



# A new perspective to promote organizational citizenship behaviour for the environment: The role of transformational leadership

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## ARTICLE INFO

### Article history:

Received 13 February 2019  
Received in revised form  
7 July 2019  
Accepted 10 August 2019  
Available online 13 August 2019

Handling Editor: Yutao Wang

### Keywords:

Pro-environmental behavior  
Organizational citizenship behavior for the environment  
Transformational leadership  
Psychological ownership  
Structural equation model

## ABSTRACT

Employees' spontaneous organizational citizenship behavior for the environment (OCBE) in the workplace is of great significance for enterprises' low-carbon transition. However, how such behavior can be promoted through leadership styles has not been considered. Therefore, this study established a model that explores how transformational leadership affects employees' OCBE from the perspective of the leader-member exchange relationship. With 215 superior-subordinate paired data, a structural equation model (SEM) was used to test the hypotheses. The results revealed four key findings. (1) A transformational leadership style can effectively promote employees' OCBE, but the four dimensions of transformational leadership have different influencing paths and strengths on OCBE. (2) Leaders' vision motivation directly inspires employees' OCBE, and the effect intensity is the largest among all dimensions. (3) Both leaders' individualized consideration and moral modeling promote OCBE indirectly through psychological ownership, and the effect of individualized consideration is greater than the effect of moral modeling. (4) Contrary to our expectations, leadership charm does not have any effect on OCBE. Finally, firm recommendations were proposed on how to facilitate employees' OCBE by transforming the leadership style, thus promoting the green and low-carbon development of enterprises.

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## 1. Introduction

Governments around the world have reached consensus on responding to climate change and promoting green and low-carbon development. As the basic subjects of social production and economic activities, enterprises and the public are decisive forces for promoting the development of a low-carbon society (Figueres et al., 2018). Employees as a common component of both enterprises and the public, their green behaviors should be given more attention (Boiral, 2009; Zhang et al., 2014; Zientara and Zamojska, 2018). However, the past research mainly focused on achieving green and low-carbon goals via the promotion of government policies (Liao et al., 2018; Zhang et al., 2019b) and green technology innovation (Kuo and Smith, 2018; Zhang et al., 2019a), and most studies have ignored the role of employees' active environmental behaviors in the corporate green and low-carbon transition. The low-carbon development of enterprises does not rely solely on the

constraints of hard and fast rule, more importantly, it also requires employees' active response and cooperation. Therefore, attentions should be paid to employees' organizational citizenship behavior for the environment (OCBE). OCBE refers to discretionary and environmentally friendly behavior that is not explicitly recognized by the formal reward system (Boiral, 2009). This proactive behavior implemented by employees does not only contributes to corporate environmental performance but also fills the environmental gap outside enterprises' formal systems (Alt and Spitzbeck, 2016; Raineri and Paillé, 2016).

Various researchers have found factors that have a positive effect on OCBE, including employees' participation ability (Alt and Spitzbeck, 2016), organizations' supervision (Paillé et al., 2017), and pro-environmental organizational atmosphere (Paillé et al., 2014; Zientara and Zamojska, 2018). However, little is known about the effect of the leader-member relationship in the workplace on OCBE. The relationship between superiors and subordinates is the core part of organizational interpersonal relationships and the leadership style of superiors is a key factor affecting subordinates' mental states and behaviors (Piccolo and Colquitt, 2006; Kim and Beehr, 2017; Graves and Sarkis, 2018). Particularly in Chinese society with a "high power distance" culture, subordinates are more likely to accept the power hierarchy gap with superiors (Hofstede, 1984), which makes the superiors

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have a stronger influence on subordinates. (Lin et al., 2018). Therefore, it will be a new approach to encourage employees' OCBE through leadership style.

Compared with traditional transactional leadership, transformational leadership is more capable of inspiring subordinates' intrinsic motivation by portraying the organization's vision, caring for subordinates, and demonstrating by models. In this way, subordinates can improve their work performance (Chun et al., 2016) and implement more voice behaviors (Duan et al., 2017) and innovative behaviors (Li et al., 2015; Dong et al., 2017). Unfortunately, it remains a gap in the literature whether OCBE can be motivated by transformational leadership? Managers may overlook an important opportunity to enhance corporate environmental performance through employee behaviors. To fill this gap, we expand transformational leadership theory and explore the effect of transformational leadership on employees' OCBE in the perspective of leader-member exchange.

This study contributes to the research field in the following ways. First, it explores a new approach to promote corporate green and low-carbon development by inspiring employees' active environmental citizenship behavior. Second, this study expands transformational leadership theory research and explores its relationship with OCBE for the first time, thus filling a gap in the existing literature. Third, this study establishes a mechanism model of transformational leadership on OCBE from the perspective of the leader-member exchange relationship and provides new valuable insight and direction to understand employees' psychological motivation to implement OCBE. Finally, this study is one of the few empirical studies on OCBE in the Chinese context, which not only provides theoretical support for the development of OCBE in China but also promotes its cross-cultural research. In practice, this study can provide useful suggestions for enterprise managers to motivate employees' environmental behaviors, and thus accelerating the low-carbon transition of enterprises.

The rest of the paper is organized as follows. In section 2, five groups of research hypotheses are proposed after reviewing the literature. Section 3 describes the research method and data. Section 4 presents the data analysis results obtained from empirical tests. Discussion is provided in Section 5. Eventually, the conclusion, implications and future research are discussed in the last two sections.

