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Trends to Green Collaboration in Chinese Retail Industry Based on Discrete Choice Model

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ABSTRACT

Green collaboration refers to a process initiated by the retailers to conduct coordinated actions and to work together over extended periods of time in order to achieve sustainability of the supply base, thereby it can generate benefits for the supply and retail firms. Empirical evidence of retailers has been exuberated in recent years, however, relative quantitative research is very limited. In this paper, we elicit the common attributes and levels of retailer green collaboration through firm social responsibility reports and expert interview. Green collaboration includes environmental criteria & regulation , production process, package, purchase, logistic and others. The green collaboration status quo and future trend of 19 firms all around China are analyzed to by a conjoint choice experiment. Green collaboration in China is still on the primitive stage yet. It is essential to further logistic collaboration to reduce product cost. Package reduction and reuse is another important issue but retailers are still not aware of it.

Keywords: *Green collaboration, importance of attribute, conjoint choice experiment, Criteria & Regulation, Logistic, Package*

INTRODUCTION

After Stevens (1989) has defined supply chain as the integration of business functions involving the flow of materials and information from inbound to outbound of the business for the first time, the concept of supply chain management (SCM) represents (Thomas and Griffin, 1996) the most advanced state in the evolutionary development of purchasing, procurement and other supply chain activities. During 1990s, green supply chain management (GSCM) has been an emerging field that stands out of the traditional supply chain perspective (Srivastava, 2007). In recent years, accompanying that GSCM itself has gained increasing attention within both academic and practical field, various theories, models and practical cases have become more and more important to perceive green chain. Abroad organizational theories provide ample opportunities for operating application at the organizational level (Ketchen and Hult, 2007; Sarkis et al., 2011).

Dyadic relationship between upstream suppliers and downstream customers is one of the most essential performance improvements in green supply chain management (Seyfang, 2006; de Brito et al, 2008; Gunther and Scheibe, 2005). Scholars have found that significant economic benefits earned from effective management of supplier-custom relationship could improve supply management proficiency (Narasimhan and Das, 2001) and Bowen et al (2001) also indicated that companies will implement Green Supply Chain Management practices if they can gain both financial and operational benefits. Although in theory, the adoption of environmental sustainability is a benefit to chain partners (Seuring, 2004), it is questioned if adoption results in a win-win situation or a trade-off between environmental and economic advantages for the green supply chain partners. In many cases, unless there is a significant direct economic return or because of mandated policies, the implementation of green chain programs may be disregarded (Bai and Sarkis, 2010). However, the external and internal pressures make business firms reduce negative impacts and increase positive ones although involving a large investment, it probably has less clear economic returns in short terms (Cai et al., 2008). Governments are trying to adjust legislations and social pressures through individual activists, non-governmental organizations, and international institutions, and are also growing to express public mandate against the negative impacts of business

activities on environment. From an internal perspective, the demand to improve organizational efficiency, to reduce waste, and to overcome supply chain riskhas strengthened companies's pressure to consider environmental issues in order to sustain a competitive position (Humphreys, 2003; Gunther and Scheibe, 2005).

Although green supplier selection is a very essential research focus, collaboration with existing or new suppliers to achieve higher level of greenness or sustainability (Vachon and Klassen, 2006, Lee and Klassen, 2008, Pauraj, 2009) is an less investigated trend (Powell 1990, Williamson 1991). The relationship between suppliers and customers becomes even more important under conditions of uncertainty (Pfeffer and Salancik, 1978), and it could improve suppliers' economic sustainability through vertical coordination (Carter and Roger, 2008). By interacting with suppliers and their customers, organizations can potentially develop and implement more effective solutions to environmental challenges they are facing (Vachon and Klassen, 2006, Lee and Klassen, 2008). The development of such relationship requires a mutual willingness to learn about each others' operations in order to improve environmental performance through green technological innovation (Geffen and Rothenbery, 2000; Chiou et al., 2011).

Supply chain of retail industry has a different character from that of manufacturers or other industries. Retail industry is a conjoint part of production and consumption with upstream production suppliers and downstream individual consumers. Retailing is not engaged in the manufacturing and product transforming, instead it pursues maximizing downstream consumers satisfaction. Its business variety is a necessary condition to meet individual consumer demands, so firms' upstream suppliers are numerous. Considering the China retail industry, the scale of firms' suppliers ranges from 200 to 2000. For most large-scale chain enterprises it is above 2000 (CCFA and Deloitte, 2014). Secondly, retailing itself has restricted impacts on upstream suppliers than manufacturing industry (CCFA, 2011), which cannot be compared with dominating multinational retailers like Walmart and Carrefour. Furthermore, development peed of traditional retailing continues to decline because of the development of e-commerce with low average gross margins about 17% in 2013(CCFA and Deloitte, 2014). One the one hand, external pressure supports the development of green supply. On the other hand green supply is associated with increased commercial risks, especially in the short-term (Cai et al., 2008) Green collaboration delievers a solution to the problems mentioned above. The collaboration mode between retailers and suppliers is the mode of enterprise to enterprise, while the mode between retailers and downstream consumers is the mode of enterprise to individual. It is worth mentioning that green collaboration mode in our research only include the former one.

Through numerous social responsibility reports, the main aspects and extent of green collaboration between suppliers and retailers are sorted to ensure common attributes and levels of retailer green collaboration, and elicit retail green collaboration using a discrete choice model. A survey based on a conjoint choice experiment is conducted by 19 retail firms to examine green collaboration propensity.

