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**GREEN MARKETING, GREEN SUPPLY CHAIN MANAGEMENT,
AND BUSINESS PERFORMANCE: EMPIRICAL
EVIDENCE FROM CHINA**

This study aims to contribute to the existing literature by introducing a synthetic model based on structural equation modeling to test the relationships of green marketing, green supply chain management, green branding and market performance in Chinese logistics. Green marketing is divided into two areas: green internal marketing, which focuses on inbound process, and green external marketing, focused on customers. Our findings show that green internal marketing has direct impact on green supply chain management (GSCM); however, it has no significant direct relationship to green branding performance or market performance. On the other hand, green external marketing has direct impact on green branding and market performance, but not on GSCM. With GSCM, there is a missing link between internal and external marketing. Thus, diverse marketing activities should be integrated with the emphasis on sustainability, as well as on effective intermediation such as GSCM and green brand images.

Keywords: green marketing; green branding; green supply chain management; market performance; structural equation modeling (SEM).

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**"ЗЕЛЕНИЙ" МАРКЕТИНГ, УПРАВЛІННЯ "ЗЕЛЕНИМ"
ЛАНЦЮЖКОМ ПОСТАЧАЊ І БІЗНЕС-ПОКАЗНИКИ
(НА ПРИКЛАДІ КИТАЮ)**

У статті досліджено проблему взаємозв'язку "зеленого" маркетингу, управління "зеленим" ланцюжком постачань, "зеленого" брендингу та ринкових показників у галузі логістики у Китаї. Отримані результати показують, що "зелений" внутрішній маркетинг має прямий вплив на управління "зеленим" ланцюжком постачань (GSCM). У той же час він не має прямої кореляції з показниками "зеленого" брендингу, а також із іншими ринковими показниками. З іншого боку, "зелений" зовнішній маркетинг прямо впливає на показники "зеленого" брендингу і ринкові показники, але не на GSCM. У випадку із GSCM відсутня ланка між внутрішнім та зовнішнім маркетингом. Відповідно, різні маркетингові заходи мають бути інтегровані таким чином, щоб забезпечити стійкість, а також передбачити ефективне посередництво у вигляді GSCM і "зеленого" іміджу бренду.

Ключові слова: "зелений" маркетинг; показники "зеленого" брендингу; "зелене" управління ланцюжком постачань; ринкові показники; моделювання структурними рівняннями (SEM).

Йонг-Рок Цой, Нінг Чанг, Су Чанг

**"ЗЕЛЕНЬИЙ" МАРКЕТИНГ, УПРАВЛЕНИЕ "ЗЕЛЕНОЙ"
ЦЕПОЧКОЙ ПОСТАВОК И БИЗНЕС-ПОКАЗАТЕЛИ
(НА ПРИМЕРЕ КИТАЯ)**

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В статті досліджена проблема взаємозв'язи "зеленого" маркетингу, управління "зеленою" ланкою поставок, "зеленого" брендингу та ринкових показателів в сфері логістики в Китаї. Отримані результати показують, що "зелений" внутрішній маркетинг оказує пряме вплив на управління "зеленою" ланкою поставок (GSCM). В той же час він не має прямої кореляції з показателями "зеленого" брендингу, а також з іншими ринковими показателями. С іншої сторони, "зелений" зовнішній маркетинг напряму впливає на показателі "зеленого" брендингу та ринкові показателі, але не на GSCM. В разі з GSCM існує недостатнє зв'язок між внутрішнім і зовнішнім маркетингом. Отже, різноманітні маркетингові заходи повинні бути інтегровані таким чином, щоб забезпечити стійкість, а також передбачити ефективне посередництво в формі GSCM та "зеленого" іміджу бренду.

Ключові слова: "зелений" маркетинг; показателі "зеленого" брендингу; "зелене" управління ланкою поставок; ринкові показателі; моделювання структурними рівняннями (SEM).

1. Introduction. "Sustainable development" was proposed by the UN Summit Conference on Environment and Development in 1992, it revolves around the idea that goals of environmental conservation and the goals of business development do not necessarily need to conflict each other (Holliday et al., 2002). Reflecting this paradigm shift, public concern has now increased regarding environmental issues. New international standards have been introduced, including ISO 14001 and 26000, to accredit enterprises' sustainability practices. Customers are more willing to purchase products that are more environment friendly. Thus, if enterprises plan to extract more value by adopting green management, they must use the strategic elements of sustainable/green management to increase their business performance.

