Executive Team Functional Background and Enterprise Green Technology Innovation

--The Mediating Role of Environmental Strategy

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Abstract. To achieve "double carbon" target, intelligent design, green technology innovation and other changes and breakthroughs are needed. Based on this, this paper takes 2011-2019 manufacturing listed companies as the research object, deeply discusses the impact of executive team functional background on enterprise green technology innovation. The results show that: (1) Executive team functional background has a significant impact on green technology innovation; (2) Environmental strategy plays a mediating role between functional backgrounds and green technology innovation; (3) Property rights and the marketization process play a regulatory role between executive team functional background and green technology innovation. The conclusion expands the research scope of green technology innovation theory and provides guidance for enterprises to develop green technology innovation.

Keywords: Executive team functional background; Enterprise green technology innovation; Environmental strategy

1 Introduction

Environmental governance is very important to the future development of manufacturing enterprises. How to coordinate the contradiction between their own economic development and environmental protection has become the focus of public attention. With the rapid development of a new generation of information technology, the Internet, big data, artificial intelligence and other technologies are deeply integrated with various industries, promoting the development of traditional manufacturing industries into advanced manufacturing clusters. Most enterprises are actively adapting to the development requirements of the times to establish intelligent network systems, and achieve green economic growth through the development of intelligent green technologies.

Green technology innovation can effectively reduce the "negative externality" of environmental pollution with its technology spillover "positive externality", and has incomparable advantages different from traditional innovation methods. Studies on driving factors of green technology innovation in the academic circle mostly focus on

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external environmental regulations, policies and regulations, green subsidies, market demand and other external perspectives. There are few literatures analyzing the driving factors of green technology innovation from the perspective of internal managers' characteristics. As the main carrier of green technology innovation, enterprises need not only the promotion of external impetus, but also the support of internal actors [1].

The existing literature mostly focused on the heterogeneity or central tendency of the age, gender, tenure and education level of the senior management team, there is no systematic study on the relationship between functional background and green technology innovation and its influencing mechanism. Studies show that executive team functional background has a more direct impact on their cognition and thinking mode than their early education experience [2]. In view of this, this article will explore: First, the functional background of the executive team will have an impact on green technology innovation, and whether the impact is different under different functional backgrounds of the executive team. Second, is the impact of executive team functional background on green technology innovation direct, or are there other variables that play a mediating role?

2 Hypothesis

2.1 Executive team functional background and enterprise green technology innovation

Executive team functions background reflects the team members' professional level and knowledge skills, determines its unique cognitive structure in the decision-making process and value orientation [3]. When enterprises make green transformation decisions, due to the different functional backgrounds of the senior management team, their understanding of green technology innovation activities is different and their attitudes to the development of green technology innovation are different, which will eventually have different impacts on the green technology innovation of enterprises.

Output-oriented executives need frequent contact with external markets due to their occupational nature, and their ability to perceive the external natural environment is stronger than other executives, and they can quickly and accurately detect changes in environmental policies and consumption trends [4]. At the same time, it broadens external social capital in external contact, which can provide rich human, material and financial resources for enterprises' green technology innovation [5]. production-oriented executives are interested in updating internal production equipment and improving process flow, thus supporting green technology innovation practices. Simultaneously, it is easier to promote the formulation and implementation of enterprise green strategy by establishing extensive connections with internal employees and thus having rich internal social capital [6]. Peripheral-oriented executives can provide support to enterprises from the overall level, but they are never involved in the core business of enterprises [7], so they cannot directly play a role in enterprises' green technology innovation. In addition, green technology innovation investment is a high-risk economic behavior due to its high development cost and long return period,

from the point of view of risk control, peripheral-oriented executives would have inhibitory effect on green technology innovation.

H1a: Output-oriented executives will promote enterprise green technology innovation;

H1b: Production-oriented executives will promote enterprise green technology innovation;

H1c: Peripheral-oriented executives will inhibit enterprise green technology innovation.

2.2 Mediating role of environmental strategy

Environmental strategy reflects the enterprise's management process and degree of environmental responsibility. Affected by external environmental regulation factors and internal organizational development factors, different enterprises have different attitudes towards environmental responsibility [8]. Which environmental strategy the executive focuses on depends on the executive's perception of the environment. Output-oriented executives and production-oriented executives have strong cognition of the potential benefits that positive environmental strategies may bring. They believe that the implementation of positive environmental strategies can not only win the recognition of stakeholders, gain more resources for enterprise development, but also improve the environmental performance of enterprises, such as reducing energy consumption and improving the quality of green products. Peripheral-oriented executives have a strong awareness of the potential risks that a positive environmental strategy may bring, and believe that the implementation of a positive environmental strategy squeezes other non-technical module resources, and the investment risk at the environmental level is extremely high [9].

