

## HOW TO INCREASE ENTERPRISE COMPETITIVENESS? GREEN MANAGEMENT AS A MEDIATOR IN CORPORATE GREENING

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### ABSTRACT

The purpose of this paper is to understand not only how to improve firms' competitive advantages by green management, which is implemented through employees' green competences, but also the role of managers' leadership style in corporate greening.

**Keywords:** Green leadership, Green competence, Green management, Enterprise competitiveness

### INTRODUCTION

Green management has been an important issue for nations all over the world. In view of the sharp decline in economy during financial tsunami, many countries have supported the claims declared by the United Nations about the practice of green management in order to recover from the depression. For example, some nations have especially emphasized green production, design, and innovation in the policy of economy revitalization, showing the concern and attention about global green development. It seems that the rising concern of green management has brought fundamental impacts on businesses worldwide. Besides, demands for green management result from a variety of sources, but the fundamental one may be that resources are limited on the earth. We are putting increasing pressure on the world's resources and threatening the globe's climate and other life support systems (Marcus, 2009). Owing to the increasing pollution and environmental degradation, people expect resources can be used wisely and responsibly by managers to protect the environment, to minimize the usage amounts of energy, to recycle nature's calm and beauty, and to eliminate toxins that harm people in the workplace and communities (Marcus and Fremeth, 2009). Positively speaking, for enterprises the demands for sustainable development are not just environmental and social but also economic. Under certain conditions, managers can maximize profit while adopting eco-friendly practices. Hence, whether from environmental, social, or economic perspectives, it's essential for businesses to put green management into practice.

When implementing green management, one of the most important elements is human resource. In order to create corporate competitive advantages, green human capital that possesses concepts, attitudes, knowledge, and skills in energy saving and carbon emission reduction needs to be developed in green industries (Chen, 2008). This is also discussed through the lens of the resource-based view of the firm (RBV). RBV, as introduced by

Wernerfelt (1984) and further refined by Barney (1991), builds on previous research by Penrose (1959). This theory is based on the belief that firms have bundles of heterogeneous resources and capabilities that are imperfectly mobile across companies (Siegel, 2009). Barney (1991) found that if such resources and capabilities are valuable, rare, inimitable, and non-substitutable, they could constitute a source of sustainable competitive advantage. Since green human capital helps firms implement green management, it has strategic value and uniqueness, which becomes a kind of valuable resource to enhance firms' competitive advantages.

Not only employees' competence but also top managers' support is the key success factor in organizational changes. The ethical dimension of executive leadership is thought to be uniquely important because of the executive's potential to influence employee and organizational behavior (Trevino et al., 2003). Hence, if a firm decides to transform into a green company, top managers' leadership or support should play an important role.

Above all, this research seeks to make a contribution to know not only how to improve firms' competitive advantages by green management, which is implemented through employees' green competence, but also the role of managers' leadership style in corporate greening.

## **LITERATURE REVIEW AND HYPOTHESES**

### **Relationships Between Green Competence and Green Management**

Among various definitions of green management, this study adopts the definition brought up by Huang (2001) that green management is that a firm produces eco-friendly products by clean production operations, such as improvement of production process, energy saving, reduction of waste amount, and recycle of resources; green marketing activities, such as research and development of green products, promotion of green products, and communication; and active administrative management, such as ISO 14000, responsible care-RC, environment audit, office environmental protection, and so on. Therefore, by implementing green management, enterprises adjust their goals, reduce costs, and improve product qualities to maintain their competitive advantages.

According to Callenbach et al. (1993), in order to implement green management, employees must be encouraged, inspired, empowered and environmentally aware for greening to be successful. That is, employees have to be equipped with knowledge, skills, and abilities concerning environmental protection, energy saving, carbon emission reduction, and sustainable development. Such aggregation of employees' knowledge, skills, abilities, experiences, attitude, and commitment in green management can be regarded as green human capital which is embedded in employees (Chen, 2008). Corporate green management requires a high level of technical and management skills in employees, since the company will develop innovation-focused environmental initiatives and programmes that have significant managerial implications. In this respect, the introduction of training programmes targeted at increasing the employees' environmental awareness and courses especially addressed to the development of new technical and management competencies has a basic importance for fostering environmental innovations and green management (Lee, 2009; Hart, 2005; Perez-Sanchez et al., 2003). Through green competence owned by employees, companies are able to transform their present products and process into green products and green process that meet the environmental requirements set by the government, and then have a better chance to become green enterprises. Based on the arguments above, we proposes that:

H1: More green competence owned by employees will enhance a firm's degree of green management.