Many authors argue that environment friendly strategies and proactive sustainable operations can lead to competitive advantages and superior financial performance (Sarkis et al., 2011; Zhu et al., 2007). Under these circumstances, green marketing becomes increasingly critical in some operational fields, such as green supply chain management, as it provides a firm with a strong green brand image. Strategists in both marketing and management argue that managerial decisions must incorporate environmental issues to enhance company's green reputation (Sharma et al., 2010). Researchers have focused on competitive benefits of green marketing. However, little attention has been given to the role of marketing in green supply chain management (GSCM) in its relation with green brand performance.

Previous studies had from some other limitations. First, most of the previous literature highlights only partial relationship between company's green operation and its performance (Zhu and Sarkis, 2004). Other studies tested the causality between environmental management and financial performance (Wagner et al., 2002; Wagner, 2005). Second, previous studies primarily focused on manufacturing enterprises with general environmental variables especially in developed countries, but no studies have researched the logistics sector and its special green supply chain management.

This study offers an integrated framework that fills these gaps. First, this study introduces a comprehensive or strategic marketing model that incorporates green

marketing, green supply chain management, green brand performance, and market performance to test multi-dimensional relationship. Second, this study focuses on the logistics sector in China, which is the second largest producer in the world. Thus, Chinese government has much more responsibility for sustainable development than any other country (Choi, 2011).

2. Modeling and hypothesis.

2.1 Green marketing. Over the last two decades, green-conscious customization or consumer environmentalism has prevailed. This prevalence implies that consumers are aware of the global environmental issues due to the impact of ever-increasing environmental mishaps. Eventually, consumers will become more willing to purchase environment friendly products (Krause, 1993). Therefore, companies have been forced to change their behavior to comply with society's environment concerns. Green marketing is a broad concept that encompasses all marketing activities developed to stimulate and sustain consumers' environment friendly attitudes and behaviors. Thus, the concept can generate and facilitate innovative activities to satisfy customers' environmental needs (Polonsky, 1994). Previous studies suggest that firms can undertake green marketing activities to investigate their consumers' green attitudes and behaviors, to identify the marketing of green products, to stratify the green market into different segments based on the consumers' needs, to develop green positioning strategies, and to formulate a green marketing mix program (Jain and Kaur, 2004).

For these diverse marketing activities, recent literature on marketing performance emphasizes the distinction between external and internal marketing (Sharma et al., 2010). External marketing refers to marketing strategies and activities outside of a firm that attract or retain customers or increase market share. Internal marketing refers to the marketing strategies based on process changes within a firm; in particular, it refers to intra-firm communications necessary to successfully deploy new organizational strategies such as green SCM. In the framework of this study, we consider both firm's internal and external marketing efforts on the green supply chain management (GSCM).

Most previous research has focused on the competitive benefits of green marketing that consists of two implications. First, the resource-based theory suggests that better access and utilization of resources lead to a competitive advantage (Hunt and Morgan, 1995). Second, empirical evidence suggests that sustainability-oriented policies lead to better customer retention; in turn, customer retention will lead to better performance (Sisodia et al., 2007). Sharma et al. (2010) introduced a conceptual model that assumes that green supply chain management requires both enhanced internal marketing for better performance and outstanding external marketing for better customization. Based on these statements, this study proposes the following hypotheses:

H1: Internal green marketing (IGM) has positive impact on green supply chain management (GSCM).

H2: External green marketing (EGM) has positive impact on GSCM.

H3: Internal green marketing has positive effect on green brand performance.

H4: External green marketing has positive effect on green brand performance.

H5: Internal green marketing has positive effect on the firm's market performance.

H6: External green marketing has positive effect on the firm's market performance.

2.2 Green supply chain management. Supply chain management (SCM) is a popular research topic for both practitioners and academia over the last two decades (Wang and Chan, 2010). A great deal of literature is devoted to empirical testing of the link between green logistics and management performance. However, a general consensus has not yet been reached (Zeng et al., 2010). Some authors argued that GSCM positively impacts firms' sustainable performance. Rao and Holt (2005) suggested that if a firm promotes green supply chains, then it will achieve substantial cost savings as well as enhanced sales, market share, and better marketing opportunities; thus, the firm will have a greater market performance. Zhu et al. (2010) also confirmed the positive effect of green supply chain management on firm performance.

H7: GSCM has positive effect on green brand performance (GBP).

H8: GSCM has positive effect on a firm's market performance (MP).

