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Would Customers Pay to Go Green: The Impact of Green Innovation on Corporate Value in Chinese Context

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Article

Keywords: value creation, green innovation, corporate value, marketing capability

Posted Date: October 7th, 2025

DOI: https://doi.org/10.21203/rs.3.rs-7308220/v1

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Additional Declarations: No competing interests reported.

Abstract

Understanding how firms translate environmental innovation into financial value through customer engagement is a critical global sustainability challenge. In response, this paper investigates the impact of green innovation on green income (revenue from eco-products or low-carbon business activities) in China's corporate landscape. Focusing on the customer value creation mechanism, we employ rigorous identification strategies to analyze a sample of Shanghai and Shenzhen A-share listed companies from 2010 to 2020. Our findings reveal that green innovation significantly enhances green income, confirming customers financially reward sustainability initiatives. We further find that marketing capabilities amplify this effect, while firm-level heterogeneity tests show stronger impacts when firms' agency costs are low, boards have environmental background, and products are differentiated; and provincial heterogeneity reveals the effect more pronounced in regions with advanced factor markets, market intermediary maturity, and legal system development. This study contributes to stakeholder theory by demonstrating customers' role as active value co-creators and provides a granular, multi-tier analysis that advances both green innovation literature and sustainable value creation frameworks.

JEL Classification: L1 M31 N3 O32 Q01

Introduction

Traditional views of green innovation focus on three key aspects: addressing environmental externalities, complying with regulations, and promoting social change (Rennings, 2000; Rezende et al., 2019). However, existing research rarely examines how green innovation affects corporate value, especially from the customer's perspective. In this paper, corporate value refers to the value generated from customers, specifically the green income generated from eco-products or low-carbon business activities. While green income serves as our empirical dependent variable, we theorize its role in translating green innovation into broader corporate value creation. Thus, this study addresses this gap and significantly advances theoretical understanding.

Globally, governments and institutions are prioritizing green innovation to meet climate goals. Initiatives such as the Paris Agreement and the EU Green Deal encourage companies to adopt sustainable practices. These policies aim to reconcile economic growth with environmental protection, enabling firms to develop sustainable products. Concurrently, rising global consumer demand for eco-friendly vehicles has compelled automakers to innovate. Ford accelerated production of fuel-efficient cars by retooling factories and launching programs like ECOnetic in Europe. This shift reduced emissions and attracted environmentally conscious consumers. Similarly, Toyota expanded its hybrid lineup, capitalizing on stricter emission regulations and shifting consumer preferences. Consequently, Ford's U.S. hybrid sales grew by 4.2% in 2024.[1] Such cases show how aligning innovation with global trends can boost competitiveness.

We argue that customer demand for green products is a key driver of corporate value. As depicted in Fig. 1, firms integrate resources from stakeholders (e.g., investors, suppliers) with customer feedback to tailor green innovations to market needs. This alignment enhances competitiveness; for instance, customers frequently pay premium prices for eco-friendly products (Henriques and Sadorsky, 1996), directly boosting sales and profit margins (Kumar, 2018).

[insert Fig. 1 about here]

Corporate value depends on optimizing the distribution of value across stakeholders. Figure 2 illustrates two paths: the upper path prioritizes shareholder value (A1) but risks diminishing customer value, creating stakeholder conflict (Queen, 2015; Flammer and Bansal, 2017). Conversely, the lower path simultaneously increases value for shareholders and stakeholders (A1 + B1), thereby expanding the firm's total value pie and aligning with shared value creation (Porter and Kramer, 2011). While past research frames customers as passive recipients of value (Bocken et al., 2014), we emphasize their active role in value co-creation. Specifically, customer purchases of green products generate revenue (green income) that incrementally benefit both shareholders (A) and stakeholders (B) (Haksever et al., 2004).

[insert Fig. 2 about here]

While green innovation is widely studied (e.g., Wedari et al., 2022), critical gaps persist. First, prior work overlooks how green innovation enhances firm value via customer-driven mechanisms, particularly the role of green income (i.e., revenue from green or low-carbon business activities). Second, through stakeholders like investors are well-researched, customers – key revenue contributors – are often framed as passive recipients (Bocken et al., 2014) rather than active co-creators. Third, conflicting priorities between shareholders and stakeholders create ambiguity in optimizing value distribution. Thus, we ask: *How does green innovation enhance corporate value by increasing green income, and what contextual factors strengthen this relationship?*

We integrate New Stakeholder Theory (NST) and Agency Theory to explain this linkage. NST posits that firms optimize value creation by aligning innovation with stakeholder needs. In this vein, we believe that customers are pivotal: their purchasing decisions generate green income, signaling demand and guiding resource allocation toward high-impact green innovations. Conversely, Agency Theory warns that managerial focus on short-term shareholder gains risks underinvesting in sustainability (Markman et al., 2004). For instance, cutting green R&D to boost immediate profits may reduce green income, eroding customer trust and long-term shareholder returns. Synthesized, these two theories reveal how customer-aligned green innovation converts environmental efforts into incremental financial value.

Our analysis reveals four key insights. First, green innovation enhances corporate value primarily through green income. Second, marketing capabilities amplify this effect by strengthening resource-customer feedback integration. Third, results withstand robustness checks (e.g., reverse causality, sample

selection bias), confirming that green innovation drives value through customer-linked green income. Fourth, the relationship is stronger in firms with environmentally experienced leadership, differentiated products, and lower agency costs. Additionally, contextual factors matter: the effects are more pronounced in regions with supportive institutions (e.g., robust intellectual property protections).

This study differentiates itself by measuring corporate value via green income – a metric capturing customers' active co-creation role. Whereas prior work focuses on operational metrics (e.g., emissions), we reveal how customer purchases forge a direct financial bridge between green innovation and corporate value. This repositions customers from passive observers (Bocken et al., 2014) to active validators who economically reward sustainability.

Literature Review and Hypotheses Development

2.1 Green Innovation and Corporate Value

Prior research predominantly measures corporate value using Tobin's Q or sales growth (Ruf et al., 2001; Harjoto & Laksmana, 2018). This study diverges by adopting a value-creation lens, operationalizing corporate value through green income, which is defined as the proportion of revenue derived from low-carbon or eco-friendly products. This approach addresses a critical gap: while existing work links corporate value to governance (e.g., board structure; Coles et al., 2008) or CSR (e.g., CSR-driven sales growth; Lins et al., 2017), it overlooks customers as active contributors to value creation through green purchasing behavior (Vomberg et al., 2015).

Green innovation enhances environmental performance through two primary pathways: (1) integrating sustainability into product design (e.g., recyclability; Marchi, 2012), and (2) optimizing processes for energy efficiency (Shu et al., 2016). It also strengthens market competitiveness by aligning with eco-conscious demand (Hart, 1995). Despite these established benefits, three research limitations persist. First, prior studies neglect how green innovation translates to corporate value via customer-linked green income. Second, theoretical conflicts remain unresolved – particularly between shareholder-centric frameworks (e.g., Agency Theory) and stakeholder-inclusive paradigms (e.g., New Stakeholder Theory, NST). Third, the role of marketing capability in converting green innovation into value is underdeveloped.