### **Relationships Between Green Management and Enterprise Competitiveness**

Many researchers defined competitive advantages in previous literature. Ansoff (1965) suggested that competitive advantage derive from the special features of the products; companies that compose such products could get a superior position in the market. Porter (1985) clarified competitive advantage denotes that compared to competitors, organizations have the advantage in the industrial competition based on their unique assets and skills that are not available to their competitors, and through these assets particular abilities could be developed to help them get a position superior to that of competitors. Besides, Porter (1980) claimed that cost leadership and differentiation are the keys to competitive advantage. With cost leadership strategy, competitive advantages come from the lower price for products at the same quality level. With differentiation strategy, firms achieve competitive advantages through higher price margin by providing products with special value for customers. Other researchers mentioned that competitive advantage results from the value created for the customers through unique and superior competing abilities that brings higher market share and profitability (Hofer et al., 1978; George, 1984; Hill and Jones, 2001). Based on the above arguments, in this study competitive advantage is defined as the superior competing position derived from the special features of the products, valuable and unique resource of firms, and value creation for the customers, which leads to higher market share and profitability (Ansoff, 1965; Hofer et al., 1978; George, 1984; Porter, 1985; Hill and Jones, 2001). The concern for environmental protection could bring economic value for organizations (Siegel, 2009). A good example of a firm proactively adopting a strategy to engage in environmental social responsibility is Wal-Mart. In October 2005, Wal-Mart's CEO announced an environmental initiative to improve energy efficiency, increase sales of organic food, and reduce waste and greenhouse gas emissions (Siegel, 2009). Another example is British Petroleum (BP), the first major industrial company to impose a limit on greenhouse gas emissions (Lowe and Harris, 1998). BP also instituted a corporate emissions trading system and joined global efforts to reduce greenhouse emissions, and made significant investments in solar energy. In both instances, these companies were able to enhance their profitability while simultaneously reducing pollution (Siegel, 2009). Therefore, it seems that competitive advantages deriving from green management include cost reduction resulted from green production, enhancement of productivity, improvement of quality, development of new green technologies, and green corporate image.

However, this positive view coexists with a more traditional stance, which postulates that an improvement in the environmental impact caused by a company leads to a reduction in its profitability (Molina-Azorin et al., 2009). It is suggested that compliance with environmental regulations incurs significant costs, reducing the capacity to compete (Jaffe et al., 1995). These suggesting a negative relationship between environmental management and financial performance argue that firms trying to enhance environmental performance draw resources and management effort away from core areas of the business, resulting in lower profits. In this view, managers cannot make both environmental and competitive improvements (Hull and Rothenberg, 2008; Klassen and Whybark, 1999). Consequently, good social and environmental performance come at the expense of good financial performance because social and environmental performance make use of firm resources in ways that confer significant managerial benefits rather than devoting those resources to alternative investment projects or returning them to shareholders (Molina-Azorin et al., 2009).

Recently, management scholars have devoted considerable attention to examining efforts undertaken by firms to engage in environmental self-regulation (e.g., Barnett and King, 2008; Christmann and Taylor, 2001, 2002; Delmas and Terlaak, 2001; King et al., 2005). Firms can voluntarily implement environmental management systems such as the ISO 14001 standard and achieve certification by independent third-party auditors. ISO 14001 allows companies to signal their environmental responsibility to customers, which allows these customers to factor in the level of ESR of their suppliers in their purchasing decisions (Christmann and Taylor, 2002; Terlaak & King, 2006), which benefit the increase of firms' competitive advantages. Though there are many different perspectives about the green management - performance relationship, this study postulates:

H2: The implementation of green management will enhance firm's competitiveness.

