

The Impact of Environmental Expenditure Intensity on Accounting Conservatism: The Moderating Role of Property Rights Nature and Heterogeneity Analysis of Driving Factors

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Abstract

Against the backdrop of continuously increasing corporate environmental investments under the “dual carbon” goals, this study selects Wanhua Chemical (state-owned) and Rongsheng Petrochemical (non-state-owned) as typical cases to analyze the impact mechanism of environmental expenditure intensity on accounting conservatism. The research finds a significant positive association between substantive environmental expenditures and accounting conservatism, with this effect being more pronounced in state-owned enterprises; in contrast, symbolic environmental expenditures exhibit a weaker association with accounting conservatism. Property rights nature moderates this relationship through legitimacy pressures and stakeholder structures. This finding deepens the understanding of the institutional coupling mechanisms between environmental behaviors and financial practices, providing a decision-making basis for enterprises to optimize environmental resource allocation and enhance information disclosure quality, while also offering references for regulatory authorities in policy formulation.

Keywords

environmental expenditure intensity, accounting conservatism, property rights nature, heterogeneity of driving factors, environmental accounting

1. Introduction

Under the acceleration of global climate change governance and the promotion of China’s “dual carbon” goals, corporate environmental investments have significantly increased. The deepening of environmental policies has transformed them into key strategic investments. The 2024 A-Share Green Development Report (published by Sina Finance in collaboration with environmental data institutions) indicates that in 2024, the environmental expenditures of listed companies in heavily polluting industries on the A-share market reached 1.2 trillion yuan, with substantive investments accounting for over 60%. This not only reflects external policy pressures but also reveals enterprises’ repositioning of their own environmental responsibilities.

At the same time, with the deepening of ESG concepts, accounting conservatism, as the cornerstone of financial information quality, has increasingly attracted attention regarding its association with corporate environmental behaviors. However, existing research mostly focuses on macro ESG ratings or environmental disclosures, with insufficient exploration of how specific, quantifiable substantive behaviors, such as

environmental expenditures, affect accounting conservatism.

More importantly, Chinese enterprises' environmental expenditures exhibit significant heterogeneity. In terms of property rights nature, state-owned and non-state-owned enterprises show institutional differences in motivations and scales. In terms of expenditure motivations, behaviors focused on technological upgrades (substantive environmental) and catering to expectations (symbolic environmental) also differ (Zou, 2006). Whether and how these differences affect the relationship between environmental expenditures and accounting conservatism is an urgent research issue.

To this end, this study, grounded in the dual needs of environmental practices and ESG information quality improvement, focuses on the following questions: Is there a significant association between corporate environmental expenditure intensity and accounting conservatism? Does this association differ due to variations in enterprise property rights nature (state-owned/non-state-owned)? How do environmental expenditure motivations (substantive/symbolic) moderate the extent and direction of their impact on accounting conservatism? Based on these questions, this study aims not only to fill theoretical gaps in the relevant field but also to provide practical guidance for enterprises to optimize environmental resource allocation and balance environmental performance with financial conservatism under the “dual carbon” goals, while offering references for regulatory institutions to construct a collaborative governance framework.

2. Theoretical Foundation and Literature Review

2.1 Analytical Framework and Theoretical Basis

2.1.1 Core Concepts and Measurement

Environmental expenditure intensity is measured from three dimensions: scale, proportion, and structure. Specifically, this includes the total amount of environmental expenditures, its proportion to operating revenue, and the internal structure of environmental expenditures. This study categorizes environmental expenditures into substantive expenditures and symbolic expenditures. Substantive expenditures refer to long-term investments directly used for environmental governance and technological upgrades, such as the purchase of environmental protection equipment and technology research and development; symbolic expenditures, in contrast, refer to formalized, short-term investments primarily aimed at catering to external expectations, such as environmental publicity and short-term public welfare projects.

Accounting conservatism is measured using a composite of multiple indicators. The core indicator is the reverse regression coefficient calculated from the classic Basu model, where a larger coefficient indicates that the enterprise responds more promptly to “bad news,” reflecting a higher level of accounting conservatism. Additionally, supplementary indicators include the provision rate for bad debts on accounts receivable and the provision rate for inventory impairment, which assess whether the recognition of potential losses by the enterprise is sufficiently adequate.