2.2 The Theoretical Analysis and Hypotheses Development

2.2.1 New Stakeholder Theory (NST) and Value Creation

NST posits that firms maximize value when stakeholders co-create outcomes (Tantalo and Priem, 2014; Klein et al., 2019). Customers are pivotal: their demand for green products generates revenue, encouraging companies to focus resources on eco-innovation (McGahan, 2021) and make products that fit market needs (Flammer, 2015). Greener corporate behaviour improves value creation by enhancing reputation, providing a cleaner working environment, and increasing customer satisfaction (Klassen and McLaughlin, 1996; Hart, 1995). In the current context, where customers tend to prefer eco-friendly products, companies that align their product designs and packaging with environmental principles can produce green products that satisfy customer needs. So, when companies recognize the potential market for green products, they are more motivated to address challenges and allocate significant resources to costly and uncertain innovation activities. This then starts a cycle: Green innovation leads to customer purchases (green income), which increases company value, benefits stakeholders, and creates shared value (as shown in Fig. 2). Thus, we propose that:

H1a

Green innovation increases corporate value by boosting green income.

2.2.2 Agency Theory and Value Erosion

Agency theory highlights conflicts from misaligned incentives (Jensen, 2001). Managers may deprioritize green innovation due to high costs and uncertain returns (Markman et al., 2004), favor short-term profits over sustainability (Bushee, 1998), or disregard customer preferences, thereby reducing green income potential (Haksever et al., 2004). Further, green innovation consumes substantial capital and diverts resources away from production investments, potentially reducing a firm's short-term production performance (Hu et al., 2022). Moreover, increased investment in green technologies can lead to higher production costs, elevated product prices, reduced customer demand, and ultimately lower profitability. When these adverse effects dominate, a decline in corporate value can be observed (Flammer and Bansal, 2017).

Potential agency problems may also emerge between shareholders and customers. Managers are primarily tasked with maximizing shareholder value. However, excessive focus on shareholder value, especially at the expense of other stakeholders, can lead to conflicts of interest that undermine the firm's overall value (Queen, 2015; Flammer and Bansal, 2017). When customer value remains constant, increasing the proportion allocated to shareholders inherently diminishes the value for other stakeholders, creating imbalances. Imbalanced value distribution between shareholders and customers further exacerbates conflicts (Queen, 2015). Failing to consider stakeholder interests can prevent firms from achieving value maximization (Jensen, 2001). Consequently:

H1b

Green innovation decreases corporate value by reducing green income.

2.2.3 Marketing Capability as Moderator

Resource-Based View (RBV) & Dynamic Capabilities Perspective

Previous research suggests that marketing capability is a comprehensive process through which firms leverage market knowledge to enhance interactions between suppliers and customers and foster relationships with all stakeholders (Nath et al., 2010; Yu et al., 2014). Mu and Zhang (2021) define marketing capability as a firm's ability to effectively transform consumer feedback into actionable outputs, enabling companies to identify customer needs better and understand the factors influencing customer decision-making (Dutta et al., 1999).

According to RBV, scarce, inimitable, and valuable resources form the foundation for building robust marketing capabilities that generate competitive advantages (Nath et al., 2010). RBV applied to marketing emphasizes the importance of developing market-based relationships and intellectual assets to meet customer needs and enhance brand equity (Srivastava et al., 2001). Dynamic Capability Theory, on the other hand, posits that firms must continually develop and adapt their resources and capabilities in response to market changes. Companies that swiftly respond to environmental shifts are more likely to perform better (Jarvenpaa and Leidner, 1998). A critical aspect of marketing capability is allocating resources to serve customers more effectively. Firms with strong marketing capabilities leverage both internal and external resources to introduce new products that meet market demands, build a positive brand image, and understand customer preferences. This capability ensures the consistent delivery of customer value, fostering loyalty and satisfaction (Gu et al., 2018). Enhanced customer loyalty leads to accelerated purchases of firm products, preventing competitors from capturing customer resources. Moreover, firms with advanced marketing capabilities can efficiently gauge customer reactions to products and quickly address their concerns, thereby reducing time costs and improving customer acquisition and retention rates (Mu and Zhang, 2021; Angulo-Ruiz et al., 2014).

Marketing capability enables firms to transform customer insights into innovation (Nath et al., 2010), build eco-brand loyalty (Chen, 2010), and accelerate the adoption of green practices (Hirunyawipada & Xiong, 2018). Strong marketing amplifies the value of green innovation by bridging customer needs and firm offerings (Yu et al., 2017). We therefore propose:

H2a

Marketing capability strengthens the positive relationship between green innovation and corporate value.

Agency Conflicts Perspective

Marketing capabilities reflect a firm’s ability to allocate resources effectively. However, according to Agency Theory, resource allocation decisions made by managers may not always be efficient due to agency friction. Managers, acting in their self-interest, may prioritize short-term gains or personal incentives, resulting in suboptimal resource allocation and increased cost uncertainty for the firm (Chen et al., 2012).

Furthermore, agency issues are not confined to the relationship between managers and shareholders. A notable agency problem also exists between shareholders and customers. As discussed earlier, conflicts often arise between maximizing shareholder value and the interests of other stakeholders. Customer value is a critical driver of corporate value, and when the focus on shareholder value maximization overshadows customers’ needs, it can lead to adverse outcomes. While the primary responsibility of management is to maximize shareholder value, an overemphasis on this goal, especially at the expense of other stakeholders, can harm the firm’s overall interests. Pursuing shareholder value in a way that disregards the negative impacts on customers and other groups undermines the firm’s ability to achieve value maximization (Jensen, 2001).

Thus, marketing investments may backfire in the presence of agency problems. Resource constraints can lead to inefficient spending (Carayannopoulos, 2009), managerial self-interest may distort priorities (Chen et al., 2012), and customer dissatisfaction can result in reputational harm (Mu & Zhang, 2021). When such issues dominate, marketing capability weakens the value impact of green innovation. Hence:

H2b

Marketing capability weakens the relationship between green innovation and corporate value.

Research Design

4.1 Data and Sample

This paper uses data from companies listed on the Shanghai and Shenzhen stock exchanges in China from 2010 to 2020 as the research sample to explore the relationship between green innovation and corporate value. The data on corporate value (green income) is extracted from WIND database. We manually retrieved data on patent applications, patent grants, and IPC classification codes for listed companies from the search portal of the China National Intellectual Property Administration (CNIPA). We then matched the patent types obtained from CNIPA against the green patent IPC classification codes in the World Intellectual Property Organization's (WIPO) 2010 “International Patent Classification Green Inventory” to derive the annual count of green patents obtained by each firm. The rest of the data are from the China Stock Market Accounting Research Database (CSMAR). We exclude companies labeled as ST, SST, or ST*, as well as companies in the financial or insurance industries. We winsorize all continuous variables to within 1% of the upper and lower bounds. The above selection criteria leave us with 13,356 firm-year observations.

4.2 Variable Definitions

4.2.1 Corporate value (GRev)

Similar to Huang et al. (2024), who identify six main categories of green business activities, including green revenues, as outlined in the *2019 Green Industry Guiding Catalogue*, we conduct a more comprehensive analysis of green performance using a new database. First, we identify the green and low-carbon keywords based on the government official document, "*Opinions on Fully Implementing the New Development Concept and Achieving Carbon Peak and Carbon Neutrality*." Second, we categorize green and low-carbon business activities based on keywords and classify the revenues generated from these activities as green or low-carbon revenues. Third, we divide those revenues by total revenue and use the ratio as the green revenue implication of corporate value.