### **Relationships Between Green Competence and Enterprise Competitiveness**

According to Pfeffer (1994), human resource plays the most important part in sustaining competitive advantage and is the key to determine the level of organizational performance. Jackson and Schuler (2002) mentioned that employees' knowledge, skills, and abilities provide organizations with economic value, and if human capital within organizations is enhanced, it will achieve higher organizational performance, which leads to better competitive advantages (Youndt and Snell, 2004). Some researchers also found that the more training companies put into their employees, the more competences and abilities their employees' have, and the higher employees' productivity would be. This leads to a better organizational performance and increasing competitive advantages (Black et al., 1996; Roos et al., 1998).

This study defines green competence as knowledge, skills, abilities, attitudes, and commitments that are unique and strategically valuable for green companies to exert a positive impact on environment. For those who possess green abilities and concepts will help enterprises improve competitive advantages by innovating environmental technologies and designing energy saving products and processes, which decreases the negative impact on environment and pollution resulted from production activities (Shrivastava, 1996). Moreover, companies that improve production process, reduce waste, and save energy will enhance environmental management and operation performance, which in turn increase firm competitive advantages (Gao et al., 2008).

Some literature has found that firms' human capital has a positive effect on competitive advantages (Lepak and Snell, 1999; Johnson, 1999; Dzinkowski, 2000; Huang, 2009). According to Barney (1991), since green human capital is unique and valuable asset that contains knowledge, abilities, and skills about environmental protection (Lepak and Snell, 2002; Chen, 2008), it will create firm competitive advantages. Thus, we infer that:

H3: Green competence has significantly positive effects on a firm's competitiveness.

### **Green Leadership as an Antecedent of Green Management and Green Competence**

Leadership is an important aspect of the work environment for employees (e.g., Oldham & Cummings, 1996; Scott & Bruce, 1994). The ethical dimension of top managers' leadership is thought to be uniquely important because of the executive's potential to influence employee and organizational behavior (Trevino et al., 2003). Recently, researchers have examined the

relationships between environmentally social responsibility (ESR) and CEOs, in view that corporate leaders typically formulate such policies and often are actively involved in promoting the ESR activities of their companies (Muller and Fahey, 2004; Waldman, Siegel, and Javidan, 2006; Sully de Luque, Washburn, Waldman, and House, 2008). According to Trevino (2003), ethical leadership is more than traits such as integrity and more than values-based inspirational leadership. It includes transactional leader behaviors such as setting ethical standards, holding followers accountable for ethical conduct, and using communication and the reward system to guide ethical behavior. Besides, ethical leaders are perceived as having a broad ethical awareness and concern for multiple stakeholders, and using ethical decision processes. Therefore, when executives create the atmosphere at the top that shapes the ethical climate and ethical culture of an organization (Trevino et al., 1998; Weaver et al., 1999) as well as the organizational strategy (Freeman et al., 1988), they display a kind of ethical leadership.

Over the last two decades, awareness of corporate green sustainability has increased significantly in many business organizations and enterprises (Lee, 2009). Green sustainability and corporate responsibility have become increasingly important strategic issues for companies in most industries. Leading manufacturers in Europe, the USA, and Asia have begun to emphasize “green” and “sustainability” in their internal business processes, to external stakeholders, and in investor relations (Lee, 2009). When it comes to corporate greening or green management, one key question for executives at corporations is how to integrate environmental decision making into business with profitable results. Thus, based on the concept of ethical leadership, this study develops the definition of “green leadership” as the following:

Green leaders devote themselves to meeting the standards of environmental protection, and to implementing policies about corporate greening. They share information publicly about important organizational decisions about green management along with information about the principles and decision-making process that are used to make these decisions. Green leaders can demonstrate their care about the environment and concern for the long-term best interest of the organization. They also communicate with employees regularly about environmental issues, and use some ways such as rewards and punishments to signal support for green values. Siegel (2009) indicated that top-level managers are obviously the most influential factor of the implementation of green management. When managers display green leadership or set certain standards for greening, employees may be inspired to learn more knowledge and skills to induce green innovation in either hardware or software, such as improvement in green products, processes or technologies, which motivates green management (Shin & Zhou, 2003). For example, in order to implement environmental management systems such as the ISO 14001 standard and achieve certification by independent third-party auditors, employees need to improve the production process and the quality of products to meet the ISO 14001. From the statements above, we infer that:

H4: Green leadership has significantly positive effects on the implementation of green management.

