



# The Differentiation of Strategies, Overseas Experiences of CEOs, and Green Innovation: Evidence from China

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**Abstract.** Nowadays, when green development is highly emphasized, the differentiation of corporate strategies affects corporate innovation, and it is worth paying attention to how to increase green innovation and guarantee sustainable development. Using the data of China's A-share listed companies from 2012-2021, the empirical research analyzed the association between the differentiation of strategies and green innovation, and the moderating effect of CEOs overseas experiences. The results show that the differentiation of strategies has a positive effect on improving green innovation, while CEOs overseas experiences play a positive moderating role. This paper enriches the literature on the factors influencing green innovation from a strategic perspective, combining the background characteristics of CEOs to protect the environment and develop the economy.

**Keywords:** the differentiation of corporate strategies; overseas experiences of CEO; corporate green innovation; Sustainable Development

## 1 Introduction

Promoting green development is the general tone of China's development. Enterprises as an important role of environmental pollution need to fulfill the corresponding social responsibility. Because green innovation has a positive impact on both economic and environmental benefits, it is important to examine how to promote corporate research on green innovation.

Differentiation strategies increase productivity through innovation can ultimately help firms to increase value <sup>[1]</sup>. Innovative behavior may be promoted when firms' strategies are highly differentiated <sup>[2,3]</sup>. Green innovation has a positive effect on corporate sustainability, brand image and access to resources <sup>[4]</sup>. Enterprises will continue to invest in green innovation when they receive positive feedback.

Around 2000, based on Schumpeter's innovation perspective, western countries conducted more systematic research on the environmental problems. According to CNKI, China's green innovation research did not improve significantly until after 2015. Based on the top echelon theory, the behavioral characteristics of executives will have an impact on corporate decision-making. Previous studies have explored the demographic related statistical indicators such as gender and their heterogeneity. The

CEO plays a more important role in major decisions <sup>[5]</sup>. Based on the imprinting theory, if the CEO has overseas experience can help the company to better carry out green innovation.

In view of this, green innovation may be an important tool used by firms with large strategic differentiation to balance economic efficiency and sustainable development, and the overseas experience of CEOs may play a moderating role. Using data from China's A-share listed companies from 2012-2021, the research combine strategic management theory, risk-return theory, and top echelon theory to empirically test the association between strategic differentiation and green innovation, and the moderating role of CEOs' overseas experience from the perspective of strategic differentiation. Enriching the literature on differentiation strategies and green innovation in Chinese firms.

## 2 Theory and hypotheses

### 2.1 Corporate strategic differentiation and green innovation

According to strategic management theory, influenced by the general environment of the industry, companies imitate each other in order to avoid certain risks, and eventually form a similar strategic model <sup>[6]</sup>. The degree of strategic differentiation is the extent to which a firm deviates from this prevailing strategic model <sup>[7]</sup>. According to the risk-return theory, the higher the degree of strategic differentiation of a firm, the more strategic initiatives to pursue high risk and high return.

A more unified view on the relationship between firms' strategic differentiation and innovation has not yet emerged. While strategic differentiation can have some negative impacts, at the same time can have a positive positive impact on firm performance through innovation, whereas firms with traditional strategies may fall into homogeneous competition. High differentiation implies higher input costs and risks, and once successful it is difficult to be imitated, helping firms to achieve excess returns <sup>[8]</sup>. Past research also suggests that firms will mitigate the regulatory rigors of strategic differentiation through environmental investments. <sup>[9]</sup>. Established studies have considered the economic consequences mainly in terms of audit costs, corporate violations, etc. <sup>[10,11]</sup>. Few scholars have explored green innovation at the level of strategic differences.

Specifically, the impact of enterprise differentiation on green innovation behavior is mainly reflected in the following aspects. First, enterprises hope to obtain high returns through the differentiation strategy of green innovation. Second, strict regulation prompts enterprises to prefer the green development direction advocated by the government at this stage. Finally, the green innovation behavior of enterprises can help them win the goodwill of target customers and consumers and fulfill their social responsibility.

Hypothesis 1: The degree of corporate strategic differentiation has a positive effect on improving the level of green innovation in companies.

## 2.2 The moderating effect of the CEO's overseas experience

As the main decision makers of strategy, the composition of the executive team, represented by the CEO, is extremely closely related to the degree of strategic differentiation<sup>[12]</sup>. Traditional business managers may prefer short-term, quick-impact innovation activities to strategies such as green innovation, which has a long payback period, uncertain results, and may negatively impact tenure appraisals<sup>[5]</sup>.

