Bridging Green Transition and Economic Growth: The Role of Fiscal Policies in Reducing Corporate Green Premiums in China

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Abstract

This study investigates the compensation mechanism for green premiums in high-carbon industries within emerging economies, leveraging panel data from Chinese listed companies from 2008 to 2017 and employing a staggered difference-in-differences (DID) approach to evaluate the policy effects of the Energy Conservation and Emissions Reduction Fiscal Comprehensive Demonstration Cities. Key contributions include: (1) Mechanistic insights: Green fiscal policies effectively compensate corporate green premiums through three channels: alleviating urban fiscal pressure, enhancing government governance capacity, and strengthening environmental regulations, thereby facilitating low-carbon transformation in high-carbon industries. (2) Heterogeneity analysis: The compensation effects are more pronounced in firms with high internal control quality, heavily polluting enterprises, and those located in central regions. By contrast, weaker effects are observed in eastern regions, and no significant impact is detected in western regions. These findings suggest that governments should emphasize green fiscal development, provide policy recommendations for policy implementation, and offer new perspectives for achieving climate goals.

Keywords: Green Fiscal Policy; Corporate Green Premium Compensation; Energy Conservation and Emissions Reduction; Staggered DID; Dynamic Exit

1. Introduction

The green economy is viewed as a solution to the global triple crisis and the achievement of sustainable development (Brown et al., 2016). Emerging economies, particularly those undergoing rapid socio-economic development, face significant environmental challenges that complicate their transition toward a more sustainable future. These nations must reconcile the demands of economic growth with the urgent need for environmental protection, navigating a delicate balance that requires innovation, effective governance, and substantial investments in green technologies.

As of 2022, 136 countries have explicitly committed to carbon neutrality goals, and the European Union has also outlined a vision for achieving net-zero greenhouse gas emissions by 2050 through the European Climate Law (Chen et al., 2023). Developed countries, which have largely entered post-industrial societies, carbon reduction efforts primarily rely on total control approaches. For instance, Europe emphasizes the trading of carbon credits across sectors, while the United States focuses on responsible investment, Environmental, Social, and Governance (ESG) practices, green supply chains, and green infrastructure investments (Wood et al., 2020). In contrast ,emerging economies face unique challenges as they attempt to balance energy-intensive industrial growth with environmental sustainability. The green transition in these regions involves not only energy sector transformation but also the restructuring of governance frameworks. As such, emerging economies, including China, are exploring green transformation pathways that minimize structural frictions while achieving parallel progress in energy conservation, environmental protection, and economic development.

China, as the world’s second-largest economy, faces particular tensions between economic growth and environmental protection. The country’s rapid industrialization has been largely fueled by high-carbon industries such as steel, cement, and coal, which significantly contribute to carbon emissions (Qi et al., 2023). While China has committed to achieving its "dual carbon" goals—carbon peaking by 2030 and carbon neutrality by 2060—this goal hinges on transforming its high-carbon sectors. However, the practical challenge lies in China’s insufficient innovation capacity, weak industrial foundation, and low input-output efficiency, which make the adoption of clean energy costly for companies. This results in a reluctance to transition to greener technologies. How to address the cost premiums that companies face during their transformation and effectively guide capital flows into green enterprises is a crucial issue for China’s "dual carbon" goal.

Gates first first introduced the concept of green premium in 2021, defining it as "the extra amount that we need to pay for zero-carbon substitutes for existing products" (Gates, 2021). The connotation of green premium carries different meanings across various fields. Research on industrial green premiums has primarily focused on financial derivatives and consumer behavior regarding green products or services, establishing the foundation for corporate green premium compensation. However, expansion and deepening are still needed in several aspects: First, existing research on corporate green premium compensation mainly emphasizes market transactions and green consumption, while neglecting the role of government as a critical driver. Second, the effectiveness and mechanisms of green fiscal policies in achieving corporate green premium compensation remain insufficiently understood.Third, current studies on green fiscal policies tend to focus on the macro level, with limited attention to policy effectiveness and operational dynamics at the micro level.

Therefore, the contributions of this paper are as follows: (1) Through a review of existing literature, this paper clarifies that green premium compensation is a carbon reduction support tool, and the green premium relevant to this study refers to "the additional costs paid by energy-intensive enterprises for energy conservation, emissions reduction, and environmental protection." This helps to enrich the theoretical framework of high-carbon enterprise transformation and green premium mechanisms. Furthermore, the literature review provides a clearer understanding of the green premium issue and identifies new perspectives for addressing it. It examines how corporate green premium compensation can be achieved from a governmental perspective. Fiscal policy is a crucial component of public policy in addressing climate change and environmental pollution (Yan et al., 2023). It can fulfill the supply function of public goods, overcome the negative externalities of pollution, and undertake effective provision for environmental protection.

(2) Existing literature on corporate green transformation primarily has primarily concentrated on enhancing green innovation levels (Sun et al., 2023; Amore et al., 2016), while neglecting research on companies' underlying motivations. Companies are profit-driven (Braun, 2019), and the social value created by traditional entrepreneurs is a byproduct of economic value (Diochon et al., 2011). Although environmental regulations can constrain corporate behavior and force companies to pursue green innovation (Li et al., 2023), directly compensating companies for their additional costs is undoubtedly the most direct and effective incentive method. The government can fully utilize fiscal governance and allocation functions to effectively guide capital flow into green development enterprises and alleviate funding constraints in corporate green transformation. Therefore, this paper focuses on the government's role in corporate green premium compensation and explores its effectiveness and mechanisms, aiming to enhance companies' motivation for carbon reduction and promote high-quality transformation and sustainable green development.

(3) This study investigates how green fiscal policies influence firms by identifying their transmission pathways and providing empirical evidence to inform corporate governance and fiscal policy design. While prior research has emphasized regional carbon reduction mechanisms (Runst et al., 2022; Kamal et al., 2021) and policy effectiveness (Khan et al., 2021; Wang et al., 2022), less attention has been given to firm-level effects and underlying channels. Focusing on green premium compensation, this paper examines the effectiveness of policy implementation and uses heterogeneity analysis to identify key influencing factors. It also highlights the feasibility of transformation paths tailored to national contexts in emerging economies and offers insights for global climate cooperation frameworks.It argues for the necessity and feasibility of emerging economies pursuing transformation paths suited to their national conditions, and provides a reference for global climate cooperation frameworks.

The remainder of this paper is structured as follows. Section 2 discusses the policy background and literature review; Section 3 outlines the research hypotheses, Section 4 describes the research design; Section 5 presents empirical analysis, and Section 6 provides conclusions and policy recommendations.

