Executive Environmental Background, Risk-Taking Behavior, and Corporate Green Innovation

Yixuan Wang

BeiHang University, Xueyuan Road, Haidian District, Beijing, 100191, P. R. China

3861580308@qq.com

Abstract. With regards to “Dual Carbon”, Corporate Transition, we look at whether Executive's Eco Background makes firm green innovative or not with A-listed Chinese firm data since 2014. The results show us: (1) those people who have been around the area concerning nature, like environmental care do really well at creating something nice and good for Mother Earth when running a company; (2) Moderating analysis also points out there’s an inverse relationship between level of taking business risks by companies on executive background as far as environment concerns; (3) And then if we want to break down these differences among different kinds of companies, it means non-heavy polluters plus privately owned ones get more influence from execs having backgrounds related ecologically towards making greener things around here. This kind of findings help us understand how managers differ so much about their companies going into better environmental practices. And they will become some sort of idea to use within companies looking at changing up leaders as part of progressing themselves in being environmentally friendly.

Keywords: executive environmental background, corporate green innovation, risk-taking level, corporate governance.

1. Introduction

Against the backdrop of the in-depth advancement of “Dual Carbon” strategy and green development becoming the core focus of high-quality economic development, enterprises as the mainstay of the real economy and key participants in ecological and environmental governance play an important role. Their green innovation behaviors are not only related to their own transformation, upgrading, and long-term competitiveness, but also provide important support for regional ecological protection and low-carbon development throughout society. Green innovation is marked by heavy investment, lengthy cycles, strong uncertainty, and dual economic and environmental externalities; thus, it cannot depend entirely on spontaneous market forces. Senior management’s cognitive perspectives, professional backgrounds, and value orientations have a significant impact on corporate green R&D investment and innovation choices.

As the main decision-makers in corporate strategy formulation and resource allocation, the professional experience, expertise, and environmental background of executive teams are increasingly becoming important internal factors that affect corporate green innovation. Executives who have experience in the environment sector and a background in green-related fields tend to have a greater sense of environmental responsibility and a better understanding of green development. They can more accurately grasp policy directions and opportunities for industry-wide green transformation, thus promoting companies to increase green R&D investment and improve the number of green patents. Clarifying the intrinsic relationship between executives’ environmental backgrounds and corporate green innovation helps promote the sustainable development of enterprises, the economy, and the environment, and offers useful guidance for corporate green innovation and transformation.

In line with such an approach, using A-shares listed firms in China during the years between 2014-2024 as our empirical subject for examining how executive’s environmentally oriented histories could potentially lead their firms being able to perform some sort of eco-innovative task and see if different degrees when taking a risky venture will also make them play differently on that front.

2. Theoretical Analysis and Research Hypotheses

2.1. The Impact of Executive Environmental Background on Corporate Green Innovation

Executive ladder theory says that bosses' own experiences, jobs they've had before, and what they believe in really affect how companies decide on big plans and use their stuff [1]. At the same time, according to imprinting theory, people are greatly influenced by certain environments and experiences during their growth and career development, internalizing these influences to form corresponding personal trait imprints. These imprints show up not just as professional knowledge and abilities but also as inner values and problem-solving choices that favor nature care.[2] Executives with an environmental background have been marked with environmental characteristics throughout their academic and professional lives. They have systematic environmental expertise, practical experience in the field, and a strong sense of environmental responsibility, allowing them to display a sharper comprehension and foresight concerning national "dual carbon" policies and industry tendencies toward green transformation. Green innovation is a strategic investment activity that integrates environmental benefits with long-term economic returns, it has long R&D cycles, large-scale investments, high innovation risks, and delayed returns. It's not a short-term profit-driven project; it depends heavily on executives' value orientations and willingness to carry out strategic planning. On one hand, executives with an environmental background can see the value of green innovation from a long-term development perspective, going beyond a narrow focus on short-term operating profits. They are willing to push the company to invest more in green R&D and develop green patent technologies. On the other hand, such executives hold considerable decision-making power within the organization, enabling them to guide corporate resources towards green innovation, coordinate efforts among R&D, production, and other departments to implement green innovation strategies, and thus effectively increase the number of green patent applications and raise the company's overall level of green innovation.

At the same time, based on signaling theory, appointing executives with an environmental background gives off a good sign about the company's move towards being greener to the market, government, and society, which helps the company get more support from policies and outside resources, making things better for doing something new that's environmentally friendly.