Empirical studies have shown that managers' background characteristics have an impact on firm performance, choice of firm strategy, and investment in R&D<sup>[5]</sup>. For CEOs with overseas experience, the social background and cultural perceptions of overseas societies different from their home countries implicitly influence their mindset and values, which, according to the high-level theory, carries over into the firm's strategic decisions, thus creating further differentiating effects. Analyzing from the perspective of cognitive imprint, overseas countries have earlier economic development and better concepts and systems. CEOs with overseas experience are more daring in choosing breakthrough and differentiation strategies and focusing on green in the innovation process<sup>[13]</sup>. From the perspective of capability imprinting, overseas background not only brings a change in mindset, but also international networks and resources, which reduces the risks CEOs face in the green innovation process<sup>[14]</sup>.

The overseas experience of CEOs will influence their values and behavioral norms, making them more inclined to choose differentiated strategies and make more positive innovation choices. CEOs with overseas experience have a strong awareness of environmental protection and the ability to enhance green innovation. CEOs can achieve a balance between economic benefits and environmental protection by means of more differentiated strategies to effectively enhance corporate green innovation.

Hypothesis 2: CEO overseas experience has a positive moderating effect in the relationship between the influence of corporate strategic differentiation on corporate green innovation.

## 3 Study

### 3.1 Sample and data collection

This study takes major Chinese A-share listed companies in Shanghai and Shenzhen during the ten years from 2012 to 2021 as the research object, and is screened according to the following principles: (1) exclude the samples of ST-type companies; (2) exclude the data of finance and insurance based on the 2012 edition of the Industry Classification of the Securities and Exchange Commission (SEC); and (3) exclude the samples with missing data values, and finally obtain 19,225 panels of data. In order to eliminate the effect of extreme outliers, the continuous variables in the study were subjected to a tail reduction of 1% up and down, and stata16.0 was used as the data analysis software.

### 3.2 Measures

Dependent variable: firms' green innovation (GP). Calculated by adding 1 to the logarithm of the number of corporate green patent applications (from the CNRDS database of green patent applications and acquisitions by listed companies).

Independent variable: the degree of strategic differentiation (DS). Based on the research methods of Tang <sup>[7]</sup>, the size of a firm's degree of strategic differentiation consists of six dimensions: investment in advertising and promotion, investment in R&D, capital intensity, degree of renewal of fixed assets, investment in management expenses, and corporate financial leverage. The final statistical degree of difference indicator for each panel data is the average of the six standardized secondary indicators.

Moderating variable: overseas experience of CEOs. Define OVERSEA as a 0-1 dummy variable, and take 1 when the CEO of the company has overseas study or employment experience in that year, and take 0 if there is no relevant experience.

Control variables: considering the existence of other factors that may affect the results of corporate green innovation, including corporate financial characteristics variables: corporate size, gearing ratio, equity concentration, Tobin's Q, and return on assets; and corporate governance variables: corporate age, proportion of independent directors, board size, average age of executives, and nature of property rights. Dummy variables annual factor, industry factor, and province factor are also included.

In order to investigate the relationship between the degree of corporate strategic differentiation and the level of corporate green innovation, the following model was designed for the study:

$$GP = \beta_0 + \beta_1 DS + \beta_2 Controls + \varepsilon \quad (1)$$

In order to verify the relationship between the degree of corporate strategy differentiation and corporate green innovation, we focus on the regression coefficient  $\beta_1$  in front of DS. When the coefficient is significantly positive, the greater the degree of corporate strategy differentiation, the higher the level of corporate green innovation, and the degree of corporate strategy differentiation has a positive effect on the improvement of the level of corporate green innovation, and the hypothesis H1 is verified; on the contrary, H1 is not valid.

To test Hypothesis H2, the following regression model was designed, adding CEO's overseas experience as a moderator variable to Model 1:

$$GP = \beta_0 + \beta_1 DS + \beta_2 DS * OVERSEA + \beta_3 OVERSEA + \beta_4 Controls + \varepsilon \quad (2)$$

Before conducting the empirical test, the model was first subjected to the Hausman test to provide a basis for whether to use a fixed effects or random effects model. The test results show that  $\chi^2(1) = 181.12$  and  $Prob > \chi^2 = 0.0000$ . The test results indicate that the study model can obtain more robust results using the fixed effects test, which can alleviate the problem of model heterogeneity to some extent.