## 2. Theory and hypothesis development

### 2.1. Organizational citizenship behavior for the environment

OCBE is a discretionary behavior that is not recognized by an organization's formal reward system, but contributes to environmental performance (Boiral, 2009). An example of OCBE is when employees propose suggestions to reduce resource and energy consumption, or persuade colleagues to conduct their work in other more environmentally friendly ways (Boiral and Paillé, 2012). On the one hand, OCBE promotes the complementarity and interaction with the formal environmental management systems and fills the environmental gaps that have not been noticed by the regulatory systems. On the other hand, it can directly help the organization to reduce environmental costs and enhance the organization's environmental reputation (Paillé et al., 2014; Alt and Spitzbeck, 2016; Zhang and Liu, 2016).

The concept of OCBE was first proposed by Boiral in 2009, and it has since attracted the attentions of many scholars. Previous studies have affirmed the role of OCBE in improving organizational environmental performance (Paillé et al., 2013; Alt and Spitzbeck, 2016) and explored its promotion mechanism at an individual level (e.g. employees' participation ability (Alt and Spitzbeck, 2016)

or organizational level, (e.g. organizations' supervision (Paillé et al., 2017) and pro-environment atmosphere (Zientara and Zamojska, 2018). In 2016, the Chinese scholars Zhang et al. conducted a theoretical review on OCBE's background, conceptual connotation, and scale development based on the research of western scholars, which is the earliest study on this topic in China. However, there is still a lack of empirical research on OCBE, and the promotion of OCBE in the Chinese context still needs more investigations. Therefore, from the perspective of the leader-member exchange relationship, this empirical study examined the effect of transformational leadership style on OCBE in the Chinese context to promote the cross-cultural development of OCBE.

To explore the connotation and construct of OCBE in the Chinese context, we conducted one-on-one interviews with 38 managers and employees of Chinese enterprises. These interviewees were all randomly selected from the class of 2016 and 2017 MBA students at China's key national universities. The interviewees had more than 3 years of working experience at the enterprise and a general higher education level. They came from different industries, including finance (26.3%), education and the municipal industry (18.5%), electronics (15.8%), the Internet industry (10.5%), manufacture (10.5%), healthcare (5.3%), the daily chemical industry (5.3%), transportation (3.9%), and the petrochemical industry (3.9%). Males accounted for 60.5% of the surveyors and females accounted for 39.5%. The average age of the interviewees is 32.7 years old.

Before the interviews, we informed the interviewees of the anonymity of the survey, assuring them that all of their personal replies would only be used for academic purposes to eliminate their privacy concerns. After the interviews, the interview content was timely sorted and analyzed. Finally, we found that the employees in Chinese enterprises mainly described two types of OCBE: organization-oriented behavior and colleague-oriented behavior. On this basis, we drew on the research of Boiral and Paillé (2012) and divided OCBE into two dimensions: eco-civic engagement and eco-helping. Eco-civic engagement means that employees volunteer to participate in an organization's environmental projects and environmental actions; eco-helping means that employees help colleagues to become more concerned about environmental issues and to implement more environmental protection behaviors in the workplace. The scale test in Table 2 also confirmed the high reliability and validity of the OCBE' concept and two-dimensional structure. Accordingly, this study will explore the mechanism of transformational leadership on these two types of OCBE.

### 2.2. Transformational leadership and OCBE

The social exchange theory was proposed by Homans (1961) and it provided a theoretical basis for understanding the interaction relationship between leaders and members in an organization. According to this theory, a satisfactory social relationship is mutually beneficial (Emerson, 1976). In a social interaction, individuals need to repay the acquired value and benefits to maintain the exchange relationships (Cropanzano and Mitchell, 2005). In organizations, leader-member exchange is regarded as the core of the social exchange relationship. Buil et al. (2019) found that transformational leadership can promote a high-quality exchange relationship with subordinates by directly expressing care, trust, and support. Out of reciprocity, subordinates will increase their care and loyalty to the organization and thus volunteer to implement positive behaviors out of their obligations. Therefore, promoting OCBE from the perspective of transformational leadership may be an effective way to accelerate the corporate low-carbon transition.

The early research on transformational leadership divided it into

the four dimensions of idealized influence, inspirational motivation, intellectual stimulation and individualized consideration (Bass, 1985). However, the concept and composition of leadership vary with the national culture (Hofstede, 1993). Compared with western countries, Chinese corporations have “high power distance” cultural characteristics, where the status gap between leaders and subordinates is larger, and leadership has a greater influence on subordinates (Hofstede, 1984). Therefore, Li and Shi (2005) proposed a China-specific transformational leadership model that includes four dimensions: moral modeling, individualized consideration, vision motivation and leadership charm. This model has proven to be applicable in the Chinese culture (Li et al., 2015). Thus, this study draws on this model to analyze the effect of transformational leadership on OCBE.

Among the four dimensions of China-specific transformational leadership, moral modeling is a unique dimension that is distinct from western culture. It means that leaders demonstrate high ethical standards and behaviors and establish a good model for their subordinates. Such leaders are generally considered trustworthy and fair (Li et al., 2015). Based on social learning theory, subordinates imitate and learn from their superiors' virtue, enhance their moral consciousness, and show various positive behaviors (Wang and Sung, 2016). OCBE, as an environmental citizenship behavior that is not subject to organizational rewards and job duties, has a strong moral component. Therefore, we conclude that employees' OCBE may be closely related to leaders' morality. **H1** is accordingly proposed as follows.

