. In each scenario, participants assume the role of a supply chain manager of the fictional company BUL. After reading the scenario, participants were asked to respond to a series of questions regarding BUL's adoption of GCC. To mitigate for the "order" effects, we randomized the sequence in which participants were exposed to descriptions of green innovations, government interventions, and *guanxi* to ensure that the nature of the sequence does not significantly influence the overall results (Bendoly & Swink, 2007). Appendix A describes how the scenarios were developed.

3.2 Pilot study

A pilot study was conducted with 52 EE companies in the Suzhou Industrial Park to ensure the realism and clarity of vignette scenarios. The manipulation checks confirmed effective scenario design for green innovations and government interventions. However, the initial guanxi description showed no significant differentiation between high and low conditions. Interviews with 12 Chinese managers highlighted the original vignette's inadequate representation of guanxi's reciprocal nature, describing it as overly one-directional. Therefore, we revised the vignette to better reflect mutual reciprocity in guanxi, incorporating feedback on emotional bond, interpersonal trust, and reciprocal favor exchange dimensions (Yen et al., 2011).

3.3 Study participants

The participants are managers from EE firms, working in supply chain management, located in seven national-level eco-industrial parks in Jiangsu Province in China. Located in the Yangtze River Delta in eastern China, Jiangsu Province features a higher-than-average

degree of economic development and accounts for 20% of China's export trade value (Chinese Ministry of Industry and Information Technology, 2016). Firms within the national-level eco-industrial parks had obtained either ISO14000 or Green Label certification, aligning with China's circular economy policy (Zhu et al., 2013a).

Seven national-level eco-industrial parks were identified via China's Ministry of Environmental Protection website, and contact details from EE firms were obtained from Jiangsu EE industry business directory. A random sample of 1,000 out of 2143 EE firms were contacted by telephone, targeting managers familiar with GSCM who interact regularly with their customers. Out of 322 managers, we received 240 usable responses using a questionnaire, resulting in an effective response rate of 24%.

3.4 Manipulation check and heteroskedasticity

To assess and adjust the vignettes for internal consistency and plausibility (Wason et al. (2002), we checked the confounding and manipulations of the experimental cues, and the extent to which participants regarded the scenarios to be realistic (Rungtusanatham et al., 2011). In doing so, we conducted manipulation checks to assess variances in the perceived levels of the three operated factors of the adoption of GCC via t-test using SPSS 23. The results indicate that the mean score for green innovation is statistically significantly higher than in the low green innovation group (green innovation high=3.88, green innovation low=2.79, p=.000). Similarly, the mean score for high government intervention is statistically significantly higher than in the low group (Intervention high=4.02, Intervention low=3.29, $p<0.05$). Furthermore, the mean score for high *guanxi* is also statistically significantly higher than in the low group (*guanxi* high=4.11, *guanxi* low=3.21, $p<0.05$).

We also conducted the manipulation checks as filter questions by specifying thresholds for "correct" answers. Specifically, for the *guanxi* manipulation, participants were required to read

the scenario and then select the quality of *guanxi* on a five-point scale (1 = "not good," 5 = "very good), where correct answers ranged from 1 to 2 for low-*guanxi,* and 4 to 5 for high-*guanxi*. Regarding online participants, if a person provided an incorrect answer first, this person would have been requested to review the vignette and answer the same question again. If the response was incorrect the second time, the questionnaire would have ended. We also used two items to check whether the scenarios were regarded as realistic (Dabholkar, 1994). Participants were asked the extent to which (a) the scenarios were realistic; and (b) the participants could envisage themselves in such a situation. The mean scores for these two checks were 3.55 and 3.93, respectively, which is comparable to previous studies (Chen et al., 2016; Hartmann and Moeller, 2014).

To examine the robustness of the results, we ran a Breusch–Pagan test (a.k.a., the Cook-Weisberg test) for heteroskedasticity with Stata 12.1. We examined whether the error variance from a regression was dependent on the values of the independent variables. The result shows that the null hypothesis of the constant error variance fails to be rejected, with a p value of 0.59, which indicates heteroskedasticity may not be an issue here.

3.5 Data analysis and results

Multiple regression analysis was employed to test the moderating impact of government intervention and *guanxi* on the relationship between green innovation and the adoption of GCC. Two control variables were included in the model: the number of years of experience in GSCM and the number of years of working experience in supply chain/operations management (SCM/OM). To reduce multicollinearity, we employed the "mean-centering" technique by using deviation scores for the independent variables and moderators (Zhu and Sarkis, 2007). Most of the VIFs of the moderated regression analysis were close to 1, but less than 10, showing the range of variance inflation was adequate. Since the maximum VIF value in all regression models is 1.2 (O'Brien, 2007), it is confirmed that multicollinearity is not an issue in this study.