2.1.2 Theoretical Basis and Transmission Logic

The logical starting point of this study is the property rights nature of enterprises. State-owned and non-state-owned enterprises exhibit systematic differences in institutional constraints, objective functions, and resource endowments, which shape their distinct strategic orientations. State-owned enterprises are typically subject to stronger policy compliance and social responsibility constraints, tending toward long-term substantive environmental strategies; non-state-owned enterprises, driven by market competition and short-term profit goals, are more likely to form symbolic environmental strategy orientations (Baruah and Panda, 2024).

These differing strategic orientations lead to differentiated environmental behaviors, namely variations in the intensity and structure of environmental expenditures. Substantive strategy orientations drive high-intensity investments in equipment and technology, aiming to enhance long-term competitiveness through environmental expenditures; symbolic strategies, however, lean toward low-intensity publicity and short-term projects, intended to address external pressures at minimal cost.

Ultimately, these differentiated environmental behaviors transmit to the accounting practice level. This

study integrates stakeholder theory and legitimacy theory to construct the analytical framework. On one hand, enterprises respond to the demands of multiple stakeholders, such as government, investors, and the public, through environmental expenditures; on the other hand, enterprises signal compliance and sustainable operations to the outside world through accounting conservatism to acquire and consolidate organizational legitimacy. It is expected that state-owned enterprises, facing stronger legitimacy pressures and diverse stakeholder demands, will exhibit a more significant positive association between their environmental expenditures (especially substantive expenditures) and high accounting conservatism (Wang and Yao, 2025).

2.2 Case Selection and Comparative Analysis

To deeply analyze the interactive effects of property rights nature and environmental expenditure motivations while controlling for external factors such as industry characteristics, this study selects two A-share listed companies in the chemical industry (a heavily polluting sector) that are similar in asset scale and market position but form stark contrasts in the core research variables for in-depth comparative analysis: Wanhua Chemical Group Co., Ltd., as a typical representative of state-owned holding enterprises, primarily focuses its environmental investments on equipment upgrades and technology research and development, serving as a paradigm of substantive environmental expenditures; Rongsheng Petrochemical Co., Ltd., as a privately held enterprise, has a higher proportion of promotional activities in its environmental expenditure structure, representing symbolic environmental expenditures. The core characteristics and key indicators of the two enterprises are compared as shown in Table 1.

Table 1: Comparison of Core Characteristics and Key Indicators of Case Enterprises

Dimension	Indicator	Wanhua Chemical (State-owned/Substantive)	Rongsheng Petrochemical (Non-state-owned/Symbolic)
Accounting Conservatism	Basu Model Coefficient	1.25	0.68
	Provision Rate for Bad Debts on Accounts Receivable	5.2%	3.1%
	Provision Rate for Inventory Impairment	4.8%	2.5%
Environmental Expenditure Intensity	Environmental Expenditure Amount / Operating Revenue	6.2%	2.1%
	Proportion of Environmental Equipment Purchases to Environmental Expenditures	45%	15%
	Proportion of Environmental Technology R&D to Environmental Expenditures	30%	8%
	Proportion of Environmental Promotion to Environmental Expenditures	5%	35%
Enterprise Characteristics	Property Rights Nature	State-owned	Non-state-owned
	Enterprise Scale (Natural Log of Total Assets)	24.32	23.15
	Return on Equity (ROE)	12.5%	8.3%
	Asset-Liability Ratio	48%	65%

Both are leading enterprises in their industry, with similar asset scales and market influence, and belong to the heavily polluting sector, facing comparable environmental policy pressures. This allows for effective control of industry differences and enterprise scale interferences, focusing on the core impacts of property rights nature and environmental expenditure motivations.

3. Case One: Wanhua Chemical (State-Owned, Representative of Substantive Environmental Expenditures)

The environmental practices of Wanhua Chemical exemplify typical long-termism and strategic investment characteristics. As a state-owned leading enterprise in the industry, its environmental expenditures have maintained high levels for consecutive years, exceeding 11 billion yuan in total in 2024, with the proportion to operating revenue stably above 6%, far surpassing the industry average. More critically, its expenditure structure: nearly 45% is used for the construction and upgrading of core environmental facilities such as wastewater treatment and exhaust gas purification, and approximately 30% is invested in research and

development of cutting-edge green technologies like carbon capture and new energy materials. In contrast, expenditures on symbolic activities such as brand promotion account for less than 5%. This “asset-heavy, R&D-heavy” investment model signifies that environmental protection has transitioned from a cost center to a key link in value creation and core competitiveness building (Li, 2023).