### 3.3 Analysis and results

The mean value of green innovation is 0.353, the minimum value is 0, the maximum value is 3.664, and the standard deviation is 0.775, indicating that the level of green innovation of the sample enterprises is still in the initial stage in general, and there is a large gap between enterprises. The standard deviation of enterprise strategy difference is 0.315, indicating that there are some differences in the level of strategy difference within the sample enterprises. The mean value of the moderator variable CEO overseas experience is 0.078, indicating that the proportion of CEOs with overseas experience is relatively small. All other control variables are at a reasonable level.

This study adopts the method of cascade multiple regression analysis, adding the corresponding control variables, explanatory variables and moderating variables into the model step by step and observing the results.

**Table 1.** Regression analysis results

VARIABLES	(1) GP	(2) GP	(3) GP
DS	0.055*** (3.16)	0.053*** (3.05)	0.053*** (3.05)
OVERSEA			0.015 (0.75)
DS*OVERSEA			0.159*** (2.63)
Control variables			
YEAR	Control	Control	Control
INDUSTRY	Control	Control	Control
PROVINCE	Control	Control	Control
Constant	0.318*** (26.76)	-3.136*** (-20.86)	-3.126*** (-20.79)
Observations	19,225	19,225	19,225
R-squared	0.109	0.165	0.165
F test	0.001533	0	0
r2_a	0.107	0.162	0.162
F	10.31	116.7	99.32

t-statistics in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

According to model (1) regression analysis of the degree of strategic differences and green innovation. As shown in column (1) of the Table 1 above, it is significant at the 1% level with a coefficient of 0.055 (t=3.16), which initially verifies Hypothesis 1. The regression is repeated with the addition of control variables, and as shown in column (2) of the Table 1 above, it is also significant at the 1% level with a coefficient of 0.052 (t=3.05). Accordingly, Hypothesis 1 is relevantly verified.

Model (2) adds the variable of CEO overseas experience to model (1) and analyzes the coefficients of the cross terms and their significance levels, and the results are

shown in column (3) of the Table 1 above. The results show that the regression coefficient of CEO overseas experience is 0.015 ( $t=0.75$ ) and the cross-multiplication regression coefficient is 0.159 ( $t=2.63$ ), which is significant at 1% level. This indicates that CEO overseas experience has a positive moderating effect on the relationship between corporate strategy differentiation and green innovation. Hypothesis H2 is verified.

After limiting the scope of the study to the Yangtze River Delta region, the results are basically consistent, indicating that the findings of this paper are relatively robust. In order to further address the endogeneity of the sample, this paper lags the dependent variable corporate strategy differences by one and two periods, respectively, and the final results show that the results are consistent with the previous findings. Tang(2011) used six indicators to measure the degree of strategy differences, but the database has a relatively large amount of missing indicators for the two indicators of advertising expenses and R&D investments . Therefore, these two indicators were removed from the study and the experiment was conducted again with consistent results.

## 4 Conclusion

The results indicate that, first, the degree of corporate strategy differentiation has a positive impact on improving green innovation. Second, the relationship between corporate strategic differentiation and corporate green innovation was positively moderated when the CEO of the firm had overseas study or work experience.

Based on the above research, this paper draws the following insights: First, firms are aware that policies and industry guidelines emphasize the role of green innovation in achieving sustainable development. Firms should utilize green innovation models to balance operational risks and corporate returns to achieve sustainable development. Second, when companies try to improve their strategic differentiation and innovation capabilities, the board of directors may prioritize the hiring of CEOs with overseas experience. Where conditions permit, expatriate training can be conducted. Third, the government should increase incentives for green innovation through policy support, financial support, and talent support, especially for enterprises with a high degree of strategic differentiation, so as to promote environmental protection and economic development. Fourth, not only should the cultivation and introduction of high-level returnee talents be strengthened through settlement subsidies and entrepreneurial mechanisms, but a localized green innovation atmosphere should also be created.

Based on the limitations of the research topic, this paper has the following limitations: first, the influence mechanism between strategic differentiation and green innovation is not clear. Second, a single measure may bias the interpretation of variables. Third, this paper is unable to distinguish which overseas experience contributes more to firms' strategic differentiation and green innovation. The above factors constitute future research directions.

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