TABLE 1 ABOUT HERE

As shown in Table 1, Model 1 includes only the control variables, while independent variables and the moderators are added to Models 2 and 3, respectively. Model 4 features all the interaction terms. Model 1 shows the control variables account for 0.4% of the variance in the GCC, where SCM/OM experience (β = .160, p< .005) and GSCM experience (β = .136, p < .005), have a significant and positive influence on the adoption of GCC. Model 2 shows that green innovations have a statistically significant and positive effect on the adoption of GCC (β = .528, p<.001). Compared to Model 1, R^2 increases to 27.7% in Model 2. In Model 3, R^2 increases to 29.5%, where the moderating variables of *guanxi* and government intervention are included. Both variables, *guanxi* (β = .286, p < .0001) and government intervention (β = .116, p<.05), statistically significantly influence the adoption of GCC positively. Lastly, R^2 increases to 30.3% in Model 4, where the interaction terms are added. The results across the four models are regarded as consistent, and Model 4 is superior to the other models. Model 4 reveals the moderating effects in two ways: i) by demonstrating that the collective incremental of the F value for the regression step is statistically significant; ii) by confirming that an individual interaction variable has a statistically significant β value (O'Brien, 2007). The results indicate that the effect of green innovations on GCC is positive and statistically significant, confirming H1.

Model 4 displays that government intervention has a negative and statistically significant influence on the impact of green innovations on the adoption of GCC (β = –.300, p < 0.05). Figure 1a also confirms that when government intervention is high, the impact of green innovations on the adoption of GCC is weaker. Consequently, H2 is supported.

FIGURE 1 ABOUT HERE

Similarly, Model 4 indicates that *guanxi* statistically significantly and negatively moderates the above relationship (β = –.363, p < 0.001), while Figure b confirms that with a high level of

guanxi, the impact of green innovations on the adoption of GCC becomes significantly weaker. Therefore, H3 is also supported.

4. Discussion and implications

This study contributes to a deeper understanding of how competing institutional logics in transitional economies like China can shape—and often complicate—firms' implementation of green innovations and subsequent cooperation with customers. Our empirical evidence shows that government interventions and *guanxi* have detrimental effects on the relationship between green innovations and GCC. Rather than working as enablers that support green innovations to GCC, our findings show support for the hypotheses that government interventions (macro-institutional force) and *guanxi* (micro-institutional force) are indeed disablers – their resource-demanding nature weaken the relation between green innovations and GCC. In particular, high levels of government intervention are counterproductive to promoting GCC, as unpredictable interventions are perceived as political hazards. These hazards are resource-intensive, create uncertainty, and ultimately reduce firms' commitment to dedicating and orchestrating the necessary resources to drive GCC (Sirmon et al., 2011; Wang et al., 2016a; Luk et al., 2008).

Also, better *guanxi* ties with their customers are less likely to extend green innovations to GCC. Our findings challenge previous literature (Geng et al., 2017; Yen and Abosag, 2016) and point to the dark side of *guanxi* (Villena et al., 2011; Abosag et al., 2021). Instead of allocating resources to drive customer engagement in cooperative green practices, the results reveal that building and maintaining *guanxi* consumes excessive resources, weakening the relationship between green innovations and GCC, extending the work of Ren et al. (2024) into a different context. Moreover, the lack of enforceability in *guanxi*, the coercive nature of favor reciprocation, and the potential for collective blindness arising from *guanxi* (Ameyaw et al.,

2022; Chen and Kuo, 2024) may adversely affect the efficiency of business decision-making (Luo et al., 2012; Yen et al., 2011). Overreliance on *guanxi* may lead to inertia and create a false sense of security, reducing firms' motivation for continuous innovation and GCC.

4.1. Theoretical implications

Bridging resource orchestration theory to explain the negative effect of government interventions and *guanxi* as macro- and micro-institutional forces, we contribute to the wider (green) innovation and GSCM literature in several ways.

First, we sharpen the boundary of our contribution by explicitly conceptualizing green innovation not just as a firm-level capability, but as a relational enabler of downstream collaboration with customers. Extending Kibbeling et al. (2013) and Flores, (2024), we show that GCC is not merely a desirable outcome of GSCM but a dependent capability shaped by the firm's ability to orchestrate internal green resources in response to customer demands. The findings extend the previous understanding of GSCM literature (Lee and Klassen, 2008; Zhu et al., 2013a; Chiambaretto et al., 2024) by offering clear empirical evidence to justify the relationship between green innovations and GCC. Moreover, by integrating the concept of *guanxi* into the green innovation framework, our study provides empirical support for the argument that formal institutional arrangements (like government regulations) as well as informal practices (like *guanxi*) significantly drive green innovation. This dual perspective challenges existing paradigms in the innovation literature that predominantly focus on formal mechanisms, encouraging a broader investigation into how combined formal and informal institutional forces can be leveraged to foster sustainable innovation practices. This approach broadens the theoretical base of green innovation studies, and offers practical insights for managers and policymakers aiming to enhance the efficacy of green innovation strategies within complex institutional contexts.