If top managers are supportive of green management, employees will be motivated to display the behaviors which meet the standards for corporate greening. For example, Lee (2009) found that the introduction of training and education programs for green management and the extra incentives to attend these programs offered by the top management team make the employees' attitudes toward green management become positive and motivated to

participating new green management activities including education programs for other partners. From the statements above, we infer that:

H5: Green leadership has significantly positive effects on the increase of employee's green competence.

### **The Mediating Role of Green Management**

Lee (2009) found that human resources are one of the most often cited reasons by small and medium-sized enterprises as obstacles against adopting green management. The study also offered additional support for the work of Callenbach et al. (1993), in that employees are one of the critical factors needed for the successful implementation of green management. Similarly, Haden et al. (2009) found that Anderson (2004) proposed an interrelated, seven-step process, based on his knowledge and experience in the field and his industry, that he believes his company must engage in, in order to emerge as a restorative and sustainable organization (McClenahan, 1998; Anderson, 2004). Among these steps, some focus upon the production process itself and require the organization to uncover ways to eliminate harmful emissions, create and utilize renewable energy, and redesign products and processes for recycling (McClenahan, 1998; Anderson, 2004). Rising to meet these challenges will help the organization operate in a clean and eco-friendly way and become sustainable, increasing firm's competitive advantages. Therefore, we infer that:

H6: Green management has a mediation effect in the process of corporate greening.

## **METHODOLOGY**

### **Sample and Data Collection**

Our target sample are those workers in green enterprises which have sustainability report listed on the website of the Taiwan Business Council for Sustainable Development; meanwhile, they need to presently produce, research and development green products in Taiwan. The targets are those in management level (e.g., managers or directors) in charge of HR and RD departments as well as top managers. Questionnaire serves as the primary means for data collection. The data was collected from September to October 2011. We sent out 300 questionnaires and a total of 177 usable questionnaires were returned. The overall response rate was 59%.

### **Variables and Measures**

**Green competence.** Green competence refers to the stock of employees' knowledge, abilities, skills, attitudes, and commitment with are both strategically valuable for carrying out organizational environmental strategy by improving the effectiveness and efficiency within enterprises (Schultz, 1961; Lepak and Snell, 1999; Chen, 2008). We assess green competence using the 21-item scale developed based on Liao (2005). The 21-item scale represents three factors, including employee's concept, behavior and attitudes toward corporate greening. A sample indicator is: "I dedicate myself to company's green policies." Items are rated on a Likert 7-point scale, from 1 "strongly disagree" to 7 "strongly agree".

**Green management.** We assess company's degree of green management using the 12-item scale developed based on Huang (2001). The 12-item scale represents three factors, including

green production, green marketing, and active administrative management. Each factor is composed of 4 indicators. Some sample indicators are: “My company puts green design into practice. For example, my company will purchase materials with green mark.” “My company encourages green product promotion and communication activities.” “My company promotes use of electronic bill and e-official document.” Items are rated on a Likert 7-point scale, from 1 “strongly disagree” to 7 “strongly agree”.

**Enterprise competitiveness.** Enterprise competitiveness refers to the superior competing position derived from the special features of the products, valuable and unique resources of firms, and value creation for the customers, which then leads to higher market share and profitability (Ansoff, 1965; George, 1984; Porter, 1985; Barney, 1991; Hill and Jones, 2001). We measure competitiveness using the 12-item scale developed by Cheng (2010). A sample indicator is: “Our company profitability on green products is better than that of major competitors.” Items are rated on a Likert 7-point scale, from 1 “strongly disagree” to 7 “strongly agree”.

**Green leadership.** Items are adapted from the concept of ethical leadership based on Arthur et al. (2006), including the factor of leaders’ role modeling for firm greening, rewards and disciplines for green management, and communication of firm greening. Items are rated on a Likert 7-point scale, from 1 “strongly disagree” to 7 “strongly agree”. A sample indicator is: “My leader puts the environmental protection into practice.”

## RESULTS

### Descriptive Statistics and Correlations

Table 1 shows the detailed sample demographics. Means, standard deviations, and correlations among the study variables are in Table 2. All significant correlations were in the expected direction.