4.2.2 Green innovation (Green)

Following prior literature (Ghoul et al., 2017; Quan et al., 2021), we measure green innovation using the natural logarithm of one plus the number of the sum of green invention patents and green utility model patents independently obtained within the focal year.[2] To ensure the robustness of our conclusions, we re-estimate our main models using *Green1* as an alternative proxy for *Green* and present the results in Tables S1-S4 in the Supplementary Information.

4.2.3 Marketing Capability (MC)

Management research has consistently emphasized the importance of functional capabilities in explaining interfirm differences in profitability (Dutta et al., 1999). Building on prior studies (Dutta et al., 1999; Hu et al., 2023), we estimate marketing capability (*MC*) using the stochastic frontier estimation (SFE) methodology. This approach conceptualizes marketing capability as a firm's efficiency in utilizing limited resources (inputs) to generate desired outputs. Specifically, we use sales, general, and administrative expenses, as well as receivables, as proxies for inputs, while sales revenue serves as the output variable. The SFE models are presented as follows:

$$
\begin{aligned}
&Y_{i,t} = \alpha + X'_{i,t} \times \beta + \varepsilon_{i,t}, \\
&\varepsilon_{i,t} = \nu_{i,t} - \mu_{i,t} \\
&\nu_{i,t} \sim \mathrm{N}\left(0, \sigma_{\nu}^{2}\right) \\
&\mu_{i,t} \sim \mathrm{N}^{+}\left(0, \sigma_{\mu}^{2}\right)
\end{aligned}
$$

where $i = 1, \ldots, N$ represents the company, $t = 1, \ldots, T_i$ denotes the period, Y refers to the output variable (sales revenue), and X is a vector of input variables (sales, general and administrative expenses, and receivables). The inefficiency term $\mu_{i,t} > 0$ indicates the degree to which a firm is unable to convert inputs into outputs optimally. The model assesses a firm's effectiveness in utilizing marketing resources to optimize sales revenue (Dutta et al., 1999; Xiong & Bharadwaj, 2013).

A primary objective of marketing activities is to enhance the perception of product value among current and prospective customers, thereby increasing operating income through pricing differentials. We normalize the efficiency scores on a scale from 0 to 1000, representing the spectrum of marketing capability (*MC*) from low to high.

4.2.4 Control Variables

Referring to previous relevant studies (Bloom and Van Reenen, 2002; Lins et al., 2017; Wei, 2021), we control the following firm-level characteristics: (1) firm Age (*Age*): the natural logarithm of the number of years from the firm's listing year to the statistical year; (2) state ownership (*SOE*): the indicator which equals one if a firm is state-owned; and zero otherwise; (3) firm size (*Size)*: the natural logarithm of the total assets of the firm; (4) equity concentration (*Share*): the shareholding proportion of the top ten shareholders; (5) R&D expenditure (*R&D*): the ratio of R&D expenditure to total sales; (6) profitability (*ROA*): the ratio of net profit to total assets; (7) financial leverage (*Lev*): the ratio of total liabilities to total assets; (8) firm growth (*Growth*): average growth rate of sales in three years (Wei, 2021); (9) analyst following (*Ana*): the natural logarithm of the number of analysts (teams) who have analyzed a firm in the calendar year plus one. Table 1 presents the detailed descriptions of all variables.

Table 1
Variable Description

Variable name	Variable symbol	Variable definition
Green income ratio	*GRev*	The ratio of green or low-carbon business revenue to total income
Green innovation	*Green*	The number of green invention patents *independently* obtained in the focal year
Marketing capability	*MC*	Using stochastic frontier analysis to calculate, the reverse term of the inefficient ability of firms to obtain output by using input.
Firm size	*Size*	The natural logarithm of total assets
Financial leverage	*Lev*	Total liabilities divided by total assets
R&D investment	*R&D*	R&D expenditures scaled by total sales
Firm growth	*Growth*	Average sales growth rate of sales in three years
Profitability	*ROA*	The ratio of net profit to total assets
Firm age	*Age*	The natural logarithm of the number of years from the firm's listing year to the statistical year
State ownership	*SOE*	Indicator which equals one if a firm is state-owned; and zero otherwise.
Equity concentration	*Share*	The shareholding proportion of the top ten shareholders
Analyst following	*Ana*	The natural logarithm of the number of analysts (teams) who have conducted analysis on a firm in the calendar year plus one

[Insert Table 1 about here]

4.3 Empirical Models

To test the impact of green innovation on corporate value (H1), this paper constructs the following model:

$$GRev_{i,t} = \beta_0 + \beta_1 \times Green_{i,t-1} + \sum_k \beta_k Controls_{i,t}^k + \mu_t + \delta_i + \epsilon_{i,t} \quad (1)$$

where *GRev* represents the ratio of corporate green revenue to total revenue of firm *i* in year *t*; *Green* represents corporate green innovation, and we'll use *Green1* and *Green2*, which refer to the number of green patents independently obtained and the number of green patents jointly obtained by firm *i* in year *t-1*, respectively. *Controls* refer to the controlled variables described earlier; μ is the year-fixed effect; δ is the industry-fixed effect; γ is the city-fixed effect; and ε is the error term.

To test the moderating effect (H2), we construct the following model:

$$GRev_{i,t} = \gamma_0 + \gamma_1 \times Green_{i,t-1} + \gamma_2 \times Green_{i,t-1} \times MC_{i,t-1} + \gamma_3 \times MC_{i,t-1} + \sum_k \gamma_k Controls_{i,t}^k + \mu_t + \delta_i + \vartheta_{i,t} \quad (2)$$

where *MC* represents the marketing capability of firm *i* in year *t-1*, which is the moderating variable; γ_2 is of our focus in this model; and other variables are as above.

Empirical Results

5.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the main variables. The explained variable, green income ratio (GRev), has a mean value of 0.054, a standard deviation of 0.179, a minimum value of 0, and a maximum value of 0.987, reflecting a large variation in the level of green activities among companies. The explanatory variable 'green patent' (Green1/Green2) has a mean value of 0.781/0.208, a minimum value of 0, and a maximum value of 4.111/3.526, indicating that the degree of green innovation varies among companies. Though there are some differences in the numerical values between *Green1* and *Green2*, the distributions are relatively similar, indicating that the two proxies can effectively measure the level of green innovation.

Table 2
Descriptive Statistics

	Mean	Std.	Min.	25th	Median	75th	Max.
GRev	0.054	0.179	0.000	0.000	0.000	0.000	0.987
Green	0.781	0.994	0.000	0.000	0.000	1.386	4.111
MC	41.512	0.521	39.717	41.213	41.562	41.870	42.734
Size	22.498	1.272	19.847	21.622	22.292	23.225	27.072
Lev	0.073	0.092	0.000	0.001	0.035	0.116	0.531
R&D	0.023	0.024	0.000	0.004	0.017	0.033	0.154
Growth	0.204	1.569	-8.941	0.030	0.149	0.314	17.990
ROA	0.069	0.058	-0.304	0.037	0.060	0.097	0.285
Age	2.673	0.314	1.946	2.398	2.708	2.944	3.367
SOE	0.537	0.499	0.000	0.000	1.000	1.000	1.000
Share	0.380	0.155	0.064	0.257	0.363	0.497	0.794
Ana	1.680	1.131	0.000	0.693	1.792	2.639	3.871

[Insert Table 2 about here]

Moreover, the average value of marketing capability (*MC*) is 41.512, with a standard deviation of 0.521. The maximum value and the minimum value are 42.734 and 39.717, respectively, indicating that most sample firms attach more importance to marketing ability. From the perspective of innovation investment (*R&D*), the average value is 0.023, the standard deviation is 0.024, the maximum value is 0.154, and the minimum value is 0, indicating that innovation investment is generally low.