Second, we introduce government interventions and *guanxi* as macro- and micro-institutional forces and empirically investigate the extent to which they hinder the adoption of GCC in China. While prior research has predominantly focused on the direct effects of regulatory policies on green innovation (e.g. Stojčić,2021; Jia et al., 2024; Lee et al., 2024; Hao et al., 2024), our findings suggest a nuanced interplay between *guanxi* (personal connections) and regulatory frameworks, shaping green innovation outcomes. Those macro- and micro-institutional forces represent important mechanisms in decision-making; therefore, the transition from green innovations to GCC can vary in how organizations perceive and interpret such forces (Greve and Man Zhang, 2017; Jia et al., 2024). By showing the negative effect of government interventions and *guanxi* as macro- and micro-institutional forces, we challenge existing literature that tends to regard institutional forces as positive drivers and ignore their dark side.

Third, we draw on resource orchestration theory to examine how macro- and micro-level institutional forces—specifically government intervention and *guanxi*—individually influence firms' ability to mobilize and configure green innovation resources for external collaboration. Rather than testing their combined or compounding effects, we investigate their separate moderating roles to reflect how firms interpret and respond to institutional pressures in complex environments. This contextualized orchestration view complements emerging perspectives in sustainability and supply chain management, where institutional misalignment is increasingly recognized as a constraint on capability deployment (Kareem et al., 2024; Li et al., 2022). In particular, this research touches upon a sensitive issue related to macro-institutional forces in China (Luo et al., 2017; Zhou and Lin, 2024). It provides new insights on the extent of government interventions on business operations in China. Whilst government interventions are often strong and powerful, companies in China tend to conform to such interventions obediently. Therefore, conflictual and unpredictable government interventions can still hinder

Chinese manufacturers' green agenda and delay their GCC. Our findings thereby extend the scope of orchestration theory by linking it with institutional volatility, especially in politically fragmented environments like China

4.2. Managerial implications

Our results indicate that rapid changes in the institutional environment can result in serious complications in the supply chain and operations management (Wang et al., 2016b; Lee et al., 2024). A successful transition from green innovation to GCC depends on the institutional environment. Therefore, businesses need to acknowledge the strategic dilemma and challenges presented by the various institutional forces and actively develop strategic responses and resource planning accordingly, when collaborating with manufacturers in countries with demanding institutional environments.

International managers are encouraged to critically reassess their guanxi strategies. Despite guanxi's widespread use and perceived benefits in Chinese business practices,(Yen and Abosag, 2016; Yen et al., 2017; Li et al., 2021; Abosag et al., 2021), our findings show that guanxi's favor exchange is resource-demanding and lacks enforceability, with no clear responsibility in terms of how and when the favor could be returned to the businesses, beyond the individuals. This is also a wake-up call for senior management of Chinese manufacturers, keen to promote the green agenda, to reconsider their current resource allocation structure and system (Gu et al., 2008; Abosag et al., 2016).

Finally, while our results indicate that government interventions have a statistically significant and negative impact on the trajectory to GCC, Chinese policymakers are encouraged to focus on establishing clear and well-monitored legal frameworks. These frameworks should aim to minimize frequent and abrupt interventions, thereby safeguarding firms' operations and fostering their adoption of green environmental practices. For instance, the Chinese State-owned Assets Supervision and Administration Commission of the State Council provides

training programs on corporate social responsibility for firms under the agency's supervision. Regional government agencies could offer training programs on GSCM to manufacturing companies, promoting the adoption of green practices.

5. Limitations and future research directions

This study is not without limitations. First, we focus only on two institutional forces, government interventions and *guanxi*.. Future studies may examine the influence of other institutional factors, such as legal enforceability, contracts, and trust on the relationship between green innovations and GCC. Second, the results of this study should be interpreted with caution, as they refer only to the current state of the institutional environment in China. Whilst China embraces the green agenda in the next decade, future studies are advised to continue monitoring and evaluating how, and to what extent, other institutional forces affect environmental sustainability in China and other emerging markets.