**TABLE 1 Sample Description**

<b>Demographics</b>	<b>Number</b>	<b>%</b>
Age		
<=30 years old	29	16.4
31-40 years old	91	51.4
>=41 years old	44	24.9
Missing data	13	7.3
Highest education		
Senior high school	3	1.7
College/ University	95	53.7
Graduate school	75	42.4
Missing data	4	2.3
Sex		
Male	83	46.9
Female	94	53.1
Industries		
DSolar Power	34	19.2
LED illumination	49	27.7
Electric vehicles	35	19.7

Bio-fuels	14	7.9
Energy ICT	30	17.0
Missing data	15	8.5

N=177

**TABLE 2 Correlations, Means, and Standard Deviations**

Variable	1	2	3	4	5	6	7	8	9	10
Green Leadership (GL)										
1. Modeling (GLA)	1.00									
2. Discipline (GLB)	.84**	1.00								
3. Communication (GLC)	.65**	.817**	1.00							
Green Competence (GC)										
4. Attitude (GCA)	.27**	.36**	.32**	1.00						
5. Cognition (GCB)	.24**	.31**	.30**	.69**	1.00					
6. Behavior (GCC)	.33**	.36**	.39**	.60**	.66**	1.00				
Green Management (GM)										
7. Production (GMA)	.47**	.61**	.63**	.44**	.37**	.32**	1.00			
8. Marketing (GMB)	.47**	.61**	.63**	.32**	.36**	.28**	.86**	1.00		
9. Administration (GMC)	.46**	.57**	.62**	.34**	.29**	.29**	.81**	.82**	1.00	
Enterprise Competitiveness (EC)										
10. Competitiveness	.56**	.67**	.66**	.40**	.41**	.37**	.65**	.62**	.61**	1.00
Mean	5.15	5.27	5.78	6.20	6.24	5.93	6.00	6.00	6.04	6.08
Standard deviation	1.32	1.16	1.06	.94	.95	.96	.94	.92	.96	.91

N=177. (Casewise deletion of missing data) \*\* p<0.01

**Measurement Model**

Content validity was established through personal interviews with two managers in a green company and one professor. Then, we used CFA to assess discriminant validity, convergence validity, and construct reliability. According to Anderson and Gerbing (1988), we evaluated discriminant validity by constraining the correlation between each pair of constructs to be 1, which gave a new chi-square value for the model. The difference between the new model and the original model also had a chi-square distribution, with one degree of freedom. If the difference exceeded 3.84 for each pair of constructs tested, then discriminant validity was achieved. Table 3 shows most chi-square differences are above 3.84, showing good discriminant validity.

**TABLE 3 Discriminant Validity between Pairs of Constructs**

Pairs of Construct	Unconstrained Model		Constrained Model		$\Delta\chi^2$	
		$\chi^2$	Freedom	$\chi^2$		Freedom
GLA	GLB	353.5	51	355.1	52	1.6
	GLC	353.5	51	360.6	52	7.1
GLB	GLC	353.5	51	354.0	52	0.5
	GCA	260.5	51	274.3	52	13.8
GCA	GCC	260.5	51	270.3	52	9.8
	GCB	260.5	51	278.5	52	12.0

GMA	GMB	165.4	51	171.6	52	6.2
	GMC	165.4	51	169.7	52	4.3
GMB	GMC	165.4	51	170.1	52	4.7

NOTE: The shadowed value mans  $\Delta\chi^2 < 3.84$

After several rounds of CFA, we eliminated those indicators whose loadings were under 0.7. Thus, all factor loadings of remaining items were above 0.7, showing adequate convergence validity (Anderson and Gerbing, 1988). Besides, all measures have construct reliability greater than the recommended level of 0.7 (Hair *et al.*, 1998). The Cronbach's alpha of the subscales ranged from 83% to 96%, achieving acceptable values. As for the variance extracted, all exceeds 0.5, showing good reliability (Hair *et al.*, 1998). See Table 4 for details.

### Structural Model

We used SEM to assess the overall fit of the model. Multiple indexes were used to assess the fitness. According to the criterion recommended by previous studies, the best model (Figure 1) was tested in this study, and Table 5 showed the results of the model, concluding the model was quite adequate.