Supplier Attribute Term of Green Performance

Criteria and Regulation

The collaboration scope between firms and suppliers is extensive (Boons and Baas, 1997; Vachon and Klassen, 2006). Whether based on stakeholders' pressure, economic actor or governmental agencies, it is required that upstream suppliers with the aim of improving their environmental performance leading to an enhanced environmental profile the firms' own products and service. Many large Western-European retails establish requirements to assess and to improve their own environmental performance. Commercial Ministry of China in 2013 reveals that (CMPRC, 2013） 51.7% of surveyed firms are in compliance with environmental laws and regulations in 2012 (CMPRC, 2012）.

Retailers pay more attention to environmental actions of its upstream, even make clear goal for them to comply with national environmental laws and regulations (Ginza, 2013; Aeon, 2013; Costco, 2009; ALDI, 2009; Home Depot,2010; REWE, 2009), including national and local environment, safety, labor and other related standards. In addition, some retailers claim that suppliers should possess obligatory environmental permission and registration documents (Costco, 2009), and should comply with related social responsibility regulations and environmental criteria(ALDI, 2009; Home Depot, 2009). In addition, generally speaking, social aspects are stricter than state regulations. For instance,

REWE cautiously selected suppliers to backbone supply chain to make sure of fulfilling common sustainable standards (REWE, 2010).

Retailers take various assessments and audits to identify suppliers' compliance. Home Depot audited suppliers randomly by the third party (Home Depot, 2010). McDonald's introduces environmental scorecard as a second party to audit bread, beef, chicken, pork and potatoes suppliers in 9 major markets, which supervises their energy consumptions, water usage, waste gas emission and waste solid disposal in their assembly lines. Tesco asks suppliers in England to accomplish surveys about carbon emissions reduction, water conservation, waste and packaging reduction (Tesco, 2011).

Green Design

Retailers differ from manufacturers which engage in product design and process directly. With increasing awareness of green consumption and the consumers' increased attention to green firm image (CMPRC, 2012; CMPRC, 2013; CMPRC, 2014）,retailers will coordinate with suppliers to value sustainability in own brand product design, to trace product life-cycle and even to develop and design environmental conservation product (Archon, 2010; Aeon, 2013; ALDI, 2009).

Except for own brand product, retailers also collaborate on labels of other products with suppliers, for example, developing sustainable e-label（Metro Group, 2010; Lotte, 2009), displaying carbon footprint in label and attaching carbon reduction advice(REWE, 2009; Walmart, 2012; Tesco, 2010).

Green Manufacturing

Retailing encourages and helps suppliers to increase energy efficiency (CRV, 2012; Walmart China, 2012), to conserve water (Walmart China, 2012; IKEA, 2013), and to reduce environmental pollution. They give their suppliers some advice about energy audit and find potential opportunities in their factories. They work together to detect these problems at the beginning of production and in the process and provide guidance for the suppliers (CVS, 2011; Home Depot 2010), which aim to solve related sustainable problems and improve products quality.

Package Improvement

Package occupies a large proportion in the wide variety and large number of goods sold by retail industry. Slimming package materials with integrity of commodities not only decreases total amount of solid waste but also abates cost. Usually, manufacturers are responsible for the package process, while retailers just use and dispose the package. It is understandable for the collaboration between two sides to make cost saving in environment and economy.

It is a common practice for retailers to reduce the type and weight of packaging materials (Walmart China, 2012; Uniark, 2013; Carrefour, 2010; ALDI, 2010; CVS, 2011; Best buy, 2013), different firms cooperate in different attributes and at different levels, such as downsizing package (Walmart China, 2012), narrowing down package box (Uniark, 2013; CVS, 2011), removing unnecessary package (ALDI, 2010; Best buy, 2013）and so on.

Additional, some retail enterprises research and develop recycled materials and non-toxic environmental protection materials to substitute the original ones cooperatively (Bestbuy, 2013; Walmart China, 2012; ALDI, 2013), including polyvinyl chloride PVC and other plastic reduction (Target, 2011; Best buy, 2013), and by using new eco-friendly materials.

Green Purchase

Purchase is such a most important key link in the supply chain that green purchase affects environment performance directly in the whole process. Due to the variety of commodities offered in the retail industry, it is hard to complete green purchase in a short term, but rather in a gradual process. Considering social responsibility reports of various retailers, their previous collaboration is represented in the following:

Formulating and implementing their own moral purchasing standards boosts environmental behavior and at the same time improves purchasing ratio of more environment-friendly products.

Many retailers introduce farm-to-market mode to purchase agricultural products (CRV, 2012; Walmart China, 2010; Metro, 2014), which eliminates intermediate links and ensures food safety. This mode subtracts carbon emission in logistic process and reduces environmental pollution in production process through an appropriate training of farmers. Some reports read that there is a rising tendency in farm-to-market mode to purchase fresh products (CRV, 2012; Walmart China, 2010; Carrefour, 2010). In addition, purchasing green products which mainly concentrates on electronics and

appliances, also includes energy saving illuminant and cooking utensil (Sunny, 2013; CRV, 2013; Walmart, 2012; Ginza, 2013; Costco Wholesale,2012, CRV, 2013). In China, promoting green appliances contributes to increase the green purchase and is supported by a government's or suppliers' subsidy, so does electronic products certified by RoHS (Sunny, 2013; Walmart, 2012）.

Retailers have positives attitude toward the purchase of green products with environmental labels, e.g. papers certified by FSC (Aeon, 2013; Carrefour, 2011) and marine products certified by MSC(Aeon, 2012; Metro, 2011; Target, 2010). But Chinese consumers are only able to recognize 5% of environmentally certified products (CCFA, 2011).

Logistics

The carbon emission in the process of logistic distribution accounts for 60% of the total carbon emission in the Chinese retail industry. The average logistic cost in Chinese retailing accounts for 10% of the total. Some fresh products even cause higher costs from 20% to 30% of its goods value, which is significantly higher than that in the EU and US with 4%-6% (MOPRC, 2013). So logistics efficiency is proposed for further improvement. A survey conducted by Ministry of Commerce reads that 40.4% of firms consider increasing logistic energy efficiency with regard to decrease logistic cost and to protect environment as a necessity (MOPRC, 2013).