2. Policy Background and Literature Review

2.1 Policy Background

To relieve carbon reduction pressures and promote China’s high-quality transformation in energy conservation and emissions reduction, a joint policy was issued in 2011 by the Ministry of Finance and the National Development and Reform Commission, establishing comprehensive demonstration zones in eight cities including Beijing for a three-year pilot program. The policy aimed to promote the concept of green, circular, and low-carbon development through a combination of fiscal, taxation, financial, and administrative measures, while encouraging active participation from all sectors of society. The second and third batches of demonstration cities were announced in 2013 and 2014, bringing the total number of demonstration cities under the fiscal policy to 30, spanning 27 provinces, autonomous regions, and municipalities across China. These cities represent eastern, central, and western regions and vary significantly in urban scale, economic development, and resource endowments. The list of demonstration cities is presented in Figure 1.

Table 1: List of Demonstration Cities

Year	Pilot Cities	Number of Cities	Province/Municipality
2011 (First Batch)	Beijing, Chongqing, Hangzhou, Shenzhen, Guiyang, Jilin, Changsha, Xinyu	8	Beijing Municipality, Chongqing Municipality, Zhejiang Province, Guangdong Province, Guizhou Province, Jilin Province, Hunan Province, Jiangxi Province
2013 (Second Batch)	Shijiazhuang, Tangshan, Tieling, Qiqihar, Tongling, Nanping, Jingmen, Shaoguan, Dongguan, Tongchuan	10	Hebei Province, Liaoning Province, Heilongjiang Province, Anhui Province, Fujian Province, Hubei Province, Guangdong Province, Shaanxi Province
2014 (Third Batch)	Linfen, Baotou, Tianjin, Xuzhou, Liaocheng, Haidong, Hebi, Meizhou, Nanning, Deyang, Urumqi, Lanzhou	12	Shanxi Province, Inner Mongolia Autonomous Region, Tianjin Municipality, Jiangsu Province, Shandong Province, Qinghai Province, Henan Province, Guangxi Zhuang Autonomous Region, Sichuan Province, Xinjiang Uygur Autonomous Region, Gansu Province

2.2 Literature Review

2.2.1 Research on Green Premium

Most scholars agree that a green premium exists in the green bond market, meaning meaning that green bond yields are typically lower than those of conventional bonds (MacAskill et al., 2022; Hyun et al., 2020), often measured by the yield spread between matched green and conventional bonds. The emergence of green consumption preferences in the market provides high-emission producers with a "process emission reduction" method for self-reduction (Groening et al., 2018), where producing green products allows green consumers to share the emission reduction costs. In this context, the green premium refers to the additional amount consumers pay for green products, representing the portion exceeding the product's intrinsic value that is allocated to environmental purposes (Chekima et al., 2018). Empirical research by Roheim (2011) demonstrates that green consumers are indeed willing to pay for the environmental value of eco-friendly products, with the green premium ranging from approximately 5% to 25%.

2.2.2 The Mechanisms of Green Fiscal Policies in Compensating Corporate Green Premiums

From the perspective of green fiscal revenue, Runst et al. (2022) demonstrated that fossil fuel taxation in Germany's road transport sector effectively reduces CO_2 emissions. Expansionary fiscal policies, including increased public expenditure, have also been shown to lower emissions in G7 countries (Pata and Yilanci, 2021). Yu et al. (2021) reported that subsidies provide firms with sufficient financial capacity to upgrade green technologies, facilitating carbon reduction. However, Kamal et al. (2021) caution that fiscal policy may have unintended consequences, as increased spending and industrial upgrades can exacerbate environmental pollution through negative externalities. This suggests that the structure of fiscal expenditure is more critical than the overall scale in achieving emission reductions.

Government compensation for corporate green premiums primarily involves tax relief and direct subsidies. Fiscal and taxation policies serve as key economic regulation tools by influencing corporate research, development, and investment through tax incentives and subsidies, thereby fostering technological innovation and industrial upgrading (Chang et al., 2020). Tax preferences reduce the costs of green innovation by offering deductions on R&D expenditures, enhancing firms' incentives to develop new technologies (OECD, 2020). Among policy tools, fiscal subsidies provide the most direct financial support, effectively motivating heavily polluting enterprises to increase environmental protection investments and reduce emissions (Fang et al., 2021; Zhong et al., 2022).

2.2.3 The Effectiveness of Green Fiscal Policies in Compensating Corporate Green Premiums

Fiscal output efficiency varies regionally due to differences in fiscal development. Khan et al. (2021) showed that fiscal decentralization influences CO_2 emissions via institutional quality and human capital, indicating that green fiscal policies should be adapted to local economic conditions. Wu et al. (2021) demonstrated that a single fiscal system has limited effect on environmental governance, underscoring the importance of inclusive green growth strategies. Xu et al. (2023) found green finance effectively reduces urban carbon emissions while fostering economic growth. Yan et al. (2022) reported that enhanced environmental fiscal input and stricter regulations improve urban environments and public services, boosting residents' well-being.

Environmental protection subsidies significantly enhance corporate environmental performance and carbon reduction. Empirical evidence by Du et al. (2023) confirms a positive link between subsidies and corporate carbon outcomes. These subsidies ease financing constraints and promote R&D investment (Jiang et al., 2024), incentivizing firms to innovate and improve environmental outcomes (Bai et al., 2019). However, subsidies may also distort markets, causing resource overuse and environmental degradation (Kohn, 1991; Barde, 2000). Zhou (2017) highlighted that local protectionism exacerbates resource misallocation and reduces governance efficiency. Furthermore, Zhe et al. (2022) found subsidies can encourage symbolic compliance, resulting in inefficient resource allocation.

2.3 Research Hypotheses

2.3.1 Comprehensive Demonstration City Pilot Program and Corporate Green Premium Compensation

There exists a fundamental tension between economic growth and environmental protection. From a neoclassical economic perspective, environmental regulations—particularly those targeting high-carbon industries—tend to increase operating costs and conflict with firms' profit-maximization goals (Duan et al., 2025). In contrast, new institutional economics emphasizes the role of transaction costs, property rights, and institutional frameworks in shaping corporate decision-making. Under this logic, rational firms often lack sufficient incentives to invest in environmental governance, resulting in issues such as greenwashing, policy noncompliance, and resistance to transition (Zhang et al., 2021; Sheng et al., 2019).Full regulation raises compliance costs, while laissez-faire fails to address market failures. A balanced approach—using fiscal incentives and institutional design—can promote green transformation by aligning environmental objectives with firm interests and easing development constraints.

