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Yu, W, Chavez, R, Feng, M et al. (2 more authors) (2020) Green human resource management and environmental cooperation: An ability-motivation-opportunity and contingency perspective. International Journal of Production Economics, 219. pp. 224-235. ISSN 0925-5273

https://doi.org/10.1016/j.ijpe.2019.06.013

Green human resource management and environmental cooperation: An ability-motivation-opportunity and contingency perspective

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Acknowledgments

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This research was supported by National Planning Office of Philosophy and Social Science (NPOPSS16XGL003) and Chongqing Bayu Talent Scheme (1019101611).

Abstract

This study examines the value of green human resource management (GHRM) in supporting environmental cooperation with customers and suppliers, and the moderating roles of internal green supply chain management (GSCM). A survey of 126 automobile manufacturers in China is analysed using moderated regression analysis, based on a proposed conceptual model grounded in ability–motivation–opportunity (AMO) theory and contingency theory (CT). The results reveal that GHRM is significantly and positively related to environmental cooperation with customers and suppliers, and that the relationships are significantly moderated by internal GSCM. HRM practitioners are advised to develop GHRM practices that provide training (ability), incentive (motivation), and conductive environment (opportunity) to help implement environmental collaboration, while SCM practitioners may improve internal GSCM to strengthen the effects of GHRM. This study clarifies key GHRM practices that contribute to GSCM, and advances related research by developing and testing an overarching model to explain such synergies and the moderating role of internal GSCM.

Keywords Green supply chain management; Green human resource management; Environmental cooperation

1. Introduction

Green supply chain management (GSCM) consists of internal environmental management (EM) practices and environmental cooperation with customers and suppliers (Vachon and Klassen, 2006; Yu et al., 2014). It has attracted considerable attention from both academia and industry (Green et al., 2012; Sarkis et al., 2011). In addition, the role of human resource management (HRM) in sustainability initiatives has been extensively explored in the literature (Daily et al., 2012; Daily and Huang, 2001; Markey et al., 2016; Renwick et al., 2013, 2016). The concept of Green HRM (GHRM) has emerged from these two streams of research to address the alignment of diverse HRM practices with firms' environmental sustainability objectives (Daily and Huang, 2001; Renwick et al., 2013). From a management perspective, firms may view GHRM practices as essential organisational assets that support EM practices (Vidal-Salazar et al., 2012), while poor human resource management practices can be a major obstacle to GSCM implementation (Jabbour and de Sousa Jabbhour, 2016; Teixeira et al., 2016). Despite this, the GSCM literature to date has not fully considered the integration of GHRM and GSCM practices (Jabbour and de Sousa Jabbour, 2016; Longoni et al., 2018) or empirically researched the GHRM–GSCM relationship (Jabbour and de Sousa Jabbour, 2016; Lengnick-Hall et al., 2013; Teixeira et al., 2016; Yu et al., 2017).

There are some major gaps in existing research that need to be addressed. Conceptualisations of GHRM in previous empirical studies have been either too narrow or not concerned with academic theory, reflecting a focus on environmental training for industrial applications in most empirical investigations (e.g., Daily and Huang, 2001; Jabbour, 2013, 2015; Sarkis et al., 2010; Teixeira et al., 2016; Vidal-Salazar et al., 2012). Conversely, a considerable number of theoretical papers have identified additional HRM practices that might support the implementation of environmental initiatives, including recruiting, performance evaluation, pay/reward systems, employee empowerment/engagement and organisational learning (e.g., Daily and Huang, 2001; Jabbour and Santos, 2008; Renwick et al., 2013, 2016); however, frameworks that integrate a more comprehensive set of GHRM practices with GSCM (e.g., Jabbour and de Sousa Jabbour, 2016) still lack an overarching theory and empirical validation (DuBois and DuBois, 2012).

Although recent studies of GHRM bundle practices have consolidated key HRM roles (e.g., Bon et al., 2018; Gupta, 2018; Yusliza et al., 2017), including hiring, training, and compensation (following Renwick et al., 2016), we still lack a theoretical understanding of how HRM practices targeted at motivating employees can influence them to engage in external environmental cooperation. Environmental cooperation represents an interesting setting for GHRM scholarship, and an opportunity for HR managers to play a strategic role (DuBois and DuBois, 2012; Wagner, 2013). It involves changes in how suppliers and customers are managed, and its implementation is more complex within an organization than traditional 'green' activities such as recycling. Moreover, when GHRM practices are introduced to promote environmental cooperation, their effects could be affected by other contingent factors (Daily et al., 2012; Renwick et al., 2013). For instance, internal GSCM requires a higher level of self-determination (Green-Demers et al., 1997), as well as leadership and teamwork skills (Daily et al., 2012). However, there has been no empirical investigation of its moderating role. In the past, internal and external GSCM were thought to act as mediators between GHRM bundle and performance (Zaid et al., 2018), without considering the distinctions between them, or that one of them may act as a contingency factor. Consequently, this study investigates the following two crucial research questions (RQs):

RQ (1): *Does GHRM affect environmental cooperation with suppliers and customers?*

RQ (2): *Does internal GSCM moderate the relationship between GHRM and environmental cooperation?*

To answer these two questions, this study develops and empirically tests an overarching theoretical framework that integrates the GHRM–GSCM relationship. First, following the seminal work of Renwick et al. (2013), we use the ability–motivation–opportunity (AMO) theory (Appelbaum et al., 2000) to identify the key HRM practices that affect the implementation of GSCM practices. The AMO theory posits that ability (A), motivation (M), and opportunity (O) are important determinants of the implementation of EM practices (Boselie et al., 2005). Training and development (A) are an important step because acquired green competence has a stronger association with green behaviour than natural green competence (Subramanian et al., 2016), but training alone might not warrant involvement (Green-Demers et al., 1997). Our integrative framework suggests using some forms of promotion to motivate trained employees (M), and to provide them with opportunities to contribute (O). Employees' ability, motivation, and opportunity (A-M-O) must be co-existent in an integrated framework (Martinez-Del-Rio et al., 2012), whereby the AOM theory provides a coherent comprehensive explanation of the contributions of GHRM to environmental sustainability (Renwick et al., 2013, 2016).

Second, based on contingency theory (CT) (Lawrence and Lorsch, 1967; Sousa and Voss, 2008), this study extends the work of Teixeira et al. (2016) and Zaid et al. (2018) by clarifying the moderating role of internal GSCM in the relationships between GHRM and environmental cooperation. As a form of GSCM, internal GSCM refers to EM practices internally adopted by firms to address environmental issues (Yu et al., 2014; Zhu and Sarkis, 2004). Arguably, successful collaborative environmental programs with customers and suppliers are contingent on internal GSCM practices and knowledge (De Giovanni, 2012). This contingency argument suggests that organizational systems are not closed, in that they are exposed to internal and external organizational factors that affect strategies (Schoonhoven, 1981). Thus, we draw upon the CT and consider internal GSCM as a complementary EM capability to GHRM. The contingency argument suggests that an internally green supply chain environment facilitates the implementation of collaborative environmental cooperation (De Giovanni, 2012). In other words, being internally green establishes environmental knowledge and capabilities, which streamlines and optimizes the implementation of external collaboration (Simpson et al., 2007).