The higher the strategic position of enterprise environment is, the more active the enterprise takes environmental management measures to deal with environmental protection problems. First of all, positive environmental strategies indicate that enterprises are willing to invest more resources into green technology innovation practices [10]. Secondly, the more important an enterprise's environmental management is in its strategic layout, the more willing an enterprise is to incorporate the concept of environmental protection into the whole process of operation and development. Therefore, this paper defines the mechanism of "idiosyncrasy-strategy-behavior", and holds that executive team functions background will affect the company's environmental strategy and thus have an impact on green technology innovation.

H2a: Environmental strategy plays a mediating role between output-oriented executives and enterprise green technology innovation;

H2b: Environmental strategy plays a mediating role between production-oriented executives and enterprise green technology innovation;

H2c: Environmental strategy plays a mediating role between peripheral-oriented executives and enterprise green technology innovation.

3 Study design

3.1 Sample selection and data sources

Taking a-share manufacturing listed companies in Shanghai and Shenzhen stock exchanges from 2011 to 2019 as the research object, the data are processed as follows: (1) Obtained from CSMAR database list of manufacturing listed companies; (2) Delete ST and *ST listed companies and listed companies that did not publish CSR reports from 2011 to 2019; (3) Variables are indented 1% to 99%. Finally, 458 listed manufacturing companies were obtained with 2008 research data.

3.2 Variable Measurement

Independent variable: Obtain executive resumes from the CSMAR database and the annual reports of listed companies, and executive team functions background are divided into three types according to the initial functions: "output", "production" and "peripheral"[11]. Calculate their proportion to the total number of senior management team in the company.

Dependent variable: Select green patent data to measure enterprises green technology innovation [1], the data comes from the State Intellectual Property Office. If the enterprises that applied for a green invention patent or a green utility model patent, then thinks that enterprise to carry on the green technology innovation.

Mediating variables: Conduct text analysis on sample companies' annual reports, CSR reports, official websites, and score them from four levels (senior management support and participation, environmental management system, environmental information transmission and employee participation). The higher the score, the more aggressive the implemented environmental strategy [8].

Control variables: Enterprise size, enterprise age, enterprise growth, financial leverage and ownership concentration.

4 Empirical research

4.1 Descriptive statistics and correlation analysis

Form table 1, "Output", "production" and "peripheral" executives are significantly related to green technology innovation at the 0.05 level, it shows that executive team functions background has a significant impact on enterprise green technology innovation, the relationship between the rest of the variables are within a reasonable range. Due to space restrictions, the following table variables take abbreviations, OP, PD, PP, means "output" "production" "peripheral" executive, Green means enterprise green technology innovation, Envi means environment strategy, PR means property rights, Market means the marketization process.

Table 1. Descriptive statistics and correlation analysis

variable	Green	OP	PD	PP	Envi
Green	1				
OP	0.14**	1			
PD	0.08**	-0.30**	1		
PP	-0.19**	-0.68**	-0.50**	1	
Envi	0.19**	0.15**	0.09**	-0.21**	1
Mean	0.20	0.30	0.33	0.37	2.84
S.D.	0.40	0.20	0.17	0.22	1.18

Note: **, * indicate significant at the 5% and 1% levels.

4.2 Regression analysis

4.2.1 Main effects.

From Table 2 Model 1-3, output-oriented executives and production-oriented executives have a significant positive impact on green technology innovation (β_1=0.16, P_1<0.05; β_2=0.17, P_2<0.05), peripheral-oriented executives have a significant negative impact on green technology innovation (β_1=-0.24, P_1<0.01). Hypothesis 1a-1c was verified.

Table 2. Main effect test results

variable	Green		
	1	2	3
OP	0.16**		
PD		0.17**	
PP			-0.24***
Controls	Yes	Yes	Yes
R-squared	0.04	0.04	0.05
F-test	5.53	5.48	6.40

Note: ***, **, and * indicate significant at the 1%, 5%, and 10% levels, the same below.

4.2.2 Mediation effect.

From Table 3 Model 1-3, environmental strategy has a significant impact on green technology innovation (β_1=0.03, P_1<0.05; β_2=0.03, P_2<0.05; β_3=0.02, P_3<0.05), suggesting that environmental strategy plays a mediating role between executive team functional background and green technology innovation. Hypothesis 2a-2c was verified.

Table 3. Moderating effect test results

variable	Green		
	1	2	3
OP	0.15**		
PD		0.16**	
PP			-0.23***

Envi	0.03**	0.03**	0.02**
Controls	Yes	Yes	Yes
R-squared	0.05	0.05	0.05
F-test	5.52	5.46	6.24

4.3 Extended research

4.3.1 Property rights.

From Table 4 Model 1-3, the interaction term between executive team functional background and property rights has a significant impact on green technology innovation (β_1=0.26, P_1<0.05; β_2=0.43, P_2<0.05; β_3=-0.47, P_3<0.05), indicating that property rights plays a regulatory role between executive team functional background and green technology innovation.