Moreover, while the experimental vignette methodology enables strong internal validity through controlled manipulation of independent variables, we acknowledge its limitations in terms of external validity. Because the scenarios are hypothetical, participants' stated intentions may not fully translate into real-world behavior. Additionally, our sample—while composed of experienced supply chain professionals—may not fully represent the broader population of manufacturing firms in China. To mitigate these limitations, we drew on validated constructs from prior empirical studies, carefully developed culturally relevant scenarios, and ensured scenario realism through pilot testing. Nonetheless, future research could complement this approach with field experiments or longitudinal case studies to triangulate findings in naturalistic settings. Additionally, the scope of this study is limited to the Chinese electronics and manufacturing sectors. While the underlying institutional mechanisms may exist elsewhere,

caution should be exercised in generalizing these findings to other industries or national contexts without further empirical validation.

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Table 1. Regression results

		GCC (n = 240)			
		Model 1	Model 2	Model 3	Model 4
Control	SCM/OM experience	.160*	.111*	.087*	.148*
	GSCM experience	.136*	-.037	-.076	-.062
Independent	GI		.528***	.528***	.687***
Moderator	GIn			.116*	.272***
	GX			.286***	.227**
Interaction	GI * GIn				-.300*
	GI * *GX*				-.363*
F for the step		1.501	102.889***	4.302*	2.535**
F for the regression		1.501	35.676***	23.654***	17.815***
Adjusted R^2		.040	.277	.295	.303

This table contains standardized coefficient betas.
*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$
GI: Green innovations; GIn: Government Intervention; GX: *guanxi*, GCC: Green customer cooperation

Appendix A. Vignette "BUL"

<table>
<tr><td colspan="3">Experiment design logic</td></tr>
<tr><td>Introduction</td><td colspan="2">To guard against framing effects, stemming from variance (Rungtusanatham et al., 2011), the introduction section is standardized across eight scenarios, where the participants are instructed to assume the role of a supply chain manager of the fictional company BUL.</td></tr>
<tr><td>Manipulation</td><td colspan="2">- The manipulation paragraphs presented the experimental cues. Hence, they are different across the various combinations of green innovations, government intervention, and guanxi.
- Green innovations are described based on the level of improvement in existing products and processes to lessen the environmental impact during product design and production (Zhu et al., 2017a).
- Government intervention reflects the level of political intervention in the manufacturing firm's business operations (Child et al., 2003).
- Guanxi reflects the strength of interpersonal relationships between the participant (as the manufacturing firm's supply chain manager) and the procurement manager in the customer company (Yen et al., 2011).

The measurements of GCC were adopted from Zhu et al. (2005) and Wu et al. (2012). (see Appendix)</td></tr>
<tr><td>Conclusion</td><td colspan="2">A standardized text is provided here to thank all participants for their participation.</td></tr>
<tr><td colspan="3">1. General questions (about the respondent):</td></tr>
<tr><td colspan="3">* Number of years of practical operation management experience</td></tr>
<tr><td colspan="3">* Experience with green innovation products and process</td></tr>
<tr><td colspan="3">2. Vignette "BUL" (2 *2*2)</td></tr>
<tr><td colspan="3">When you read the following scenario, please assume that you are working on the supply chain matter for company "BUL" below, and directly responsible for managing the business relationship with your customers, Company A; Mr Wong is the purchasing manager you are dealing with. Upon completion of reading the scenario below, please answer the survey questions immediately following the scenario.
Eight possible experimental manipulations:
A1B1C1, A1B2C1, A1B1C2, A1B2C2, A2B1C1, A2B2C1, A2B1C2, A2B2C2</td></tr>
<tr><td rowspan="2">Green innovations</td><td>A1. High GI</td><td>A2. Low GI</td></tr>
<tr><td>Your company BUL is a company that produces Electronic and Electrical products. Your company designs products for reuse, recycling, and recovery of</td><td>Your company BUL is a company that produces Electronic and Electrical products. Your company DOES NOT design products for reuse, recycling, or recovery of material, and</td></tr>
</table>