**H1.** Moral modeling of transformational leadership is positively related to OCBE.

**H1a.** Moral modeling of transformational leadership is positively related to eco-civic engagement.

**H1b.** Moral modeling of transformational leadership is positively related to eco-helping.

Individualized consideration of transformational leadership refers to a leader who cares about each subordinate, attaches importance to their personal needs, abilities and wishes, and conducts differentiated cultivation and guidance according to subordinates' situations. Compared with western culture, the individualized consideration of leaders in the Chinese context involves a broader connotation. It is not limited to leaders' guidance and attention to subordinates' personal needs and career development, but it also emphasizes care for the private lives of employees and even their family members (Li and Shi, 2005). All of these leader behaviors make subordinates feel a sense of indebtedness and appreciation. Based on the reciprocity principle of social exchange theory, employees return the favour, which is reflected in strengthening their social emotional bond with the organization, enhancing their task performance and increasing their altruistic behaviors (Song et al., 2009). In addition, subordinates may directly reciprocate the source of the received benefits or reward other people involved in exchange processes (Flynn, 2005; Mostafa and Bottomley, 2018). Therefore, when employees feel individualized consideration from leaders, they may indirectly reward the reciprocity by helping colleagues to implement environmental behaviors or by participating in organizational environmental activities. Hence, we propose the following:

**H2.** Individualized consideration of transformational leadership is positively related to OCBE.

**H2a.** Individualized consideration of transformational leadership is positively related to eco-civic engagement.

**H2b.** Individualized consideration of transformational leadership

is positively related to eco-helping.

Vision motivation of transformational leadership refers to leaders who help subordinates to foresee the development trends and future blueprint of the organization by drawing and passing on the organizational vision, which thus stimulates the internal motivation of subordinates. This leadership style sets high expectations and high performance goals for their subordinates, emphasizing subordinates' important role and value in achieving organizational goals. In this way, employees are motivated to internalize their own values into team values (Bass, 1985; Avolio et al., 1999). Previous studies have suggested that vision motivation not only heightens employees' job engagement (Caniëls et al., 2018; Li and Mao, 2018), but also encourages them to implement more organizational citizenship behavior (OCB) that is conducive to organizations (Li et al., 2006). For firms in general and nonenvironmental industries, both OCBE and OCB are active behaviors outside the employees' responsibility, but they have different targets. OCB is an active behavior oriented towards the improvement of organizational performance, whereas OCBE is oriented towards the enhancement of environmental performance. The two behaviors share more similarities when environmental performance is included in the company's performance goals. Therefore, we predict the following hypothesis:

**H3.** Vision motivation of transformational leadership is positively related to OCBE.

**H3a.** Vision motivation of transformational leadership is positively related to eco-civic engagement.

**H3b.** Vision motivation of transformational leadership is positively related to eco-helping.

The charisma of transformational leadership refers to certain characteristics that can make followers trust, respect and follow leaders, which is similar to the concept of idealized influence proposed by Bass (1985). Leadership charm can enhance employees' identification with their leaders, and consequently the organization (Li, 2014; Li and Mao, 2018). This organizational identification encourages employees to help colleagues and organizations spontaneously (Buil et al., 2019). Therefore, we conclude that OCBE, as a type of employee voluntary behavior that helps colleagues and organizations to be more environmentally friendly, may also be motivated by leadership charm. Accordingly, the following hypothesis are proposed:

**H4.** Leadership charm of transformational leadership is positively related to OCBE.

**H4a.** Leadership charm of transformational leadership is positively related to eco-civic engagement.

**H4b.** Leadership charm of transformational leadership is positively related to eco-helping.

### 2.3. Mediating role of psychological ownership between transformational leadership and OCBE

Psychological ownership originates from the “employee stock ownership plan”, which fosters a perception of formal ownership among employees. Based on this concept, Pierce and his colleagues (1991) proposed psychological ownership and defined it as: the state in which individuals sense that the target of ownership (material or immaterial in nature) or a part of it is “theirs”. Studies have found that leadership behavior is an important factor that affects employee psychological ownership (Avey et al., 2009; Bernhard and O'Driscoll, 2011; Kim and Beehr, 2017). On the one

hand, the leader, as the “agent” of the enterprise, is a link connecting the organization and employees; the agent's behaviors will affect employees' feelings towards the organization (Zhou and Long, 2012). On the other hand, within a culture characterized by high power distance, employees' behaviors are strongly constrained by their leaders (Hofstede, 1984). Therefore, leadership behavior is a vital predictor of employees' psychological ownership of the organization.

The origin of psychological ownership lies in its ability to satisfy three basic human needs, namely, home, self-efficacy and self-identity (Pierce et al., 2001). Transformational leadership has significant advantages in meeting these three needs. First, transformational leaders enhance employees' trust and sense of security within the organization through their impartiality and morality. These leaders also attach importance to caring for employees' work and home lives and make efforts to fulfil employees' needs for achievement and growth. These behaviors all lead to an increased sense of belongingness among employees and will further promote psychological ownership (Zhou and Long, 2012). Second, the charisma of transformational leaders lies in their strong business ability and enterprise (Li and Mao, 2018). Charismatic leaders focus on cultivating employees' autonomy and encouraging them to make decisions independently; this behavior helps improve employees' perceived sense of control and effectiveness, which thus amplifies their sense of ownership (Kim and Beehr, 2017). Finally, transformational leaders affirm employees' value and significance to the organization by portraying an attractive vision, and they help employees to establish a positive self-concept (Bass, 1985), which thus heightens employees' self-identity and further generates psychological ownership.

