

How Does Green Entrepreneurship Orientation Impact on Green Innovation: Evidence from China

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Abstract—Green innovation is an important way to achieve low-carbon development and green economic growth. Based on the green entrepreneurship theory, green entrepreneurship patchwork is introduced as the intermediary variable to build the intermediary effect model, and empirical analysis is conducted based on 367 questionnaires to explore the impact mechanism of green entrepreneurship orientation on green innovation. The results show that green entrepreneurship orientation has a positive impact on green innovation; Green entrepreneurship orientation can drive green innovation of enterprises by enhancing the ability to cobble together green resources.

Keywords-green entrepreneurship orientation; green innovation; green resource patchwork

1. Introduction

With the global energy, environment, climate change and other issues becoming increasingly prominent, the pursuit of green economic growth is becoming a strategic opportunity for enterprises to meet the needs of the environmental market. Green innovation refers to improving environmental performance by developing and utilizing new products, processes and services, including product innovation, process innovation and project innovation [1]. According to the green entrepreneurship theory, the green entrepreneurship orientation of actively capturing green opportunities and taking risks is a valuable intangible resource and ability of enterprises [2], which plays an important role in green innovation of enterprises. Although the goal of green entrepreneurship orientation is to improve technology and reduce costs, it can intentionally or unintentionally promote green innovation in products, services and processes [3]. This undoubtedly provides a new perspective for the realization path of green innovation. Green resource patching is a sustainable strategic behavior adopted by enterprises, which enables enterprises to break through the fixed cognition of existing resources, creatively combine green resources and achieve green innovation [4].

In view of this, based on the perspective of resource pooling, this study attempts to explore the impact mechanism of green entrepreneurship orientation on green innovation, to clarify the internal operation mechanism between green entrepreneurship orientation and green innovation, and hopes to further enrich the green entrepreneurship theory and provide practical guidance for new enterprises to implement green innovation.

2. Theoretical Analysis and Research Hypothesis

2.1 Green Entrepreneurship Orientation and Green Innovation

Green entrepreneurship orientation is a strategic tendency, which enables enterprises to actively identify and grasp green opportunities while comprehensively considering risks [5]. Green entrepreneurship orientation encourages enterprises to seek natural protection and life security, and obtain certain benefits, including economic benefits, non economic benefits and contributions to the economy and society by meeting consumers' needs for products and services [6]. Driven by the green entrepreneurship orientation, enterprises have concentrated various resources, reduced the impact on the environment, and enabled them to discover and utilize green innovation opportunities by deploying and arranging more controllable resources [7]. At the same time, green entrepreneurship orientation, as a strategic posture, can help enterprises form an organizational force within themselves to produce as many green innovative products as possible. Compared with enterprises that only focus on economic interests, green entrepreneurial enterprises are easier to achieve green innovation [8]. Although the goal of green entrepreneurship orientation is to improve technology and reduce costs, it can intentionally or unintentionally promote green innovation in products, services and processes [9]. Based on this, this study proposes the following assumptions:

H1: Green entrepreneurship orientation has a positive impact on green innovation.

2.2 Green Resource Patchwork

Green resource integration refers to the sustainable methods and strategic behaviors of enterprises to integrate and reorganize existing green resources in the context of resource scarcity [4]. Green entrepreneurship orientation emphasizes thinking innovation and advanced decision-making based on green resources. Therefore, in the face of resource constraints, green entrepreneurship oriented enterprises can quickly integrate the green resources at hand, and then seize [3]. Green entrepreneurship orientation can help enterprises quickly integrate existing green resources, so as to get rid of the dilemma of green resource constraints. Based on the above analysis, this study proposes the following assumptions:

H2: Green entrepreneurship orientation has a positive impact on green resource patchwork.