Based on this, we propose the following hypothesis: H1: Executives with an environmental background can improve the level of a company's green innovation.

2.2. The Moderating Role of Corporate Risk-Taking Levels

A firm's risk taking behavior shows what kind of investment choices and strategic decision-making tendencies it has, deciding how to distribute limited resources among short-term, risky projects and long-term, valuable projects. Green Innovation means doing some work really hard to make less bad things happen to nature, maybe by using stuff better for making energy that helps the Earth grow, or creating new stuff or ways of doing things that don't do as much harm when they pollute, plus running businesses well too.[3] Green innovation is uncertain, with a long R&D cycle and delayed returns; it is a typical long-term strategic investment. It naturally leads to a conflict between allocating resources according to high-risk-taking companies' preference for immediate profit over the long term, thus diminishing the positive enabling function of executives with an environmental background in advancing green innovation.

A company's level of risk-taking goes up, then management will tend to focus on quick-profit, high-risk business ventures rather than looking at longer-term investments that might provide slower but more reliable gains. But Green Innovations takes time for investment and also have chances to fail which conflicts with short-term profits goal so lots of money from corporations go away from Research & Development. Such as if there is someone who has got this kind of environment background and wants to develop something environmentally friendly, yet still cannot get enough research funds available even though he/she does want to push forward this type of development. Conversely, when a company's level of risk taking is low, business decisions become more cautious,

reducing reckless speculative investments and placing greater emphasis on long-term value creation. Provide stable resources and institutional protection for executives with an environmental background to carry out green innovation strategies, thereby enabling the implementation of environmental principles. Based on this, I propose the following hypothesis:

H2: The firm risk taking is a negative moderator for the executive environmental background with regards to their firms innovation towards the green side; meaning when the firm's level of risk taking go higher it will have less effect as a result as executives from more environmentally sensitive background will do so in pushing for this change within these organizations.

3. Model Construction

3.1. Data Sources

In this work we pick the A shares which is in stock on 2014 - 2024 first. Then it is left out any finance industry stuff as well as ST companies, *ST ones plus all having too much information gaps to deal properly with those kinds of cases. Continuous variables: The top and bottom 1% were cut off; total N=34,109. Data comes form csmar database, cnrds database.

3.2. Variable Description

Dependent Variable: Corporate Green Innovation. Drawing on existing research that classifies green patents based on the WIPO Green Patent List and further distinguishes corporate patents into green invention patents and green utility model patents[4] , this study adopts the logarithm of the sum of the number of independently filed green invention patents in the current year plus the number of independently filed green utility model patents in the current year plus one as a measure of corporate green innovation levels.

Explanatory Variable: Environmental Background of Executives. Drawing on the approach of Wang Hui et al. [5], this study uses panel data from Chinese listed companies on the Shanghai and Shenzhen A-share markets from 2007 to 2017 as the research sample to examine the impact of executives with an environmental background on corporate green innovation. The raw data on executives' environmental backgrounds is sourced from personal resumes published on the Sina Finance website. Samples where resumes contain keywords such as "environment," "environmental protection," "new energy," "clean energy," "ecology," "low-carbon," "sustainable," "energy conservation," or "green" are identified as having an environmental background, and the number of such executives is calculated accordingly. Accordingly, the core explanatory variable in this paper is whether a firm employs executives with an environmental background (hbbjdum). If a firm's executive team in a given year includes one or more executives with an environmental background, the firm is deemed to have such executives that year, and hbbjdum is set to 1; otherwise, it is set to 0.

Moderator: Risk-taking level. Drawing on the research methods of Yu Minggui[6] and , this study uses the standard deviation of industry-adjusted ROA over a five-year period to measure a firm's risk-taking level.

Control Variables: Drawing on existing literature, this study selects indicators that may influence corporate green innovation as control variables. These include firm size (Size), firm age (Age), debt-to-asset ratio (Lev), profitability (ROA), ownership type (SOE), board size (Board), proportion of independent directors (Indep), dual-role directors (Dual), and growth potential (Growth). See Table 1 for detailed variable definitions.