Previous studies have tested the mediating role of psychological ownership between positive leadership and employees' extra-role behaviors (Zhou and Long, 2012; Kim and Beehr, 2017). Psychological ownership encourages employees to have a strong sense of responsibility for the organization (Pierce et al., 2001). For individuals who are driven by this responsibility, reciprocal behavior becomes a moral requirement; thus, individuals will take the initiative to defend, protect and improve ownership objectives. In the organizational context, the reciprocity behaviors of employees are embodied in investing time and energy in their work voluntarily for the collective welfare (Pierce et al., 2001; Brown and Zhu, 2016; Kim and Beehr, 2017). Therefore, we infer that when employees perceive that they have psychological ownership in the organization, they may proactively engage more in OCBE outside the organizational reward system to achieve corporate low-carbon goals. Accordingly, H5 is proposed Fig. 1.

**H5.** Psychological ownership mediates the relationship between transformational leadership and OCBE.

### 3. Methodology

#### 3.1. Sample and data

The data were collected by a questionnaire survey. To reduce potential common method bias, we collected superior-subordinate paired data with a time lag. We contacted human resource managers from the following four different types of enterprises: a state-owned enterprise, a private enterprise, a foreign enterprise, and a Sino-foreign joint venture. Among them, the state-owned enterprise belongs to the financial industry, the private enterprise belongs to the photovoltaic industry, and the foreign enterprise and Sino-foreign joint venture belong to the manufacturing industry. The size of the enterprises is about 770 people, 790 people, 610 people and 550 people, respectively. Through communication with these managers, the email addresses of subordinates and their immediate superiors were obtained.

The first stage of the survey was conducted in May 2018. 308 randomly selected subordinates were contacted via email and asked to fill out questionnaires on transformational leadership and psychological ownership. To exclude the privacy concerns among the respondents and obtain real survey data, we informed them of the confidentiality of the survey and that all of their personal replies would be used only for academic purposes. A total of 256 valid questionnaires were received. Two weeks later, we sent emails to the 64 direct supervisors of these 256 subordinates to invite them to evaluate their subordinates' OCBE. Finally, the effective paired data of 49 superiors and 215 subordinates were collected, and each superior evaluated 4.39 subordinates on average. The efficiency of the questionnaire was 69.81%. According to Anderson and Gerbing, 1988 and Bentler and Chou, 1987 suggestion, a sample size between 100 and 200 or 5–10 times of the scale measurement index items is sufficient for small and medium-sized structural equation models (SEMs). Table 1 lists the paired sample characteristics of 49 superiors and 215 subordinates.

#### 3.2. Measures

The measures of the constructs in this study were based on established scales. All items used a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Appendix I shows the complete questionnaire.

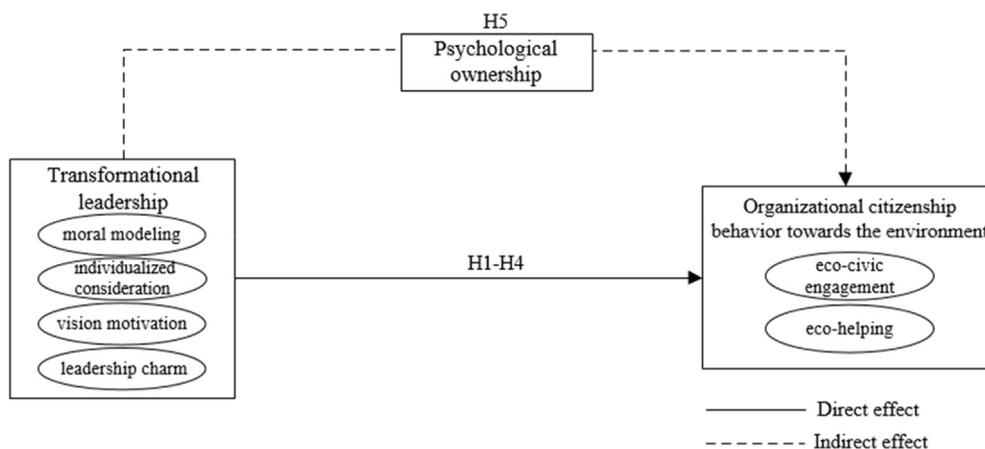


Fig. 1. Conceptual framework.

**Table 1**  
Demographic characteristics of the subordinates (N = 215) and superiors (N = 49).

Variable	Category	Subordinate		Superiors	
		No.	Percentage	No.	Percentage
Gender	male	99	46.0%	30	61.2%
	female	116	54.0%	19	38.8%
Marriage	married	100	46.5%	42	85.7%
	unmarried	115	53.5%	7	14.3%
Age	<20	2	0.9%	0	0
	20–30	159	74.0%	13	26.5%
	31–40	39	18.1%	21	42.9%
	41–50	14	6.5%	10	20.4%
	>50	1	0.5%	5	10.2%
Education	Below junior high school	1	0.5%	0	0
	Senior high school or secondary school degree	5	2.3%	3	6.1%
	Associate degree or bachelor degree	158	73.5%	35	71.4%
	Graduate degree	51	23.7%	11	22.5%
Organizational tenure	<1	61	28.4%	0	0
	1–3	41	19.1%	7	14.3%
	3–5	46	21.4%	10	20.4%
	5–10	48	22.3%	13	26.5%
	10–15	10	4.6%	9	18.4%
	15–20	2	0.9%	6	12.2%
	>20	7	3.3%	4	8.2%
Position	Grassroots employee	121	56.3%	0	0
	Junior manager	57	26.5%	21	42.8%
	Middle manager	37	17.2%	19	38.8%
	Top manager	0	0	9	18.4%
Enterprise style	State-owned enterprise	79	36.7%	20	40.8%
	Private enterprise	66	30.7%	13	26.5%
	Foreign enterprise	28	13.0%	6	12.3%
	Sino-foreign joint venture	42	19.6%	10	20.4%

**Table 2**  
Summary of model fit indices.

Fit index standard	CMIN	DF	CMIN/DF <3	RMR <0.05	GFI >0.9	NFI >0.9	CFI >0.9	RMSEA <0.08
One-factor model	1465.386	275	5.329	0.129	0.569	0.662	0.705	0.142
Two-factor model	1100.442	274	4.016	0.089	0.643	0.746	0.795	0.119
Three-factor model	725.215	272	2.666	0.055	0.770	0.833	0.888	0.088
Seven-factor model	296.348	244	1.215	0.039	0.902	0.932	0.987	0.032

Note: CMIN: chi-square statistic, DF: degree of freedom, RMR: the root mean squared residuals, GFI: the goodness-of-fit index, NFI: the normed fit index, CFI: the comparative fit index, and RMSEA: the root mean squared error of approximation.