Through a questionnaire survey of 126 automotive manufacturers in China, this study contributes to both the HRM and SCM literature in several aspects. We develop and empirically test a synergistic theoretical framework that explains the relationship between GHRM and GSCM. We incorporate AMO theory into a synergistic framework to advance our understanding of organizational sustainability in a supply chain context (Pagell and Shevchenko, 2014; Sarkis et al., 2011; Seuring and Müller, 2008). We contribute to interdisciplinary research across the HRM and SCM disciplines to comprehend how various GHRM practices affect the implementation of GSCM practices (Jabbour and de Sousa Jabbour, 2016; Renwick et al., 2016). From a practical perspective, this study also provides valuable insights and guidelines for HRM and supply chain managers to better understand the GHRM–GSCM relationship. Since implementing GHRM practices involves costs, this study is important for managers to understand which GHRM practices are more effective for the GSCM initiative they decide to pursue.

2. Theory and literature review

2.1. Ability–motivation–opportunity theory (AMO)

RQ (1) concerning the effect of GHRM on environmental cooperation with suppliers and customers can be addressed from an AMO perspective. Grounded in AMO theory, we argue GHRM should be measured using three sets of HRM practices, which includes green training and development, green employee motivation, and green employee involvement. Such GHRM contributes to environmental sustainability by developing green employee "Ability" (A) through attracting/selecting and training high-performing employees and enhancing them; green employee "Motivation" (M) through encouraging commitment through green initiatives; and providing "Opportunities" (O) for employees to get involved in EM initiatives (Renwick et al., 2013). Since acquired green competence is more useful than natural green competence (Subramanian et al., 2016), green training is required for increasing employees' capacity to cooperate with suppliers and customers. Even though training can possibly increase commitment level (Haddock-Millar et al., 2016; Yu et al., 2017), being trained does not automatically translate into motivation and participation in environmental cooperation. Trained employees can be motivated by encouragement, performance appraisal, and the perceived and experienced ease of actually getting involved (Martinez-Del-Rio et al., 2012).

The dimensions of GHRM become meaningful when they can be combined in an overarching theoretical framework that explains their effects on environmental cooperation. AMO theory allows us to integrate three essential GHRM factors into one construct, which is substantially different from the onus of previous studies on one specific GHRM factor (i.e., green training) (e.g., Jabbour, 2013, 2015; Sarkis et al., 2010; Teixeira et al., 2016). The AMO perspective of GHRM requires a measurement scale that combines the dimensions of ability, motivation, and opportunity; separation of the A-M-O factors into different constructs in a research model will yield an inaccurate interpretation of their effects on employees' involvement in environmental cooperation initiatives (Renwick et al., 2013, 2016).

2.2. Contingency theory (CT)

RQ (2) about the moderating effect of internal GSCM can be answered by adopting CT, which argues that no universal set of strategic choices applies to every business situation (Fredericks, 2005). In other words, there is no "one-size-fits-all" way to organize a company's strategy (Ginsberg and Venkatraman, 1985), in this case GHRM. Early proponents such as Lawrence and Lorsch (1967) suggested that the environment, including internal and external dimensions, plays a key role in shaping an organization's strategy, and that a single organizational model will simply not achieve optimal results. Furthermore, Hofer (1975) and Schoonhoven (1981) pointed out that a typical framework in the contingency research tradition would focus on the contingent relationship between the dependent and independent variables in a certain type of context (Ginsberg and Venkatraman, 1985). With a contingency theoretic approach, the effects of circumstance-contingent factors (internal GSCM) on the effects of the independent variable (GHRM) is operationalised as the effects of interactions between the moderator (internal GSCM) and independent variable (GHRM) (Andersson et al., 2014). A positive interaction (or moderation) effect means internal GSCM strengthen the effects of GHRM, and a negative interaction suggests otherwise (Ginsberg and Venkatraman, 1985).

The strategic role of human resources is well established in the literature as a fundamental contributor to firms' competitive advantage (Combs et al., 2006). The literature recognises that the effects of HRM practices grounded in an AMO perspective are dependent on a variety of factors (Boselie et al., 2005; Kim et al., 2015). In a dynamic, competitive market environment, the competitive value of human resources can be affected by changes in the environment or organizational factors (Porter, 1991). The value of a best practice, such as GHRM or GSCM, can be better explained by understanding possible contextual factors (Sousa and Voss, 2008). Thus, it is important to identify aspects that may influence the effects of GHRM on GSCM practices. While SCM is a field in an explanatory (rather than exploratory) stage of epistemological evolution, additional investigation is needed to explore the true dynamics of the field through contextual analysis (Ho et al., 2002). Consideration of contextual variables under which causal mechanisms tie action to results provide predictability (Christensen and Raynor, 2003).

2.3. Green supply chain management (GSCM)

There are many different GSCM practices, including eco-design, reverse logistics, green purchasing, cooperation with customers, internal EM, and investment recovery (Zhu and Sarkis, 2004). The extant literature tends to concentrate on aggregate constructs of GSCM (e.g., Feng et al., 2018), and on either the upstream side (e.g., Yu et al., 2017) or downstream side (e.g., Chavez et al., 2016) of the supply chain. One exception is given by Yu et al. (2014), who investigated an integrated framework that included internal GSCM and GSCM with customers and suppliers using the same sample of 126 car manufacturing firms used in the present study. Building on the work of Yu et al. (2014), in this study we distinguish between GSCM practices based on internal and external EM practices with customers and suppliers. It has been suggested that organizations seeking to green their entire supply chain should start by greening their internal operations and the operations of their supply chain members, such as suppliers and customers (Rao and Holt, 2005; Vachon and Klassen, 2006). Thus, GSCM is defined as intra- and inter-firm management of the upstream and downstream supply chain, aimed at minimising the overall environmental impact of both the forward and reverse flows (Rao and Holt, 2005; Vachon and Klassen, 2008; Yu et al., 2014; Zhu and Sarkis, 2004). Internal GSCM concerns EM practices within an organization, while external GSCM (concerning environmental cooperation) comprises practices aimed at generating collaboration with external trading partners, especially with customers and suppliers. The operational definitions of these concepts are explained below.

Internal GSCM is defined as the EM practices that organizations implement within their organisations (Rao and Holt, 2005; Vachon and Klassen, 2006; Zhu and Sarkis, 2004). Internal GSCM contains various environmental practices that organizations adopt at the organisational level, including EMS, eco-labelling of products, environmental compliance and auditing programs, environmental reports for internal evaluation, and ISO 14001 certification (Green et al., 2012; Yu et al., 2014; Zhu et al., 2010; Zhu and Sarkis, 2004). Cooperation between functional departments is equally important, guided by common objectives and an integrative strategy (del Brio et al., 2007).

Environmental cooperation with customers is defined as working collaboratively with customers on the implementation of EM practices (Vachon and Klassen, 2008). It focuses on building environmental collaboration with customers on the downstream part of the supply chain, through commitment to collective environmental goals, such as jointly planning and solving environmental problems (Klassen and Vachon, 2003). It also involves building close- and long-term strategic relationships with downstream customers (Christmann and Taylor, 2001). Knowing and understanding customer needs helps fulfil customer's environmental requirements and create customer value (Chavez et al., 2016). Given the increasing environmental pressures from stakeholders in the modern global marketplace and supply chains, it is important for firms to cooperate with customers for eco-design, achieving environmental goals collectively, reducing overall environmental impact, and developing joint environmental planning (Chavez et al., 2016; Green et al., 2012; Vachon and Klassen, 2008; Zhu and Sarkis, 2004).