	material, and component parts. Your company designs products in order to reduce consumption of material/energy. Your company designs products to avoid or reduce the use of hazardous materials and/or their manufacturing process. Your company uses eco-labeling for your products. During production and product transportation, your company uses cleaner or renewable technology to lower the consumption of energy (e.g., water, electricity, gas, and petrol). During disposal, your company uses cleaner or renewable technology to lower the consumption of energy (e.g., water, electricity, gas, and petrol). Your company uses recycled, reused, and remanufactured materials or parts. Your company reduces the use of hazardous raw materials in the manufacturing process.	component parts. Your company **DOES NOT** design products in order to reduce consumption of material/energy. Your company **DOES NOT** design products to avoid or reduce the use of hazardous material and/or their manufacturing process. Your company **DOES NOT** use eco-labeling for your products. During production and product transportation, your company **DOES NOT** use cleaner or renewable technology to lower the consumption of energy (e.g., water, electricity, gas, and petrol). During disposal, your company **DOES NOT** use cleaner or renewable technology to lower consumption of energy (e.g., water, electricity, gas, and petrol). Your company **DOES NOT** use recycled, reused, and remanufactured materials or parts. Your company **DOES NOT** reduce the use of hazardous raw materials in the manufacturing process.
Government interventions	*B1. High interventions*	*B2. Low interventions*
	In the past five years, the government regulations have changed frequently. The government officials exert unexpected and abrupt interference in your firm's operation. The government officials can easily take actions to affect your business operation. Relevant local authorities such as the Bureau of Tax and the Bureau of Industry and Commerce Administration have a great influence on your business.	In the past five years, the government regulations **have not** changed frequently. The government officials **DO NOT** exert unexpected or abrupt interference on your firm's operation. The government officials **CANNOT** easily take actions to affect your business operation. Relevant local authorities such as the Bureau of Tax and the Bureau of Industry and Commerce Administration **DO NOT** have a great influence on your business.
Guanxi	C1. *High guanxi*	*C2. Low guanxi*

	You and Mr Wong (the purchasing manager in Company A) have very good *guanxi*. Mr Wong and you often interact socially outside of work. Mr Wong is almost as close to you as family. You would consider his feelings before making important decisions and vice versa. If Mr Wong asks for your help you will certainly give him a hand. The practice of "calling in" favors is necessary in doing business with Mr Wong. You practice the "giving and taking" of favors with Mr Wong on a constant basis, because otherwise, it may damage your *guanxi*. Mr Wong is a trustworthy and reliable person. You trust him because you know the *guanxi* between you and him is very good.	Mr Wong is the purchasing manager in Company A. You do not have very good *guanxi* with Mr Wong. Mr Wong **rarely** interacts with you socially outside of work. You **don't** have any personal relationship with Mr Wong. You **would not** consider his feelings before making important decisions and vice versa. If Mr Wong asks for your help you are **not sure** you will give him a hand. You **don't** think that "calling in" favors is part of doing business with Mr Wong. You **don't** practice the "giving and taking" of favors with Mr Wong often, because you don't have good *guanx*i with him. You are **not sure** Mr Wong is a trustworthy and reliable person. You **don't** trust him because you know the *guanxi* between you and Mr Wong is **not** very good.

3. Questions regarding green customers' cooperation

Based on the above scenario, please indicate to what extent you agree with the following statement, as the key person responsible for BUL's supply chain matters with company A. (Likert scale, ranging from 1= strongly disagree to 5= strongly agree).

- Our company is likely to cooperate with this customer regarding eco-design (eco-design is a practice that aims to reduce the environmental impact of a product over the product lifecycle).
- Our company is likely to cooperate with this customer regarding cleaner production (cleaner production is a practice that aims to minimize waste and emissions and maximize product output).
- Our company is likely to cooperate with this customer regarding green packaging (green packaging reduces the environmental impact and ecological footprint during the development and use of packaging).
- Our company is likely to cooperate with this customer regarding using a lower amount of energy during production and product transportation.
- Our company is likely to provide a logistics service to facilitate product returns by the customer.