Facing the negative externalities of environmental pollution, the government should exercise its regulatory role by alleviating firms' operational pressure through fiscal resource allocation, thereby promoting corporate green development and enhancing resident well-being. Green fiscal policy implies that while conducting economic regulation, the government comprehensively considers environmental protection goals such as ecological protection, pollution control, and energy conservation and emissions reduction, with green fiscal revenue and expenditure as core operational elements (Wang et al., 2024). Comprehensive demonstration cities, with "energy conservation and emissions reduction" as their designated goal, aim to balance environmental and economic development through coordinated policy design and institutional arrangements. Fiscal tools such as subsidies, public investment, and policy support help reallocate resources toward green transformation, enhancing firms' incentives and facilitating industrial upgrading. Meanwhile, government-led development of carbon, emission, and energy-saving trading schemes attracts private investment and fosters a sustainable emissions reduction system, improving urban environmental and economic performance.Therefore, this paper **proposes Hypothesis H1.**

H1: Green fiscal policies can achieve corporate green premium compensation and incentivize enterprises to reduce carbon emissions.

2.3.2 Operating Mechanisms of Comprehensive Demonstration City Pilot Program in Achieving Corporate Green Premium Compensation

(1) Resource Allocation Channel

Fiscal policy functions as a key governmental instrument for resource allocation, exerting financing effects that support environmental governance (Kim et al., 2021). Under the demonstration city pilot program, participating cities receive dedicated funding from higher-level governments, which alleviates local fiscal pressure and boosts environmental expenditure. These subsidies help offset firms' costs related to clean energy adoption, green innovation, and pollution control, thereby incentivizing proactive carbon reduction. Additionally, demonstration cities are prioritized in the implementation of energy and environmental policies, reshaping resource allocation and reducing firms' access costs to green technologies and financing. Fiscal incentives also ease internal funding constraints, enabling enterprises to adjust production structures and achieve economies of scale. Moreover, preferential fiscal support sends positive market signals, attracting social capital toward low-carbon sectors and enhancing the competitiveness and reputation of green firms. Accordingly, this paper proposes **Hypothesis H2**.

H2: Energy conservation and emissions reduction fiscal policies can achieve corporate green premium compensation through alleviating fiscal pressure.

(2) Public Service Channel

Government compensation for corporate green premiums relies not only on resource optimization but also on enhanced government governance capacity. The construction of comprehensive demonstration cities establishes requirements for industrial structure transformation, energy efficiency, energy conservation and emissions reduction market mechanisms, and green ecological environment in demonstration cities, aiming to significantly enhance their sustainable development capacity.This presents challenges to local government efficiency and fiscal provision. The central government alleviates local fiscal pressure through preferential allocation of funds, resources, and policies, leading to expansion or efficiency improvements in local government public service expenditure. Simultaneously, through assessment and penalty mechanisms, it supervises and regulates government behavior, employing a dual approach to enhance fiscal capacity in public service provision, such as faster approval speeds, more detailed regulations, broader service coverage, and more abundant resources. Environmental protection subsidies, as important public goods, are characterized by strong externalities, long investment cycles, high risk, and low returns (Orsato , 2006), depending on fiscal arrangements and government governance capacity. The high attention, multiple requirements, and strict supervision of comprehensive demonstration pilots compel local governments to prioritize energy conservation, emissions reduction, and public welfare, reducing government inaction such as buckpassing and confusion. This improves government administrative efficiency, enhances governance levels, and increases public goods provision capacity , leading to the expansion of positive externalities Therefore, this paper **proposes Hypothesis H3.**

H3: Energy conservation and emissions reduction fiscal policies can achieve corporate green premium compensation through enhancing government governance capacity.

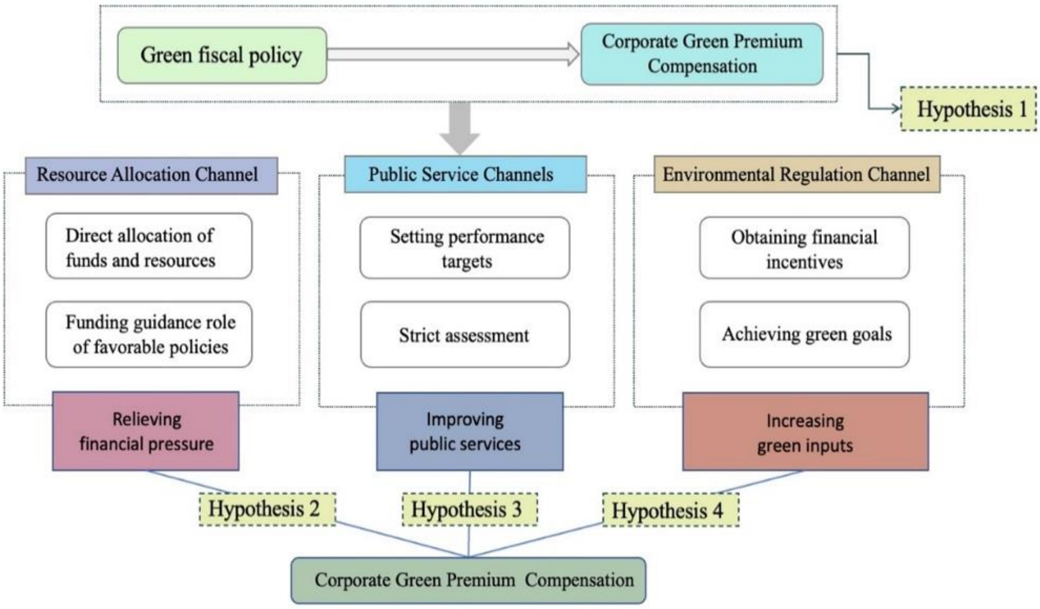

Figure 1.Mechanism Action Diagram

(3) Environmental Regulation Channel

To obtain central green fiscal reward funds and various resource preferences, and fulfill green development commitments to the central government while maintaining economic growth and steadily achieving regional industrial structure transformation, local governments often implement increased environmental regulation administrative orders to rapidly improve urban environment (Bengston et al., 2004; Chu et al., 2022).On one hand, governments face pressure for environmental protection, emissions reduction, and efficiency improvement, leading to high attention to urban environmental quality and corporate pollution behavior. For local enterprises that fail to meet energy conservation requirements and face significant transformation obstacles but play important roles in regional economy and employment, governments can only resolve the contradiction between economic development and green development goals through strengthened pollution monitoring and fiscal subsidies (Yang et al., 2021). For local enterprises that consistently fail to meet energy conservation requirements, governments exercise their regulatory functions by ordering closures or transformations, creating more space for green environmental protection enterprises and improve urban development efficiency (Child et al., 2005). On the other hand, many scholars argue environmental regulation can achieve the "Porter Hypothesis" (Petroni et al., 2019).

Under strict environmental constraints, enterprises are motivated to address corporate pollution effects in order to gain government support, avoid fines, and achieve stable operations. This, in turn, forces companies to increase their R&D investments and enhance green core technologies and innovation capabilities, thereby obtaining more environmental protection subsidies. Therefore, this paper **proposes Hypothesis H4.**

H4: Energy conservation and emissions reduction fiscal policies can achieve corporate green premium compensation through strengthening environmental regulation.