Environmental cooperation with suppliers is defined as working collaboratively with suppliers on the implementation of EM practices (Vachon and Klassen, 2008; Yu et al., 2014). It recognizes the importance of establishing environmental cooperation with suppliers on the upstream part of the supply chain (Yu et al., 2017; Zhu and Cote, 2004). Suppliers are considered as important trading partners, since they can support the implementation of GSCM initiatives, such as enhancing green purchasing processes and material management procedures (Seuring and Müller, 2008; Zhu et al., 2010). Organizations are increasingly managing close and interactive cooperation with suppliers to ensure that the materials and components they purchase from suppliers are eco-friendly in nature, or produced using eco-friendly processes (Rao and Holt, 2005; Vachon and Klassen, 2008; Yu et al., 2017).

Despite the integrative nature of GSCM, previous studies exploring GSCM initiatives have focused predominantly on technical and process issues related to operations or supply chain management functions (Rao and Holt, 2005; Yu et al., 2014). Only a few studies provide empirical evidence relating to specific HRM factors in relation to GSCM, such as training (Teixiera et al., 2016). The integration of people or HRM factors into GSCM study is rare (De Stefano et al., 2018; Jabbour and de Sousa Jabbour, 2016).

2.4. Green human resource management (GHRM)

The human resource function can play a strategic role in creating and implementing sustainable business strategies throughout an organization (Cohen et al., 2012; DuBois and DuBois, 2012). GHRM concerns the HRM aspects of EM for achieving environmental sustainability (Renwick et al., 2013; Wagner, 2013). GHRM involves a "systemic, planned alignment of typical human resource management practices with the organizations environmental goals" (Jabbour, 2013, pp. 147-148). This means that HRM functions such as recruitment, selection, training, performance evaluation, rewards, teamwork, engagement, empowerment, and culture (Renwick et al., 2013, 2016), should be aligned with EM functions (Haddock-Millar et al., 2016) and objectives (Daily and Huang, 2001; DuBois and DuBois, 2012; Renwick et al., 2013, 2016). The degree to which HRM practices, systems, policies, and activities are aligned with EM is a growing area of research (Haddock-Millar et al., 2016; Renwick et al., 2016).

The strategic roles of GHRM have been recognized by researchers and practitioners (Haddock-Millar et al., 2016; Jabbour and de Sousa Jabbour, 2016). It has been argued that the management of human and behavioural aspects is required for implementing GSCM (Jabbour and de Sousa Jabbour, 2016), but there are debates in the literature concerning which dimensions of HRM contribute the most to EM (O'Donohue and Torugsa, 2016). Daily and Huang (2001) suggested that the HRM practices of top management support, environmental training, employee empowerment, teamwork, and rewards are the key enablers of EM. Other studies have mentioned additional HRM factors such as recruitment, short-listing, performance appraisal, engagement, culture, and organizational learning (Renwick et al., 2013, 2016). Some empirical investigations found that the impacts on EM of various types of HRM factors (e.g., rewards, training, empowerment, and manager involvement) vary according to particular organizational and personnel contexts (Zibarras and Coan, 2015).

Conducting similar research to expand the list of known HRM factors involved in EM effectiveness will not necessarily help advance theory and practice. While environmental training has been widely studied and is seen as a vital enabler of EM (Daily et al., 2012; Daily and Huang, 2001; Sarkis et al., 2010), the field lacks evidence about the combined effects of training and other HRM factors. Some studies show training and rewards could generate environmental performance through employee empowerment and teamwork (Daily et al., 2012). Another study theorizes that employees' affected commitment to EM initiatives arises from a combination of supervisory support, environmental training, and rewards (Cantor et al., 2012). These studies seem to suggest that the value of conceptualizing GHRM as a set of HRM practices comprises the development of green abilities, motivating green employees, and providing green opportunities (Renwick et al., 2013), which enables the testing of the AMO theory (Renwick et al., 2016).

The GHRM literature has been criticized for emphasizing activities within organizational boundaries while simultaneously ignoring interfaces with the external environment, stakeholders, and supply chains (De Stefano et al., 2018). HR managers may help supply chain managers develop codes of conduct and labour standards for suppliers and customers, and address issues related to human rights, safe working conditions, human dignity, wages, and skills development beyond the organizational boundaries (Locke et al., 2007). The GSCM literature recognizes the need for cooperating with suppliers and customers (Klassen and Vachon, 2003), but cooperation with external suppliers and customers is inherently more complex and difficult than working within the organizational boundaries. The work of Teixeira et al. (2016) is perhaps the first study that relates green training to environmental cooperation with suppliers and customers. Thus, the distinction between EM practices in terms of difficulty, such as recycling within an organization and environmental cooperation with customers and suppliers, requires further exploration.

3. Research hypotheses development

Figure 1 presents a theoretical framework that reflects the effects of A-M-O GHRM factors on environmental cooperation with customers and suppliers, moderated by internal GSCM as suggested by the CT.

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3.1. GHRM and environmental cooperation with customers and suppliers

GHRM practices are central drivers of EM adoption (Daily et al., 2012; Haddock-Millar et al., 2016; Jabbour et al., 2008, 2010; Markey et al., 2016; Renwick et al., 2016; Sarkis et al., 2010). HRM factors such as people involvement, dissemination of environmental knowledge, and learning throughout the organization are considered vital for implementing EM practices (Martinez-Jurado et al., 2013). Jabbour et al. (2010) stated that GHRM had a decisive role in the evolution of EM in organizations, and that human resource practices (such as performance evaluation and rewards) are critical to achieving more proactive EM. Evidence shows a close relationship between the implementation of EM and green human resource benefits, e.g., work satisfaction and recruitment/staff retention benefits (Wagner, 2013). With regard to different GSCM practices, some studies demonstrated that training helps generate green competence and knowledge among employees (Daily and Huang, 2001; Daily et al., 2012; Subramanian et al., 2016), although only Teixeira et al. (2016) examined the relationship between green training and environmental cooperation with customers on one hand and green purchasing on the other.

We argue that training alone is inadequate, because there is a need for employees' environmental motivation and a proactive engagement in environmental cooperation. Drawing on AMO theory (Appelbaum et al., 2000), we contend that the alignment between HRM and GSCM can help implement environmental cooperation. When organizations train and develop green employees (to improve ability), they need to further motivate them towards green orientation, and then provide opportunities for them to get involved in environmental cooperation. Employees are more likely to successfully implement environmental cooperation with customers and suppliers if they are trained, encouraged, and given opportunities to do so. Training creates awareness and new skills (e.g., lifecycle assessment) for analysing environmental problems facing suppliers and customers (Daily and Huang, 2001; Martinez-Jurado et al., 2013; Renwick et al., 2013). Increased knowledge and/or capability as a result of training might not be utilised if there is a lack of motivation and opportunity. This is especially true because environmental problems facing the suppliers and customers are harder to address (Daily and Huang, 2001; Renwick et al., 2013, 2016; Sarkis et al., 2010).

When HRM practices are aligned to specifically promote cooperation with customers and suppliers, employees are more motivated to address wider environmental issues. The opportunity to become involved is a key factor in this regard. When implementing EM systems, some organizations may restrict their EM efforts to specific supply chain and sustainability functional employees (Green et al., 2012; Renwick et al., 2013; Yu et al., 2014). The total quality management literature posits that employee involvement is a very powerful force in driving continuous improvement (Sila, 2007). When HR managers develop new opportunities for employees to contribute, more ideas and solutions can be generated to solve suppliers' and customers' environmental problems (Daily and Huang, 2001; Renwick et al., 2013).