5.2 Correlation Analysis

Table 3 presents the correlation matrix of the main variables. There is a significant positive correlation between green innovation and corporate value at the 1% level, which supports our hypothesis at the preliminary stage. It indicates that as the corporate green innovation level improves, the proportion of green income will increase. For the control variables, the results presented in this paper are consistent with the correlations reported in previous literature. The correlation coefficients between the other variables are less than 0.5, suggesting that this study will not be affected by multicollinearity in subsequent empirical models.

Table 3
Correlation Matrix

	Grev	*Green*	*MC*	*Size*	*Lev*	*R&D*	*Growth*	*ROA*	*Age*	*SOE*	*Share*	*Ana*
GRev	1.000	0.266***	0.007	0.094***	0.119***	0.047***	-0.009	-0.038***	-0.020**	-0.032***	0.001	0.068***
Green	0.247***	1.000	-0.303***	0.383***	0.164***	0.112***	-0.028***	-0.050***	0.068***	0.098***	0.060***	0.170***
MC	0.029***	-0.358***	1.000	-0.859***	-0.343***	0.348***	0.100***	-0.104***	-0.237***	-0.297***	-0.244***	-0.371***
Size	0.074***	0.454***	-0.874***	1.000	0.481***	-0.222***	-0.113***	-0.018**	0.267***	0.255***	0.227***	0.385***
Lev	0.139***	0.124***	-0.269***	0.415***	1.000	-0.228***	-0.051***	-0.204***	0.139***	0.185***	0.019**	0.049***
R&D	0.004	0.091***	0.326***	-0.201***	-0.211***	1.000	0.055***	0.117***	-0.196***	-0.233***	-0.047***	0.110***
Growth	0.017**	-0.009	0.049***	-0.069***	-0.028***	0.002	1.000	0.147***	-0.042***	-0.055***	-0.041***	0.084***
ROA	-0.034***	-0.059***	-0.120***	0.004	-0.178***	0.048***	0.081***	1.000	-0.123***	-0.171***	0.127***	0.480***
Age	-0.010	0.056***	-0.193***	0.213***	0.109***	-0.189***	0.009	-0.096***	1.000	0.371***	-0.181***	-0.163***
SOE	-0.009	0.099***	-0.305***	0.278***	0.173***	-0.211***	-0.007	-0.150***	0.365***	1.000	0.066***	-0.086***
Share	0.026***	0.079***	-0.282***	0.261***	0.041***	-0.036***	-0.001	0.127***	-0.181***	0.058***	1.000	0.165***
Ana	0.063***	0.191***	-0.373***	0.380***	0.033***	0.106***	0.018**	0.461***	-0.165***	-0.085***	0.167***	1.000

***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

[Insert Table 3 about here]

5.3 Green Innovation and Corporate Value

Table 4 presents the baseline results for Model (1). Specifically, Column (1) presents the results without the core explanatory variable, and it shows that corporate green income (*GRev*) is significantly related with the control variables. We test the main hypothesis in Column (2). The coefficient of *Green* is significantly positive at the 1% level, supporting our hypothesis H1a that green innovation has a positive impact on green revenue implications for corporate value.

Table 4
Green Innovation, Marketing Capability and Corporate Value

	GRev			
	(1)	(2)	(3)	(4)
Intercept	0.426***	0.732***	-4.013***	-3.582***
	(9.21)	(15.86)	(-11.04)	(-9.86)
Green		0.046***	0.046***	-0.874***
		(19.73)	(20.01)	(-7.22)
Green×MC				0.022***
				(7.55)
MC			0.095***	0.082***
			(13.06)	(11.29)
Size	-0.003	-0.020***	0.014***	0.019***
	(-1.63)	(-10.87)	(4.45)	(6.21)
Lev	0.106***	0.142***	0.093***	0.078***
	(4.11)	(5.60)	(3.74)	(3.16)
R&D	0.073	-0.147*	-0.420***	-0.449***
	(0.92)	(-1.86)	(-4.95)	(-5.21)
Growth	0.002*	0.001	0.002	0.002
	(1.89)	(1.28)	(1.36)	(1.52)
ROA	-0.192***	-0.146***	-0.063**	-0.066**
	(-6.92)	(-5.41)	(-2.37)	(-2.49)
Age	-0.006	< 0.001	0.001	-0.006
	(-0.92)	(-0.02)	(0.10)	(-1.00)
SOE	-0.015***	-0.017***	-0.011***	-0.008**
	(-4.45)	(-4.99)	(-3.19)	(-2.55)
Share	0.004	0.013	0.027***	0.026**
	(0.37)	(1.27)	(2.60)	(2.54)
Ana	0.016***	0.015***	0.015***	0.014***
	(9.40)	(8.59)	(8.78)	(8.12)
Year	YES	YES	YES	YES
Ind	YES	YES	YES	YES
R^2	11.30%	15.79%	17.00%	17.48%
Adj R^2	11.13%	15.61%	16.82%	17.29%
N	13356	13356	13356	13356
F-value	35.541***	41.093***	41.889***	40.843***

Note: The t-statistics in parentheses are calculated using robust standard errors clustered at firm-level. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

[Insert Table 4 about here]

5.4 The Moderate Effect of Marketing Capability

Further, the coefficient of the interaction term of marketing capability (*MC*) and green innovation (*Green*) in Column (4) of Table 4 is significantly positive at 1% level, with a *t-statistic* of 7.55. This suggests that firms' marketing capability positively promotes the impact of green innovation on corporate green income, supporting our hypothesis H2a.

5.5 Endogeneity Tests

5.5.1 Measurement Error Problem

To address the potential measurement error, we use the dummy variable for green innovation (*Green_dum*) as the independent variable in the regression. Specifically, the dummy variable is defined as follows: if a firm has any green patents, the variable equals one; otherwise, it equals zero. Table 5 presents the results, which show that both *Green_dum* is significantly positively associated with the green income (*GRev*) at the 1% significance level. This aligns with prior research, further supporting the robustness of the relationship between green innovation and green income.

Table 5
Measurement error test results

	GRev	
	(1)	(2)
Intercept	0.426***	0.535***
	(9.21)	(11.42)
Green_dum		0.049***
		(15.11)
Size	-0.003	-0.009***
	(-1.63)	(-5.03)
Lev	0.106***	0.114***
	(4.11)	(4.43)
R&D	0.073	-0.042
	(0.92)	(-0.53)
Growth	0.002*	0.002
	(1.89)	(1.64)
ROA	-0.192***	-0.183***
	(-6.92)	(-6.69)
Age	-0.006	-0.006
	(-0.92)	(-0.91)
SOE	-0.015***	-0.016***
	(-4.45)	(-4.80)
Share	0.004	0.009
	(0.37)	(0.87)
Ana	0.016***	0.016***
	(9.40)	(9.00)
Year	YES	YES
Ind	YES	YES
R^2	11.31%	12.84%
Adj R^2	11.13%	12.65%
N	13356	13356
F-value	35.541***	37.724***

Note: The t-statistics in parentheses are calculated using robust standard errors clustered at firm-level. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

[Insert Table 5 about here]

5.5.2 Selection Bias Problem

To address the potential endogeneity issue of selection bias in our previous findings, we conduct a Heckman two-stage model. Since there are firms in our sample that have a zero value of green income, whether a firm engages in green activities may be determined by its characteristics rather than being randomly selected. To mitigate this concern, we first regress whether a firm has green income on firm-level control variables. We calculate the Inverse Mills Ratio (*lambda*) from the first stage and then add it in the second stage. Table 6 shows the results. Column (2) shows that after controlling for endogeneity, the coefficient of *Green1* on *GRev* remains significantly positive. This suggests that previous findings are robust and not affected by the selection bias problem.