2.3. Green brand performance. Brand image plays an important role in two particular situations: (1) when products are difficult to differentiate from each other, and (2) when services are based on intangible quality features (Mudambi et al., 1997). Brand image includes symbolic meanings associated with particular brand attributes, and it can be defined as a consumer's mental picture of a brand linked to an offering (Cretu and Brodie, 2007). Chen (2010) argued that brand image covers functional benefits, symbolic benefits, and experiential benefits. Recently, green customers have more actively changed the market. Thus, firms should develop new business models that can secure compliance with global green trend. He and Li (2011) examined the mediation effect of brand identification on service performance, and they find a positive relationship. Lopez-Gamero et al. (2009) found that green management has positive impact on market performance via green brand promotion. Hence, we propose the following hypothesis and all these arguments and their hypotheses could result in the research framework as shown in Fig. 1.

H9: Green brand performance has positive effect on a firm's market performance.

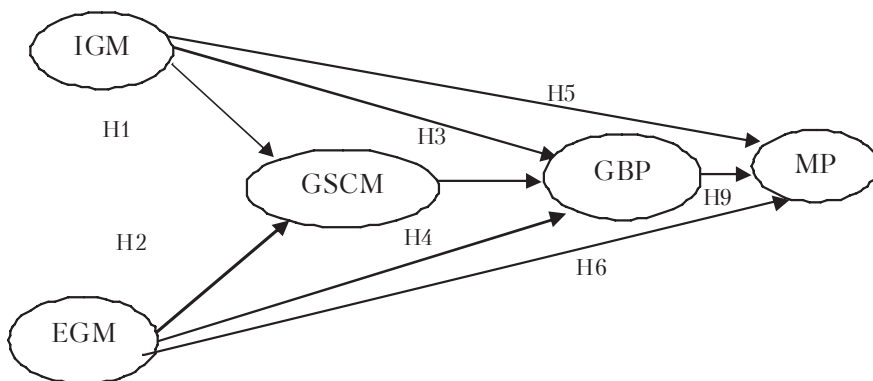


Figure 1. Proposed structural model framework

3. Methodology.

3.1 *Data collection.* For the research, the sample and the data were collected through professional web questionnaires. It is chosen for our case study, because China is the largest “global factory” and thus environmental issues are very sensitive, affecting the future of China.

The respondents were staff, section chiefs, and managers of the enterprises which took care of the green supply chain management. The survey started in November 2011 and was completed in January 2012. A total of 145 questionnaires were collected from different areas of China with the response rate of 83.6%. The questionnaires represent various operational areas and the results suggested that non-response bias is not a problem in this study.

3.2 *Measurement.*

To measure all the observed variables in this study, we adopted existing well-established multiple-item 7-point Likert scales. These scales ranged from strongly disagree (1) to strongly agree (7).

Green marketing.

According to Sharma et al. (2010), green marketing is divided into two groups: internal green marketing and external green marketing. Internal green marketing refers to the firm's procedural in-bound innovation using green marketing. External green marketing refers to green marketing strategies and promotion activities outside a firm. Tables 1 and 2 show the measurement of internal green marketing and external green marketing variables. The measurements of GSCM, GBP and MP are presented in Tables 3, 4 and 5 respectively. According to Chen (2010), this study defines a firm as having green brand performance if a firm builds a good green brand image and meets customers' green needs. We selected 4 items that are used the most: market share, sales growth, return on investment, and operation cost savings.

Table 1. Measurement of internal green marketing

Internal green marketing items	Variable	SD	Mean
Your firm emphasizes the government policy on green supply chain actively	IGM1	0.866	3.967
The managers of the firm pay close attention to the green supply chain	IGM2	0.923	4.361
The staff has a good awareness of the green supply chain	IGM3	0.932	4.232
The firm discusses green standardization well (such as ISO 14001 and GRI guidelines)	IGM4	0.901	4.696
The firm pays attention to green marketing training for employees	IGM5	0.806	4.343

Table 2. Measurement of external green marketing

External green marketing items	Variable	SD	Mean
The firm targets green business customers	EGM1	0.833	3.867
The firm predicts demand for green supply chain	EGM2	0.903	4.051
The firm promotes green supply chain management service	EGM3	0.923	4.173
The firm builds competitive advantage via green marketing	EGM4	0.913	4.296
The firm markets its proactive green principle	EGM5	0.912	4.061