3. Research Design

3.1 Data Sources

This paper takes A-share listed companies, matched with city-level data as research subjects, with the following sample processing steps. First, since comprehensive demonstration zones were established in 2011, 2013, and 2014 respectively, with a three-year demonstration period, 2008-2017 is selected as the research period. Second, companies that underwent ST treatment, were delisted, or had discontinuous financial data during the research period were excluded. The remaining sample data were winsorized at the 1% level. Finally, data on government environmental protection subsidies were collected from 201 prefecture-level cities, including 27 Energy Conservation and Emissions Reduction Fiscal Policy Comprehensive Demonstration Cities, resulting in a total of 12,382 observations. Sample data sources include the ESP database, "China City Statistical Yearbook," CSMAR database, and others.

3.2 Variable Definitions

3.2.1 Dependent Variable: Environmental Protection Subsidy (Subsidy)

This paper uses environmental protection subsidies received by enterprises as a proxy variable for corporate green premium compensation. Subsidies are the most direct and effective means of compensation in fiscal policy. By quantifying the environmental protection subsidies received by enterprises, the policy's compensation amount and degree can be directly observed. Data were manually collected and organized from the "government subsidies" items in enterprise annual report notes, including subsidy information for environmental pollutant flue gas desulfurization, online monitoring, COD reduction rewards, environmental governance, wastewater treatment , and so on , forming a dataset of government environmental protection subsidies. Considering the varying effects of subsidies on companies of different sizes, this paper uses the ratio of government subsidies to total assets as a measurement indicator to eliminate the impact of company size on environmental protection subsidies.

3.2.2 Core Explanatory Variable: Energy Conservation and Emissions Reduction Comprehensive Demonstration City Policy Impact (Treat×Post)

Treat is a group indicator variable, with demonstration cities assigned 1 and other cities 0; Post is a policy indicator variable, with a value of 1 for the three-year demonstration period after selection as a demonstration city and 0 for other years. It should be emphasized that demonstration city approval occurred in phases rather than completed at once. Therefore, there are significant differences in the timing of cities' selection as demonstration cities. Since demonstration city approval was conducted gradually rather than simultaneously, it is not possible to set unified time-point dummy variables for samples as in traditional difference-in-differences methods. Therefore, this paper primarily focuses on the interaction effect between the treatment group dummy variable and policy time dummy variable, analyzing its sign and significance.

The interaction term $Treat_i \times Post_{it}$ is the core variable of research interest, aimed at capturing the actual impact of green fiscal policy on corporate green premium compensation.

3.2.3 Control Variables (Controls)

After synthesizing relevant literature, this study selects control variables including both enterprise characteristics and macroeconomic factors. Regarding enterprise characteristics, the study considers variables such as enterprise size (*Size*), asset-liability ratio (*Lev*), profitability (*ROA*), cash flow (*Cashflow*), growth potential (*Growth*), ownership nature (*SOE*), and listing age (*Age)*. For macroeconomic aspects, control variables include economic growth (*lnpgdp*), financial development (*Finance*), foreign direct investment (*Fdi*), and internet usage rate (*Inter*). The detailed measurement methods are provided in Table 2.

Table 2. Variable Definitions

Variable Symbol	Variable Name	Measurement Method
Subsidy	Environmental Protection Subsidy	Environmental Protection Subsidy/Total Assets
Treat×Post	Comprehensive Demonstration City Pilot Dummy	Assigned a value of 1 for the three years following selection as a demonstration city, and 0 otherwise
Size	Enterprise Size	Natural logarithm of total assets
Lev	Leverage Ratio	Total liabilities / Total assets
ROA	Profitability	Net Profit/Total Assets
Cashflow	Operating Cash Flow	Net Cash Flow from Operating Activities/Total Assets
Growth	Growth Potential	Enterprise Revenue Growth Rate

SOE	Ownership Type	Assigned 1 for state-owned enterprises, 0 otherwise
Age	Firm Age (Years Since Listing)	Natural logarithm of (Years since IPO + 1)
Fdi	Foreign Investment Level	Actual utilized foreign investment / Regional GDP
lnpgdp	Economic Development Level	Natural logarithm of city's GDP per capita
Finance	Financial Development Degree	Financial institution loan balance / Regional GDP
Inter	Internet Penetration Rate	Number of Internet Users per 10,000 City Residents/Permanent Population

3.3 Baseline Model Specification

Following the research of Yu et al. (2021) , this study employs a multi-period DID method to empirically investigate the impact of green fiscal policy on corporate green premium compensation. The baseline model is specified as follows:

$$Subsidy_{it} = \alpha + \beta \times Treat_i \times Post_{it} + \gamma Controls_{it} + \lambda_i + \mu_t + \varepsilon_{it} \quad (1)$$

Where *i* represents the enterprise; *t* represents the year; $Subsidy_{it}$ represents the government environmental protection subsidy received by enterprise *i* in year *t*; λ_i represents enterprise fixed effects, μ_t represents year fixed effects, and ε_{it} is the random error term. *Controls* represents a set of control variables, including enterprise size, profitability, and other factors that may affect government subsidies. $Treat_i \times Post_{it}$ is the core explanatory variable, representing the demonstration city construction dummy variable, with its coefficient β used to assess the policy's impact on corporate green compensation; if β is significantly positive, it indicates that demonstration city construction helps improve corporate green compensation.

3.4 Descriptive Statistics of Main Variables

Table 3 presents the descriptive statistics of the main variables. According to the statistical results, the probability distribution of enterprises receiving environmental protection subsidies is right-skewed, indicating that a minority of enterprises received high government subsidies. The average level of environmental protection subsidies (*Subsidy*) is 0.0306, with a median of 0, standard deviation of 0.1020, minimum value of 0, and maximum value of 0.6682, showing significant differences in subsidies among enterprises.