In the changing business environment, enterprises always face resource constraints. In order to achieve innovation, it is necessary to creatively integrate existing resources [10]. From this perspective, the integration of green resources has laid an important foundation for green innovation. By innovative use of green resources, enterprises often achieve unexpected innovation [11]. In the process of restructuring green resources, enterprises can often create unique green products and services by questioning, subverting and deconstructing, and achieve green innovation in terms of opportunity identification, business model, etc. [12]. This is because the patchwork of green resources is essentially the act of promoting innovation under the condition of limited resources [13], which provides favorable conditions for enterprises to further carry out green innovation. The patchwork of green resources can be seen as a process innovation strategy. Based on the above analysis, this study proposes the following assumptions:

H3: The patchwork of green resources has a positive impact on green innovation.

Driven by the green entrepreneurship orientation, enterprises have concentrated various resources, reduced the impact on the environment, and enabled them to discover and utilize green innovation opportunities by deploying and arranging more controllable resources [7]. Although the goal of green entrepreneurship orientation is to improve technology and reduce costs, it can intentionally or unintentionally promote green innovation in products, services and processes [14]. In this process, the role of green resource patching can not be ignored. On the one hand, in the face of resource constraints, enterprises with green entrepreneurship orientation can quickly integrate green resources at hand, and then preempt [3]; On the other hand, in the process of recombining green resources, enterprises can often create unique green products and services through questioning, subverting and deconstructing, and achieve green innovation in opportunity identification, business models, etc. [12]. In view of this, this study proposes the following assumptions:

H4: Green entrepreneurship orientation can drive green innovation of enterprises by enhancing the ability to cobble together green resources.

Based on the green entrepreneurship theory, this study introduces green resources to build a theoretical model, as shown in Figure 1.

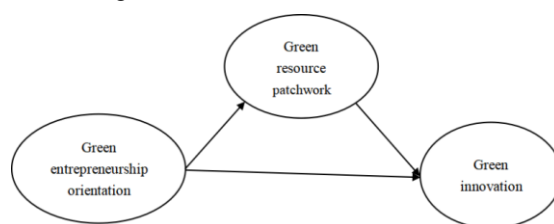


Figure 1. Theoretical Model

3. Research Methodology

3.1 Sample Selection

According to the research of Zhang et al.. Green innovation involves a wide range of industries, so in the process of this research, we comprehensively considered agriculture, construction, manufacturing and other industries, and conducted formal research on the basis of pre research results. A total of 800 questionnaires were distributed during the survey, 379 of which were eventually returned (12 were invalid), and 367 were valid (the return rate of valid questionnaires was 45.9%).

Table 1 Composition and distribution of samples (n = 367)

| Category | Classification Index | Frequency | Frequency (%) |
|----------|----------------------|-----------|---------------|
| Age | Less than 1 year | 90 | 24.52 |
| | 1-3 years | 104 | 28.34 |
| | 4-5 years | 88 | 23.98 |
| | 6-8 years | 85 | 23.16 |
| Scale | Less than 9 people | 73 | 19.89 |
| | 10-49 people | 72 | 19.62 |

| | | | |
|----------|-------------------------------|-----|-------|
| | 50-99 people | 72 | 19.62 |
| | 100-199 people | 76 | 20.71 |
| | More than 200 people | 74 | 20.16 |
| Industry | Agriculture | 64 | 17.44 |
| | Construction | 62 | 16.89 |
| | Manufacturing | 48 | 13.08 |
| | Service | 64 | 17.44 |
| | High-tech | 64 | 17.44 |
| | Others | 65 | 17.71 |
| Region | Eastern coastal area of China | 84 | 22.89 |
| | Central of China | 99 | 26.98 |
| | Western of China | 76 | 20.71 |
| | Northeast China | 108 | 29.43 |

3.2 Variable Measurement

As for the selection of variable scale, the measurement of green entrepreneurship orientation refers to the research of Covin and Slevin; Green innovation refers to the research of Shu et al. and measures from two aspects: green product innovation and green process innovation. In addition, this study included business time, industry, scale and region as control variables to improve the reliability of research results. All variables were measured with the Likert 5-point scale, that is, from strongly disagreed (1 point) to strongly agreed (5 points).