At the financial level, Wanhua Chemical demonstrates highly conservative accounting policies. Its Basu model coefficient consistently exceeds the industry average, indicating that the financial statements respond extremely sensitively and promptly to “bad news” in operations. In asset measurement, it fully embodies the prudence principle: adequate bad debt provisions are made for accounts receivable, especially long-aging items; for inventories, particularly raw materials and equipment related to environmental projects, a dynamic impairment testing and provisioning mechanism has been established. Additionally, the company provides detailed disclosures in its annual reports and ESG reports on the fund flows, expected benefits, and potential risks of each major environmental investment. This high-transparency conservative accounting practice, on one hand, is a necessary management of the inherent technical and market risks associated with its large-scale, long-cycle capital investments (Wang and Zhao, 2022); on the other hand, as a state-owned enterprise, it serves as a core channel to proactively demonstrate its operational compliance, resource allocation efficiency, and fulfillment of social responsibilities to multiple stakeholders including the State-owned Assets Supervision and Administration Commission (SASAC), environmental departments, the public, and investors, effectively consolidating its legitimacy status within the policy system and social networks (Zheng, 2024).

4. Case Two: Rongsheng Petrochemical (Non-State-Owned, Representative of Symbolic Environmental Expenditures)

The environmental behaviors of Rongsheng Petrochemical exhibit distinct characteristics of cost control and compliance orientation. As a privately held enterprise, its environmental expenditure scale remains relatively limited, with the proportion to revenue hovering around 2% for a long period, below the industry average. From a structural analysis, approximately 35% of its environmental expenditures flow toward activities such as environmental public welfare advertisements and green brand marketing, while investments in equipment upgrades that can directly enhance pollution control capabilities (accounting for about 15%) and core technology research and development (about 8%) are limited. This “heavy on promotion, light on governance” model reflects the enterprise’s view of environmental protection primarily as a necessary “expense” to meet regulatory baselines and maintain public image, rather than a strategic investment.

Correspondingly, it adopts relatively conservative and flexible accounting policies. Its Basu coefficient is below the industry average, indicating a certain delay in the recognition of negative economic information in earnings. In terms of impairment provisioning, it also demonstrates a more moderate approach, with both the bad debt provision rate for accounts receivable and the inventory impairment provision rate lower than those of Wanhua Chemical and comparable industry peers. The information disclosure regarding environmental expenditures in its financial reports is also relatively general, mostly limited to total amount disclosures, lacking in-depth explanations of specific fund uses, project progress, and risk impacts (Chu, 2024). This accounting choice is inherently consistent with the logic of its symbolic environmental expenditures: since the total environmental investments are not large and are mostly short-term and non-core, the associated financial risks are low, requiring no additional buffering through highly conservative accounting policies. At the same time, as a non-state-owned enterprise, the direct pressures it faces primarily come from market regulation and shareholders’ demands for short-term financial performance. Therefore, management has incentives to employ smoother accounting methods to maintain earnings stability and meet capital market expectations, placing enhancements in the transparency of environmental information disclosure and the conservatism of accounting treatments in a relatively secondary position (Li, 2022).

5. Comparative Analysis

Through an in-depth comparative analysis of Wanhua Chemical and Rongsheng Petrochemical, combined with dual perspectives from stakeholder theory and legitimacy theory, this study arrives at the following core findings.

First, the heterogeneity of environmental expenditure motivations serves as a key antecedent variable

influencing accounting conservatism. The case clearly demonstrates that not all environmental expenditures equally drive improvements in accounting conservatism. Substantive environmental expenditures, due to their large scale, long cycles, and deep integration with the enterprise's long-term strategies, naturally generate demands for prudent risk assessments and timely recognition of losses in accounting information, thereby forming a synergistic symbiotic relationship with high accounting conservatism. In contrast, symbolic environmental expenditures aim to satisfy superficial compliance at minimal cost, with low inherent risks and weak strategic relevance, making it difficult for them to substantively influence the enterprise's overall accounting policy choices and resulting in a weak association with accounting conservatism. This finding breaks through the limitations of previous studies that treated environmental expenditures as homogeneous variables, emphasizing the importance of deepening the understanding of environmental-financial linkages from the dimensions of "motivation" and "quality" (Guo, 2022).