Table 6
Sample Selection Bias - Heckman two-stage model results

	(1)	(2)
	GRev_dum	*GRev*
Intercept	-4.042***	2.318***
	(-6.38)	(3.29)
Green		0.069***
		(9.72)
lambda		-0.870
		(-1.43)
Size	0.069**	-0.065***
	(2.40)	(-5.27)
Lev	1.009***	0.092
	(3.28)	(0.33)
R&D	1.204	-0.552
	(1.03)	(-1.17)
Growth	-0.020	0.022***
	(-1.54)	(5.18)
ROA	-2.921***	-0.057
	(-5.10)	(-0.21)
Age	-0.093	0.025
	(-0.93)	(0.85)
SOE	-0.495***	0.065**
	(-8.11)	(2.14)
Share	-0.598***	0.288***
	(-3.22)	(4.83)
Ana	0.256***	0.008
	(8.00)	(0.49)
Year	YES	YES
Ind	YES	YES
Pseudo R2	8.90%	
R2		16.46%
Adj R2		15.37%
N	13356	2178
F-value		21.115***

Note: The t-statistics in parentheses are calculated using robust standard errors clustered at firm-level. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

[Insert Table 6 about here]

5.5.3 Reversal Causality Test

Although previous sections present a robust relationship between green innovation and corporate value via green income, the conclusion may suffer from the endogeneity problem caused by reverse causality. That is, it may be possible that firms generating more green revenue from customers are also very active in green innovation activities. To mitigate this concern, we verify the causal impact of green innovation on green income by adopting the

instrumental variable approach and two-stage least squares (2SLS) regression models. We use firm-level climate risk as the instrumental variable of corporate green innovation and rerun the main model using two-stage least squares (2SLS). Following Lin and Wu (2023) and Li et al. (2024), we construct two measures for firm-level climate risk. Specifically, Lin and Wu (2023) develop their climate risk dictionaries based on government official reports, while Li et al. (2020) develop theirs using data from the *China Meteorological Data Service Center*. We train our data on their dictionaries using the *KeyedVectors* model in Python's *gensim* library to obtain the expanded vocabularies, and finally have *ClimateRisk1* and *ClimateRisk2* as alternatives, based on the work of Lin and Wu (2023) and Li et al. (2020), respectively.

Columns (1)–(2) and Columns (3)–(4) of Table 7 present the 2SLS regression results using *ClimateRisk1* and *ClimateRisk2* as the instrumental variables, respectively. Columns (1) and (3) of Table 7 report the regression results of the first stage when the dependent variable is *Green*. In either case, the coefficient of *ClimateRisk* is significantly positive (*t-statistic* = 22.21; 19.34), consistent with the prediction that firms are more active in green innovation when they face higher climate risk. The F-value for both first-stage results is larger than 200, indicating the instrumental variables are not weak.

Table 7
Reverse Causality Tests (IV = *ClimateRisk*)

	(1)	(2)	(3)	(4)
	Green	*GRev*	*Green*	*GRev*
Intercept	-7.153***	2.508***	-6.905***	2.701***
	(-33.01)	(23.86)	(-31.31)	(23.55)
Green#		0.311***		0.340***
		(21.35)		(20.97)
ClimateRisk1	1.355***			
	(22.21)			
ClimateRisk2			0.345***	
			(19.34)	
Size	0.371***	-0.121***	0.372***	-0.132***
	(42.50)	(-20.69)	(42.35)	(-20.74)
Lev	-1.110***	0.362***	-0.973***	0.385***
	(-11.81)	(12.99)	(-10.27)	(13.52)
R&D	5.189***	-1.423***	5.017***	-1.560***
	(13.05)	(-13.79)	(12.56)	(-14.54)
Growth	0.020***	-0.004***	0.020***	-0.004***
	(4.53)	(-3.17)	(4.65)	(-3.66)
ROA	-0.839***	0.113***	-0.900***	0.142***
	(-5.94)	(4.12)	(-6.36)	(5.00)
Age	-0.125***	0.031***	-0.145***	0.035***
	(-4.26)	(4.63)	(-4.87)	(5.09)
SOE	0.061***	-0.024***	0.044**	-0.025***
	(3.54)	(-7.06)	(2.53)	(-7.18)
Share	-0.248***	0.063***	-0.230***	0.068***
	(-4.64)	(5.74)	(-4.27)	(6.21)
Ana	0.032***	0.005***	0.037***	0.004**
	(3.78)	(2.71)	(4.39)	(1.98)
Year	YES	YES	YES	YES
Ind	YES	YES	YES	YES
R2	33.01%	21.61%	32.08%	20.30%
N	13098	13098	13098	13098
F-value	209.748***	45.358***	200.204***	43.466***

Note: The t-statistics in parentheses are calculated using robust standard errors clustered at firm-level. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

Columns (2) and (4) of Table 7 report the regression results of the second stage when the dependent variable is *GRev*. The instrumented *Green* (*Green#*) is positively related to green income (*GRev*) at the significance level of 1%, suggesting the 2SLS regression results support our main conclusion.

[Insert Table 7 about here]

5.6 Heterogeneity Analysis

5.6.1 Environmental Background of the Board of Directors

Firms with more directors who have an environmental background will have stronger motivation to carry out green innovation. Ramus and Steger (2000) note that green innovation requires a greater commitment and attention from management than ordinary innovation. According to the impression effect of moral cognition, He et al. (2021) show that senior managers with academic experience will pay more attention to the coordinated development of economy, society and nature; they also pay more attention to environmental protection in ideological understanding, thus leading to the creation of green value, and actively promote the green innovation of firms. Based on the priors, we believe that the environmental background of managers can help firms enhance their green innovation activities, thereby improving corporate value. We use the proportion of environmental background board members to conduct sub-sample analysis, and the results are shown in Columns (1) and (2) of Table 8. Specifically, the coefficient of the interaction term *Green×MC* is significantly positive in high group. Consistent with hypothesis H2a, indicating that when there are more board members with an environmental protection background, the moderating effect of marketing ability is stronger, positively moderating the positive relationship between green innovation and corporate value.