A recent group of studies have introduced GHRM bundle practices (e.g., Bon et al., 2018; Gupta, 2018; Yusliza et al., 2017) and tested their effect on external GSCM (e.g., Longoni et al., 2018; Zaid et al, 2018). For instance, Longoni et al. (2018) found support for the positive association between GHRM practices and external GSCM; however, they only considered suppliers in measuring external GSCM. Zaid et al. (2018) found that GHRM positively affected external GSCM practices, based on measuring external GSCM as a composite construct combining buyers and suppliers. Such studies have further developed the association between GHRM bundle practices and external GSCM; however, they did not consider the differentiated impact of GHRM on customers and suppliers.

In this study, we distinguish external GSCM practices based on environmental cooperation with customer and suppliers, since GSCM deals with inter-firm management of the upstream and downstream supply chain aimed at minimising the overall environmental impact of both the forward and reverse flows (Rao and Holt, 2005; Vachon and Klassen, 2006). Hence, this study extends prior work through an integrated framework that allows exploring the potentially different impact of GHRM, thus achieving a more coherent understanding of its effect on environmental cooperation with customers and suppliers. Specifically, based on the above theoretical arguments, we argue that GHRM practices that embrace the A-M-O factors must be present for the implementation of environmental cooperation with customers and suppliers. Thus, we posit the following hypotheses.

H1: GHRM is positively related to environmental cooperation with customers.

H2: GHRM is positively related to environmental cooperation with suppliers.

3.2. The moderating effect of internal GSCM

As already noted, this study posits that internal GSCM acts as a moderator of the relationship between GHRM and environment cooperation with suppliers and buyers. Our fundamental thesis is that both GHRM and internal GSCM are necessary for firms to collaborate with customers and suppliers to green the entire supply chain. Recently, empirical studies have hypothesised that internal GSCM may act as a mediating variable explaining the effect of GHRM on performance (Bon et al., 2018; Longoni et al., 2018; Zaid et al, 2018). Alternatively, consistent with CT, we expect that the impact of GHRM on environmental cooperation with customers and suppliers is contingent on the level of internal GSCM practices implemented by the firms. Our GHRM construct focuses on how HRM functions promote environmental cooperation with external parties (suppliers and customers), and in this case, internal GSCM serves as an internal factor that moderates such effects.

Consistent with CT, the SCM literature categorizes the environment into contextual characteristics and internal characteristics. Contextual characteristics include aspects such as level of uncertainty, manufacturing pressure, and regulatory environment, while internal characteristics describe the company's strategic orientation, organizational infrastructure, and culture (Sousa and Voss, 2008). The present study focuses on the internal characteristics of the environment and proposes *internal GSCM* as a potential contingency variable for the relationship between GHRM and environmental cooperation with customers and suppliers.

Recent studies show that firms implementing internal GSCM practices can reduce the impact of their internal processes and activities, optimize their own environmental targets, and conform to the requirements of supply chain members such as suppliers and customers (De

Giovanni, 2012; Rao and Holt, 2005). It has been suggested that environmental collaboration with customers and suppliers fails when these stakeholders lack the prerequisite internal environmental capabilities (De Giovanni, 2012). The implementation of internal GSCM practices may grant acquisition of the needed knowledge and competences to firms and their customers and suppliers on how environmental collaboration should be conducted in supply chains (De Giovanni, 2012; Simpson et al., 2007). When composite firms within a supply chain are internally green, the implementation of collaborative practices become less complex across the whole chain (De Giovanni, 2012).

As noted previously, GHRM is concerned with the "systemic, planned alignment of typical human resource management practices with the organizations environmental goals" (Jabbour, 2013, pp. 147-148). This requires the alignment between the human resource function and other functional areas of the organization instrumental in the adoption of internal green activities (Haddock-Millar et al., 2016). It has been suggested that a more intense alignment between internal EM and GHRM practices can enable firms to build environmental collaboration with customers and suppliers (Jabbour et al., 2010; Teixeira et al., 2016). In other words, a strong association between GHRM and environmental cooperation with customers and suppliers is expected when firms are internally green (i.e., implementing internal GSCM practices) (De Giovanni, 2012). This argument suggests interaction effects between internal GSCM and GHRM.

Activities such as recruitment and selection, environmental training, performance appraisals, and teamwork require integration between the different internal functions of an organization. Internal integration processes at a supply chain level suggest that coordination and integration mechanisms (such as information sharing) of functional areas within the firm focus on departments and functions working as a cohesive process (Yu et al., 2013; Zhao et al., 2011). For instance, GHRM requires that the employees are aware of main aspects, such as problematic environmental issues, EM systems/programmes, requirements, and performance evaluation measures (Jabbour and Santos, 2008). Thus, we argue that a common understanding of green issues within organizations is a necessary precondition before green training, motivation, and participation in environmental programmes can take place. The resource-based view also stipulates that firms can gain and sustain competitive advantages if they are supported by organization-level competencies that reflect unique combinations of resources (Barney, 1991).

Furthermore, CT suggests that organizations are not closed systems, in that they are exposed to organizational factors that affect resources and capabilities (i.e., human resources) (Schoonhoven, 1981). Without the required environmental capabilities and knowledge that result from the implementation of internal GSCM practices, GHRM may have a limited impact on environmental cooperation with customers and suppliers. It could well be argued that GHRM could moderate the relationship between internal GSCM and environmental cooperation with suppliers and buyers (rather that internal GSCM moderating the relationship between GHRM and environmental cooperation with suppliers and buyers). However, the present work argues that internal GSCM aspects (e.g., environmental certifications, systems, and programmes) are necessary internal foundational characteristics of EM, which can determine how successful GHRM efforts are. Internal GSCM thus provide the internal integrative infrastructure under which GHRM affects environmental cooperation with customers and suppliers. Building upon the above argument and CT, we propose a more unified research model (as displayed in Figure 1). We expect that the degree to which GHRM improves environmental cooperation with customers and suppliers depends on the implementation of internal GSCM practices, through supplementing the required environmental knowledge and capabilities. Thus, we posit the following hypotheses.

H3: Internal GSCM positively moderates the relationship between GHRM and environmental cooperation with customers.

H4: Internal GSCM positively moderates the relationship between GHRM and environmental cooperation with suppliers.

4. Research method

4.1. Sample and data collection

The data for this study were obtained from a questionnaire survey of automotive manufacturers in China. A random sample of 1000 manufacturing plants (such as automakers and first- and second-tier automotive suppliers) was drawn from the *Official Directory of Automotive Manufacturers in China*, jointly edited by Wheelon Autoinfo, China Association of Automobile Manufacturers (CAAM) and the Society of Automotive Engineers of China (SAEC). The survey included firms from a number of regions and provinces in China, including Chongqing, Sichuan, Shanghai, Jiangsu, Hubei, and Guangdong. According to CAAM (2013), most large automobile manufacturing plants are located in these areas. For example, Chongqing and Hubei provinces are the main automobile manufacturing bases in China (Zhao et al., 2006).

In each randomly selected automotive manufacturer, we identified and contacted a key informant by telephone and email in order to obtain their preliminary agreement to participate (Zhao et al., 2006). We then sent the questionnaires to 600 manufacturing firms who agreed to take part in this research. Our respondents were executives and managers, including directors and general, supply chain, operations/production, and sales and marketing managers. The majority of respondents had more than eight years of work experience in their firms. Thus, it is reasonable to expect that the respondents were familiar with GSCM initiatives their firms implemented and had sufficient knowledge to complete the questionnaires. Follow-up calls were made to clarify any questions that potentially arose and to improve the response rate (Zhao et al., 2006). After several phone calls and email reminders, we received a total of 126 completed questionnaires, representing a response rate of 21%. Table 1 displays the demographic and professional profile data of the respondents.