As mentioned above, increasing logistics efficiency achieves a double win for both retailers and suppliers. The potential range of cooperation is wide, including green purchasing, improving load weight, optimizing routes, low carbon transport, transportation technology development（Sunny, 2013; Walmart, 2012; Wastons, 2014; Tesco, 2012). Direct collaboration is, i.e., carried out by the purchase of local products and intelligent packaging that maximizes load weight. Indirect collaboration involves assessing transportation methods and communicating with suppliers to realize double win. It is a tendency for retailing to build self-logistics center, which obviously generates cost benefits, energy efficiency andoptimized logistic management system.

Waste Management

Retailing itself produces kinds of waste including package materials (ALDI, 2009; Kroger, 2011; Costco, 2012) and organic refuse (Walmart, 2012). About 25.8% enterprises return package materials to distribution center for recycling, about 23.3% enterprises work with suppliers to reuse package material (CMPRC, 2012; CMPRC, 2013), while innocuous treatment of organic refuse for reuse is not common.

In the end of the supply chain ,consumers also need waste management such as electronic waste management（Target, 2009; Walmart, 2012; Tesco, 2012; Sunny 2012). Retailers and suppliers or third-party agencies cooperate to recycle in the way of the old for the new or the score card. Retailers may also set a special area for beverage bottles and used clothing to reuse.

Others

Except for the above collaboration modes, other collaboration modes include holding symposiums and seminars with suppliers (Tesco PLC 2012), focusing on sustainable development (Sunny, 2012; Target, 2009), promoting and instructing environmental protection (Auchon, 2012; Walmart, 2012; Metro, 2012), hosting environment protection activities to raise environment awareness (MacDonald, 2009; REWE, 2010), collecting funds for suppliers to improve energy consumption (Walmart, 2012; Carefour, 2011), accounting carbon emission in the supply chain and opening it to the public (Walmart, 2012; Costco Wholesale, 2012; Target, 2009; Seven& Eleven, 2012).

METHODS

Discrete Choice Model

Discrete Choice Model is widely used in an agent (such as person, firm, decision maker) choice or series of choice over time among a set of options (Train, 2009), which includes not only competitive products but also consumers or enterprise behaviors (McFadden, 2001). Discrete Choice Model is based on maximum utility theory, that is to say, agent options prefer to realize maximum utility.

The green collaboration between retailers and suppliers could refer as a process, initiated by the buying firms, to conduct coordinated actions and to work together. Aiming at sustainability of the supply base, thereby at generating benefits for the buying and supplying firms (Hollos et al.,2012; Anderson and Narus, Carr and Pearson, 1990; Pagell and Wu, 2009). Green collaboration is not only a one-dimensional economic collaboration, but also includes specific supplier attributes in term of their social

and environmental performance (Hollos et al., 2012). In certain external market conditions, green collaboration can increase performance for both the buyer and the supplier. However, complete green collaboration is hard to achieve in the short term. Therefore, retailer often make a pre-selection of some attributes and levels to achieve green collaboration and maximum utility. Previous research in green supply chain seldom select a discrete choice method, this research takes discrete choice analysis to study collaboration process between retailers and suppliers.

Discrete choice experiment data could be analyzed by different models. In order to understand the green collaboration process between retailers and suppliers, random coefficient choice model is used in this paper. Random coefficient choice models are based on hierarchical Bayes estimation (Allenby et al., 2004; Orme, 2007; Rossi and Allenby, 2003), and its importance for quantitative marketing approaches has been widely confirmed (Allenby et al., 2004; Rossi and Allenby, 2003).

Compared with traditional conjoint approach, it is possible to determine individual part-worth utilities based on hierarchical Bayes estimation. The hierarchical Bayes model consists of two levels: (1) at the higher level, individual's part-worth utilities are described by a multivariate normal distribution; (2) at the lower level it is assumed that, given an individual's part-worth utilities, his choosing particular alternatives follow a multi-nomial logit model (Johnson, 2000; Sawtooth Software, 2009).

The part-worth utility of ith individualβ_i is subject to a multivariate normal distribution:

$$\beta i \approx (\propto, \mathrm{D})$$

where β_i is a vector of part-worth utilities of the i^{th} individual; α is a vector of means of the distribution of individual's part-worth utilities; and D is a matrix of variance and covariance of the distribution of part-worth utilities across individuals.

The utility U_k is defined as $U_k = x_k' \beta_i$, which means the individual i ascribes to the k^{th} alternative. The probability that individual i choose k^{th} alternative in a given choice task therefore is:

$$P_K = \frac{\exp(x_k' \beta_i)}{\sum_j \exp(x_k' \beta_i)} \quad (1)$$

where x_j is a vector of attribute values describing the j^{th} alternative in the choice task（Mcfadden,1974).

The vector β_i (part-worth utilities per individual), α (means of the distribution of part-worth utilities per individual), and matrix D (variances and covariances of that distribution) could be estimated. The estimation of the part-worth vector is done by an iterative process using Markov Chain Monte Carlo, which is a numerical method for computing integrals (Rossi et al., 2005).

Attributes and Levels

Discrete choice analysis consists of two interrelated tasks: specification of the behavior model and estimation of the parameters of that model (Train, 2009). However, direct literature of discrete choice analysis of retail green collaboration is limited. In this paper, frequency of collaboration modes has been captured based on social responsibility reports and related literatures from different countries, see Section 2.The highest frequency between retailers and suppliers is in the purchasing process, the second is in formulating standards and regulations, packaging, logistics and other aspects, but green design and waste management have a relatively low frequency. Considering research accuracy, 15 retailing experts have been invited to make expert interviews that focus on collaboration modes and in-depth collaboration, which would be ranked according to importance and priorities in green collaboration. Attributes and levels finally have been determined by above discussions. See Table 1.