Table 8
Heterogeneity Tests: firm characteristics

	Proportion of Board Members with Environmental Protection Background		Product Similarity		Agency Cost	
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-4.328***	-1.805***	-3.295***	-2.536***	-5.610***	-2.135***
	(-4.91)	(-2.95)	(-5.01)	(-2.62)	(-4.06)	(-3.05)
Green	-1.302***	-0.339	-0.321	-1.572***	0.075	-1.308***
	(-3.85)	(-1.55)	(-1.28)	(-4.29)	(0.14)	(-5.18)
Green×MC	0.033***	0.009	0.009	0.039***	< 0.001	0.033***
	(4.01)	(1.64)	(1.40)	(4.42)	(-0.03)	(5.28)
MC	0.101***	0.042***	0.075***	0.063***	0.126***	0.049***
	(5.58)	(3.58)	(5.61)	(3.33)	(4.47)	(3.55)
Size	0.017**	0.015***	0.020***	0.010	0.029***	0.012*
	(2.36)	(2.73)	(3.81)	(1.21)	(3.01)	(1.94)
Lev	0.201***	-0.047	0.062	0.086	0.164***	-0.021
	(3.01)	(-1.26)	(1.11)	(1.52)	(2.62)	(-0.52)
R&D	-0.768***	0.060	-0.177	-0.707***	-0.303*	-0.274
	(-3.40)	(0.48)	(-1.09)	(-3.06)	(-1.66)	(-1.41)
Growth	0.003	0.001	-0.001	0.003	0.002	0.001
	(1.14)	(0.52)	(-0.22)	(1.30)	(0.84)	(0.63)
ROA	-0.087	-0.042	0.008	-0.198***	-0.116	-0.016
	(-1.38)	(-0.92)	(0.16)	(-2.77)	(-1.62)	(-0.34)
Age	-0.018	0.023**	0.007	-0.013	-0.004	-0.006
	(-1.19)	(2.07)	(0.58)	(-0.84)	(-0.23)	(-0.58)
SOE	-0.001	-0.009*	-0.001	-0.013	-0.025***	0.006
	(-0.07)	(-1.86)	(-0.19)	(-1.50)	(-2.98)	(1.04)
Share	0.042*	0.026*	-0.004	0.056**	0.018	0.028
	(1.67)	(1.72)	(-0.19)	(2.20)	(0.66)	(1.58)
Ana	0.014***	0.009***	0.014***	0.015***	0.014***	0.011***
	(3.37)	(3.43)	(4.31)	(3.59)	(3.26)	(3.79)
Year F.E.	YES	YES	YES	YES	YES	YES
Ind. F.E.	YES	YES	YES	YES	YES	YES
R2	20.00%	14.34%	22.71%	13.85%	24.09%	10.60%
Adj R2	19.11%	13.33%	21.86%	12.71%	23.07%	9.73%
N	2721	2564	2753	2294	2272	3013
F-value	11.077***	4.678***	9.296***	6.030***	11.278***	5.184***

Note: The t-statistics in parentheses are calculated using robust standard errors clustered at firm-level. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

[Insert Table 8 about here]

5.6.2 Product Similarity

In a competitive market, manufacturers with similar products can leverage synergies to enhance and develop new products, thus leveraging mergers to improve their differentiation relative to competitors (Hoberg and Phillips, 2010). Companies offering distinct products may leverage green innovation to attract new customer segments or create premium offerings. Thus, we believe that the marketing capability of companies with lower product similarity is more likely to enhance their innovation, thereby increasing their differentiation from competitors and leading to increased corporate profits. We divide our sample based on the level of product similarity and conduct sub-sample analysis. In light of Hoberg and Philips (2016), we construct product similarity based on firm pairwise similarity scores by analyzing the textual content of product descriptions in the annual reports of sample firms. Specifically, we form word vectors for each firm to compute continuous measures of product similarity for each pair of firms in our sample annually, based on the BERT model. We directly embed the expression vector into the words generated for the text. Based on the sentence vector, we calculate product similarity using the cosine similarity method.

As shown in Columns (3) and (4) of Table 8, the coefficient of the interaction term *Green×MC* in Column (4) is significantly positive (*t-statistic* = 4.42), consistent with our previous prediction and supports the hypothesis H2a. That is, the marketing ability has a more pronounced effect in positively moderating the positive impact of green innovation on corporate value.

5.6.3 Agency Cost

In firms with high agency costs, managers are more likely to prioritize short-term financial benefits or personal interests over long-term investments, such as green innovation activities. Zhang et al. (2023) find that green investment promotes the development of green innovation by reducing agency costs. Firms with high agency costs have larger communication gaps between stakeholders, making it harder to demonstrate the impact of green innovation on the green value of firms, thereby reducing the incentive to invest in such projects. With low agency costs, companies are more likely to adopt green innovations proactively, leveraging them as a competitive advantage to attract environmentally conscious consumers. At the same time, stakeholders can gain a comprehensive understanding of the risks and benefits of corporate green innovation, thereby reducing the negative impact of potential innovation failures and curbing short-term opportunistic behavior by management, ultimately improving corporate governance (Huang et al., 2019).

Therefore, we believe that companies with low agency problems are more likely to utilize marketing capabilities to mitigate agency friction and are more likely to make green investments to facilitate green innovation development, ultimately generating green income. As shown in Columns (5) and (6) of Table 8, the coefficient of the interaction term *Green×MC* in low group is significantly positive (*t-statistic* = 5.28), indicating that when the agency cost is lower, the moderating effect of marketing ability is stronger, which enhances the positive impact of green innovation on corporate value.

5.6.4 Regional Marketization

From a macro-level perspective, the level of regional marketization can significantly influence the relationship between green innovation and green revenue, as marketization shapes the institutional and economic environment in which firms operate. Firms located in high-level marketized regions are more likely to benefit from more competitive markets where green innovation can attract more customers. In contrast, it's relatively harder for their counterparts in low-level marketized regions to find profitable markets for green products.

Prior literature has found that marketization can enhance the impact of industrial synergy on green innovation; thus, a more effective market system can foster a favorable environment for production and business, reduce market transaction costs, and promote green innovation (Zeng et al., 2021). As product and factor markets improve and the legal system becomes more effective, these factors collectively help make resource allocation more efficient and enhance technology. The development of market organizations and the legal system also has an essential role in this process.

According to Fan et al. (2011), China's market reforms involve economic, social, and legal changes. The 30 + years of reform provide valuable conditions for analyzing the impacts of innovation. Therefore, building on this and their *Marketization Index*, we incorporate two key indicators: (1) the development of factor markets; (2) the development of market intermediaries and the legal system environment. We do sub-sample analyses that match the specific features of China's marketization process, and Table 9 presents the results.

Table 9
Heterogeneity Tests: external economic environment

	Development of Factor Market		Development of Market Intermediaries and the Legal System Environment	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
Intercept	-6.379***	-1.874**	-5.340***	-2.417***
	(-6.60)	(-2.54)	(-5.53)	(-3.29)
Green	-2.384***	-0.329	-2.435***	-0.268
	(-4.46)	(-0.28)	(-4.27)	(-0.24)
Green×MC	0.059***	0.009	0.060***	0.008
	(4.49)	(0.33)	(4.30)	(0.29)
MC	0.135***	0.044***	0.114***	0.055***
	(6.98)	(3.03)	(5.93)	(3.79)
Size	0.051***	0.011*	0.043***	0.016**
	(6.24)	(1.71)	(5.27)	(2.48)
Lev	0.069	0.068	0.010	0.109*
	(1.27)	(1.20)	(0.22)	(1.80)
R&D	-0.376*	0.011	-0.408*	0.098
	(-1.89)	(0.06)	(-1.95)	(0.54)
Growth	0.004	< 0.001	0.004	-0.001
	(1.55)	(0.04)	(1.60)	(-0.25)
ROA	-0.100	0.010	-0.149**	0.019
	(-1.46)	(0.17)	(-2.20)	(0.33)
Age	-0.026*	0.031**	-0.016	0.017
	(-1.73)	(2.32)	(-1.00)	(1.42)
SOE	-0.020**	< 0.001	-0.012	-0.008
	(-2.26)	(-0.07)	(-1.34)	(-1.15)
Share	0.032	0.013	-0.009	0.048**
	(1.20)	(0.62)	(-0.37)	(2.02)
Ana	0.007*	0.012***	0.012***	0.010***
	(1.83)	(3.39)	(2.76)	(2.69)
Year F.E.	YES	YES	YES	YES
Ind. F.E.	YES	YES	YES	YES
R2	17.21%	16.37%	16.73%	15.76%
Adj R2	16.02%	15.38%	15.55%	14.75%
N	2122	2577	2146	2553
F-value	6.155***	6.957***	6.506***	7.028***