### 3.2.1. Transformational Leadership

We used the transformational leadership scale developed by [Li and Shi \(2005\)](#), which comprises the four distinct dimensions of moral modeling, individualized consideration, vision motivation and leadership charm. Three items assessed moral modeling, e.g., “My superior can prioritize the interests of the organization and others”. Three items assessed individualized consideration, e.g., “My superior is willing to help employees solve their problems in life and family”. Four items assessed vision motivation, e.g., “My superiors will let employees know the business philosophy and development prospects of the company (or department)”. Four items assessed leadership charm, e.g., “My superiors have strong business skills”. The reliability coefficients for the four measures were acceptable (Cronbach's  $\alpha = 0.895, 0.906, 0.907$  and  $0.908$ ).

### 3.2.2. Psychological ownership

We used the one-dimensional scale of psychological ownership developed by [Pierce et al. \(1991\)](#). Considering the Chinese culture, we revised it and ultimately included five items in this scale; an example item is “For me, the organization is home”. The Cronbach's  $\alpha$  was  $0.870$ , which is an acceptable value.

### 3.2.3. OCBE

The OCBE scale is based on the scale developed by [Boiral and Pail  \(2012\)](#) and is localized through one-on-one interviews with Chinese employees. The revised scale includes two dimensions. Three items assessed eco-civic engagement, e.g., “He/she actively participates in environmental events organized by the company (or department)”. Three items assessed eco-helping, e.g., “He/she spontaneously gives his/her time to remind colleagues to pay attention to environmental protection at work”. The Cronbach's  $\alpha$  was acceptable ( $\alpha = 0.797, 0.862$ ).

### 3.2.4. Control variables

We controlled for demographic variables, including employees' gender, marital status, age, educational level, organizational tenure and position. Previous studies have shown that these variables may have an impact on individuals' environmental behavior ([Casal  and Escario, 2018](#); [Mi et al., 2018](#); [Vicente-Molina et al., 2018](#)).

### 3.3. Scale test

We evaluated the factor structure and discriminant validity of

**Table 3**  
Results of the reliability and validity tests.

Variable	Items	Loadings	Cronbach's alpha	CR	AVE
Moral modeling	MM1	0.795	0.895	0.896	0.743
	MM2	0.901			
	MM3	0.886			
Vision motivation	VM1	0.853	0.906	0.928	0.715
	VM2	0.859			
	VM3	0.824			
	VM4	0.789			
Individualized consideration	IC1	0.820	0.907	0.909	0.770
	IC2	0.899			
	IC3	0.910			
Leadership charm	LC1	0.887	0.908	0.942	0.760
	LC2	0.825			
	LC3	0.901			
	LC4	0.803			
Psychological ownership	PO1	0.680	0.870	0.918	0.567
	PO2	0.775			
	PO3	0.798			
	PO4	0.765			
	PO5	0.791			
Eco-civic engagement	ECE1	0.713	0.797	0.797	0.567
	ECE2	0.740			
	ECE3	0.803			
Eco-helping	CH1	0.873	0.862	0.870	0.691
	CH2	0.882			
	CH3	0.731			

the constructs by conducting a confirmatory factor analysis (CFA) by using the maximum likelihood method with AMOS 22.0. We evaluated a one-factor measurement model, in which all constructs were set to load on a single factor, a two-factor model combining psychological ownership and OCBE, and a three-factor model comprising transformational leadership, psychological ownership and OCBE. The fit index shows that none of these models met the standard. We subsequently tested the hypothesized seven-factor model consisting of moral modeling, vision motivation, individualized consideration, leadership charm, psychological ownership, eco-civic engagement and eco-helping. Table 2 shows that the seven-factor model fits the data better than the other models. The fit index meets the standard, which indicates a good distinction between the constructs.

Following Fornell and Larcker (1981), we further tested the factor loadings of the items. All standardized factor loadings ranged from 0.680 to 0.910 ( $>0.5$ ), and the average variance extracted (AVE) ranged from 0.567 to 0.770 ( $>0.5$ ), indicating high convergent validity. Moreover, the square root of the AVE for each construct was greater than its correlation with all other constructs (see Table 4), which indicates that the constructs had discriminant validity (Fornell and Larcker, 1981). The Cronbach's  $\alpha$  coefficients and construct reliability (CR) values were tested to check the reliability of the scale. As shown in Table 3, the Cronbach's  $\alpha$  coefficients ranged from 0.797 to 0.908, which were greater than the threshold of 0.6, and the CR values ranged from 0.797 to 0.942,

which were above the threshold of 0.7. These results support the construct reliability of all constructs (Nunnally and Bernstein, 1994).

#### 4. Results

We performed a descriptive statistical analysis and correlation analysis on the constructs with SPSS 23.0. Table 4 shows the mean (M), standard deviation (SD), and Pearson correlation coefficients for all structures. Table 4 shows that the four dimensions of transformational leadership were significantly correlated with psychological ownership, eco-civic engagement and eco-helping ( $P < 0.01$ ), and psychological ownership was significantly correlated with eco-civic engagement and eco-helping ( $P < 0.01$ ). These results provide preliminary evidence to support the next hypothesis test.