**TABLE 4 Reliability and Validity of Scales**

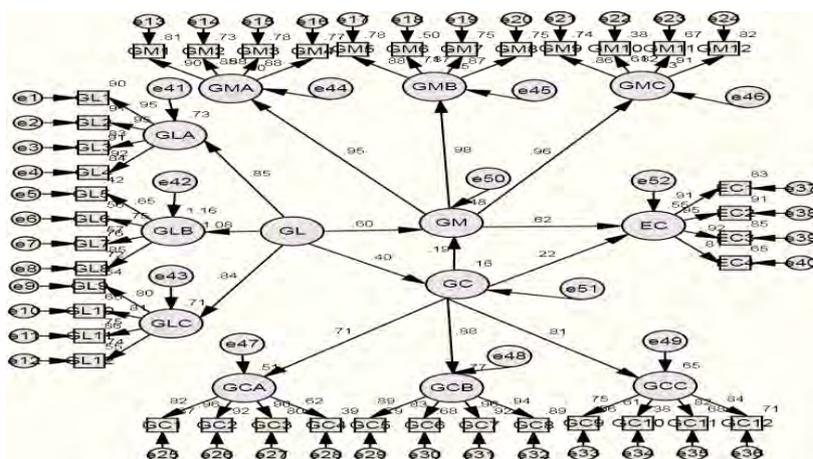
Scale	Construct	Indicator	Factor Loadings	C.R	Construct Reliability	Variance Extracted	Cronbach Alpha
Green Leadership (GL)	Modeling (GLA)	GL1	0.95	A	0.97	0.87	0.96
		GL2	0.95	27.30			
		GL3	0.92	23.60			
		GL4	0.92	23.82			
	Discipline (GLB)	GL5	0.62	A	0.84	0.58	0.84
		GL6	0.73	8.34			
		GL7	0.79	8.79			
		GL8	0.87	9.45			
	Communication (GLC)	GL9	0.81	A	0.88	0.65	0.88
		GL10	0.81	12.10			
		GL11	0.87	13.24			
		GL12	0.74	10.76			
Green Competence (GC)	Attitude (GCA)	GC1	0.82	A	0.90	0.69	0.90
		GC2	0.97	16.48			
		GC3	0.89	14.90			
		GC4	0.60	8.73			
	Cognition (GCB)	GC5	0.88	A	0.95	0.81	0.89
		GC6	0.82	14.93			
		GC7	0.96	20.90			
		GC8	0.94	20.12			
	Behavior (GCC)	GC9	0.77	A	0.86	0.6	0.83
		GC10	0.63	8.51			
		GC11	0.84	11.62			
		GC12	0.84	11.68			
Green	Production	GM1	0.89	A	0.93	0.77	0.93

Management (GM)	(GMA)	GM2	0.85	16.30	0.90	0.69
		GM3	0.89	18.03		
		GM4	0.87	17.21		
	(GMB)	GM5	0.88	A		
		GM6	0.70	11.29		
		GM7	0.86	16.69		
		GM8	0.86	16.11		
	(GMC)	GM9	0.87	A		
		GM10	0.62	9.32		
		GM11	0.81	14.08		
		GM12	0.90	17.00		
	Enterprise Competitiveness (EC)	Competitiveness	EC1	0.93		
EC2			0.95	23.60		
EC3			0.89	19.36		
EC4			0.78	14.36		

**TABLE 5 The Results of Structural Equation Model**

	Relations	Standardized Coefficients	C.R.	Hypothesis Testing Results
Path	Green Competence --> Green Management	.19*	2.56	H1- supported
	Green Management --> Enterprise Competitiveness	.62***	8.35	H2- supported
	Green Competence --> Enterprise Competitiveness	.22**	3.03	H3 - supported
	Green Leadership --> Green Management	.60***	7.69	H4 - supported
	Green Leadership --> Green Competence	.40***	4.24	H5 - supported
Fix Index	Chi-Square	1746.68	CFI	.902
	Degree of Freedom (d.f.)	726	IFI	.902
	Chi-Square/d.f.	2.406	TLI	.893
	RMSEA	.076		

Note: 1.\*: p<0.05 (C.R. >1.96); \*\*: p<0.05 (C.R. >2.575); \*\*\*: p<0.05 (C.R. >3.08);  
 2. The coefficients are standardized value.