3.3 Reliability and Validity Test

The data collected through SPSS22.0 processing in this study shows that the Cronbach coefficients of the green entrepreneurship orientation, green resource pooling and green innovation scales are all higher than 0.7 (the minimum value is 0.858), and all KMO values exceed 0.8 (the minimum value is 0.832). At the same time, the minimum factor load of all constructs is above 0.7, so the scale in this study has high reliability.

This study uses AMOS21.0 to analyze the goodness of fit of the model built in this study. The results showed that all indexes met the standards ($\chi^2/df=1.357$, $IFI=0.925$, $TLI=0.933$, $GFI=0.910$, $RMSEA=0.035$). Therefore, the goodness of fit of the model in this study is good. On this basis, this study conducted a correlation analysis of the relationship between variables. The results show that there is a correlation between green entrepreneurship orientation, green resource pooling and green innovation, and whether there is a causal relationship needs to be further verified. At the same time, the AVE square root of variables such as green entrepreneurship orientation, green resource pooling and green innovation is higher than 0.5, and higher than the correlation coefficient between variables. Therefore, the discriminant validity of the scale is good.

3.4 Common Method Deviation Test

In the process of investigation, this study fully carried out prior control, upset the order of items and required anonymous filling in the questionnaire to improve the effectiveness of the measurement process. However, due to the fact that all the respondents in this survey were surveyed by questionnaires, and the sample sources were all founders or members of senior management team, the measurement tools and sample sources were relatively single, and there

might be multiple collinearity and common method deviation problems. In view of this, the Harman single factor test method in this study was used to verify. The results showed that all items were aggregated into 4 factors greater than 1, and the cumulative variance contribution rate was 72.103%. Among them, the first factor explained 33.719% of the variation of all items, and the VIF value was not higher than 10. Therefore, the above problems did not exist in the process of this study.

4. Results

4.1 Direct Effects

This study uses the hierarchical regression method to verify the relationship between green entrepreneurship orientation and green innovation.

Table 2 Test of the relationship between green entrepreneurial orientation and green innovation

| | Model1 | Model2 | Model3 |
|---|-----------|-----------|-----------|
| GEO → GI | 0.542** | | |
| GEO → GRB | | 0.539** | |
| GRB → GI | | | 0.522** |
| Age (refer to "Less than one year") | -0.049 | -0.016 | -0.044 |
| 1-3 years | | | |
| 4-5 years | 0.018 | 0.008 | 0.008 |
| 6-8 years | -0.035 | -0.014 | -0.025 |
| Scale (refer to "Less than 9 people") | 0.013 | 0.011 | 0.001 |
| 10-49 | | | |
| 50-99 | -0.006 | -0.008 | 0.000 |
| 100-199 | 0.019 | 0.018 | 0.004 |
| More than 200 | 0.035 | -0.007 | 0.038 |
| Industry (refer to "Agriculture") | -0.023 | -0.050 | 0.024 |
| Manufacturing | | | |
| Construction | -0.047 | -0.043 | -0.007 |
| Service | -0.021 | -0.011 | -0.011 |
| High-tech | -0.011 | -0.025 | 0.014 |
| Others | -0.026 | -0.034 | 0.006 |
| Region (refer to "Eastern coastal area ") | 0.010 | -0.017 | 0.032 |
| Central of China | | | |
| Western of China | 0.017 | 0.002 | 0.019 |
| Northeast of | 0.026 | 0.017 | 0.019 |
| China | | | |
| R ² | 0.305 | 0.292 | 0.262 |
| Adj-R ² | 0.301 | 0.287 | 0.252 |
| F value | 208.101** | 180.273** | 137.092** |

Note: * p < 0.05; ** p < 0.01. GEO: Green entrepreneurship orientation; GRB: green resource bricolage; GI: Green innovation

4.2 Indirect Effects

In this study, green entrepreneurship orientation and green resource pooling are set as independent variables, and green innovation is set as dependent variables to verify the mediation effect of green resource pooling.