------------------------------ Insert Table 1 ------------------------------

Some of the survey data was used in previously published work (Chavez et al., 2016; Feng et al., 2018; Yu et al., 2014, 2017). Using the same sample of manufacturing firms used in the present study, Yu et al. (2014) investigated the effect of integrated GSCM (i.e., internal and external GSCM with customers and suppliers) on four dimensions of operational performance: quality, cost, flexibility, and delivery. Defining green supply management from the upstream side of the supply chain, Yu et al. (2017) examined how green supply management capabilities (i.e., green purchasing personnel, green supplier selection, and green supplier collaboration) can generate competitive advantage in the form of environmental and operational benefits. Feng et al. (2018) conceptualised GSCM as a unidimensional construct and examined its effect on operational, environmental, and financial performance. Chavez et al. (2016) defined customer-centric SGCM from the downstream side of the supply chain and examined the links of implementing customer-centric GSCM with its antecedent factors (i.e., customer pressure) and performance outcomes (i.e., operational performance and customer satisfaction). However, none of those studies examined GHRM in the GSCM context.

Unlike previous studies, this investigation explored the value of GHRM in supporting environmental cooperation with customer and suppliers, more specifically the moderating roles of internal GSCM. Hence while previous studies considered the GSCM topic using the same dataset, they appear to us to be fundamentally different in character.

4.2. Variables and measurement

The measures used in this study and their sources are described in Table 2. Since there was no existing measurement instrument for GHRM in the supply chain context, we developed items based on a comprehensive review of the literature and feedback from industrial executives whom we interviewed during the pilot test. First, we developed the GHRM scales following the guidance suggested by experts and knowledgeable academics (e.g., Daily and Huang, 2001; Jabbour and de Sousa Jabbour, 2016; Renwick et al., 2013). Second, we developed the items based on our understanding of AMO theory, observations we made during company visits, and field interviews with industry experts individuals knowledgeable about EM. Third, after the items were developed, six top executives (such as supply chain and production managers) at automakers reviewed and evaluated the items, which provides a preliminary assessment of the reliability and validity of the measurement instrument. Drawing up on AMO theory, this study distils the wide range of GHRM practices from a supply chain context into three sets of GHRM practices – ability through training, motivating green employees through performance appraisal, and providing green opportunities for employee involvement (Jabbour and de Sousa Jabbour, 2016; Renwick et al., 2013). Six items were used to measure GHRM. Respondents were asked to respond using a five-point Likert-type scale, ranging from 1 "no plan to implement" to 5 "full implementation".

------------------------------ Insert Table 2 ------------------------------

In this study, we conceptualized GSCM as having three main dimensions: internal GSCM, environmental cooperation with customers, and environmental cooperation with suppliers. Six items adapted from Zhu et al. (2010) and Zhu and Sarkis (2004) were used to measure *internal GSCM*. The items focused on the internal EM practices implemented by manufacturers, such as EM systems, ISO14001 certification, environmental compliance and auditing systems, pollution programs, cleaner production, and performance evaluation. A total of ten items adapted from Vachon and Klassen (2008) and Zhu et al. (2010) were used to measure *environmental cooperation with customers and suppliers*. The items focused on inter-organizational interactions between supply chain members, including such aspects as joint environmental goal setting, shared environmental planning, and working together to reduce pollution or other environmental impacts. All these items were measured on a five-point Likert scale, ranging from 1 “no plan to implement” to 5 “full implementation”.

The control variables used in this study include *firm size*, *industry*, and *ownership*. These variables are reported in Table 1. Larger firms may have more resources to implement GSCM practices in comparison with smaller ones. In this study, the number of employees was used to measure firm size. Also, firms in the different automotive industries and firms with different types of ownership may implement different levels of GSCM practices. Dummy variables for industry types and ownerships were used in this study (Hair et al., 2010). The dummy variable Industry1 refers to automaker, Industry2 refers to first-tier supplier, and Industry3 refers to second-tier supplier. The base group is other automotive industries. With regard to the ownership dummy variables, Ownership1 refers to state-owned manufacturer, Ownership2 refers to private Chinese manufacturer, and Ownership3 refers to wholly foreign-owned manufacturer. The base group is joint venture manufacturer.

4.3. Questionnaire design and pre-test

We initially developed the English version of the questionnaire and then translated it into Chinese, and conducted a back-translation to ensure conceptual equivalence, checking the back-translated English version against the original English version, which helps to improve the reliability of the questionnaire (Flynn et al., 2010; Zhao et al., 2011). Some questions were reworded to improve the accuracy of the translation and relevance to business practices in China. Even though the measurement scales were used prior and demonstrated to be valid, we took extra steps to evaluate content validity before sending out the questionnaire. Due to the unique characteristics of the Chinese automotive manufacturing industry, we modified in minor ways the existing measurement scales to account for language and cultural differences. To assess the content validity of the scales, we consulted three academic experts for feedback and comments. Furthermore, we conducted a pilot test with several randomly selected automotive manufacturers using semi-structured interviews (O’Leary-Kelly and Vokurka, 1998). One of the authors of this study held semi-structured interviews with top executives to check the relevance and clarity of the measurement items. Based on the feedback from academic and industrial experts, redundant and ambiguous items were eliminated or modified.

4.4. Non-response bias and common method bias

To assess non-response bias, we compared early and late responses to demographic characteristics, such as number of employees and annual sales (Lessler and Kalsbeek, 1992). The t-test results reveal no significant statistical difference ($p < 0.05$) among the category means for the demographic characteristics. Thus, we concluded that non-response bias is not likely to be a concern in this study.

This study employed the three most rigorous approaches to assess common method bias, according to Guide and Ketokivi (2015). First, Harman's single-factor test based on exploratory factor analysis (EFA) was performed (Podsakoff et al., 2003). EFA (see Table 2) generated four distinct factors with eigenvalues above 1.0, which explained 64.997% of the total variance. The first factor explained 43.689% of the total variance. Second, confirmatory factor analysis (CFA) was applied to Harman's single-factor model (Flynn et al., 2010; Podsakoff et al., 2003). The model fit indices (χ^2/df (621.474/209) = 2.974, CFI = 0.730, IFI = 0.734, and RMSEA = 0.126) were unacceptable and significantly worse than those of the measurement model (see Table 3). Third, to further assess common method bias, we used a latent factor to capture the common variance among all observed variables in the measurement model (Flynn et al., 2010; Podsakoff et al., 2003). The resulting model fit indices were not significantly different from those of the measurement model, and the model with a latent factor marginally improved the fits. In summary, based on the analysis results above, we conclude that common method bias is not a serious concern in this study.