Note: all entries are standardized coefficients

**FIGURE 1 Structural Equation Model**

As the overall goodness of fit is promising, it is encouraged to further identify the magnitudes

and significance of the path structural coefficients of the model. We found that the GC-GM, GM-EC, GC-EC paths were statistically positively significant, representing that green competences owned by employees would enhance the implementation of green management. Hypotheses 1-3 were thus all supported. Furthermore, the results indicated that green leadership had statistically positive effects on green management and green competence, showing that green leadership displayed by managers would benefit the degree of corporate greening and the accumulation of employee green competence. Therefore, Hypotheses 4 and 5 were both supported. Finally, we would like to examine the mediating effects of green management. From Figure 1, we found that the indirect effect of green leadership on firm competitiveness through green competence was greater than the direct effect of green leadership on firm competitiveness ( $\beta$  of indirect effects =  $.60 \times .62 + .40 \times .19 \times .62 = .419 > \beta$  of direct effects =  $.39$ ). Therefore, we concluded that green management functioned as a mediator, supporting H6.

## DISCUSSIONS AND CONCLUSIONS

### Theoretical Contributions

This paper contributes to theory in various ways. First, based on ethical leadership, this study brings out a new concept of green leadership to examine the effects of it on green management. Second, Molina-Azorin et al. (2009) suggested some mediating variables in the linkage between green management and financial performance be researched in future studies. Since this research found that the implementation of green management had a significantly positive effect on enterprises competitiveness, and previous studies indicated that competitive advantages would improve financial performance (Klassen and McLaughlin, 1996; Sharma and Vredenburg, 1998), enterprise competitiveness might be a key mediator in the relationships between green management and financial performance. Third, this paper makes a contribution to RBV theory. For scholars researching the RBV, this finding is consistent with the literature confirming that with the appropriate management of a key resource (green competence), firms enhance their implementation of green management, competitive advantage and performance (Barney, 1991; Lopez-Cabrales et al., 2006; Perez-Luno et al., 2007). Our results also confirm that green leadership facilitates employees' green competences.

### Managerial Implications

The findings of this study also provide some insights for managers. First, this research confirms that green management is a meaningful construct, which plays a mediating role in the process of corporate greening. Green management can be achieved by the improvement of production process, recycling and reuse of waste or used materials, development and promotion of products with green marks, and certification and audit of environmental protection systems. Though it seems to cost a lot to implement green management, in the long term, it not only tangibly increases firm's competitiveness, but also intangibly builds firm's image, which benefits organizational performance. Second, this paper shows that green competence owned by employees is a key success factor of green management. Based on the RBV, the types of employee knowledge, skills, and abilities have been considered the crucial resources to lead firms to sustainable competitive advantages. Thus, it's important for managers to cultivate employees' green competence by means of human resource management practices such as training activities and reward systems to let employees have positive attitude and broad awareness of environmental issues, and to behave in consistent

with firms' green policies. Finally, this study finds that green leadership functions as an antecedent of green management and green competence, so managers should develop or display green leadership in corporate greening, such as visible greening actions (a role model), the establishment of corporate greening policies and systems, continuous communication and conveyance of the importance of environmental protection.

### **Limitations and Future Studies**

There are several limitations to this study. First, some of our constructs were evaluated by perceptual measures, such as enterprise competitiveness. Second, the common method bias could pose problems for a survey research relying on self-reported data, especially if the same person reports on both dependent and independent variables. Third, though the sampling population consists of seven key green energy industries, the data we finally collected were only from some of them, which may cause the bias of the results generalization.

Based on the conclusions and the limitations outlined above, we suggest some directions for future research. First, we suggest future researchers evaluate enterprise competitiveness with objective measures. Second, we suggest that the inclusion of qualitative methods, such as in-depth interviews and meta analysis, should contribute to have an abundant understanding of the implementation of green management. Third, we suggest researchers include other selection criterion when sampling, such as the green enterprises listed on the website of Green Energy Industry Information Net, Bureau of Energy, etc, so that the sampling can be more robust.

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