Table 3. Descriptive Statistics of Main Variables

	Variable	Mean	Standard deviation	Minimum	Median	Maximum
Treat	Subsidy	0.0255	0.0908	0.0000	0.0000	0.6682
	Treat×Post	0.3031	0.4596	0.0000	0.0000	1.0000
	Size	22.5541	1.7964	18.9394	22.3042	27.8032
	Lev	0.5340	0.2231	0.0766	0.5395	1.1625
	ROA	0.0351	0.0607	-0.2127	0.0298	0.2502
	Cashflow	0.0394	0.0803	-0.2218	0.0395	0.2716
	Growth	0.1963	0.5572	-0.6579	0.1017	3.5908
	SOE	0.6292	0.4831	0.0000	1.0000	1.0000
	Age	2.8038	0.3267	1.7918	2.8332	3.4012
	Fdi	12.5904	1.6531	7.1899	13.2118	14.7046
	lnpgdp	11.3480	0.5125	9.5332	11.4065	12.1299
	Finance	4.3189	1.7556	1.0436	4.3617	7.3793
	Inter	0.2731	0.1304	0.0368	0.2530	0.7790
Control	Subsidy	0.0326	0.1061	0.0000	0.0000	0.6682
	Treat×Post	0.0000	0.0000	0.0000	0.0000	0.0000
	Size	22.1490	1.4323	18.9394	22.0179	27.8032
	Lev	0.5116	0.2173	0.0766	0.5093	1.1625
	ROA	0.0363	0.6455	-0.2127	0.2502	0.0307
	Cashflow	0.0452	0.0808	-0.2218	0.2716	0.0442
	Growth	0.1946	0.5842	-0.6579	3.5908	0.0928
	SOE	0.5913	0.4916	0.0000	1.0000	1.0000
	Age	2.8448	0.3027	1.7918	3.4012	2.8904
	Fdi	11.8670	1.6955	7.1899	14.4314	12.0834
	lnpgdp	11.0121	0.5640	9.5332	12.1299	11.1109
	Finance	3.2986	1.4708	1.0436	3.1060	7.3793
	Inter	0.2687	0.2789	0.0365	0.2163	2.2469

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4. Empirical Results and Analysis

4.1 Impact of Green Fiscal Policy on Corporate Green Premium Compensation

4.1.1 Baseline Regression Analysis

To test for potential multicollinearity among the variables, we conducted a Variance Inflation Factor (VIF) analysis for all control variables prior to the baseline regression. The results show that all VIF values are well below the commonly accepted threshold of 10, which indicates severe multicollinearity (with an average VIF of 1.42), suggesting that the model does not suffer from significant multicollinearity issues.

Table 4 presents the results of Model (1), which examines the baseline regression of the effect of the Low-Carbon Pilot Policy on firms' green premium compensation. Column (1) includes only individual and time fixed effects, with the interaction term coefficient estimated at 0.0107, significant at the 5% level. Columns (2) and (3) incorporate firm-level and city-level control variables, respectively; the interaction terms remain significant at the 5% level, with coefficients of 0.0102 and 0.0108. Column (4) includes all control variables, and the interaction term remains significant with a coefficient of 0.0105. These results suggest that firms in pilot cities receive more environmental subsidies compared to those in non-pilot cities. The baseline regression provides preliminary evidence that green fiscal policies can effectively compensate firms through green premium mechanisms, supporting Hypothesis 1.

Table 4.Baseline Regression Results

Variable	(1)	(2)	(3)	(4)
Treat×Post	0.0107**	0.0102**	0.0108**	0.0105**
	(0.00442)	(0.00464)	(0.00434)	(0.00458)
Enterprise characteristic variables	-	Yes	-	Yes
City characteristic variables	-	-	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes
N	12,382	12,382	12,382	12,382

Note: ***、**、* indicate significance at the 1%, 5%, and 10% levels respectively, with standard errors in parentheses.

4.1.2 Parallel Trends Test

To verify that the time-staggered demonstration city construction serves as an effective exogenous shock, the sample period spans from four years before construction

(*Pre_4*) to the third year of construction (*Post_2*) , based on the exact year when cities began demonstration city construction. Here, the third year of construction (*Post_2*) includes the period from the third year of construction to the end of the sample period, while the year before construction (*Pre_1*) serves as the baseline year and is not included in the analysis. As shown in Figure 1, the regression coefficients before construction are not significant, indicating that before demonstration city construction, there were no significant differences in government environmental protection subsidies between enterprises in regions experiencing demonstration city construction and other enterprises. After demonstration city construction, environmental protection subsidies received by demonstration city enterprises increased significantly, with regression coefficients significantly positive at the 5% level. This proves that demonstration cities can enhance enterprises' environmental protection subsidy income during the demonstration period, and the policy achieved green premium compensation effects for enterprises, passing the parallel trends test.

Table 5. Parallel Trend Test Results

Variable	(1) Pre_4	(2) Pre_3	(3) Pre_2	(4) current	(5) Post_1	(6) Post_2
Treat×Post	-0.0050	-0.0020	0.0035	0.0097***	0.0072**	0.0070**
	(0.0050)	(0.0040)	(0.0035)	(0.0025)	(0.0030)	(0.0029)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	12,382	12,382	12,382	12,382	12,382	12,382

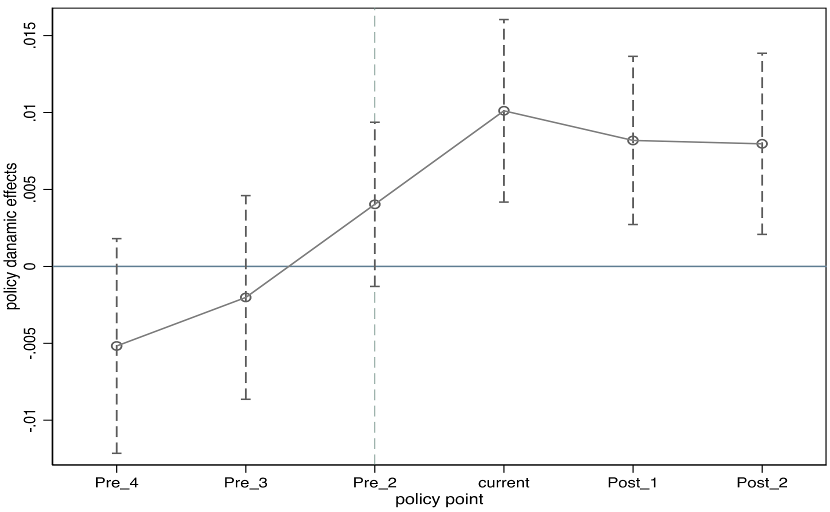


Figure 2. Parallel Trends Test

4.1.3 Placebo Test

To verify the robustness of estimation results and exclude interference from other factors, a placebo test was conducted to determine whether the increase in enterprise environmental protection subsidies was caused by the implementation of energy conservation and emissions reduction fiscal policies. After 1,000 regression repetitions, a kernel density plot of the 1,000 regression coefficients was generated (see Figure 2). The results show that the regression coefficient estimates generated by random simulation are centered around 0 and all are smaller than the baseline regression coefficient. These regression coefficients follow a normal distribution, with most p-values greater than 0.1 and not significant at the 10% significance level. Therefore, the placebo test results indicate that the previous conclusion regarding the impact of energy conservation and emissions reduction fiscal policies on corporate green premium compensation is not coincidental but rather robust.