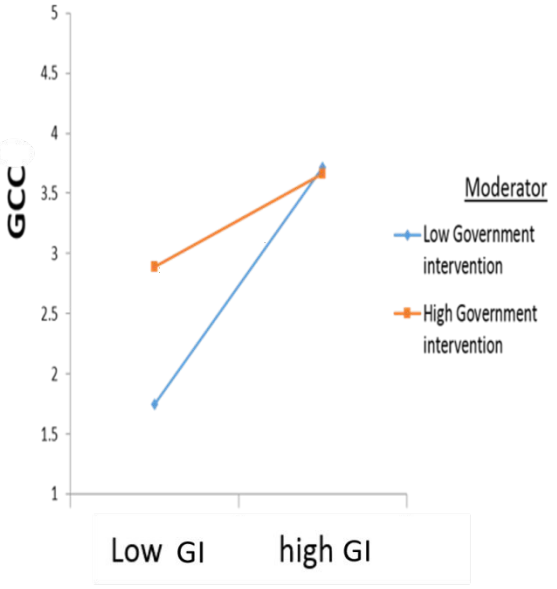

*Figure 1a, G*overnment intervention

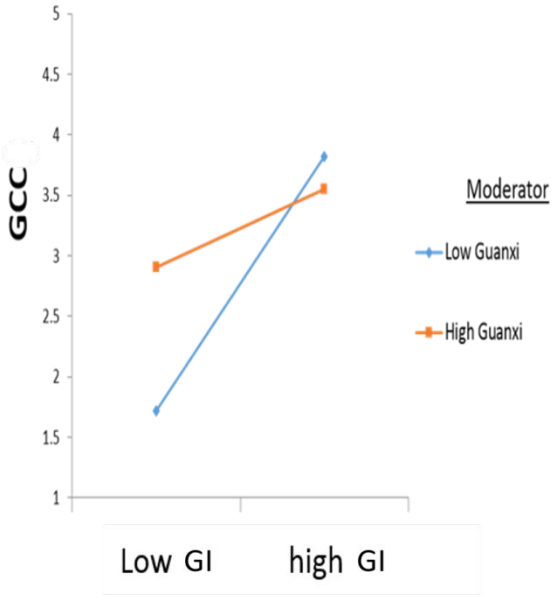

Figure *1b, guanxi*

Figure 1

Moderating Effects of Government Intervention and *guanxi*

Reviewer: 1

Recommendation: Major Revision

[Comments]
Thank you for your submission. The manuscript explores a relevant and underexamined topic—the negative moderating role of institutional forces (government intervention and guanxi) on the relationship between green innovation and green customer cooperation (GCC) in the Chinese context. The use of experimental vignette methodology is a notable strength and contributes methodologically to the field.

[Response]

Thank you very much for your positive and encouraging comments. In response to your suggestions, we have carefully revised the manuscript to better reflect the theoretical contribution and ensure stronger engagement with recent literature, particularly in relation to institutional forces and their moderating effects. All revisions are highlighted in blue in the main manuscript and are also outlined in detail in this response letter.

[Comments]

However, the most critical issue with the current version of the paper is the lack of engagement with recent literature, particularly from the past five years. While foundational sources are well cited, the manuscript overlooks a number of important contemporary studies that have advanced our understanding of institutional complexity, policy uncertainty, and capability development in green innovation and supply chain management. This gap weakens the paper's theoretical contribution and limits its positioning within current scholarly discourse.

To improve the manuscript:

Update the literature review to include recent and high-impact studies.
Clearly position your contribution in light of the latest debates and developments.
Clarify how your findings extend or challenge existing frameworks, especially in relation to resource orchestration and institutional theory.

Other aspects such as methodological design, analysis, and writing are generally sound, but the theoretical foundation must reflect current research to meet the standards of publication.
I recommend a major revision focused primarily on strengthening the literature base and theoretical framing.

[Response]

Done. Thank you for this important observation. In response, we have substantially updated the literature review to address the lack of recent engagement and to strengthen the theoretical framing. Specifically:

- We have incorporated and discussed recent high-impact studies (past five years) related to institutional complexity, policy uncertainty, and capability development in Sections 2.2.1 and 2.2.2.
- We now reference both the enabling and constraining roles of guanxi, drawing on newer studies that highlight its resource-intensive and unpredictable nature.

- We further integrated recent work on capability orchestration and green innovation to clarify the theoretical pathways linking internal practices to external collaboration (see updated citations to Kareem et al., 2024; Bhatia & Kumar, 2022; Li et al., 2022; Khan, 2021).
- Theoretical positioning has been sharpened by aligning institutional theory more clearly with recent debates on institutional logics and complexity.

These changes are aimed at ensuring the manuscript is more current, better grounded theoretically, and clearly positioned within contemporary scholarly discourse.

[Comments]

Additional Questions:

Originality: Does the paper contain new and significant information adequate to justify publication?: The paper contains potentially publishable new insights, especially in empirical method and contextual application. However, the originality would be more convincing if the theoretical positioning and boundary of contribution were sharpened. Thus, it partially meets the originality criterion and needs improvement in articulation.

[Response]

Done. We have clarified our contribution in Section 2 and Section 4 by:

- Positioning green innovation as a relational capability, not just a firm-level outcome
- Explaining how institutional forces separately moderate the relationship between internal and external practices
- Aligning our argument more explicitly with recent debates on institutional complexity

[Comments]

Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: The paper cites a substantial number of authoritative sources and demonstrates a solid understanding of foundational literature in green innovation and institutional theory. However, it lacks sufficient engagement with recent studies from the past five years, particularly those addressing emerging perspectives on institutional complexity, policy uncertainty, and resource constraints. This gap weakens the paper's relevance to current academic discourse. It is recommended that the authors incorporate more recent literature to enhance the currency and theoretical depth of the manuscript.