Note: The t-statistics in parentheses are calculated using robust standard errors clustered at firm-level. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

[Insert Table 9 about here]

Furthermore, marketing capability demonstrates a firm's ability to utilize its resources effectively. Thus, we believe that when the product market and factor market are more developed, and market organizations and the legal system are more effective, firms are more likely to enhance their marketing capabilities to increase innovation efficiency and output. As shown in Table 9, Columns (1) and (2) show the sub-sample analysis result based on the level of development of factor markets, and Columns (3) and (4) show the results based on the level of development of market intermediaries and legal environment. The coefficients of *Green×MC* in Columns (1) and (3) are all significantly positive (*t-statistic* = 4.49; 4.30), consistent with hypothesis H2a and indicate that when the development of factor market is higher, or when the development of market intermediaries organizations and the legal system environment is higher, the moderating effect of marketing capability is more pronounced on the positive impact of green innovation on corporate green income.

5.6.5 Regional Innovation Capability

Regions with high innovation capability tend to have better infrastructure, research institutions, skilled labour, and access to capital. These factors provide firms with the resources and expertise needed to develop and implement green innovations effectively. As a result, green innovations are more likely to succeed and generate higher green revenue. Referring to *the China Regional Innovation Capability Report*, we utilize regional innovation capability for sub-sample analysis. In regions with strong innovation capability, firms can more quickly adopt new green technologies and processes. These regions often have more robust networks for knowledge sharing and collaboration, enabling firms to innovate faster and more efficiently, which in turn leads to increased green revenue. Thus, we believe that firms with superior marketing capabilities can increase their revenue through innovation. Columns (1) and (2) of Table 10 show the results.

Table 10
Heterogeneity Tests: external innovation environment

	Regional Innovation Capability		Patent Infringement	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
Intercept	-6.471***	-2.167***	-4.877***	-2.137***
	(-6.27)	(-3.03)	(-5.25)	(-3.04)
Green	-2.318***	-0.429	-0.434	-1.135***
	(-4.36)	(-0.37)	(-0.87)	(-4.76)
Green×MC	0.057***	0.012	0.012	0.028***
	(4.41)	(0.42)	(0.98)	(4.86)
MC	0.138***	0.049***	0.106***	0.051***
	(6.67)	(3.48)	(5.82)	(3.54)
Size	0.050***	0.014**	0.027***	0.015***
	(5.70)	(2.30)	(3.37)	(2.70)
Lev	0.064	0.063	0.040	0.113**
	(1.10)	(1.19)	(0.75)	(1.99)
R&D	-0.273	-0.131	-0.444**	-0.256
	(-1.30)	(-0.76)	(-1.96)	(-1.60)
Growth	0.005	< 0.001	0.002	0.003
	(1.59)	(0.03)	(0.62)	(1.27)
ROA	-0.148*	0.024	-0.140**	0.073
	(-1.92)	(0.44)	(-2.29)	(1.18)
Age	-0.028*	0.033**	0.014	-0.007
	(-1.84)	(2.53)	(0.97)	(-0.58)
SOE	-0.023**	0.003	-0.009	-0.003
	(-2.55)	(0.46)	(-1.22)	(-0.45)
Share	0.046*	0.007	0.029	0.016
	(1.65)	(0.32)	(1.20)	(0.77)
Ana	0.007	0.013***	0.010***	0.010***
	(1.58)	(3.94)	(2.60)	(2.88)
Year F.E.	YES	YES	YES	YES
Ind. F.E.	YES	YES	YES	YES
R2	17.55%	16.80%	18.33%	21.85%
Adj R2	16.27%	15.87%	17.31%	20.84%
N	1966	2733	2353	2346
F-value	5.877***	7.121***	7.747***	7.400***

Note: The t-statistics in parentheses are calculated using robust standard errors clustered at firm-level. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% levels, respectively.

The coefficient of the interaction term *Green×MC* in Column (1) is significantly positive, which is consistent with the hypothesis H2a and indicates that when the regional innovation capability is stronger, the moderating effect of marketing capability is stronger, which enhances the positive impact of green

innovation on green income.

[Insert Table 10 about here]

5.6.6 Regional Patent Infringement[3]

From the macro-level of a firm's operating environment, the level of regional patent infringement can influence the relationship between green innovation and green revenue by affecting how firms innovate, protect their intellectual property (IP), and commercialize their green technologies.

This paper uses the number of patent infringement cases closed for the sub-sample analysis. Since it is often hard to guarantee patent exclusivity, this can lead to the risk of knowledge spillovers and patent infringements. These issues may negatively affect the research and development investment of firms. Thus, it is crucial to improve intellectual property protection and support the long-term growth of innovation activities.

Protecting intellectual property will encourage firms to innovate (Fang et al., 2017). Based on Ang et al. (2014) and Fang et al. (2017), we believe that the higher the rate of patent protection, the better the intellectual property protection in a region. That is, if a region has many patent disputes, the number of patent disputes in that region will also be higher. However, if there are fewer patent disputes, it means the intellectual property protection is stronger. Firms in such regions may have more time and resources to focus on improving their marketing capabilities. Columns (3)–(4) present the sub-sample analysis results.

As shown in Columns (3) and (4) of Table 10, the coefficient of the interaction term *Green×MC* in low infringement group is significantly positive (*t-statistic* = 4.86) while insignificant in high group, which is consistent with hypothesis H2a and indicates that when the number of patent infringement cases is fewer in the firm's region, the positive moderating effect of marketing ability is more announced.

Conclusion

Within the context of contemporary global imperatives for green development, this study examines how corporate green innovation contributes to enhanced firm value, with a specific focus on the mechanism of customer value creation. Using data from Chinese A-share listed companies from 2010 to 2020, we develop a theoretical framework that integrates stakeholder theory and agency theory to investigate the relationship between green innovation and corporate value, and to analyze the underlying pathways.

The study shows that green innovation positively influences corporate value, with marketing capability positively moderating this relationship and highlighting new stakeholder theory's role in driving value creation. Further, heterogeneity analyses reveal nuanced variations in the moderating effect of marketing capability. The effect is more pronounced at the firm level when firms have more board members with environmental backgrounds, lower product similarity, and reduced agency costs. At the regional level, stronger factor markets, robust market intermediary institutions, a developed legal system, higher regional innovation capacity, and fewer instances of patent infringement all contribute to the moderating effect of marketing capability, thereby enhancing the positive impact of green innovation on corporate value.