4.5. Reliability analysis

To evaluate the reliability of each theoretical construct, this study employed the two-step method suggested by Narasimhan and Jayaram (1998). In the first step, we assessed construct reliability by performing EFA to ensure the unidimensionality of the scale items. This step is a cautious procedure that helps assess the structure of the factors. It is necessary because we adapted existing scales to the Chinese automotive sector. We conducted principal component analysis with varimax rotation to identify the underlying dimensions of the theoretical constructs (Hair et al., 2010). As illustrated in Table 2, the factor analysis shows that four factors with eigenvalues greater than one were extracted, and the measurement items all had strong loadings on the construct that they were intended to measure. The results demonstrated the unidimensionality of the constructs (Hair et al., 2010). In addition, we performed CFA to further assess the unidimensionality of these constructed scales (Gerbing and Anderson, 1988). As shown in Table 3, the CFA results indicate that the measurement model in this study (χ^2/df = 1.700, RMSEA = 0.075, CFI = 0.907, IFI = 0.909 and SRMR = 0.059) is found to have acceptable fit indices (Hair et al., 2010; Hu and Bentler, 1999). Thus, we conclude that the unidimensionality of the constructs is confirmed.

------------------------------ Insert Table 3 ------------------------------

In the second step, Cronbach's alpha and composite reliability (CR) were calculated to assess the reliability of each theoretical construct. Table 3 shows that the Cronbach's alpha and CR of all the constructs were above the widely-recognized rule of thumb of 0.70 (Hair et al., 2010; Nunnally, 1978; O'Leary-Kelly and Vokurka, 1998). In addition, we used the corrected item-total correlation (CITC) reliability test (Kerlinger, 1986). Table 3 also shows that all CITC values were higher than the minimum acceptable value of 0.30. Thus, based on the results, we conclude that our theoretical constructs exhibit adequate reliability.

4.6. Validity analysis

Prior to data collection, *content validity* was supported by previous literature, executive interviews, and pilot tests (Flynn et al., 2010; Zhao et al., 2011). After the data collection, we performed a series of analyses to test reliability and validity of the theoretical constructs.

We used CFA to evaluate *convergent validity* for the four theoretical constructs (O'Leary-Kelly and Vokurka, 1998). As noted above, the model fit indices were acceptable (see Table 3), indicating convergent validity (Hu and Bentler, 1999; O'Leary-Kelly and Vokurka, 1998). Furthermore, the CFA results reported in Table 3 also reveal that all factor loadings were greater than 0.50 and were statistically significant ($p < 0.001$); furthermore, the t-values were all larger than 2.0, which provides further evidence of convergent validity (Flynn et al., 2010; Hair et al., 2010). In addition, the average variance extracted (AVE) of each construct exceeds or was marginally below the recommended minimum value of 0.50, indicating strong convergent validity (Fornell and Larcker, 1981). In summary, based on the results, we conclude that the constructs and scales have convergent validity.

We evaluated *discriminant validity* by comparing the correlation between the constructs and the square root of AVE (Fornell and Larcker, 1981). As illustrated in Table 4, the square root of the AVE value of each factor is higher than the correlation among any pairs of the constructs, thus providing evidence of discriminant validity (Fornell and Larcker, 1981).

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5. Data analysis and results

5.1. Hypothesis testing

We used moderated regression analysis to test the hypothesised relationships (Hair et al., 2010). We estimated the moderating effect using a three-stage regression analysis: (1) control variables, (2) main effect variables, and (3) interaction terms (Hair et al., 2010). Moderation occurs when the effect of an independent variable on a dependent variable varies across levels of a moderating variable (Andersson et al., 2014; Baron and Kenny, 1986). The regression coefficient for the interaction term provides an estimate of the moderating effect (Baron and Kenny, 1986; Hair et al., 2010; Preacher et al., 2007; Wu and Zumbo, 2008). Table 5 shows the results of moderated regression analysis. In all models, the variance inflation factors (VIF) values were well below the maximum acceptable cut-off value of 10, indicating that multicollinearity is not an issue (Mason and Perreault, 1991).

Firstly, we proposed that GHRM has a positive effect on environmental cooperation with customers (H1), and that this relationship is positively moderated by internal GSCM (H3). As illustrated in Table 5, the relationship between GHRM and environmental cooperation with customers was found to be significant (β = 0.383, p < 0.001), which indicates that H1 is supported. Table 5 also reveals that the coefficient of interaction term (GHRM × internal GSCM) is significant (β = 0.209, p < 0.01), which indicates that internal GSCM significantly moderates the relationship between GHRM and environmental cooperation with customers. In addition, the interaction term adds a statistically significant 3.7% to the explanatory power of the independent constructs (R^2 change = 0.037, F change = 9.659, p = 0.002). Thus, H3 is supported.

Secondly, we hypothesised that GHRM is significantly and positively related to environmental cooperation with suppliers (H2), and that this relationship is positively moderated by internal GSCM (H4). As shown in Table 5, GHRM was found to make a positive and significant contribution to the prediction of environmental cooperation with suppliers (β = 0.600,

$p < 0.001$). Thus, H2 is supported. Table 5 also indicates that the interaction term (GHRM × internal GSCM) was found to be significant ($\beta = 0.193$, $p < 0.05$) and to contribute significantly to a change in the variance explained. The inclusion of the interaction term significantly improves prediction (R^2 change = 0.032, F change = 6.151, $p = 0.015$). Thus, H4 is supported.

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5.2. Post-hoc analysis

We conducted a post-hoc analysis to further investigate the relationships among GHRM, internal GSCM, and environmental cooperation with customers and suppliers, and more specifically, the potential mediating role of internal GSCM. First, as shown in Table 5, internal GSCM has no significant effect on environmental cooperation with suppliers, thus we cannot test for mediation (Baron and Kenny, 1986). The lack of relationship between the moderator variable (i.e., internal GSCM) and the dependent variable (i.e., environmental cooperation with suppliers) helps distinguish moderators from mediators, because the latter must be related to both the independent and dependent variables in the relationship being mediated (Hair et al., 2010). Thus, the results indicate that internal GSCM acts as a moderator rather than a mediator of the relationship between GHRM and environmental cooperation with suppliers. Second, we tested the mediating effect of internal GSCM on the relationship between GHRM and environmental cooperation with customers. We carried out a mediation analysis using the PROCESS macro, which is a widely used computational tool for testing mediation (Hayes, 2013). The results reveal that internal GSCM does not fully mediate (i.e., it only partially mediates) the relationship between GHRM and environmental cooperation with customers.

6. Discussion and implications

6.1. Theoretical implications

This study contributes to both GHRM and GSCM literature in several aspects. First, we expand current knowledge about HRM factors, such as green training (Daily et al., 2012; Teixeira et al., 2016) and green competence (Subramanian et al., 2016) by combining HRM factors related to training and development (ability), encouragement (motivation), and the provision of opportunity (opportunity). This construct and its measurement scales can be used by future research to understand the roles of GHRM factors based on A-M-O in various settings.

Here we respond to the call for testing the applicability of AMO theory (Renwick et al., 2016), by demonstrating that A-M-O factors are relevant to a supply chain setting (Jabbour and de Sousa Jabbour, 2016; Teixeira et al., 2016), especially for environmental cooperation involving external suppliers and customers, which is more difficult to implement. An implication for GHRM scholarship is that the effects of GHRM factors on employee involvement could vary, depending on the types of EM practices, and whether they are internally or externally focused (De Stefano et al., 2018), and whether they are easier or harder to implement (Green-Demers et al., 1997).