Table 3. Measurement of green supply chain management

Catalog	Variable	Green supply chain management	SD	Mean
Distribution	GSCM1	The firm pushes the standardization of transport	0.788	4.586
		The firm tries to optimize the routing of vehicles	0.897	4.633
		The firm tends to select greener transport modes	0.857	4.606
Loading and unloading	GSCM2	The firm focuses on loading and unloading efficiently	0.824	4.276
		To improve efficiency, the firm considers the container or pallet	0.878	4.480
Logistics networking	GSCM3	The firm pays attention to the logistics network construction	0.813	4.671
		The firm emphasizes information technology	0.921	4.520
		The firm pays attention to an efficient logistics information network	0.913	4.531
Logistics emissions	GSCM4	The firm tries hard to reduce the pollution emissions	0.759	4.388
		The firm takes great efforts to reduce greenhouse gases (GHG)	0.866	4.867
		The firm takes great effort to save energy costs	0.853	4.388
Information sharing	GSCM5	The firm shares information with manufacturing firms and retailers well	0.841	4.653
		The firm makes efforts for an efficient order system	0.876	4.439
		The firm takes effort to outsource to cut costs	0.813	4.286
Packing	GSCM6	The firm use green packing materials	0.911	4.357
		The firm follows packing standardization	0.888	4.318
		The firm makes efforts to reduce packing materials	0.903	4.557
Warehousing	GSCM7	The firm emphasizes the warehouse's efficient management	0.864	4.653
		The firm emphasizes the reduction of warehouse fee	0.877	4.773
		The firm emphasizes the location of the warehouse	0.886	4.802

Table 4. Measurement of green brand performance

Green brand performance	Variables	SD	Mean
The firm builds a green brand image	GBP1	0.913	4.367
The firm has a good green reputation	GBP2	0.878	3.651
The firm meets the green customer's needs well	GBP3	0.823	4.083
The firm saves costs via green practices	GBP4	0.865	4.176

Table 5. Measurement of market performance

Market performance	Variables	SD	Mean
The firm gains market share by green practices	MP1	0.890	4.567
The firm gains sales' growth by green practices	MP2	0.918	4.751
The firm gains return on investment by green practices	MP3	0.876	4.383
The firm gains operation cost savings by green practices	MP4	0.887	4.476

In this study, we use a two-stage approach suggested by Anderson and Gerbing (1998). In the first stage, we use a confirmatory factor analysis (CFA) to assess the validity of the measurement model. In the second stage, we use a structural equation modeling (SEM) approach to test the research hypotheses about the latent variables.

4. Empirical results.

4.1. Reliability test. Our proposed model must be statistically reliable and valid so that it reflects reality. For the reliability test, we use the Cronbach's alpha coefficient,

the construct reliability coefficient, and the corrected item-total correlation coefficient. These are the most commonly used criteria when measuring reliability. As shown in Table 6, each measure is well above the suggested threshold at 0.7, 0.5 and 0.8, respectively. (Chang et al., 2008) These numbers are considered to be adequate for confirming a satisfactory level of reliability of the research.

Table 6. Reliability test of the variables

Latent variables	No. of items	Cronbach's α	Corrected item-total correlation	Construct reliability
Internal green marketing	5	0.833	0.621-0.732	0.842
External green marketing	5	0.903	0.743-0.823	0.912
Green supply chain Management	7	0.923	0.645-0.765	0.930
Green brand performance	4	0.913	0.674-0.743	0.921
Market performance	4	0.912	0.643-0.772	0.917

4.2 Validity test. A confirmatory factor analysis (CFA) is one of the most effective tools used to test construct validity. According to Campbell and Fiske (1959), construct validity research typically tests the extent to which data provides of the following: (a) convergent validity, the extent to which different assessment methods shows similar measurements of the same trait; (b) discriminate validity, the extent to which independent assessment methods show divergent measurements of different traits.

As summarized by He and Li (2011), convergent validity occurs when (a) all factor loadings are significantly over the 0.5 cutting point; and (b) the average variance extracted (AVE) from items by their respective constructs is greater than 0.5. Table 7 shows the results of the convergent validity by CFA. We recognize that the measurement scale shows a strong convergent validity except for the observed variables IGM1 and GSCM7; in this case, the factor loadings of IGM1 and GSCM7 are lower than suggested by 0.5, so these two items are removed from the model.