Table1. *Attributes and Levels of Green Collaboration Performance*

	Attribute	**Level**
1	Criteria & Regulation	1. requiring suppliers to comply with environment regulations strictly 2. signing on green behavior standards with suppliers 3. assessing sustainability of suppliers in producing process
2	Produce Process	1. distinguishing energy-and water- efficient in production with suppliers and improving 2.encouraging supplier to adopt green equipments and raw material in production 3. recognize energy-and water-efficient in production and make a instruction 4. decreasing hazard in production process with suppliers

3	Package	1. returning packaging boxes to suppliers for recycling 2.reducing weight and cardboard boxes in packaging 3.using green packaging, like degradable, renewable and recyclable materials
4	Purchase	1. purchasing local products in the mode of farmto-market 2. purchasing products with traceability, energy labeling, certified by FSC and MSC
5	Logistics	1. optimizing delivery time coordinating with suppliers 2. optimizing distribution route coordinating with suppliers 3. improving loading efficiency of shipping 4. encouraging suppliers to use energy efficient transportation
6	Others	1. hosting suppliers forums and training activities 2. opening of environmental information in supply chain at some extent 3. developing enlightening labeling about packaging and waste disposal

A Conjoint Choice Experiment

The research designs all factors orthogonal experiment tests to determine attributes and levels using *Sawtooth*, computer randomly forms different green collaboration modes and choice sets. Every participant will occur in one of four random collaboration modes (see Figure 1). Standard error of each attribute and level are about 0.01, much less than 0.05, which is good enough design.

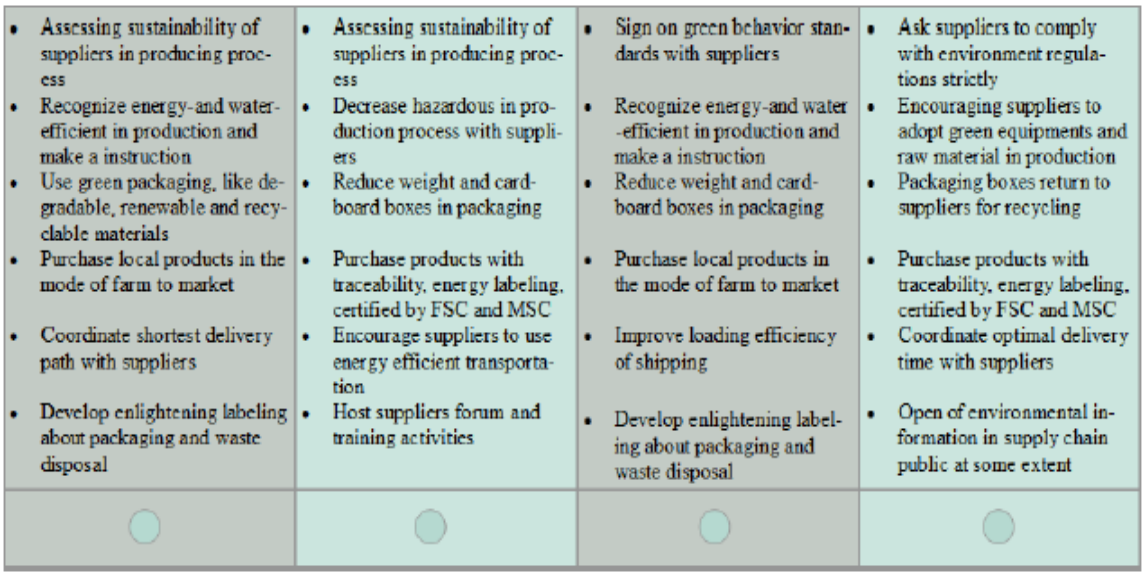

Figure1. *A Example of A Choice Task Seen By Participants*

Results And Analysis

Survey Description

Given that retail enterprises have multiple suppliers, it is an important premise to launch a supplier-oriented green collaboration that they must be certain scale one given answer. Taking rapid development of Chinese retail industry in recent three decades for an example, the total social consumption in retailing is ¥ 23781 billion, but the only fly in the ointment is their small-scale, with total sales of the largest TOP100 retail enterprises accounting for only 8.6% (CCFA, 2014).

A survey entrusted by China's Ministry of Commerce has investigated nationwide retail enterprises from 2009.

It turns out that TOP100 retail enterprises publishing social responsibility reports or sustainable information are less than a quarter, and collaboration modes and depths with suppliers are varied (see Table 2). Considering incapability of small scale enterprises to make a green collaboration, this research focuses on large retail chains' collaboration status and future development trend.

Table2. *Comparison of Green Collaboration in Chinese Part TOP100 Retail Chains*

TOP100 Ranking	Enterprise	riteria & egulation	Design	Producing	Package	purchasing	Logistics	aste anagement	others
1	**Suning**								

4	**CR Vanguard**								
6	**Wal-Mart**								
9	**Unimart**								
10	**Carrefour**								
13	**Yonghui**								
16	**Zhongbai**								
23	**Rainbow**								
24	**Tesco**								
31	**BBK**								
32	**Metro**								
36	**Lotte Mart**								
38	**Auchan**								
39	**New World Store**								
50	**Lotus**								
52	**Watsons**								
60	**McDonald's**								
62	**AEON**								
64	**IKEA**								
88	**Supermarket Sends**								
97	**Quanjude**								

Note. *General collaboration* □ *low* ▒ *media* ■ *high*

This research selects 19 nationwide retail enterprises and visit senior executives to make a face-to-face discrete choice survey with 19 eligible questionnaires from April to August in 2016. To determine retailers' preferred green collaboration, every executive accept 15 conjoint choice sets(see Figure 1), leading to a dataset of 285 choice, the operating composition is seen in Table 3.