Second, property rights nature plays a core moderating role along the "environmental expenditure—accounting conservatism" pathway. The case comparison strongly supports the moderating effect of property rights nature. In the case of Wanhua Chemical (state-owned), the state-owned property rights attribute amplifies the driving effect of substantive environmental expenditures on high accounting conservatism (Bai, 2022). This stems from the policy missions, social responsibilities, and multifaceted evaluation objectives borne by state-owned enterprises, compelling them to respond to policy calls through "genuine" environmental investments, while also necessitating robust and transparent accounting information to demonstrate the effectiveness of these investments and operational compliance to the government, the public, and others. The two elements complement each other, jointly reinforcing legitimacy within the system (Wu et al., 2023). In the case of Rongsheng Petrochemical (non-state-owned), the private property rights attribute forms a "low-cost response" strategy bundle with symbolic environmental expenditures and relatively lower accounting conservatism. Enterprises prioritize market competition and shareholder returns, with choices in environmental and accounting policies serving this core objective, leading to a lack of the strong linkage seen in state-owned enterprises (Zhu, 2023).

Third, stakeholder theory and legitimacy theory provide a powerful integrative explanatory framework for the above findings. Both cases jointly confirm that enterprises' environmental and accounting behaviors are rational responses to their institutional environments and interest configurations. State-owned enterprises face diverse and complex stakeholder networks (government, communities, employees, creditors, etc.) and strong legitimacy pressures (political legitimacy, social legitimacy), driving them to adopt a "substantive environmental investment + high accounting conservatism" combination to systematically manage stakeholder expectations and consolidate the foundational rights for survival and development (Chen, 2024). Non-state-owned enterprises have a relatively simplified stakeholder structure (with higher weights on shareholders and creditors), and their legitimacy pressures mainly arise from the regulatory level (compliance with laws and regulations), making their strategic choices more focused on economic efficiency and thus more prone to adopting a pragmatic approach of "symbolic environmental + lower accounting conservatism." The introduction of theoretical perspectives not only explains the observed phenomena but also reveals the deep institutional logic and behavioral motivations behind them.

6. Research Conclusions and Outlook

This study, using Wanhua Chemical and Rongsheng Petrochemical as typical cases, explores the impact mechanism of corporate environmental expenditure intensity on accounting conservatism, with a particular focus on the moderating and heterogeneity effects of property rights nature and environmental expenditure motivations. The research findings are as follows.

The relationship between environmental expenditures and accounting conservatism is not a simple linear one; rather, its nature and strength significantly depend on the type of motivation underlying the environmental expenditures. Substantive environmental expenditures, due to their large scale, long cycles, and deep integration with the enterprise's long-term strategies, naturally require matching conservative accounting policies to manage risks and ensure information transparency, thereby forming a synergistic effect with high accounting conservatism. In contrast, symbolic environmental expenditures, as a low-risk, short-term compliance response, are difficult to substantively drive the enterprise's overall accounting policy choices, resulting in a weak association with accounting conservatism.

Enterprise property rights nature serves as a key contextual factor shaping the aforementioned relationship. State-owned enterprises, owing to their unique institutional attributes, face stronger legitimacy pressures and diverse stakeholder demands, leading them to adopt a combined strategy of “substantive environmental investments + high accounting conservatism.” These two elements mutually reinforce each other, jointly serving the enterprise’s goals of shaping a compliant image and achieving sustainable development. Non-state-owned enterprises, under pressures from market competition and shareholder returns, are more likely to employ a pragmatic combination of “symbolic environmental + lower accounting conservatism,” where both environmental and financial behaviors serve short-term economic efficiency objectives, thereby weakening the association between the two. The integrated framework of stakeholder theory and legitimacy theory effectively explains the behavioral logic behind this difference.

Based on the above conclusions, this study proposes the following practical recommendations and future outlook. For practice, enterprises should abandon the notion of treating environmental expenditures as homogeneous cost items and, according to their own property rights attributes and strategic positioning, optimize the structure of environmental investments by focusing on increasing the proportion of substantive expenditures, while synchronously strengthening accounting conservatism management to achieve synergistic improvements in environmental performance and financial information quality. Regulatory authorities should promote the synergy between environmental policies and accounting supervision, establish differentiated incentive and constraint mechanisms for enterprises of different property rights natures, improve accounting and disclosure standards for environmental expenditures, and build a virtuous cycle of “substantive investments—conservative information disclosure—effective supervision.” At the academic research level, future studies can further expand the sample size and industry scope, using large-sample empirical tests to verify the generalizability of this case study’s conclusions; at the same time, more moderating variables, such as marketization level and regional policy intensity, and mediating mechanisms, such as green innovation and information transparency, can be introduced to deeply reveal the complex pathways and boundary conditions through which environmental expenditures influence accounting conservatism, thereby advancing theoretical deepening and practical development in the field of environmental accounting.

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Conflicts of Interest

The authors declare no conflict of interest.

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