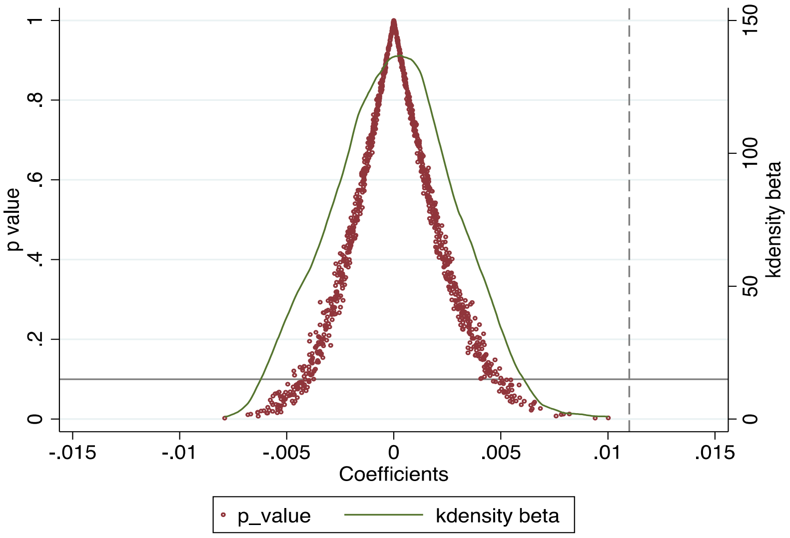


Figure 3. Placebo Test

4.1.5 PSM-DID Robustness Test

The ideal scenario for difference-in-differences (DID) evaluation assumes random selection of demonstration and non-demonstration cities. In reality, city selection depends on local resources and fiscal capacity, potentially causing estimation bias. To mitigate endogeneity from non-random pilot selection, propensity score matching (PSM) was applied to select comparable non-demonstration cities for DID analysis. Whether a city was designated as an energy-saving demonstration was the dependent variable, with 11 controls; 1:1 nearest neighbor matching with a 0.01 caliper was used. DID regression was then performed on the matched sample. Results are shown in Table 6, column 1. Findings confirm that after PSM, the policy significantly improved corporate green premium compensation, reinforcing baseline robustness.

4.1.6 Other Robustness Tests

To ensure the accuracy and validity of regression results, three robustness tests were conducted:

First, alternative measurements of the core explanatory variable were employed. To avoid the impact of extreme values, the natural logarithm of environmental protection subsidies plus one was used to represent enterprise environmental protection subsidies(Wang et al, 2020) Additionally, government subsidy intensity was represented by the ratio of government subsidies to total operating revenue of either from the previous year or the current year. The results showed that correlation coefficients under different variable construction methods were all significantly positive, at 0.4208 and 0.0031 respectively. Specific results are shown in Table 6, columns (2)-(3).

Second, a counterfactual test was conducted. Considering characteristic differences between treatment and control groups and the influence of other policy systems, counterfactual tests were conducted by advancing the implementation time of the comprehensive demonstration city pilot policy by 1, 2, and 3 years respectively. Results showed that early policy implementation had no significant impact on enterprise environmental protection subsidies, and even showed negative effects in some cases. This excludes inherent differences between treatment and control group samples before policy implementation , as well as the influence of other policies, further enhancing the credibility of results. Specific regression results are shown in Table 6, columns (4)-(6).

Third, a change in regression methods was applied. Approximately 73.4% (9088/12382) of the data sample consisted of non-environmental protection subsidy recipients. For such data samples, directly using Ordinary Least Squares (OLS) for linear regression could lead to estimation bias. Therefore, the Tobit model was used for sample regression, and the results remained significant, indicating that demonstration city construction effectively achieved green premium compensation for enterprises. Regression results are Presented in Table 6, column (7).

Fourth, omitted variables are included to mitigate endogeneity issues. Following Lei's study (2024), omitted variables are added, and a baseline regression is conducted. Fiscal investment levels influence infrastructure development, administrative efficiency, urban development levels, and consequently, the effectiveness of policy implementation. Therefore, fiscal investment levels are included as control variables in the regression of the sample, and the results remain significant, as shown in column (8) of Table 6.

Table 6. Robustness Tests

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat×Post	0.011**	0.4208**	0.0031*	-0.0038	-0.0096**	-0.0095**	0.0272***	0.008**
	(0.0050)	(0.2022)	(0.0017)	(0.0032)	(0.0041)	(0.0043)	(0.0101)	(0.004)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5,073	12,382	12,382	12,382	12,382	12,382	12,382	12,382

Note: ***、**、* indicate significance at the 1%, 5%, and 10% levels respectively, with standard errors in parentheses.

4.2 Further Analysis

4.2.1 Green Fiscal Policy and Corporate Green Premium: Channel Testing

In the theoretical analysis, this paper proposes that green fiscal policy achieves corporate green premium compensation through resource allocation channels, public service channels, and environmental regulation channels. To test the validity of these pathways, the following model is established to empirically examine the operating mechanisms of comprehensive demonstration city pilots in achieving corporate green premium compensation:

$$M_{it} = \beta_0 + \beta_1 Policy_{it} + \sum j \beta_j Controls_{jit} + \lambda_i + \mu_t + \varepsilon_{it} \qquad (2)$$

M_{it} represents the mechanism variables, including: (1) Fiscal pressure, following Asatryan et al. (2018)'s , measured by the ratio of fiscal deficit to fiscal revenue (*Fis*). (2) Public service level, following Liang et al. (2020)'s research, measured by social security level, using the number of hospital beds per thousand people (*Social*). It should be noted that, as per Liang's research, provincial-level fiscal expenditure and public service-related data were obtained and matched with enterprise-level data, ultimately yielding 8,967 samples. (3) Environmental regulation intensity, following Sheng et al. (2019)'s related research, based on China Statistical Yearbook, provincial statistical yearbooks, and publicly available data from the National Bureau of Statistics, first determining the proportion of heavy industry gross output value to GDP in prefecture-level cities within provinces. Then, this proportion is multiplied by the frequency of 'environmental protection' related terms in provincial government work reports to construct an environmental regulation intensity indicator (*EV*) for prefecture-level cities.[1] The economic implication lies in the fact that the impact of provincial-level environmental governance on cities within its jurisdiction varies with the proportion of heavy industry. Generally, cities with a higher share of heavy industry are more affected by such governance. Constructing an environmental regulation indicator using such interaction terms reflects both the overall intensity and policy characteristics of provincial governance in a given year, while preserving variation at the city level.

The mechanism testing results are shown in Table 7.

[1] This paper selects 27 environmental terms that comprehensively reflect the government's emphasis on environmental protection from three aspects: "environmental protection goals," "environmental protection objects - environmental factors and pollution," and "environmental protection measures," including environmental protection, environmental preservation, green, clean, low-carbon, blue sky, green water, green mountains, ecological, air, climate, pollution, sulfur dioxide, chemical oxygen demand, haze, particulate matter, carbon dioxide, energy consumption, scattered coal, coal burning, sewage discharge, illegal discharge, exhaust gas, energy conservation, emission reduction, desulfurization, and denitrification.