Table 4. Property rights regulation effect test

variable	Green		
	1	2	3
OP	0.14**		
PD		0.14*	
PP			-0.20***
PR	0.04	0.03	0.06
OP * PR	0.26**		
PD * PR		0.43***	
PP*PR			-0.47***
Controls	Yes	Yes	Yes
R-squared	0.05	0.05	0.06
F-test	5.10	5.36	6.76

4.3.2 Marketization Process.

From Table 5 Model 1-3, the interaction terms between executive team functional background and marketization process have a significant impact on green technology innovation (β_1=-0.07, P_1<0.05; β_2=-0.08, P_2<0.05; β_3=0.09, P_3<0.05), indicating that the marketization process plays a regulatory role between executive team functional background and green technology innovation.

Table 5. The marketization process regulation effect test

variable	Green		
	1	2	3
OP	0.16**		
PD		0.16**	
PP			-0.23***
Market	0.004	0.004	0.002
OP * Market	-0.07**		
PD * Market		-0.08**	
PP * Market			0.09***
Controls	Yes	Yes	Yes

R-squared	0.05	0.05	0.06
F-test	5.18	5.09	6.46

5 Conclusions

This paper focuses on the hot topics of economic and social development, and studies the internal behavior subjects of enterprises, expanding the research scope of enterprise green technology innovation, and digging into the mechanism and boundary effect, providing more evidence support for enterprises to strengthen green technology innovation practice.

Management implications are as follows:

(1) It makes sense to build a well-structured and efficient executive team. Grasp the proportion of various types of talents in the senior management team from an overall perspective, and give full play to the strengths of senior executives with different functional backgrounds according to the focus of strategic development.

(2) It is an inevitable requirement for enterprises to strengthen green technology innovation in line with the development of the times. Always pay attention to the development trend of national policies and changes in market demand, and actively respond to gain first-mover advantage.

(3) A positive environmental strategy is conducive to better green technology innovation practices. Attaches great importance to the status of environmental strategy in the enterprise, and creates a good atmosphere of green technology innovation in the enterprise.

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References

1. Liu Zankuo, Wang Hongyan. The impact of military experience on enterprise green innovation [J]. Soft Science, 2021, 35(12): 74-80.
2. Zhang Zhengang, Hu Antao, Huang Jieming. The functional background of the executive team and the innovation performance of enterprises: the mediating role of "energy" and "resources" [J]. Science and Technology Progress and Countermeasures, 2019, 36(24): 143-152.
3. Hambrick D C, Mason P A. Upper echelons: The organization as a reflection of its top managers [J]. Academy of Management Review, 1984, 9(2): 193-206.
4. Huang Dengshi, Zhu Xiaofei. Research on the Influence of Senior Management Team's Working Background and Enterprise Operational Performance——Based on the Experience Data of Listed Companies in Private Enterprises [J]. Economic System Reform, 2016(01): 131-138.

5. Zhang Jinhua, Yuan Zhenxing. Research on the relationship between the characteristics of the senior management team and the formation of corporate social capital [J]. Finance and Accounting Monthly, 2011(03): 34-38.
6. Cao Hongjun, Chen Yuan. Competitive behavior and corporate performance from the perspective of executive cognition: The moderating role of the functional background of the executive team [J]. China Human Resource Development, 2018, 35 (03): 61-72+135.
7. Deng Xinming, Liu Yu, Long Xianyi, Ye Zhen, Luo Huan. Research on the relationship between functional heterogeneity of executive teams and corporate performance: A mediation analysis based on managers' cognition and team conflict [J]. Chinese Journal of Management Engineering, 2020, 34(03): 32-44.
8. Li Dongwei, Zhang Chunting. Environmental Strategy, Green Innovation and Green Image [J]. Finance and Accounting Monthly, 2017(32): 3-10.
9. Chen Yufeng, Ma Yanbai. Will Green Investment Improve the Environmental Performance of Enterprises: Empirical Evidence from Chinese Energy Listed Companies [J]. Economic Theory and Economic Management, 2021, 41(05): 68-84.
10. Li Chuang. Research on Enterprise Environmental Strategy and Its Relationship with Enterprise Competitiveness [J]. Discussion on Modern Economy, 2016(03): 57-61.
11. Wang Xueli, Ma Lin, Wang Yanli. The influence of the functional background of the executive team on corporate performance: A case study of listed companies in China's information technology industry [J]. Nankai Management Review, 2013, 16(04): 80-93.