Table3. *Composition Status of Enterprises Participating in Conjoint Choice Experiment*

Scale of Enterprise			**Sales**			**Stores Number**			**Number of Suppliers**		
Global Chains	8	42 %	below 10 billon ¥	9	47 %	below 20	7	37 %	below 200	1	5%
National Chains	8	42 %	10-20 billion ¥	2	11 %	20-100	4	21 %	200-500	4	21%
Local Region Chains	2	11 %	20-50 billion ¥	3	16 %	100-500	5	26 %	500-1000	3	16%
Non-Chains	1	5%	above 50billion ¥	5	26 %	above 500	3	16 %	1000-2000	0	0%
									above 2000	11	58%

Note. *Data Is From Statistical Data In 2013*

Estimation of Utility Value of Attribute Levels of Green Collaboration

Table 4 shows results from choice experiments with the mean utility values and standards deviation of the estimated hierarchical Bayes model. The mean utility value is positively related to utility variance when each attribute's level changes. The utility value of corresponding attribute's level is zero-centered part-worth utility, whose positive utility is beneficial for whole utility and vice versa. Part-worth utility is largely determined by corresponding attribute's level settings (Louviere, et al., 2008).

Table4. *Hierarchical Bayes Model Estimation of Mean Utility Value (N=285 Choice Made By 19 Survey Participants)*

Hierarchical Bayes Model	Mean	Standards deviation
Criteria & Regulation		
asking suppliers to comply with environment regulations strictly	0.28	(1.15)
signing on green behavior standards with suppliers	-0.14	(0.68)
assessing sustainability of suppliers in producing process	-0.14	(1.08)
Max difference in part-worth 2(max-min)	0.56	
Producing Process		
encouraging suppliers to adopt green equipments and raw material in production	-0.04	(0.55)
recognizing energy-and water-efficient in production and make an instruction	0.20	(0.29)
decreasing hazardous chemicals in production process with suppliers	-0.16	(1.07)
Max difference in part-worth 2(max-min)	0.36	
Package		
returning packaging boxes to suppliers for recycling	0.24	(1.05)
reducing weight and cardboard boxes in packaging	-0.15	(1.03)
using green packaging, like degradable, renewable and recyclable materials	-0.09	(0.01)
Max difference in part-worth 2(max-min)	0.39	
Purchasing		
purchasing local fresh products in the mode of farm to market	0.19	(1.07)
purchasing products with traceability, energy labeling, certified by FSC and MSC	-0.19	(1.02)
Max difference in part-worth 2(max-min)	0.38	
Logistics		
coordinating optimal delivery time with suppliers	0.03	(1.03)
optimizing the distribution route cooperating with suppliers	0.32	(1.03)
improving loading efficiency of shipping	-0.15	(0.37)
encouraging suppliers to use energy efficient transportation	-0.20	(0.99)
Max difference in part-worth 2(max-min)	0.52	
Others		
hosting suppliers forums and training activities	0.16	(1.02)
disclosure of the environmental information in supply chain public at some extent	0.18	(1.00)
developing enlightening labeling about packaging and waste disposal	-0.34	(0.59)
Max difference in part-worth 2(max-min)	0.52	

Green collaboration is a multi-dimensional collaboration between retailers and suppliers. The positive mean utility value means that retailers are more inclined to cooperate with suppliers in the corresponding attributes, simultaneously, the higher the part-utility value, the higher willingness to cooperate.

Considering the results of choice experiments, several conclusions about attributes and levels can be drawn. In the attribute of Criteria & Regulation, mean utility of asking suppliers to comply with environment regulations strictly is 0. 28, the second and third levels are minus, which means that retailers are more willing to ask suppliers to comply with environment regulations other than requesting stricter environment-related requirements. One of the reasons may be that retailers try to avoid potential risks of taking accident liability for the suppliers.

During the producing process, retail firms prefer helping suppliers to recognize energy- and water-efficient methods and providing instructions. When product cost reduces

accompanying with the produce process improvement, suppliers would like share benefits with retailers. The condition of neither retailer-oriented nor supplier-oriented market forms an inter-balanced market, which makes fierce competitiveness between the two sides (CCFA, 2014).The influence of retailers is limited when facing plenty of suppliers. Adopting green equipments and raw materials in production process clearly reduces production costs, but considering the one-shot investment, suppliers will retreat. As results shown above, the mean value of first and last dimension is negative and the "decreasing hazardous chemicals in production process with suppliers" reaches negative peak.

Packaging management is always a big challenge that retailing has to face. Retailers prefer returning package boxes to suppliers for reuse in order to engage to environment protection. "Reducing weight and cardboard boxes in packaging" and "using green packaging, like degradable, renewable and recyclable materials" are more beneficial to environment and society, but still practiced by retail enterprises in small scales. The discourse power and therefore the willingness to cooperate is limited.

In terms of collaboration modes, retail enterprises are more willing to purchase local products in a farm-to-market approach compared to other certified products with energy labels, FSC and MSC certificates. A survey in 2014 (CMPRC, 2014) reveals that approximately three-quarters firms will strengthen local purchasing, which highlights this mode in the future development.

In the logistics process attribute, retailer firms pay more attention on how to optimize the delivery time and distribution route (utility value: 0.32 and 0.03). The value of third and fourth level are both negative, respectively, -0.15 and -0.20. Chinese retail firms in current stage would neither make efforts to improve loading efficiency of shipping nor to encourage suppliers to use energy-efficient transportation.