(1) Green Fiscal Policy - Resource Allocation - Corporate Green Premium Compensation

Column (1) reports the results for the resource allocation channel. The coefficient of the comprehensive demonstration city pilot on fiscal pressure is –0.0155 and is statistically significant at the 5% level, suggesting that the policy is associated with a reduction in local fiscal pressure. The provision of financial support and preferential policy integration under the pilot may enhance fiscal capacity, thereby enabling more effective resource allocation. This is further associated with an increase in environmental protection subsidies to firms, potentially easing green transition costs and supporting firm operations. The pilot may influence fiscal behavior by increasing government expenditure and improving the targeting of funds. The Sobel test indicates that the resource allocation pathway accounts for 20.71% of the total effect.

(2) Green Fiscal Policy - Public Service - Corporate Green Premium Compensation

Column (2) presents the results for the public service channel. The coefficient of the pilot policy on the social security index is 0.141, significant at the 1% level, indicating an association between the policy and enhanced public service provision. The reward-and-punishment mechanism embedded in the pilot may incentivize local governments to improve administrative efficiency and governance outcomes. These improvements are plausibly linked to better public goods delivery and coordination. The Sobel test shows that this pathway explains 9.02% of the total effect.

(3)Green Fiscal Policy - Environmental Regulation - Corporate Green Premium Compensation

Column (3) reports the results for the environmental regulation channel. The coefficient of the pilot policy on regulation intensity is 0.00026 and is statistically significant at the 1% level, suggesting that the pilot is associated with stronger regulatory enforcement. This may, in turn, prompt firms to increase R&D investment and green innovation to meet compliance demands. Such behavior is associated with increased fiscal compensation through innovation-related subsidies. According to the Sobel test, this mechanism accounts for 15.57% of the total effect.

Table 7. Mechanism Testing Results

	(1) Fiscal pressure	**(2) Public services**	**(3) Environmental regulation**
Treat×Post	-0.01546**	0.14100***	0.00026***
	(0.007400)	(0.025000)	(0.000036)
Control variables	Yes	Yes	Yes
Region/time fixed effects	Yes	Yes	Yes
Sample size	8,781	8,749	12,153

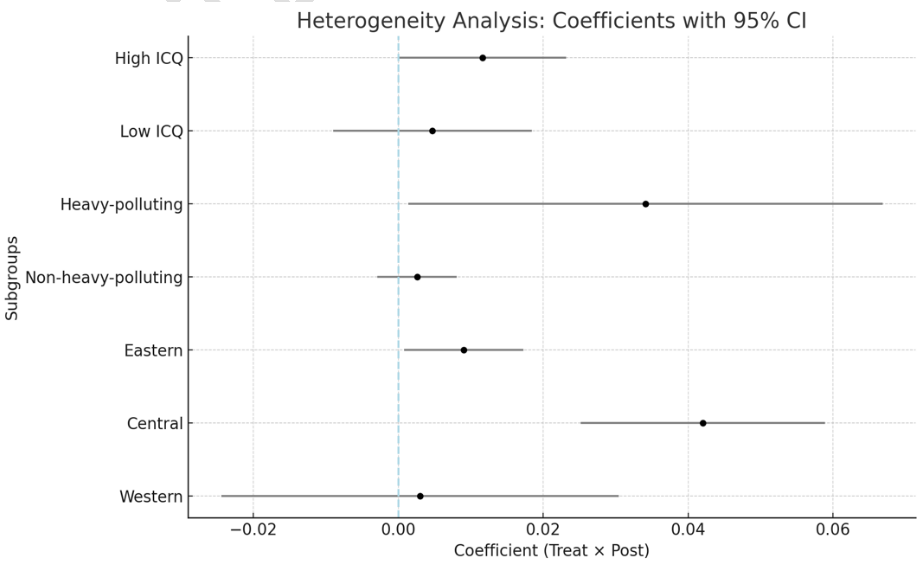
Quantitative Decomposition of Mechanisms	20.71%	9.02%	15．57%
R^2	0.33	0.59	0.12

Note: ***、**、* indicate significance at the 1%, 5%, and 10% levels respectively, with standard errors in parentheses.

4.2.2 Green Fiscal Policy and Corporate Green Premium Compensation: Heterogeneity Analysis

(1)Examination Based on Internal Control

Internal control, as an institutional arrangement for resolving internal agency problems, has gained increasing attention from both enterprises and the public. Effective internal control can properly address principal-agent relationships, improve company information reporting quality, and reduce operational risks (Li et al., 2020). It is believed that enterprises with high internal control quality are more likely to gain recognition from the government and the public, thereby obtaining more government subsidies, due to their comprehensive and transparent information disclosure ,as well as sound, effective corporate management.To examine the differences among enterprises based on internal control quality, the sample was divided into enterprises with high and low internal control quality,[2]and regression analyses were conducted on these subsamples separately. The results are shown in the first two columns of Table 7. Enterprises with high internal control quality received more environmental protection subsidies, while the interaction term's effect on enterprises with low internal control quality was not significant, indicating that enterprises with high internal control quality have an advantage in resource acquisition.



[2]This study uses the DIBO Internal Control Index of Listed Companies in China, published by Shenzhen DIBO Enterprise Risk Management Technology Co., Ltd., to measure the dependent variable internal control quality (IC), with a scoring range of [0, 1000]. To maintain consistency in regression coefficient dimensions, following Li Xin et al. (2024), the internal control index is divided by 100, resulting in a range of [0, 10]. Using the median of the internal control index as the grouping criterion, companies are classified into high internal control quality enterprises and low internal control quality enterprises, denoted as 1 and 0 respectively.

Figure 4. Heterogeneous Effects of the Policy Intervention

(2)Examination Based on Heavy Pollution Industries

Baseline regression confirms that energy conservation and emissions reduction comprehensive demonstration pilots can increase environmental protection subsidies received by enterprises, achieving green premium compensation. Heavily polluting companies, as primary pollution generators and environmental responsibility bearers, receive more attention from the public and government regulatory departments compared to low-pollution companies. They have higher environmental capital expenditure needs and greater environmental protection efficiency value. Simultaneously, due to their significant contributions to local economies, addressing their green premium compensation has practical urgency, leading to more environmental protection subsidies.To examine industry differences, the sample was divided into heavily polluting enterprises and non-heavily polluting enterprises subsamples[3], which were analyzed separately. The results are shown in Table 8,columns (3) and (4). The regression results show that the interaction term coefficient for heavily polluting enterprises is significant at the 1% level, with demonstration city construction increasing environmental protection subsidies by 3.4%. For non-heavily polluting enterprises, the interaction coefficient is positive but not significant, indicating demonstration city construction had no impact on their environmental protection subsidies. This suggests that in advancing energy conservation and emissions reduction policy objectives, governments indeed focus more attention on heavily polluting enterprises, providing them with corresponding resource preferences.