[Response]

Thank you for this insightful observation. In response, we have significantly updated the manuscript to incorporate recent literature from the past five years, including:

- Kareem et al. (2024) on institutional complexity
- Khan (2021) and Li et al. (2022) on policy uncertainty
- Ghadge et al. (2022) and Bhatia & Kumar (2022) on green innovation capabilities These updates enhance the paper's currency and relevance.

[Comments]

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well

designed? Are the methods employed appropriate?: The paper is built on a solid theoretical foundation and employs an innovative experimental vignette methodology, which is appropriate for examining causal relationships in complex institutional settings. However, the justification for using this method over more conventional approaches is insufficiently developed, and the operationalization of key constructs—particularly guanxi—requires greater clarity. While the statistical analysis is appropriate and adequately explained, the manuscript would benefit from a more detailed interpretation of interaction effects and a clearer discussion of the method's limitations regarding external validity.

[Response]

Done. We have strengthened the justification for using experimental vignette methodology (EVM) over conventional approaches by explaining its suitability for manipulating sensitive institutional variables (see p.13). We also clarified the operationalization of key constructs—particularly guanxi—by grounding our vignettes in empirically validated scales (e.g., Yen et al., 2011). Lastly, we addressed the method's external validity limitations in the revised Limitations section (see p.24), and outlined directions for future research to triangulate findings.

[Comments]

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: The results are presented clearly, with appropriate use of regression analysis to test the hypothesized relationships. The interaction effects are statistically significant and support the proposed model, although the interpretation of these moderating effects could be expanded for greater clarity. The conclusions are generally consistent with the empirical findings and tie back to the theoretical framework. However, a deeper discussion of the practical implications of the results, particularly in relation to the causal mechanisms suggested by the experimental design, would strengthen the overall contribution.

[Response]

Done. We added a paragraph at the end of Section 4.2 (p.23) to more clearly articulate the practical implications of our findings in light of the experimental design. The new content explains how firms respond to different institutional pressures and offers actionable insights for managers and policymakers aiming to foster downstream green collaboration.

[Comments]

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: The paper outlines relevant implications for research and practice, particularly by highlighting how institutional forces may hinder the effectiveness of green innovation strategies in supply chain collaboration. It offers useful managerial recommendations, such as re-evaluating guanxi practices and improving institutional stability, which align with the findings. However, the broader societal and policy implications—such as how the results could inform regulatory reform or promote sustainable industrial practices—are only briefly addressed. The paper could better bridge theory and practice by more explicitly discussing the economic, educational, and policy-level applications of its findings. Overall, the stated implications are consistent with the conclusions but would benefit from deeper elaboration.

[Response]

Thank you for this thoughtful and constructive comment. In response, we have expanded the discussion of our societal and policy implications in the revised manuscript, particularly within the contribution section. All new content is clearly marked in blue in the revised manuscript.

[Comments]

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The paper is generally well written and adheres to the technical language expected in the field of green supply chain management and institutional theory. Key concepts are clearly defined, and the structure is logical and easy to follow. However, some sections—particularly the Introduction and Discussion—contain long, dense paragraphs and occasional repetition, which may hinder readability. The use of jargon and acronyms is mostly appropriate, but certain terms (e.g., "resource orchestration") could benefit from brief clarification for broader accessibility. Overall, the manuscript communicates its ideas effectively, but minor revisions to sentence structure and flow would enhance clarity and reader engagement.

[Response]

Thank you for your constructive feedback on the clarity and readability of the manuscript. In response, we have reviewed and revised key sections—particularly the Introduction and Discussion—to improve sentence structure, reduce redundancy, and enhance paragraph flow.

Thank you once again for your helpful and detailed comments. We have implemented your suggestions carefully and believe these revisions have significantly strengthened the manuscript's theoretical contribution and practical relevance.

Reviewer: 2

Recommendation: Minor Revision

[Comments]

This study makes a valuable contribution by revealing institutional barriers to green collaboration in China. With minor theoretical refinements and clearer practical guidance, the manuscript will be a strong candidate for publication. The empirical rigor and focus on guanxi's dark side offer fresh insights to GSCM literature.

[Response]

Thank you very much for your encouraging and thoughtful feedback. We are pleased that you found the study's focus on institutional barriers and the underexplored aspects of *guanxi* valuable contributions to the GSCM literature. To reflect your comments, all revisions are highlighted in blue in the main manuscript and are also outlined in detail in this response letter.

[Comments]

Additional Questions:

1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper offers three key original contributions:

1. Empirical evidence of institutional forces as barriers (not facilitators) to GCC.
2. Theoretical integration of resource orchestration and institutional theory in a green innovation context.
3. Contextual novelty in examining China's institutional complexity

These elements provide substantial justification for publication, advancing both scholarly discourse and practical strategies in sustainable supply chain management.