We have used a number of goodness-of-fit indices recommended by many researchers; we were able to assess the fit of the measurement model using the indices such as a normal Chi-square (χ^2/df), goodness-of-fit (GFI), adjusted goodness-of-fit (AGFI), comparative fit index (CFI), root mean square residual (RMSR) and root-mean-square error of approximation (RMSEA) (Bagozzi and Yi, 1988). After removing the observed variables IGM1 and GSCM7, we find that all of the various overall goodness-of-fit measures are better than recommended. Thus, the construct validity of the data is acceptable.

We achieve discriminate validity when the square root of the AVE for the constructs is larger than any respective inter-construct correlations. Table 8 shows that the square roots of the AVE of all the variables are higher than their inter-correlations and it supports the discriminate validity of all the measures.

Table 7. Convergent validity test on the measurement model

Variable	SFL ^a	C.R ^b	AVE ^c
Internal green marketing			0.68
IGM1	0.431	3.623	
IGM2	0.725	6.325	
IGM3	0.742	6.251	
IGM4	0.835	6.214	
IGM5	0.932	5.254	
External green marketing			0.62
EGM1	0.745	5.241	
EGM2	0.853	7.521	
EGM3	0.885	6.355	
EGM4	0.921	7.212	
EGM5	0.841	6.698	
Green supply chain management			0.75
GSCM1	0.852	7.214	
GSCM2	0.841	4.387	
GSCM3	0.932	5.214	
GSCM4	0.745	6.325	
GSCM5	0.825	6.347	
GSCM6	0.776	6.541	
GSCM7	0.474	7.234	
Green brand performance			0.79
GBP1	0.885	7.327	
GBP2	0.912	8.347	
GBP3	0.795	5.541	
GBP4	0.884	6.234	
Market performance			0.71
MP1	0.925	5.364	
MP2	0.923	6.313	
MP3	0.845	7.231	
MP4	0.889	6.556	
Goodness-of-fit and recommended cutting point			
$\chi^2 = 79.76$ (98); $\chi^2 / df = 1.23$; GFI=0.918; AGFI=0.834; CFI=0.943; RMSR=0.019; RMSEA=0.031			
$\chi^2 / df < 5$; GFI > 0.9; AGFI > 0.8; CFI > 0.9; RMSR < 0.05; RMSEA < 0.05			

^aSFL is the estimate of standardized factor loading, ^bC.R is the critical ratio, ^cAVE is the average variance extracted.

Table 8. Discriminate validity test of the measurement model

Construct items	IGM	EGM	GSCM	GBP	MP
Internal green marketing	0.82 ^a				
External green marketing	0.74	0.78 ^a			
Green supply chain management	0.69	0.71	0.86 ^a		
Green brand performance	0.68	0.66	0.72	0.88 ^a	
Market performance	0.49	0.58	0.68	0.71	0.84 ^a

^a The square root of the AVE as a criteria of the cutting point for correlation.

4.3 Hypotheses Test. The results of the hypothesized relationships between the latent variables are shown in Table 9 and Figure 2. The chi-square statistics ($\chi^2 = 139.21$, $df=96$) at $p=0.18$ is below the threshold level of 0.05 significance; this suggests that the differences in the predicted and the actual matrices are not insignificant supporting the model's fitness. In addition, various goodness-of-fit indicators such as $\chi^2/df=1.45$ and $RMSEA=0.041$ reveal that the model has good fitness.

Our results show that IGM has positive impact on GSCM. Thus, H1 is supported. On the other hand, EGM is not significantly related to GSCM. Thus, H2 is rejected. During our analysis of the relationship between green marketing and green performance, IGM shows no significant relationship with green brand performance (GBP). Thus, we reject H3. On the other hand, EGM has a significant positive effect on GBP, supporting H4. The relationship between green marketing and market performance also shows a positive effect. IGM shows no direct relationship to firm market performance. Thus, H5 is rejected. However, IGM does have an indirect relationship to market performance through the role of GSCM (H1-> H8). EGM has a significant positive effect on firm market performance, supporting H6. In regard to green supply chain issues, the results show that GSCM has a both positive relationship to GBP and MP, supporting both H7 and H8. Finally, H9 is accepted because GBP shows a positive impact on the firm's market performance.