In terms of new knowledge, we show that training and development provides the ability (Ability) by raising awareness of alternative greener perspectives, and increasing knowledge to execute such new perspectives (e.g., Jabbour, 2013, 2015; Sarkis et al., 2010; Teixeira et al., 2016; Vidal-Salazar et al., 2012). Developing green abilities is particularly important to employees who are reluctant to change, who may still believe that it is costly and meaningless to cooperate with customers and suppliers to reduce environmental impacts. Despite this, training and education may not always warrant actions, especially when it comes to cooperation with customers and suppliers for reducing their environmental impacts (Renwick et al., 2013; Sarkis et al., 2010). Employees become encouraged and empowered to take the next step when complemented by encouragement (motivation), which can be harnessed to drive new green initiatives. Programmes that provide opportunities to participate and test new perspectives will reinforce HRM policies in training and motivation. Motivated employees equipped with new skills will be likely to be proactive in practicing new values and methods at work, and to further learn by engaging in green initiatives, such as introducing new ideas to customers and suppliers on how to reduce their environmental impacts (environmental cooperation).

Second, cross-disciplinary research can add novel perspectives to theory building (Whetten, 1989). When theorizing GSCM practices such as environmental cooperation, GSCM scholars often take human factors for granted. However, this study shows that GHRM focused on A-M-O factors significantly supports environmental cooperation. By identifying the combination of HRM mechanisms for promoting environmental collaboration, this paper contributes to the greening of strategic HRM scholarship (Jackson and Seo, 2010) and GSCM literature (e.g., Cantor et al., 2012). While there is mixed evidence about the effectiveness of rewards (Cantor et al., 2012; Daily et al., 2012), we show that intrinsic motivation based on encouragement works to support environmental cooperation, together with training, development, and opportunities.

Third, a novel contribution of the study is that we integrated AMO theory and CT as an appropriate theoretical lens to clarify the GHRM–GSCM relationship. We have demonstrated that GHRM research should consider different types of contextual factors, especially GSCM practices. The effectiveness of GHRM cannot be ensured without simultaneously improving internal GSCM. Clarifying the GHRM–GSCM relationship from a CT perspective is a crucial step towards more profound theoretical understanding (Ginsberg and Venkatraman, 1985). We know from past research that internal GSCM is the platform for external GSCM (De Giovanni, 2012). From the CT perspective, this study clarifies that employees who acquire new ability, motivation, and opportunity through GHRM benefit from a strong cross-functional collaborative environment (internal GSCM) in their efforts to execute environmental cooperation with customers and suppliers. This study extends the literature by showing that internal GSCM and GHRM should be further aligned to green the supply chain (Teixeira et al., 2016).

Finally, this study further integrates the largely separate literatures of GSCM and GHRM (Jabbour and de Sousa Jabbour, 2016; Renwick et al., 2013). While there were initial attempts to integrate various GHRM practices into the AMO theoretical framework (Renwick et al., 2013), and GHRM factors into the GSCM framework (Jabbour and de Sousa Jabbour, 2016), the potential effects of GHRM on GSCM remain under-researched (Jabbour and de Sousa Jabbour, 2016). By integrating three GHRM factors (A-M-O), this study provides an aggregated understanding of HRM functions such as recruitment, selection, training, performance measure and appraisal, empowerment, engagement, and involvement (Renwick et al., 2013, 2016).

6.2. Managerial implications

This study has several implications for practitioners. First, our findings of the significant relationships between GHRM and environmental cooperation with customers and suppliers provide important guidance for managers. To date, in most organizations the HRM function has lacked a powerful voice in sustainability circles. The HRM profession has yet to assume a more proactive role in implementing GSCM practices (DuBois and DuBois, 2012). Our findings present useful guidance for managers to integrate GSCM and GHRM. It is important for managers to recognise and understand how GHRM could contribute to green the supply chain.

Second, instead of simply relying on training and development, managers should incorporate additional human resource factors (such as green employee motivation and involvement) into the implementation of environmental cooperation with customers and suppliers. As a result of the increasing pressures from different stakeholder groups on environmental issues (Sarkis et al., 2010), implementing GSCM practices is becoming more complicated. Environmental training and development alone may not be adequate to enable employees to cooperate with supply chain partners in greening supply chains. Besides providing green training to employees, managers should also focus on motivating green employees and engaging employees in environmental initiatives, to enable firms to build environmental collaboration with suppliers and customers.

Third, our findings of the moderating role of internal GSCM also provides implications for managers. The key here is to increase the level of internal GSCM to strengthen the effects of GHRM practices on environmental cooperation with customers and suppliers. To build environmental cooperation with customers and suppliers across the supply chain, GHRM should be aligned with the implementation of internal GSCM practices, such as environmental auditing programs, EMs, environmental reports for internal evaluation, and EM certification (e.g., ISO 14001 certification). Such internal GSCM practices together with GHRM will help firms further green their supply chains.

7. Conclusion

This study contributes to HRM and SCM theory and practice in several aspects. First, using AMO as a theoretical lens, this study advances the existing GSCM research by empirically testing a more complete theoretical framework that simultaneously integrates various GHRM practices and the dimensions of GSCM. Second, the findings of the significant relationship between GHRM and environmental cooperation with customers and suppliers contribute to a better understanding of the integration between GSCM and GHRM (Jabbour and de Sousa Jabbour, 2016). Third, from a CT perspective, our study addresses a demonstrable gap in the existing literature that no empirical studies have examined, namely the moderating effect of internal GSCM. Fourth, the study contributes to theory by clarifying the roles of GHRM in GSCM. The findings are consistent with AMO and CT and provide managerial implications that focus on whether GHRM should be integrated to succeed in the implementation of GSCM practices, and under what circumstances this relationship is stronger.

Notwithstanding the theoretical and practical contributions, the study has certain limitations. First, we examined the GHRM–GSCM relationship but not its performance outcomes. The literature has suggested that GHRM and GSCM practices may influence firm performance (Daily et al., 2012; Green et al., 2012). Thus, future research may investigate the combined effects of GHRM and GSCM on firm performance (such as social, financial, and operational performance measures). Second, in this study, we tested the proposed conceptual framework in the Chinese automotive industry. For cross-country validation purposes, future research could test the applicability in different cultural and industrial settings, and confirm the empirical results gained from our study. Third, another important limitation of this study relates to single respondent bias. Other individuals within the company might have different perspectives on the company's GSCM and GHRM practices. Future research is encouraged to collect data from multiple respondents' perspectives, which could increase the validity and reliability of the research by providing a more comprehensive analysis. Fourth, we selected GHRM dimensions that emphasize intrinsic motivation. We have not included practices such as remuneration, rewards, and performance measures, because they might act as a form of extrinsic motivation that discourages self-worth and determination (Deci, 1972). While the present study reveals the effects of intrinsic motivation, it serves as a foundation for future studies to contrast intrinsic and extrinsic approaches to GHRM.