For other collaboration modes attribute, the mean utility value of "hosting forums and training activities" and "opening of the environmental information in the supply chain" is positive. In contrast, developing enlightening labeling is not recommended with a negative utility value. Retail giant Tesco adopted the measurement of carbon footprint for some products of its own trademarks. Consumers are instructed to recognize and to reduce their carbon footprints. However, similar measures are unaffordable for most small-scale firms.

Table5. *Mean Utility Value of Different Scale Retail Firms' Collaboration Mode*

Attribute	Level	Below ¥10 billion	Above ¥50 Billion
Criteria & Regulation	asking suppliers to comply with environment regulations strictly	0.43	0.27
	signing on green behavior standards with suppliers	-0.35	0.10
	assessing sustainability of suppliers in producing process	-0.08	-0.37
Producing Process	encouraging supplier to adopt green equipments and raw materials in production	-0.27	0.26
	discriminating energy-and water-efficient in production with suppliers and improving	0.33	0.29
	decreasing hazard in production process with suppliers	-0.05	-0.55
Package	returning packaging boxes to suppliers for recycling	0.16	0.23
	reducing weight and cardboard boxes in packaging	-0.27	0.15
	using green packaging, like degradable, renewable and recyclable materials	0.12	-0.38
Purchasing	purchasing local fresh products in the mode of farm to market	0.28	0.27
	purchasing products with traceability, energy labeling, certified by FSC and MSC	-0.28	-0.27
Logistics	coordinating optimal delivery time with suppliers	-0.22	0.21
	optimizing distribution route with suppliers	0.38	0.20
	improving loading efficiency of shipping	0.04	-0.21
	encouraging suppliers to use energy efficient transportation	-0.19	-0.20
Others	hosting suppliers forums and training activities	0.17	-0.07
	opening of environmental information in supply chain public at some extent	0.15	0.45
	developing enlightening labeling about packaging and waste	-0.32	-0.38

	disposal		

Generally speaking, it is still in the initial stage that domestic retail firms cooperate with suppliers, while their cooperation forms are primarily driven by low cost and high effectiveness. Comparing the collaboration of large scale firms with that of small scale firms, see table 5, former mean utility of higher level is large than the later one, which means collaboration of lager scale retail firms is much greener than that of small ones. With external pressure emerging and stakeholders' intervening, the collaboration willingness will be in-depths both in large and small scale firms.

Importance of Attribute

According to random utility model (Mcafdden, 2001), the utility function is assumed to be known by the individual, but some of its components are unobserved by the research. The different attributes have varying levels of influences on green collaboration. The importance of an attribute reflects its contribution to the utility of the product or service. In order to calculate the importance of attribute, we divided the difference in utility between the highest and lowest attribute level for this particular attribute by sum of these differences for all six attributes.

The mean of these ratios for each respondent stands for the importance of attribute. Therefore, the derived importance depends on how to select attributes and define their levels (Kaenzig et al., 2013). The greater the importance of the attribute is, the greater is its contribution to green collaboration, see Table 6.

Table6. *Importance of the Attributes of Green Collaboration (Sample N=19)*

Attribute	Hierarchical Bayes (%)	Direct query
Criteria & Regulation	16%	4.56
Produce process	15%	3.94
Package	18%	3.89
Purchase	9%	4.17
Logistic	24%	4.22
Others	17%	3.33
Direct query: 5-point Likert scale: 5-very important, 1- not important		

Hierarchical Bayes Model results reveal that, relative importance of logistic shows the highest score 24%, and then package, others, criteria & regulation, produce process in turn with relative importance 18%, 17%, 16%, 15% respectively. Purchasing process is associated with a low relative importance of 9%. The higher relative importance means retail firms give priority to cooperate in the corresponding level. Therefore, the future priority of retail firms rests with logistic process. This research conforms to the low-efficiency retail logistic operations in China, which directly leads to the high costs. Green collaboration in logistic process reduces logistics costs, improves logistics efficiency, and enhances market competitiveness directly. In order to further comparison, respondents are required to mark importance of above six attributes from 1 point to 5 point .The results of direct query are also showed in Table 5, which ranks in the important sequence of criteria & regulation, logistic, purchase, produce process, package and others. Combining Direct query with Hierarchical Bayes, it concludes that attribute of criteria & regulation and logistic process are in the same importance, retail firms have realized their importance and will go into deep collaboration step by step.

The results of two methods in purchasing process are quite different; direct query score is 4.17, which is next to criteria & regulation, logistics ranking the third with a lowest importance of just 9% in Hierarchnical Bayes. Furthermore, mean part-utility value is mere 0.19, See Table 4.

The different results of two methods illustrate that although purchasing is the most important process in retail industry, however, it is hard to realize green collaboration recently. Otherwise, purchasing green and traceable products is hampered by both green products themselves and green consciousness of consumers. In the current period, large-scale green purchasing is not practiced because it is difficult to bring economic benefits to firms.

The attribute of package is different significantly in both methods. Relative importance of green collaboration utility in Hierarchical Bayes Model is 18%, ranking second in the above six attributes. In contrary, it ranks fifth in direct query. The difference turns out that retail firms pay not enough attention to package process. Among three selected levels above will all reduce package cost by improving package materials and the amount of package

Strengthening collaboration with suppliers will improve firms' market competitiveness.

CONCLUSIONS

Green collaboration is a multi-dimensional collaboration process between retailers and suppliers, which helps to gain both environmental and social benefits and to share economical profits. But current literature cannot keep in pace with the rapid development of green collaboration practice. Based on our early investigation and social responsibility reports of various retail firms, we constructed common attributes and evaluated the levels green collaboration among retail firms, including criteria & regulation, produce process, package, purchase, logistic and others.