Table 9. Path relationship between the construct variables

Path Relationship			Path coefficient	C.R.	P	Hypotheses	Results
GSCM	<-	IGM	0.635	5.177	***	H1	Accepted
GSCM	<-	EGM	0.357	1.398	0.162	H2	Rejected
GBP	<-	IGM	0.084	0.585	0.558	H3	Rejected
GBP	<-	EGM	0.233	2.241	***	H4	Accepted
MP	<-	IGM	0.349	0.483	0.629	H5	Rejected
MP	<-	EGM	0.957	6.032	***	H6	Accepted
GBP	<-	GSCM	0.191	2.13	**	H7	Accepted
MP	<-	GSCM	0.691	3.43	***	H8	Accepted
MP	<-	GBP	0.351	1.993	**	H9	Accepted

***: $p < 0.01$, **: $p < 0.05$

$\chi^2/df(p) = 1.45(0.18); GFI = 0.921;$

$CFI = 0.913; RMSR = 0.026; RMSEA = 0.041$

5. Discussion and conclusion. The empirical study based on SEM concludes that internal green marketing has a positive effect only on GSCM, while it has no significant impact on firm's green brand performance or market performance. On the other hand, external green marketing does not exhibit any significant relationship to green supply chain management, while it does show a positive significant effect on both a firm's green brand performance and market performance. These results indicate that the roles of internal marketing and external marketing are not systematically well integrated on green issues. Thus, it is critical that firms integrate the roles of internal marketing and external marketing on GSCM. In addition, marketing staff should work harder to harmonize the inbound GSCM to enhance the interdepartmental promotion so that they can increase the firm's green performance.

Even if internal green marketing has no direct impact on the firm's green brand image or green market performance, it will still have indirect impact on the firm's performance via GSCM. Therefore, marketing management should harmonize with GSCM more efficiently to abolish these psychological and practical barriers (Choi and Lee, 2009). Since external green marketing has a positive effect on the firm's green brand and business performance, its role should be more emphasized. In China, if a firm wishes to extract more value by adopting green practices, then it should implement green issues as a key element of their supply chain management.

Our result is consistent with Rao and Holt (2005) who suggest that, if firms make their supply chain greener, they will achieve a greater cost savings and enhance their market performance (such as sales growth, market share, and profit margins). Our findings suggest that if firms push green marketing to establish their own green brand images, they will increase customer loyalty of green customers and thus, the firms will have enhanced market performance.

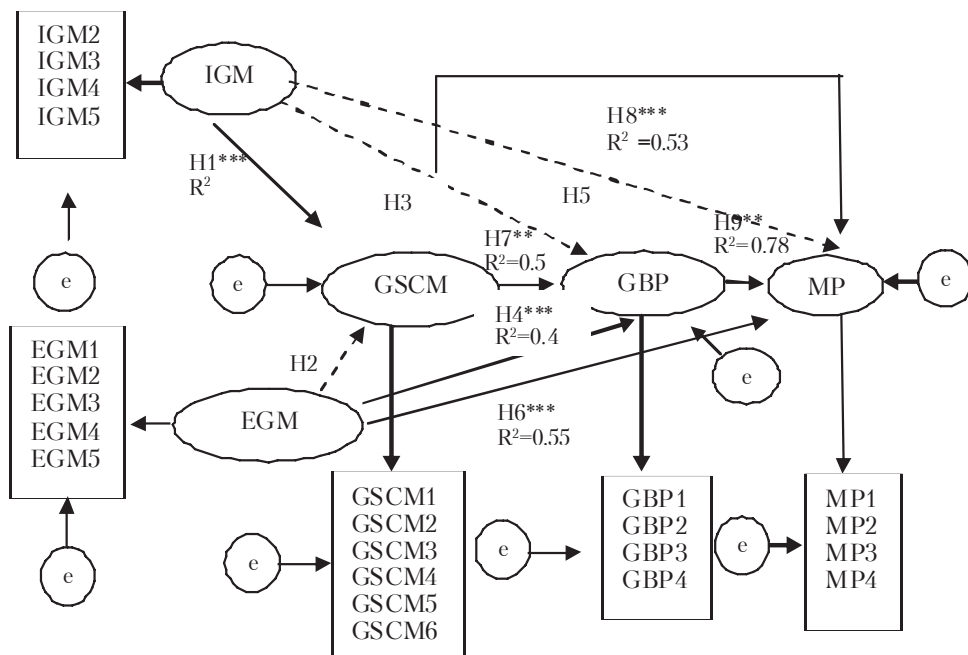


Figure 2. Structural equation modeling results

Note that government's role in green marketing is much more important in China. It is true that developing countries such as China face serious environment degradation challenges. The results implies that Chinese firms may be more sensitive to short-term marketing, rather than to green brand images or GSCM. Thus, Chinese government should offer incentives for the firms promoting green marketing in diverse fields (Choi et al., 2010).

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