The hypotheses were tested using SEM with AMOS 22.0. The results showed that the model fit indices GFI and AGFI did not meet the standard, and according to the CR value, the following four paths were found to be less significant: moral modeling—eco-civic engagement, moral modeling—eco-help, vision motivation—eco-civic engagement, and vision motivation—eco-help. Therefore, the four paths were deleted to obtain model 2, it was run again, and the fit indices changed only slightly. The results showed that leadership charm was not significant in any path and that the effect of vision motivation on psychological ownership was far from significant.

**Table 4**  
Construct descriptive and discriminant validity.

	M	SD	1	2	3	4	5	6	7
Moral modeling	3.628	0.916	<b>0.862</b>						
Vision motivation	3.762	0.832	0.740**	<b>0.846</b>					
Individualized consideration	3.492	0.928	0.743**	0.775**	<b>0.877</b>				
Leadership charm	3.721	0.823	0.760**	0.758**	0.746**	<b>0.872</b>			
Psychological ownership	3.900	0.692	0.582**	0.561**	0.573**	0.499**	<b>0.753</b>		
Eco-civic engagement	3.461	0.936	0.387**	0.436**	0.381**	0.291**	0.384**	<b>0.753</b>	
Eco-helping	3.192	1.028	0.372**	0.373**	0.358**	0.278**	0.419**	0.690**	<b>0.831</b>

Note: N = 215. \*\*P < 0.01. Square roots of the AVE on the diagonal are given in bold. The means and standard deviations are based on the averages of the items comprising the scales and were calculated from the raw data (not corrected for nonindependence).

**Table 5**  
Direct effect results.

Path relationship	Standardized coefficients	Unstandardized coefficients	SE	CR	P-value
(1) MM → PO	0.343	0.270	0.098	2.770	0.006
(2) IC → PO	0.358	0.278	0.096	2.899	0.004
(3) VM → ECE	0.384	0.400	0.100	3.998	***
(4) VM → EH	0.214	0.268	0.112	2.397	0.017
(5) PO → ECE	0.217	0.272	0.122	2.233	0.026
(6) PO → EH	0.304	0.459	0.143	3.212	0.001

Note: \*\*\* $P < 0.001$ . MM moral modeling, VM vision motivation, IC individualized consideration, LC leadership charm, PO psychological ownership, ECE eco-civic engagement, EH eco-helping.

Deleting these paths led to model 3, and the fit indices of M3 reached the standard (CMIN/DF = 1.058; RMR = 0.044; GFI = 0.927; NFI = 0.947; CFI = 0.997; RMSEA = 0.016). M3 was determined to be the best-fitting model. Table 5 shows the path coefficients of the final model.

The direct effect results are provided in Table 5. The results indicate that vision motivation was significantly positively related to eco-civic engagement ( $p < 0.000$ ) and eco-helping ( $p = 0.017$ ), and the standardized path values were 0.384 and 0.214, respectively. Therefore, H3a and H3b are well supported. However, in the process of model adjustment, we found that moral modeling, individualized consideration and leadership charm had no significant direct impact on eco-civic engagement or eco-helping ( $p > 0.05$ ); thus, H1a, H1b, H2a, H2b, H4a and H4b are rejected.

Indirect effect results are presented in Table 6. We proposed that psychological ownership would mediate the relationship between transformational leadership and OCBE. To estimate the hypothesized indirect relationship, we performed a bootstrap procedure using 2000 samples to develop bias-corrected confidence intervals for the indirect effect (Preacher and Hayes, 2008; Wen and Ye, 2014). The results demonstrate that both the indirect pathway from moral modeling through psychological ownership to eco-civic engagement and the indirect path of moral modeling via psychological ownership to eco-helping were significantly different from zero (95% bias-corrected bootstrap, CI = [0.011, 0.219]; 95% bias-corrected bootstrap, CI = [0.020, 0.304], respectively). Moreover, moral modeling had no direct effect on eco-civic engagement and eco-helping, which indicate that psychological ownership acts as a full rather than as a partial mediator of the relationship between moral modeling and OCBE. Similarly, psychological ownership acts as a full mediator between individualized consideration and eco-civic engagement (95% bias-corrected bootstrap, CI = [0.002, 0.218] and eco-helping (95% bias-corrected bootstrap, CI = [0.026, 0.293]). Additionally, as mentioned above, the influence path from vision motivation and leadership charm to psychological ownership is not significant. Thus, H5 is partly supported. Fig. 2 shows the final structural equation model and standardized estimate value.

## 5. Discussion

A corporate low-carbon transition requires not only the rigid supervision and restraints of regulations but also the support of

OCBE implemented by employees. Combined with psychological ownership, this study established a mechanism model of transformational leadership on OCBE from the perspective of the leader-member exchange relationship. Our main findings are as follows:

- (1) A transformational leadership style can effectively enhance employees' OCBE. In addition, it can also stimulate OCBE through psychological ownership indirectly. This shows managers can promote OCBE through a change in leadership style, which provides a new approach for the green and low-carbon development of enterprises.
- (2) Four dimensions of transformational leadership have different influencing paths and strengths on OCBE. Specifically, leaders' vision motivation has a direct positive effect on OCBE, and its effect is the strongest in all dimensions. Leaders' moral modeling and individualized consideration indirectly affect OCBE through psychological ownership, and the effect of individualized consideration is greater than the effect of moral modeling. Surprisingly, leadership charm has no significant effect on OCBE.
- (3) Vision motivation of transformational leadership is a direct motivation that encourages employees to implement the two types of OCBE. Among them, the impact on eco-civic engagement is greater than the impact on eco-helping. This shows that leaders' vision motivation is an effective way to promote employees to actively participate in the organization's environmental activities and to help colleagues to implement environmental behaviors. Transformational leaders help subordinates to foresee the development blueprint of the organization and individual goals through vision motivation, and they closely integrate personal vision with organizational vision, thus leading to a shared vision. Inspired by this shared vision, employees implement OCBE voluntarily to promote enterprises' green and low-carbon development (Alt and Spitzbeck, 2016). Meanwhile, by planning and delivering the organization's future vision, leaders build a long-term oriented corporate culture. In this cultural context, people make full preparations for the future. An organizational long-term orientation leads to a higher level of systematic environmental management of the enterprise (Durach and Wiengarten, 2017) and causes subordinates to pay more attention to the farsighted development of the

**Table 6**  
Indirect effect results.

Path relationship	Standardized indirect effect	95% bias-corrected CI <sup>a</sup>	P-value
(1)MM → PO → ECE	0.074	[0.011,0.219] <sup>b</sup>	0.025
(2)MM → PO → EH	0.104	[0.020,0.304] <sup>b</sup>	0.016
(3)IC → PO → ECE	0.078	[0.002,0.218] <sup>b</sup>	0.044
(4)IC → PO → EH	0.109	[0.026,0.293] <sup>b</sup>	0.009

Note: Bootstrap standard errors are in parentheses.

a. Bias-corrected bootstrap CI based on 2000 bootstrapping samples.

b. Indirect effect is also significant based on 95% bias-corrected CI.

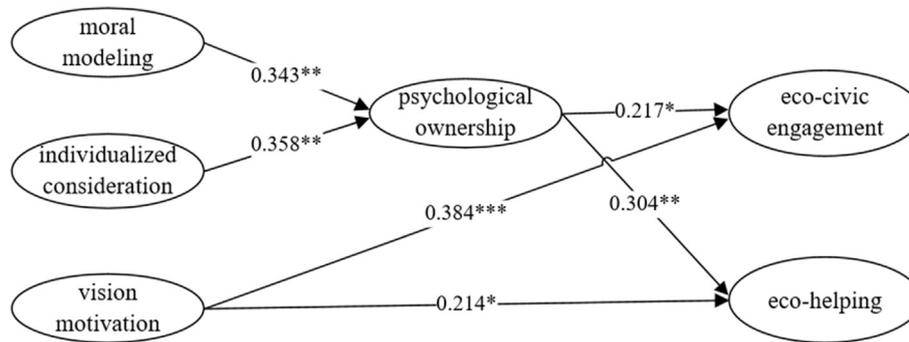


Fig. 2. Final structural equation model and standardized estimate value. Note: \* $P < 0.1$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .

organization to actively implement OCBE that benefits the organization's potential performance and long-term reputation.

- (4) Moral modeling and individualized consideration of transformational leadership indirectly promote employees' eco-civic engagement and eco-helping by inspiring employees' psychological ownership. Leaders promote high-quality leader-member exchange relationships through positive behaviors such as caring for subordinates and leading by modeling. In exchange, subordinates will increase their psychological ownership of the organization. Our research finds that this sense of psychological ownership is not only transformed into active behavior that benefits enterprise performance (Avey et al., 2009; Bernhard and O'Driscoll, 2011; Kim and Beehr, 2017) but also a direct driving force for OCBE. This finding further verifies the applicability of social exchange theory to environmental behaviors in the workplace (Paillé et al., 2013, 2016). Therefore, to motivate employees' OCBE, leaders should attach importance to facilitating and reinforcing employees' psychological ownership and strengthen the expression of individualized consideration and morality.
- (5) Surprisingly, leadership charm has no effect on eco-civic engagement and eco-helping. Although the existing research on transformational leadership has proven that leadership charm can effectively improve employees' job performance (Frieder et al., 2018) and team performance (Li, 2014), our results show that it cannot promote employees' OCBE. This finding is consistent with the views of Li et al. (2006) and Podsakoff et al. (1990) on the relationship between leadership charm and organizational citizenship behavior. Why does the leadership charm of transformational leaders improve individual and corporate performance, while the effect disappears in motivating initiative behavior beyond employees' duties? Perhaps leadership charm enhances employees' recognition and followership of their leaders so that employees are willing to engage more in the performance-oriented behaviors that are expected by leaders and valued by the organization's reward system. However, for the active behaviors are not recognized by the formal system, employees lack behavioral motives, as these civic behaviors are often not the focus of the leader's attention. On the other hand, the environmental benefits generated by the employees' environmental behaviors in the organization are external and widely shared, which will lead to a decrease in the individual perception of behavioral effects and may thus reduce employee motivation to actively implement environmental behaviors (Chen and Peng, 2014). Therefore, to motivate employees' OCBE through leadership

charm, transformational leaders should fully express their personal appeals for green and low-carbon development. In addition, transformational leaders should form a green value-oriented leader-member exchange relationship in combination with vision motivation, individualized consideration and moral modeling.