19 firms all around China are examined with regard to their green collaboration status quo and future trend by conducting a conjoint choice experiment. The result showed that green collaboration in China is still at a primitive stage yet, and the main collaboration modes consist of asking suppliers to comply with environment regulations strictly, improving energy-and water-efficient in production with suppliers , returning packaging cases to suppliers for recycling, purchasing local products in the mode of farm-to-market, optimizing the delivery time and distribution route in cooperation with suppliers, hosting suppliers forums and training activities, and gaining environmental information in supply chain to some extent.

Green collaboration is an improving process step by step, which brings environmental, social and economic benefits for both suppliers and retail firms. Combining status quo in Chinese retail industry with discrete choice model results, logistics needs to be emphasized, since increasing logistics efficiency brings cost advantage directly for both two sides. In addition, recycling package materials is an economically potential behavior, but it does not attract enough attention of retail firms. Green purchase is another important attribute, but cooperative potentiality is limited at present. In addition, large scale firms are in priority-queue than small ones in green collaboration.

The research is hampered by limited statistical data, not only because the firms' empirical data is difficult to obtain, but also there are fewer firms which improved their green collaboration. In the future, we will improve further.

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REFERENCE

[1] AEON, 2013. 2013 AEON Sustainability Magazine, Japan.

[2] Aeon, 2013. Aeon Environmental and Social Report 2013, Japan.

[3] ALDI Stores, 2009. ALDI Developments: Sustainability Statement, Germany.

[4] Allenby, G., M., Bakken, D.O., Rossi, P.E., 2004. The HB revolution- How Bayesian methods have changed the face of marketing research. Marketing Research 16, 20-25.

[5] Anderson, J.C., Narus, A., 1990. A model of distributor firm and manufacturer firm working partnerships, Journal of Marketing, 54, 42-58.

[6] Auchan (China), 2010. The Sustainable Practice in China, Beijing.

[7] Bai, C., Sarkis, J., 2010. Green supplier development: analytical evaluation using rough set theory, Journal of Cleaner Production, 18, 1200-1210.

[8] Best Buy, 2013. Corporate Responsibility& Sustainability Report, USA.

[9] Boons, F.A.A., Baas, L.W., 1997. Types of industrial ecology: the problem of coordination, Journal of Cleaner Production, 5, 79-86.

[10] Bowen, F. E., Cousins, P.D., Lamming, R.C., Faruk, A.C., 2001. The role of supply management capabilities in green supply, Journal of Production and Operation Management Society, 10, 174-189.

[11] Cai, S., Souza, R.D., Goh, M., Li, W., Sundarakani, B., 2008. The adoption of green supply chain strategy: An institutional perspective, Proceedings of the 2008 IEEE ICMIT, 1044-1049.

[12] Carr, A.S., Person, J.N., 1999. Strategically managed buyer-supplier relationships and performance outcomes, Journal of Operations Management, 17, 497-519.

[13] Carrefour, 2010. 2010 Annual Activity and Sustainability Report, France.

[14] Carrefour, 2011. Sustainability Expert Report, France.

[15] Carter, C.R., Rogers, D.S., 2008. A frame work of sustainable supply chain management: moving towards new theory, International Journal of Physical Distribution & Logistics Management, 38, 360-387.

[16] CCFA, 2014. 2013-2014 China Store & Franchise Retail Firms Management Report, Beijing.

[17] CCFA, 2011. Investigation Report on Green Commerce Development, Beijing

[18] CCFA and Deloitte, 2014. 2013-2014 Operation Report on China Store & Franchise Company, Beijing

[19] China Resources Vanguard, 2012. China Resources Vanguard Social Responsibility Report 2012, China.

[20] China Resources Vanguard, 2013. China Resources Vanguard Social Responsibility Report 2013, China.

[21] Chiou, T., Chan, H.K., Lettice, F., Chung, S.H., 2011. The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan, Transportation Research Part E, 47, 822-836.

[22] Commercial Ministry of People's Republic of China, 2014. 2014 Green Book of The Chinese Retail Industry 's Energy Conversation and Environmental Protection, Beijing.

[23] Commercial Ministry of People's Republic of China, 2013. 2013 Green Book of The Chinese Retail Industry 's Energy Conversation and Environmental Protection, Beijing.

[24] Commercial Ministry of People's Republic of China, 2012. 2012 Green Book of The Chinese Retail Industry 's Energy Conversation and Environmental Protection, Beijing.

[25] Costco, 2009. Costco Wholesale Sustainability and Energy Group. Corporate Sustainability Report, USA.

[26] Costco Wholesale Australian Home Office, 2012. Australian Packaging Covenant Action Plan 2012-2016, USA.

[27] CVS Caremark, 2011. 2011Corporate Responsibility Report, USA.

[28] de Brito, M.P., Carbone, V., Blanquart, C.M., 2008. Towards a sustainable fashion retail supply chain in Europe: organization and performance, International Journal of Production Economics, 114, 534-553.

[29] Geffen, C.A., Rothenberg, S., Suppliers and environmental innovation: the automotive paint process, International Journal of Operations and Production Management, 20, 166-186.

[30] Ginza Group Ltd,2012 Ginza Group Corporate Sustainability Report, 2013, Shan Dong, China.

[31] Gunther, E., Scheibe, L., 2005. The hurdles analysis as instrument for improving environmental value chain management, Progress in Industrial Ecology, an International Journal, 2, 107-131.

[32] Hollos, D., Blome, C., Forest, K., 2012. Does sustainable supplier co-operation affect performance? Examining implications for the triple bottom line, International Journal of Production Research, 50, 2968-2986.

[33] Humphreys, P.K., Y. W., 2003. Integrating environmental criteria into supplier selection process, Journal of Materials Processing Technology, 349-356.

[34] IKEA, 2013. 2013 Social Responsibility and Sustainability Development Report, Swede.