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Table 1: Demographic characteristics of respondents (n = 126)

	Percent (%)		Percent (%)
Automotive industry		**Number of employees**	
Automaker	30.2	1-99	4.0
First-tier supplier	54.0	100-199	12.7
Second-tier supplier	9.5	200-499	25.4
Others	6.3	500-999	10.3
Annual sales (in million Yuan)		1,000-4,999	26.2
Below 10	1.6	5,000 or more	21.4
10-50	9.5	**Firm ownership**	
50-100	12.7	State-owned manufacturer	20.6
100-500	25.4	Private Chinese manufacturer	18.3
500-1,000	11.1	Wholly foreign-owned manufacturer	19.8
More than 1,000	39.7	Joint venture manufacturer	41.3

Table 2: EFA of GSCM and GHRM

Measurement items	F1	F2	F3	F4
1. Internal GSCM				
GIN1: Environmental compliance and auditing programs	**0.771**	0.210	0.169	0.092
GIN2: Environmental management certification e.g. ISO14000/ISO14001 certification	**0.738**	0.084	0.229	0.146
GIN3: Environmental Management Systems exist	**0.648**	0.125	0.188	0.410
GIN4: Existence of pollution prevention programs such as cleaner production	**0.658**	0.058	0.046	0.412
GIN5: The internal performance evaluation system incorporates environmental factors	**0.620**	0.047	0.170	0.375
GIN6: Generate environmental reports for internal evaluation	**0.533**	0.088	0.464	0.163
2. Environmental cooperation with suppliers				
GSU1: Cooperate with supplier to reduce packaging waste	0.309	**0.766**	-0.068	0.073
GSU2: Require suppliers to use environmental packaging (degradable and non-hazardous)	0.148	**0.717**	0.182	0.179
GSU3: Developing a mutual understanding of responsibilities regarding environmental performance with suppliers	0.069	**0.775**	0.231	0.274
GSU4: Conducting joint planning with suppliers to anticipate and resolve environmental-related problems	0.015	**0.770**	0.354	0.224
GSU5: Making joint decisions with supplies about ways to reduce overall environmental impact of our products	-0.015	**0.677**	0.364	0.326
3. GHRM				
GHR1: Provide training programmes on environmental management for our employees [training and development]	0.466	0.371	**0.502**	0.052
GHR2: Organize environmental education activities for our employees [training and development]	0.488	0.241	**0.634**	-0.169
GHR3: Promote employee participation for green development [employee motivation]	0.157	0.179	**0.717**	0.159
GHR4: Our employees introduce environmental issues to customers [employee involvement]	0.140	0.088	**0.777**	0.397
GHR5: Purchasing personnel introduce environmental issues to suppliers [employee involvement]	0.283	0.262	**0.604**	0.420
GHR6: Purchasing personnel receive training regarding the purchase of environmentally friendly products [training and development]	0.256	0.374	**0.615**	0.303
4. Environmental cooperation with customers				
GCU1: Cooperation with customers for eco-design	0.315	0.111	0.106	**0.602**
GCU2: Achieving environmental goals collectively with customers	0.219	0.416	0.071	**0.555**
GCU3: Developing a mutual understanding of responsibilities regarding environmental performance with customers	0.311	0.343	0.236	**0.614**
GCU4: Working together with customers to reduce environmental impact of our activities	0.254	0.292	0.197	**0.721**
GCU5: Making joint decisions with customers about ways to reduce overall environmental impact of our products	0.092	0.278	0.377	**0.692**
Eigenvalues	9.612	2.094	1.402	1.191
% of variance	43.689	9.520	6.373	5.414
Cumulative explained variance (%)	43.689	53.209	59.582	64.997

Table 3: CFA: reliability and validity

Measurement items*	Factor loadings	t-values	α	CR	AVE	CITC range
1. Internal GSCM			0.855	0.855	0.497	0.550–0.650
GIN1	0.710	–				
GIN2	0.696	7.202				
GIN3	0.763	7.859				
GIN4	0.706	7.300				
GIN5	0.698	7.225				
GIN6	0.653	6.774				
2. Environmental cooperation with suppliers			0.873	0.875	0.588	0.493–0.629
GSU1	0.597	–				
GSU2	0.683	6.172				
GSU3	0.841	7.080				
GSU4	0.876	7.245				
GSU5	0.800	6.868				
3. GHRM			0.876	0.877	0.544	0.562–0.747
GHR1	0.705	–				
GHR2	0.649	6.848				
GHR3	0.651	6.863				
GHR4	0.789	8.261				
GHR5	0.832	8.677				
GHR6	0.780	8.176				
4. Environmental cooperation with customers						
GCU1	0.590	–	0.842	0.847	0.529	0.519–0.710
GCU2	0.665	5.930				
GCU3	0.796	6.675				
GCU4	0.800	6.696				
GCU5	0.763	6.501				
Model fit statistics: χ^2 = 345.165; df = 203; χ^2/df = 1.700; RMSEA = 0.075; CFI = 0.907; IFI = 0.909; SRMR = 0.059						

Note: * **See Table 2 for the survey questions on the measurement items.**

Table 4: Descriptive statistics

	Mean	S.D.	1	2	3	4
1. Internal GSCM	3.824	0.758	0.705[a]			
2. Environmental cooperation with suppliers	3.797	0.731	0.411**	0.766		
3. GHRM	3.672	0.745	0.662**	0.607**	0.738	
4. Environmental cooperation with customers	3.856	0.666	0.640**	0.629**	0.637**	0.727

Note: [a] **Square root of AVE is on the diagonal.**
** $p < 0.01$. **(2-tailed).**

Table 5: Results of moderated regression analysis

	Dependent Variable: Environmental Cooperation with Customers			Dependent Variable: Environmental Cooperation with Suppliers		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Control variables						
Firm size	0.111 (0.942[a], 1.792[b])	0.022 (0.250, 1.828)	0.009 (0.110, 1.832)	0.053 (0.448, 1.792)	0.017 (0.170, 1.828)	0.005 (0.054, 1.832)
Industry1	0.237 (1.187, 5.178)	-0.193 (-1.226, 6.026)	-0.018 (-0.113, 6.851)	0.233 (1.149, 5.178)	0.059 (0.330, 6.026)	0.221 (1.177, 6.851)
Industry2	0.483 (2.577, 4.573)*	-0.100 (-0.647, 5.839)	0.076 (0.477, 6.682)	0.416 (2.186, 4.573)	0.135 (0.761, 5.839)	0.299 (1.608, 6.682)
Industry3	0.194 (1.446, 2.353)	-0.061 (-0.580, 2.694)	0.034 (0.325, 2.940)	0.121 (0.883, 2.353)	0.030 (0.247, 2.694)	0.118 (0.960, 2.940)
Ownership1	-0.092 (-0.876, 1.423)	-0.120 (-1.567, 1.427)	-0.106 (-1.427, 1.432)	0.056 (0.530, 1.423)	0.024 (0.279, 1.427)	0.038 (0.440, 1.432)
Ownership2	0.011 (0.108, 1.259)	-0.041 (-0.567, 1.266)	-0.063 (-0.902, 1.279)	0.044 (0.439, 1.259)	0.007 (0.090, 1.266)	-0.013 (-0.161, 1.279)
Ownership3	-0.016 (-0.158, 1.330)	-0.013 (-0.176, 1.416)	0.009 (0.117, 1.429)	-0.067 (-0.655, 1.330)	0.005 (0.061, 1.416)	0.026 (0.301, 1.429)
Independent variables						
GHRM		0.383 (4.285, 1.948)***	0.401 (4.635, 1.956)***		0.600 (5.855, 1.948)***	0.616 (6.133, 1.956)***
Internal GSCM (moderator)		0.413 (4.184, 2.371)***	0.362 (3.745, 2.442)***		-0.022 (-0.196, 2.371)	-0.070 (-0.620, 2.442)
Interaction effect						
GHRM × Internal GSCM			0.209 (3.108, 1.179)**			0.193 (2.480, 1.179)*
R^2	0.093	0.523	0.560	0.064	0.375	0.407
Adjust R^2	0.039	0.486	0.522	0.009	0.327	0.355
F-value	1.723	14.130***	14.632***	1.153	7.739***	7.890***

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.
Note: The numbers in parentheses are: [a] t values and [b] variance inflation factor (VIF).

Figure 1: Proposed research model