Table 1. Variable Definitions

Variable Type	Variable Name	Variable Symbol	Variable Definition
Independent Variable	Senior executives with an environmental background	hbbjdum	If the company's executive team in the current year includes one or more executives with an environmental background, the value is 1; otherwise, it is 0
Dependent variable	Level of Green Innovation	lngrn	ln(number of green invention patent applications + number of green utility model patent applications + 1)
Control variables	Enterprise size	Size	Natural logarithm of total enterprise assets
	Enterprise age	Age	Natural logarithm of the company's age
	Debt-to-Asset Ratio	Lev	Total Liabilities / Total Assets
	Profitability	ROA	Net Income / Total Assets
	Nature of Equity	SOE	State-controlled enterprise = 1, otherwise = 0
	Board size	Board	Logarithm of the number of directors
	Proportion of independent directors	Indep	Number of Independent Directors / Total Number of Directors
	Dual Role	Dual	Chairman and General Manager = 1, otherwise = 0
	Growth Potential	Growth	Expressed as the revenue growth rate, calculated as (Current Year Total Revenue - Previous Year Total Revenue) / Previous Year Total Revenue
Adjustment Variable	Risk-Taking Level	RiskT	Degree of fluctuation in corporate profits

3.3. Model Construction

Based on the above theoretical analysis, this paper establishes baseline model (1) to examine the impact of executives' environmental background on corporate green innovation. The baseline model is specified as follows:

$$lngrn_{i,t}=\alpha_0+\alpha_1 hbbjdum_{i,t}+\alpha_2 Controls_{i,t}+Ind_i+Year_t+\epsilon_{i,t} \quad (1)$$

where i represents the firm and t represents the year. $lngrn_{i,t}$ denotes the firm's green innovation. $hbbjdum_{i,t}$ denotes executives with an environmental background. $Controls_{i,t}$ denotes the set of all defined control variables. Ind and Year are industry and year dummy variables, respectively, used to control for fixed effects. The coefficient α_1 measures the net effect of executives with an environmental background on the firm's green innovation; if it is significantly positive, it supports Hypothesis H1.

This study specifies moderation model (2) to test the moderating role of risk-taking levels.

$$lngrn_{i,t}=\beta_0+\beta_1 hbbjdum_{i,t}+\beta_2 RiskT_{i,t}+\beta_3 hbbjdum_{i,t}*RiskT_{i,t}+\beta_4 Controls_{i,t}+Ind_i+Year_t+\epsilon_{i,t} \quad (2)$$

where `$RiskT_{i,t}$` represents the firm's risk-taking level. If `$\beta_3$` is significant, it indicates that the effect of executives' environmental background on the firm's green innovation is moderated by the firm's risk-taking level.

4. Empirical Analysis

4.1. Baseline Regression

Table 2 gives the outcomes of the baseline regressions with regards to how much companies' green innovation level depends upon what type and extent of environmental knowledge do their executives have. Column (1) shows an executive's environmental background is positively significant for being in the top 0.1%, where coefficient equals about 0.107: The environment backgrounds from these executives really helps the firms create more new eco-friendly stuff. So that confirms our initial idea about H1.

Table 2. Regression Results

	(1) lngrn	(2) lngrn	(3) lngrn
hbbjdum	0.107***		0.109***
	(0.00942)		(0.0142)
hbbj		0.0875***	
		(0.00410)	
Size	0.158***	0.155***	0.167***
	(0.00437)	(0.00435)	(0.00663)
Age	-0.0860***	-0.0847***	-0.0936***
	(0.00526)	(0.00523)	(0.00775)
Lev	0.140***	0.130***	0.138***
	(0.0272)	(0.0270)	(0.0421)
ROA	0.530***	0.558***	0.491***
	(0.0759)	(0.0755)	(0.109)
Soe	0.104***	0.104***	0.105***
	(0.0109)	(0.0108)	(0.0165)
Board	0.101***	0.0928***	0.0888**
	(0.0275)	(0.0274)	(0.0418)
Indep	0.00228**	0.00251***	0.00128
	(0.000910)	(0.000906)	(0.00136)
Dual	0.0136	0.0138	0.0216
	(0.00952)	(0.00947)	(0.0143)
Growth	-0.0517***	-0.0557***	-0.0594***
	(0.0124)	(0.0124)	(0.0194)
_cons	-3.639***	-3.572***	-3.768***
	(0.123)	(0.123)	(0.187)
Year/Ind	Yes	Yes	Yes
N	34109	34109	16398
R^2	0.192	0.200	0.196
adj. R^2	0.190	0.197	0.191

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.2. Robustness Tests

In order for the regression results to be reliable we have conducted this in two ways: changing variables and sample range.