This research offers several contributions to the existing literature. First, the study introduces a novel approach by analyzing corporate value creation through the lens of green income share. Second, integrating resource-based theory with stakeholder theory under the new stakeholder theory illuminates key pathways that connect green innovation to corporate value. Third, the study balances shareholder value maximization with broader stakeholder interests, offering insights into achieving shared value creation for firms.

Overall, this study offers a comprehensive framework for understanding how green innovation influences corporate value, providing theoretical and practical insights. It contributes to the growing body of research on green innovation and value creation while offering strategic guidance for policymakers and managers in navigating the transition to sustainable business practices.

Declarations

INFORMED CONSENT:

This article does not contain any studies with human participants performed by any of the authors.

COMPETING INTERESTS:

The authors declare they have no competing interests.

FUNDING DECLARATION: Details of funding sources have been removed from this version of the manuscript to preserve anonymity during the peer-review process. This information will be added to the final manuscript upon acceptance.

Author Contribution

Y.L.: conceptualization and methodology, investigation. Z.L.: formal analysis, validation, and writing the first-round draft. W.H.: data collection and preparation, investigation, resources, review, and revising.

Acknowledgement

We gratefully acknowledge the constructive feedback from discussants and participants at two conferences: the 7th International Conference on Accounting and Finance in Emerging Markets (Nanjing University of Finance and Economics, October 16th, 2024), and the Self-reliance and Self-improvement of High-level Science and Technology and New Productivity Conference (South China University of Technology, May 18th, 2024). We are particularly honored that this paper received the Best Paper Award at the latter conference and thank the organizers for this recognition. This research was funded by the Jilin Provincial Social Science Fund (Grant No. 2025B46), and the Chunhui Project Foundation of the Ministry of Education of China (Grant No. HZKY20220373).

Data Availability

Data sharing is not applicable to this article as no new data was created or analyzed in this study. All data are sourced from publicly available materials cited within the text.

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Footnotes

1. Reuters. (2025, January 3). Ford’s U.S. sales rise 4.2% in 2024. https://www.reuters.com/business/autos-transportation/fords-us-sales-rise-42-2024-2025-01-03/
2. As an alternative measure, *Green1* incorporates jointly obtained green patents; results based on *Green1* are reported in the Supplementary Information.
3. The panel data of patent infringement cases in 31 provinces and municipalities directly under the Central Government come from China National Intellectual Property Administration.

Figures

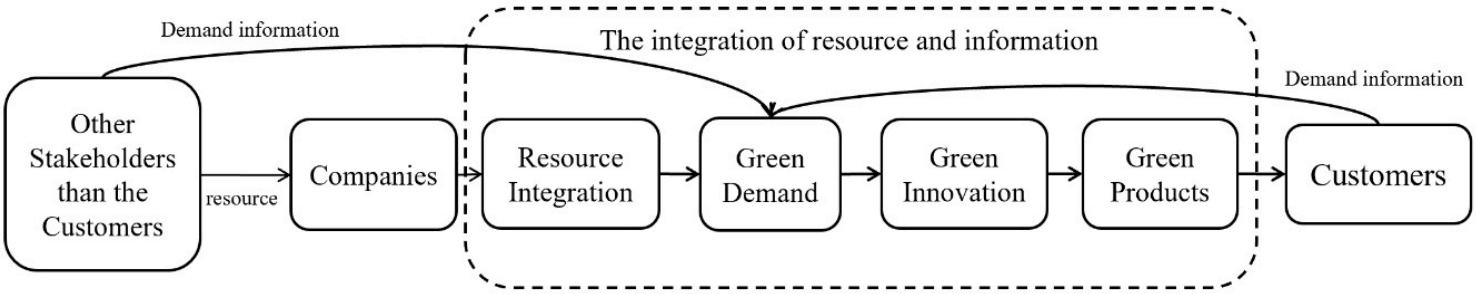


Figure 1

Corporate Information, Resource Integration, and Green Products

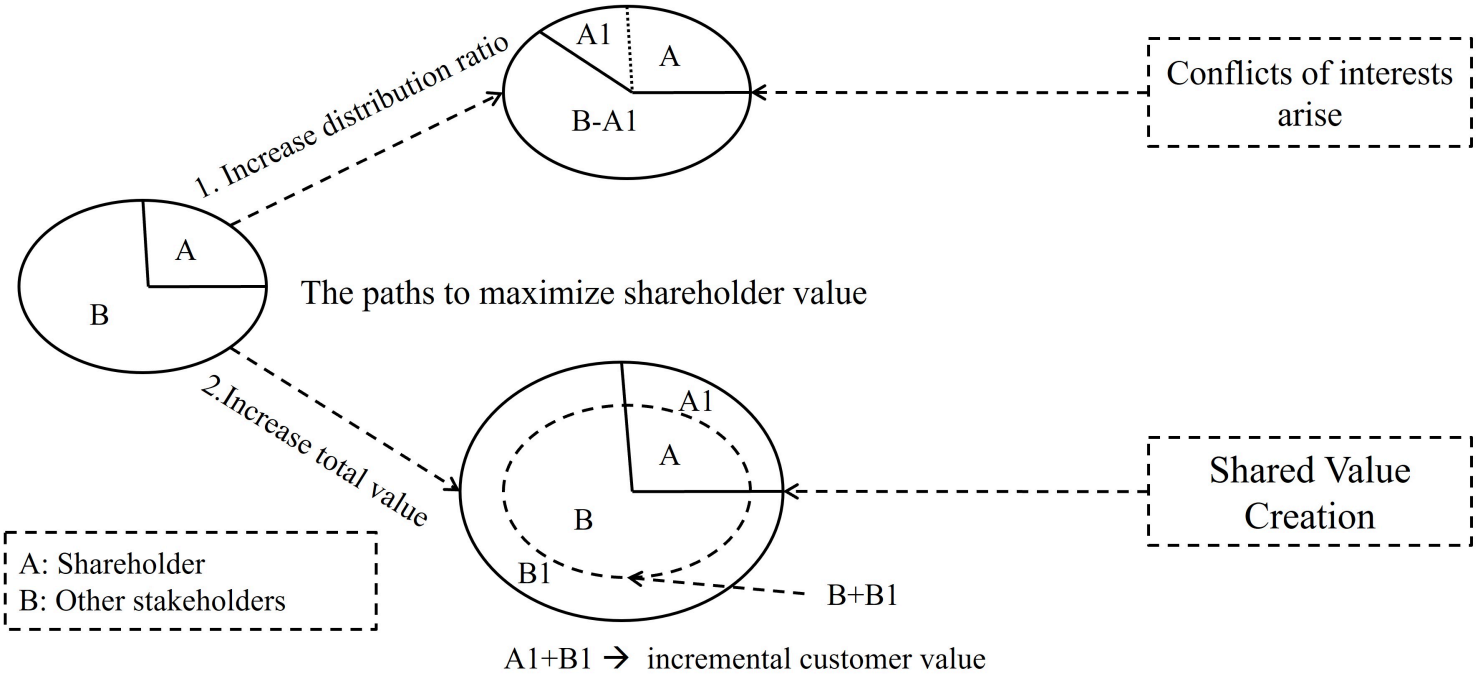


Figure 2

Conflict of Interests, Customer value, and Shared Value Creation

Supplementary Files

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- SupplementarydocumentHSSC.docx