[Response]

Thank you—we are grateful for your positive recognition of the manuscript's contributions to GSCM theory and practice.

[Comments]

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: Yes, the paper demonstrates an adequate understanding of relevant literature and cites an appropriate range of sources. However, some omissions exist:

1. While institutional theory is cited, deeper engagement with institutional complexity or institutional logics could strengthen the analysis of conflicting pressures in China's transitional economy.

[Response]

Done. We have strengthened our engagement with institutional theory by incorporating recent perspectives on institutional complexity and competing institutional logics. Specifically, we added a paragraph in Section 2.2.1 (p.7) that explains how firms in transitional economies like China must navigate conflicting pressures from state-led mandates, market-driven innovation, and relational norms like guanxi. This addition provides a more nuanced explanation of the constraints facing green innovation implementation in complex institutional environments.

[Comments]

2. Resource orchestration theory is applied but not critically contrasted with related frameworks.

[Response]

Done. We clarified the theoretical positioning in Section 2.2.1 (p.7) by explaining that institutional theory serves as the primary framework, while resource orchestration theory is used in a complementary role to support our explanation of how firms mobilize internal green capabilities for external collaboration. We did not aim to contrast frameworks, but rather to enhance conceptual clarity around the relational mechanisms underpinning GCC.

[Comments]

3. Some studies show guanxi facilitates environmental collaboration. The paper dismisses this as a "dark side" without reconciling contradictions.

[Response]

For your third concern, we fully acknowledge that prior studies have highlighted the positive role of *guanxi* in facilitating trust, information exchange, and coordination between business partners in China (e.g., Zhao et al., 2008; Luk et al., 2008; Barnes, 2011). In response, we have now incorporated a paragraph into Section 2.2.2 and as below that explicitly discusses this enabling perspective, situating our contribution within the broader literature. At the same time, we want to clarify that the focus of our

study is to explore the relatively underexamined "dark side" of *guanxi*. We hope this more balanced treatment addresses your concern and improves the conceptual framing of our argument.

[Comments]

Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?:

1. The argument is theoretically sophisticated, integrating multiple frameworks to address a clear gap.
2. Design is rigorous and contextually appropriate for testing moderation hypotheses.

[Response]

Thank you, —we appreciate your support on the methodological robustness of our approach.

[Comments]

Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Results are transparent, methodologically sound, and clearly linked to hypotheses. Conclusions robustly tie together theory, empirics, and practical implications. Some suggestions for improvement:

1. Discuss practical significance beyond statistical significance (e.g., how much institutional forces weaken GI→GCC);
2. Clarify contextual boundaries (e.g., generalizability beyond electronics/manufacturing).

[Response]

Thank you for your thoughtful suggestions. In response to your first point, we have added a new paragraph to Section 4.2 (Managerial Implications) that discusses the practical significance of our findings beyond statistical significance. This paragraph elaborates on how institutional forces—specifically ambiguous *guanxi* relationships and volatile government intervention—can shape managerial decisions and influence firms' willingness to pursue green collaboration. We also highlight how our experimental vignette methodology reveals behavioural patterns that can inform targeted policy and strategic responses.

To address your second point, we have added a note in the Limitations section in page 24 and as below acknowledging that our sample and scenario design are situated within the Chinese electronics and manufacturing sectors:

Additionally, the scope of this study is limited to the Chinese electronics and manufacturing sectors. While the underlying institutional mechanisms may exist elsewhere, caution should be exercised in generalizing these findings to other industries or national contexts without further empirical validation.

[Comments]

Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society

(influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: The paper excels in deriving coherent, actionable implications anchored in its findings. It bridges theory and practice by exposing institutional barriers to sustainability and prescribing strategies for firms/policymakers. Societal relevance is strong, emphasizing environmental and public health gains. Recommendations for future research and policy reforms are logical extensions of the study's limitations and results.

[Response]

Thank you very much for your supportive assessment of the practical and policy relevance of our work. We have reinforced these points in the revised contribution section.

[Comments]

Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The manuscript successfully communicates its case to APJML's audience, balancing academic rigor with contextual relevance. Some suggestions for improvement:

1. Critical improvements involve streamlining prose, clarifying niche terms, and tightening theoretical narrative.
2. Minor revisions (e.g., simplifying syntax, acronym glossaries) would enhance accessibility without compromising depth.

[Response]

Done. We reviewed and streamlined sections with dense prose and clarified niche terms. Edits were made to improve overall narrative flow and accessibility for an international audience.

Thank you again for your constructive and generous comments. We are grateful for your insights and hope the revised manuscript now meets your expectations for clarity, rigour, and contribution.