4.2.1. Replacing the Dependent Variable

We have used here executive environmental experience in terms of the count on how many executives have it within the firm as they make up an executive team over the next year (hjjb) according to our table from 2. From table two's column two, we can say that when looking at coefficient associated with Environmental background on the executives it comes highly significant which is a consistent result when compared between baseline regression analysis.

4.2.2. Changing the Sample Period

We changed the time frame from 2018-2022 and ran our regression, as seen in Table 2 Column(3), the coefficient for Executive Environmental Background is 0.109 with a p-value less than .01 which supports our conclusion of Baseline Regression.

4.3. Heterogeneity Analysis

4.3.1. Industry Characteristics

Drawing on the research by Pan Ailing et al[7] ;and , this study categorizes the sample firms into heavily polluting and non-heavily polluting enterprises for regression analysis. Columns (1) and (2)

of Table 3 show that the coefficient values and significance levels for non-heavily polluting enterprises are significantly better than those for heavily polluting enterprises. This indicates that, among non-heavily polluting enterprises, executives with an environmental background have a stronger and more significant effect on enhancing green innovation, whereas this promotional effect is not significant in heavily polluting enterprises.

4.3.2. Ownership Structure

This paper looks at the differences in how much different types of executive environmental backgrounds affect companies' green tech innovations. Columns (3) and (4) of Table 3 show that the coefficient for executives' environmental backgrounds is 0.0874 in state-controlled enterprises, while it is 0.105 in private enterprises. This suggests that the promotional effect of executives' environmental backgrounds on green innovation is greater in private enterprises than in state-controlled enterprises.

Table 3. Test for Heterogeneity

	(1) lngrn	(2) lngrn	(3) lngrn	(4) lngrn
hbbjdum	0.000471	0.149***	0.0874***	0.105***
	(0.0163)	(0.0113)	(0.0174)	(0.0110)
Size	0.141***	0.162***	0.166***	0.159***
	(0.00789)	(0.00517)	(0.00735)	(0.00565)
Age	-0.0745***	-0.0898***	-0.0604***	-0.0988***
	(0.0103)	(0.00606)	(0.0113)	(0.00595)
Lev	-0.0969*	0.200***	-0.0652	0.240***
	(0.0523)	(0.0316)	(0.0519)	(0.0317)
ROA	0.354**	0.582***	0.784***	0.431***
	(0.159)	(0.0863)	(0.167)	(0.0831)
Soe	0.150***	0.0896***		
	(0.0205)	(0.0127)		
Board	0.372***	0.0205	0.250***	-0.00604
	(0.0523)	(0.0321)	(0.0489)	(0.0334)
Indep	0.00833***	0.000369	0.00460***	0.000669
	(0.00180)	(0.00105)	(0.00150)	(0.00116)
Dual	-0.0619***	0.0306***	0.0831***	0.00770
	(0.0193)	(0.0109)	(0.0262)	(0.00985)
Growth	-0.0323	-0.0562***	-0.0737***	-0.0396***
	(0.0253)	(0.0142)	(0.0234)	(0.0144)
_cons	-4.133***	-3.517***	-4.179***	-3.292***
	(0.216)	(0.141)	(0.197)	(0.168)
Year/Industry	Yes	Yes	Yes	Yes
N	7562	26,547	11,349	22,760
R^2	0.184	0.197	0.256	0.187
adj. R^2	0.181	0.194	0.250	0.184

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.4. Moderating Effects

Table 4 gives you the results after running your moderation test on company risky stuff. Column(1): Interaction term between executives who have environmental background and corporate risk taking level: -1,275, significant at 1%. It means when it comes to how much they risk themselves as executives, with environments involved or something related; if one was like more so of these sorts then there's probably just this kind of thing that will happen where it gets them a bit less inclined about pushing anything environmentally friendly towards corporations rather than not? And thus H2 is validated.