According to the regression results, compared with model 1, the regression coefficient of green entrepreneurship orientation to green innovation in model 4 decreases from 0.542 to 0.182. It can be seen that green resource patching plays a part of intermediary effect, and H4 is assumed to be true.

5. Research Conclusions and Future Prospects

5.1 Research Conclusion

Based on the green entrepreneurship theory, this study constructs and verifies the mechanism model of the impact of green entrepreneurship orientation on green innovation, and draws the following conclusions: First, green entrepreneurship orientation has a significant positive impact on green innovation. As a strategic posture, green entrepreneurship orientation can help enterprises form an organizational force and drive the production of as many innovative green products as possible; Second, the patchwork of green resources plays a partial intermediary role between green entrepreneurship orientation and green innovation. To a large extent, the implementation of green entrepreneurship orientation by enterprises has promoted the innovative assembly and combination of their own green resources, providing strong support for green innovation.

5.2 Theoretical Implications

First, based on the green entrepreneurship orientation, explore the driving mechanism of green innovation, and enrich the research on the driving path of green innovation of new enterprises. Previous scholars have conducted some research on the connotation of green entrepreneurship orientation, the relationship between green entrepreneurship orientation and enterprise performance and green competitive advantage. However, few scholars have deeply discussed the process of green entrepreneurship orientation empowering green innovation of enterprises. This research explores the driving path of green innovation from the perspective of green entrepreneurship orientation, clarifies the mechanism of green innovation, opens the "black box" between green entrepreneurship orientation and green innovation, discusses the process of green innovation driven by green entrepreneurship orientation, and enriches the research on the promotion path of green innovation of enterprises; Second, integrate green entrepreneurship theory and resource pooling theory, explore the role of green resource pooling in green entrepreneurship orientation and green innovation, deeply analyze the driving mechanism of green innovation of enterprises under the role of green resource pooling, expand the application scope of resource pooling theory in the field of green entrepreneurship, and deepen the research in the field of green entrepreneurship.

5.3 Practical Implications

This study explores the relationship among green entrepreneurship orientation, green resource patching and green innovation in the context of sustainable development, which has certain

practical significance. First, if new enterprises want to carry out green innovation, they need to adopt and implement green entrepreneurship orientation. New enterprises can take advantage of the green entrepreneurship orientation to develop potential opportunities in the market, and in this process, they can pool green resources, actively carry out green reform, and then convert green resources into green products and services, so that they can achieve green innovation in market competition and pursue both environmental and economic benefits; Second, the process of assembling green resources is crucial in the practice of green innovation by new enterprises. The patchwork of green resources urges enterprises to focus on existing green resources, make self-reliance, fully tap the intrinsic value of existing green resources, build courage and confidence for enterprises in difficult situations under the drive of green entrepreneurship orientation, so that enterprises can get rid of the shackles of green resources, and then promote green innovation.

5.4 Research Limitations and Future Prospects

This study also has some limitations: on the one hand, in order to explore the formation mechanism of green innovation from within the enterprise, the intermediary mechanism and boundary conditions discussed in this study both consider the internal resources and capabilities of the enterprise, and do not introduce external environmental factors into the model. Future research can comprehensively consider the impact of internal and external factors on the implementation of green entrepreneurship orientation, and explore the role of environmental uncertainty in this process; On the other hand, in order to enhance the universality of the results of this study, this study investigated new enterprises in multiple industries, and did not start from the characteristics of a single industry. Considering that the green activities of enterprises involve green products, green processes, green services and green innovation, this study mainly investigates the newly established enterprises in agriculture, manufacturing, construction, wholesale and retail, high-tech industries and other industries. Therefore, it is difficult to show the characteristics of green entrepreneurship orientation of newly established enterprises in a specific industry.

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