[35] Johnson, R.M., 2000. Understanding HB: An intuitive approach. Sawtooth Software Inc., Sequim, WA.

[36] Kaenzig, J., Heinzle, S.L., Wüstenhagen, R., 2013. Whatever the customer wants, the customer gets? Exploring the gap between consumer preferences and default electricity products in Germany, Energy Policy, 53, 311-322.

[37] Ketchen, J.D.J., Hult, G.T.M., 2007. Bridging organization theory and supply chain management: the case of best value supply chain, Journal of Operations Management, 25, 573-580.

[38] Lee, S., Klassen, R.D., 2008. Drivers and enavle s that foster environmental management capabilities in small- and medium-sized suppliers in supply chain, Production and Operations Management, 17, 573-586.

[39] Lotte Group,2009. http://www.lotte.co.kr/chn/06_withlotte/env_about.jsp.

[40] Louviere, J.J., Street, D., Burgess, L., Wasi, N., Islam, T., Marley, A.A.J., 2008. Modeling the choices of individual decision-maker by combining efficient choice experiment designs with preference information, Journal of Choice Modelling,1, 128-164.

[41] MacDonald, 2009. http:// www. mcdonalds. com.cn/news/news_content.aspx?id=181.

[42] McFadden, D., 2001. Economic choice, American Economic Review, 351-378.

[43] Mcfadden, D., 1974. Conditional logit analysis of qualitative choice behavior, Frontier in Econometrics, 105-142.

[44] Metro Group, 2010. Sustainability Progress Report: Key Data and Target, Germany.

[45] Metro, 2014. Metro China Social Responsibility, http: //www. metro. com.cn /public /cn/ home-cn /company_ info/ corporate_ social_ responsibility.

[46] Narasimhan, R., Das, A., 2001. The impact of purchasing integration and practices on manufacturing performance, Journal of Operations Management, 19, 593-609.

[47] Orme, B.K., 2007. Spftware for Hierarichical Bayes Estimation for CBC Data.

[48] Pagell, M., Wu, Z., Wasserman, M.E., 2010. Thinking differently about purchasing portfolios-an assessment of sustainable sourcing, Journal of Supply Chain Management, 46, 19-45.

[49] Paulraj, A., 2009. Environmental motivations: a

classification scheme and its impact on environmental strategies and practices, Business Strategy and the environment, 18, 453-468.

[50] Pfeffer, J., Salancik, G.R., 1978. The external control of organizations: A resource dependence perspective, Harp & Row, New York, NY.

[51] Powell, W.W., 1990. Neither market nor hierarchy: network forms of organization, Research in Organizational Behaviour, 12, 295-336.

[52] REWE Group, 2010. Sustainability Report 2009/2010, Germany.

[53] Rossi, P.E., Allenby, G.M., 2003. Bayesian staistics and marketing. Marketing Science 22, 304-328.

[54] Rossi, P., Allenby, G., McCulloch, R., 2005. Bayesian Statistics and Marketing, Wiley, New York.

[55] Sarkis, J., Zhu, Q., Lai, K., 2011. An organizational theoretic review of green supply chain management literature, International Journal of Production Economics, 130, 1-15.

[56] SCLCAL, 2009. Green Supply Chain Management Retail Chains & Consumer Product Goods- A Canadian Perspective, www.ic.gc.ca/logistics.

[57] Seuring, S., 2004. Integrated chain management and supply chain management comparative analysis and illustrative cases, Journal of Cleaner Production, 12, 1059-1071.

[58] Seyfang, G., 2006. Ecological citizenship and sustainable consumption: Examining local organic food networks, Journal of Rural Studies, 22, 383-395.

[59] Seven & Eleven Holdings, Seven & Eleven Holdings CSR Report, Japan.

[60] Sirvastava, S., 2007. Green supply-chain management: A stated-of-the -art literature review, International Journal of Management Review, 9, 53-80.

[61] Stevens, G.C., 1989. Integrating the supply chain, International Journal of Physical Distribution and Materials Management, 19, 3-8.

[62] Sunny Corporation, 2013. 2012 Sunny Social Responsibility Report, China.

[63] Target, 2010. 2009 Target Corporate Responsibility Report, USA.

[64] TESCO, 2012. TESCO Corporate Responsibility Report 2011, UK.

[65] Tesco PLC, TESCO PLC Corporate Responsibility Review 2012, UK.

[66] The Home Depot, 2010. Inter departmental Working Group on Corporate Social Responsibility (CSR). CSR Case Study: The Home Depot, Canada.

[67] The Home Depot, 2010. The sustainability Strategy: How The Home Depot Turns Ideas Into Action, USA.

[68] The Kroger Co, 2012. Social Responsibility Report, USA.

[69] Thomas, D.J., Griffin, P.M., 1996. Co-ordinated supply chain management, European Journal of Operational Research, 94, 1-15.

[70] Train, K., 2009. Discrete Choice Methods with Simulation, Cambridge University Press.

[71] Uniark Limited Corporation, 2013. 2012 Social Responsibility Report, China.

[72] Vachon, S., Klassen, R.D., 2006. Extending green practices across the supply chain- The impact of upstream and downstream integration, International Journal of Operations & Production Management, 26, 795-821.

[73] Vachon, S., Klassen, R.D., 2006. Green project partnership in the supply chain: the case of package printing industry, Journal of Cleaner Production, 14, 661-671.

[74] Walmart,2012. Global Responsibility Report, USA.

[75] Walmart China Group, 2012. 2011-2012 Social Responsibility and Sustainability Development Report, Beijing.

[76] Walmart China Group, 2010. 2009-2010 Social Responsibility and Sustainability Development Report, Beijing.

[77] Watsons, 2014. Watsons Social Responsibility http://csr.watsons.com.cn/zr.aspx.

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