## 6. Conclusion and managerial implications

This study established a mechanism model of transformational leadership on OCBE from the perspective of the leader-member exchange relationship. With 215 superior-subordinate paired data, a structural equation model was applied to analyze the different mechanisms of transformational leadership's four dimensions on employees' eco-civic engagement and eco-helping. In theory, this study expands transformational leadership theory research and explores its relationship with OCBE. The results show that: a) transformational leaders' vision motivation directly inspires employees to implement the two types of OCBE; b) both leaders' individualized consideration and moral modeling of leaders can promote OCBE indirectly through psychological ownership; c) leadership charm does not have any effect on OCBE. This study's findings provide a novel insight and direction for understanding employees' psychological motivation to implement OCBE. They also provide a new approach for managers to promote corporate low-carbon transition by changing the leadership style.

In practice, the research results provide some new suggestions on how to encourage employees to actively implement OCBE.

First, leaders should attach importance to the planning and dissemination of the organizational vision, and thus motivate employees to perform more eco-civic engagement. Specifically, leaders should make employees aware of the organization's development trends and future plans in a timely manner. Leaders can also help employees to realize the significance and value of what they do for the organizational and personal future growth. In this way, employees are inspired to have confidence in the organization's future and their own prospects; therefore, they are more willing to engage in OCBE that is beneficial to the organization's potential performance and long-term reputation.

Second, organizations should strengthen management team construction and provide certain human resource management plans for cultivating and developing leaders' morality and care for employees. On the one hand, organizations can promote moral education and publicity, provide leaders with corresponding training, and regard morality as a factor that cannot be ignored in the selection and promotion of organizational managers. On the other hand, organizations can establish employee welfare files, record employees' different needs, and guide leaders to show

individualized care and consideration for their subordinates, which would narrow the psychological distance between leaders and employees and thus inspire employees' psychological ownership and their further promotion of OCBE.

## 7. Limitations and directions for future research

This study supplements the limited literature on the mechanisms that underlie employees' OCBE from the perspective of the leadership-member interaction. However, there are still some limitations that must be strengthened by subsequent research. First, this research was conducted within a limited geographic boundary i.e. China. Chinese corporate organizations have "high power distance" cultural characteristics, and the influence of leaders on subordinates' behaviors will vary with the national cultures. Therefore, future research can compare whether there is a significant difference in the impact of transformational leadership on employee OCBE in diverse cultures and further improve the universality of the research results. Second, all enterprises in the sample were nonenvironmental enterprises. Whether the corporate performance goals and environmental goals are compatible in

the short- and long-term will also affect the strength of leaders' and subordinates' motivation to implement OCBE. Therefore, whether the findings are equally applicable to nonenvironmental enterprises can be further explored in the future. Finally, the influencing path of transformational leadership on OCBE is complex. Apart from the intermediary role of psychological ownership, organizational commitment, psychological empowerment, organizational atmosphere, and the personal characteristics of leaders and employees, are worth further exploration in future research.

## Acknowledgments

This work was supported by the Key Project of National Social Sciences Foundation of China [No. 18AZD014]; the Fundamental Research Funds for the Central Universities of China [No. 2019XKQYMS58]; and Ministry of Education Humanities and Social Science Later Foundation of China [No. 18JHQ087].

## Appendix A. Formal Questionnaire

Items	1	2	3	4	5
<b>Organizational citizenship behavior towards the environment</b>					
He/she actively participates in environmental events organized by the company (or department)	Never	Rarely	Sometimes	Often	Always
He/she volunteers for projects, endeavors or events that address environmental issues in the organization	Never	Rarely	Sometimes	Often	Always
He/she voluntarily participates in environmental events outside the organization to contribute to the image of the organization (or department).	Never	Rarely	Sometimes	Often	Always
He/she spontaneously gives his/her time to remind colleagues to pay attention to environmental protection at work.	Never	Rarely	Sometimes	Often	Always
He/she makes suggestions to his/her colleagues about ways to protect the environment more effectively, even when it is not his/her direct responsibility.	Never	Rarely	Sometimes	Often	Always
He/she will persuade the company or colleagues to buy environmental products	Never	Rarely	Sometimes	Often	Always
<b>Transformational leadership</b>					
My superior can prioritize the interests of the organization and others.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader is willing to share the joys and sorrows with the employees and do his best at work.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader can separate business from private affairs.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader will let employees know the business philosophy and development prospects of the company (or department).	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader will show employees the goals and direction.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader often explains to employees the value and significance of the work they do.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader communicates a clear and desirable vision of the future.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader is willing to help employees solve their problems in life and with family.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader often communicates with employees and gives them encouragement and recognition.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader cares about his employees and supports and encourages their development.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader will create conditions for employees to develop their strengths.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader has strong business skills.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader is dedicated to his work and has a strong sense of professionalism and initiative.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
My leader is open-minded and has a strong sense of innovation	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
<b>Psychological ownership</b>					
For me, the organization is home.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
I am totally comfortable being in this organization.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
I feel that I belong in this organization.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree
I feel that this organization's success is my success.	Strongly Disagree	Disagree	Neutral	agree	Strongly agree

(continued on next page)

(continued)

Items	1	2	3	4	5
I feel that being a member in this organization helps me realize my value.	Strongly Disagree				Strongly Disagree
	Strongly Disagree	Disagree	Neutral	agree	Strongly Disagree
Demographic characteristics					
1. Gender	A. male; B. female				
2. Marital status	A. married; B. unmarried				
3. Age	A. <20 years; B.20–30 years; C.31–40 years; D.41–50 years; E. >50 years				
4. Education	A. Below junior high school; B. Senior high school or secondary school degree; C. Associate's degree or Bachelor's degree; D. Graduate degree				
5. Organizational tenure	A. <1 year; B. 1–3 years; C. 3–5 years; D. 5–10 years; E. 10–15 years; F. 15–20 years; G. >20years				
6. Position	A. Grassroots employee; B. Junior manager; C. Middle manager; D. Top manager				

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