(3)Examination Based on Regional Differences

Different regions have varying economic levels, resource endowments, and development models. To explore heterogeneous effects of premium compensation across regions, the sample was divided into eastern, central, and western subsamples and analyzed separately, with results shown in the final three columns of Table 8. The regression results show significantly positive coefficients for eastern and central regions, with compensation effects in central regions exceeding those in eastern regions, while western regions show no significant enterprise green premium compensation effects. While most studies argue that the eastern region achieves better policy outcomes due to its advanced infrastructure and economic development (Lei et al., 2025), the stronger compensation effect in the central region may result from the concentration of resource-based cities and greater central government attention to environmental governance. Compared to the diversified and prosperous eastern region, the central region’s reliance on resource-intensive and manufacturing industries compels local governments to prioritize regulatory compliance and sustainability. This increased policy focus and resource allocation align with China’s national strategy for

[3] Following Li et al. (2022) and based on the "Guidelines for Environmental Information Disclosure of Listed Companies" published by the Ministry of Environmental Protection, combined with the "Guidelines for Industry Classification of Listed Companies" revised by the China Securities Regulatory Commission in 2012, the research sample is divided into heavy-polluting enterprises (including mining, textile and fur industry, metal and non-metal industry, biomedicine industry, petrochemical and plastic industry, paper printing industry, water and electricity gas industry, and food and beverage industry) and non-heavy-polluting enterprises, denoted as 1 and 0 respectively.

reducing emissions in high-carbon industries.The western region faces weaker economic development and resource endowments compared to the east and central regions. Despite national efforts such as the Western Development Strategy, structural gaps remain. Financing constraints and inadequate infrastructure limit fiscal effectiveness, while limited fiscal capacity, staffing shortages, and weak implementation mechanisms hinder policy delivery. Fragmented governance and rent-seeking further undermine policy outcomes. Consequently, green fiscal incentives have yet to achieve their intended effects in the western region.

Table 8. Heterogeneity Analysis

	(1) Enterprise Heterogeneity		**(2) Industry Heterogeneity**		**(3) Regional Heterogeneity**		
	High ICQ	Low ICQ	Heavy-polluting	Non-heavy polluting	Eastern	Central	Western
Treat×Post	0.0116**	0.0047	0.0341**	0.0026	0.009*	0.042***	0.003
	(0.0059)	(0.007)	(0.0167)	(0.0028)	(0.005)	(0.016)	(0.014)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Enterprise/Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inter-group coefficient test p-value	0.000***		0.000***		0.024**	-	
N	7753	4629	3418	8964	2,771	8,124	1,501

Note: ***、**、* indicate significance at the 1%, 5%, and 10% levels respectively, with standard errors in parentheses.

5. Conclusions and Policy Recommendations

Achieving corporate green premium compensation and promoting rapid, robust transformation of energy-intensive enterprises is a current practical dilemma in China's energy conservation and emissions reduction efforts, and a crucial issue that requires urgent resolution to achieve China's "dual carbon" goals. Using the "Energy Conservation and Emissions Reduction Fiscal Policy Comprehensive Demonstration Cities" as a quasi-natural experiment, this paper examines how the government's "visible hand" can assist enterprises in overcoming green premium issues that limit their energy conservation, emissions reduction, and long-term development through fiscal resource allocation. **The research findings show that:(1)**Green fiscal policies can achieve corporate green premium compensation. **(2)**Comprehensive demonstration city pilots promote local governments' achievement of corporate green premium compensation through alleviating fiscal pressure, improving government public service levels, and strengthening environmental regulation.**(3)** The construction of Comprehensive demonstration city promotes fairness in resource allocation, showing no bias toward state-owned enterprises , but placing greater emphasis on heavily polluting enterprises. Policy effects in achieving green premium compensation are most significant in central regions, while effects in western regions are not significant due to location, resource, and development limitations.

The policy implications of this paper include: First,emphasize green fiscal policies, actively summarize patterns, and leverage fiscal incentives. Summarize comprehensive demonstration city pilot experiences, deeply grasp and understand fiscal functions, and utilize fiscal policies to absorb environmental policy measures, thereby increasing the likelihood and feasibility of a green transition. For example, in 2015, the city of Meizhou utilized comprehensive incentive funds from the central government to leverage 13.665 billion yuan of investment in environmental protection. Consider multi-stakeholder synergies to promote the implementation of green policies through public outreach and the mobilization of stakeholders, such as NGOs , and through cooperation and interaction to build broad support for the policies and promote their implementation. At the same time, actively innovate financial instruments and diversifying incentives, such as green bonds and green funds, which can help to promote the greening of enterprises , address financing issues, and effectively mitigate the structural frictions of the transition.

Second, acknowledge corporate green premium issues, skillfully utilize fund allocation and innovation compensation effects to stimulate enterprise initiative. Emerging economies are currently facing widespread pressures from both economic transformation and carbon reduction.Fiscal authorities should fully recognize the importance of enterprises in urban energy conservation and emissions reduction. As major pollution sources and key responsibility bearers for energy conservation and emissions reduction, stimulating corporate green initiative and alleviating transformation pressure are key to achieving carbon reduction. A combination of incentives and regulations should be employed , with increased investment in environmental protection subsidies and the establishment of sound reward and punishment systems to encourage and constrain enterprises in addressing emissions reduction challenges.

Third, focus on enhancing social public services, improving government governance, and clarifying fiscal action channels. Policy effectiveness depends on efficient administration. To prevent the misallocation of subsidies, strengthened government supervision is necessary, relying on administrative efficiency. While increasing fiscal support, priority should be given to system development, policy implementation, and improving government capacity. Synergies between government departments should be developed, information-sharing platforms strengthened, and an efficient regulatory system established to improve supervision and ensure long-term stability. Leverage digital transformation to improve policy effectiveness. Digital platforms expand access to policy information for enterprise owners and managers, enhancing transparency in resource allocation. Digital tools based on big data, online disclosure, and smart governance help clarify the interaction between fiscal funds and corporate behavior, enhancing policy visibility and implementation efficiency.

Fourth, balance regional differences by formulating and advancing policies tailored to each region's geographical characteristics, resource endowments, and urban development levels. Different regions exhibit significant variations in geographical conditions, development plans, and economic levels. Enhance awareness of precise policy implementation by level and sector, and select appropriate development strategies based on each region's specific conditions. For example, in regions like eastern China and southern Vietnam, where infrastructure is advanced and marketization is high, the focus should be on regulatory coordination and innovating incentive mechanisms, exploring market-based carbon reduction methods such as carbon trading and green finance to set national examples. In less-developed areas like central and western China and northern Vietnam, policy implementation should prioritize urban development, starting with grassroots infrastructure, and avoid rushing the process by improving policy transmission mechanisms.

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