Table 4. Moderation Effect Test

	(1) lngrn
hbbjdum	0.156***
	(0.0138)
RiskT	0.0725
	(0.151)
t	-1.275***
	(0.262)
Size	0.155***
	(0.00442)
Age	-0.0853***
	(0.00526)
Lev	0.138***
	(0.0272)
ROA	0.490***
	(0.0784)
SOE	0.103***
	(0.0109)
Board	0.102***
	(0.0275)
Indep	0.00233**
	(0.000910)
Dual	0.0138
	(0.00951)
Growth	-0.0496***
	(0.0125)
_cons	-3.595***
	(0.125)
Year/Ind	Yes
N	34,109
R^2	0.193
adj. R^2	0.190

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5. Conclusions and Recommendations

Taking the background of "carbon dual goals" & "corporate change to be greener", we will explore what the executives' backgrounds regarding nature conservation do on firms being able to do better when making changes toward being cleaner with some data about A-shares in 2014-2024. The result shows: (1) Executive's Environmental Protection Background has a great promoting effect on company green innovation, and (2) The firm Risk-taking Moderates it that Executives' Environment Background Is Negative Correlate to Corporate Green Innovation, and Heterogeneity Analysis suggests Non-Polluting and Small Size Firm Promoted Greater by Executives Environmental protection. And these results could help you learn how much boss people like can help make things clean in businesses as well as giving advice for what might work if one day your own bosses decided they needed someone more special around than just anyone else around who wanted something different inside where money came out of. Based on the research findings, this paper offers the following recommendations:

Firstly at the firm level: Firstly, firms need to optimize the selection and distribution of their executive teams. When choosing and appointing executives, companies should focus on hiring people who have professional experience in environmental protection, green and low-carbon projects, and sustainable development. By using executives' environmental knowledge, businesses can improve

their green growth strategies and make internal reasons for green creation stronger. Second, enterprises must properly handle how much they take risks. They ought to rationally restrain preferences for blind expansion and short-term high-risk investments, moderately cut down tendencies towards over-risky operations, and distribute money and other resources appropriately. This guarantees that there will always be enough funds set aside for green R&D and green patent development so that the ideas about making things greener from those in charge of protecting nature can actually happen. Thirdly, create different kinds of green development plans. Non-heavily polluting enterprises should use the governance advantages of environmental executives to actively place themselves within green innovation areas; private enterprises could further refine green innovation incentive systems and raise investment in green R&D through leveraging the expertise of environmental executives; state-owned enterprises might enhance environmental performance appraisals and limitations to encourage executives to carry out their environmental duties, thus reducing the distance between green innovation among private enterprises.

Second, concerning the government: The government needs to enhance its supportive policies toward green innovations by giving more green R&D subsidies as well as tax breaks to non-heavy-polluting industries and private firms which lowers the cost involved with creating new environmentally friendly products allowing environmental managers' efforts become even more effective. It should also set up an equilibrium mechanism between environment regulation and incentives for heavily polluted industries, maintaining proper regulatory pressure while applying special incentive policies for green innovations, avoiding merely following rules due to policy compliance and guiding companies to voluntarily adopt green technological improvements according to their leaders' environmental knowledge. Establish a system for recognizing and cultivating executives' environmental qualifications, improve channels for training environmental professionals, provide listed companies with more management talents with specialized environmental expertise, support corporate green transformation from a talent perspective.

References

[1] Hambrick D. C., Mason P. A., “Upper Echelons: The Organization as a Reflection of Its Top Managers,” in The Academy of Management Review, 1984, Vol. 9, No. 2, pp. 193–206.

[2] Marquis C., Tilcsik A., “Imprinting: Toward a M ultilevel Theory,” in Academy of Management Annals, 2013, Vol. 7, No. 1, pp. 195–245.

[3] Xie X M, Zhu Q W. How Can Corporate Green Innovation Practices Resolve the Dilemmas of “Harmonious Coexistence”? [J]. Management World, 2021, 37(1): 128–149. Xie X M, Zhu Q W. How Can Green Innovation Solve the Dilemmas of “Harmonious Coexistence”? [J]. Management World, 2021, 37(1): 128–149.

[4] Qi Shaozhou, Lin Shen, Cui Jingbo. Can Environmental Rights Trading Markets Induce Green Innovation?— Evidence from Green Patent Data of Chinese Listed Companies [J]. Economic Research Journal, 2018, 53(12): 129-143.

[5] Wang Hui, Lin Weifen, Xie Rui. Executives’ Environmental Background and Green Investor Entry [J]. Journal of Quantitative Economics and Technical Economics, 2022, 39(12): 173-194.

[6] Yu Minggui, Li Wengui, Pan Hongbo. Managerial Overconfidence and Corporate Risk-Taking [J]. Financial Research, 2013, (01): 149-163.

[7] Pan Ailing, Liu Xin, Qiu Jinlong, et al. Can Green M&A Under Media Pressure Prompt Substantive Transformation in Heavy Polluters? [J]. China Industrial Economics, 2019, (02), 174-192.