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# Optimization of the Tax Business Environment and Corporate Green Transformation: Empirical Evidence from the Tax "Streamlining Administration and Delegating Power" Reform

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## Abstract

This paper employs the pilot reform of the "streamlining administration and delegating power" in the tax system as a quasi-natural experiment. Drawing on data from A-share listed companies spanning 2013-2023, it investigates the impact of optimizing the tax business environment on corporate green innovation. The findings reveal that optimizing the tax business environment significantly enhances the level of corporate green innovation. This conclusion holds robust after a series of robustness tests, including parallel trends tests, placebo tests, and controls for contemporaneous policy interferences. Mechanism analysis indicates that optimizing the tax business environment promotes corporate green transformation through two pathways: alleviating financing constraints and reducing agency costs. Heterogeneity analysis further demonstrates that this policy effect is more pronounced in state-owned enterprises, non-heavy polluting enterprises, and regions with higher levels of economic and financial development. This study provides important theoretical foundations and policy implications for deepening the "streamlining administration and delegating power" reform and optimizing the tax business environment to stimulate corporate green innovation momentum.

## Keywords

tax business environment, "streamlining administration and delegating power" reform, green innovation, financing constraints, agency costs

## 1. Introduction

The Third Plenary Session of the 20th Central Committee of the Communist Party of China adopted the Decision of the Central Committee of the Communist Party of China on Further Comprehensively Deepening Reform and Advancing Chinese Modernization, which explicitly positions the construction of a Beautiful China and the promotion of harmonious coexistence between humanity and nature as key aspects of the overall objectives for further comprehensively deepening reform. However, current corporate green innovation faces numerous challenges, not only hindered by multiple internal and external factors such as resource rigidity, organizational inertia, and market uncertainty, but also prone to pursuing short-term benefits, often resulting in a "emphasis on quantity over quality" phenomenon where green innovation activities remain superficial and fail to achieve substantive breakthroughs (Jia et al., 2025, Wang and Wang, 2020). In this context, how to effectively enhance corporate green innovation capabilities has become a pressing hotspot issue that urgently

requires in-depth research and discussion.

The academic community generally believes that the government plays a crucial role in the development of corporate green innovation. Existing studies have explored this from multiple perspectives, primarily involving green tax systems, public environmental concerns, and tax incentives (Huang and Zhao, 2023, Yang and Xue, 2024, Yi et al., 2022). In recent years, optimizing the tax business environment has become an important measure in deepening the "streamlining administration and delegating power" reform and serving the national innovation-driven development strategy. Accompanying the continuous policy rollout and institutional innovations by government departments to optimize the business environment, the academic community has actively focused on the reform effects of business environment optimization in China. From the perspective of innovation incentives, business environment optimization can significantly enhance corporate innovation quality (Li et al., 2023, Tang and Huo, 2022) and promote substantive innovation through corporate digital transformation (Gu et al., 2025). From the perspective of resource allocation, business environment optimization can improve capacity utilization rates by enhancing the government-enterprise and business relationships faced by enterprises Liu and Fu (2019) and promote the development of private enterprises, thereby strengthening their competitiveness (Yang et al., 2022, Zhang and Yang, 2022). From the perspective of institutional costs, effectively reducing institutional transaction costs is a key policy focus of the "streamlining administration and delegating power" reform in optimizing the business environment (Liao, 2021), and the tax "streamlining administration and delegating power" reform promotes cross-regional capital flows and advances the construction of a unified factor market by lowering institutional transaction costs and enhancing market competition (Ma et al., 2025). Existing research has primarily focused on the ultimate impacts of business environment optimization on corporate financial performance and macroeconomic resource allocation, while relatively neglecting the transmission mechanisms of its effects on specific strategic decisions in non-financial dimensions such as environmental governance for enterprises. This paper extends the research perspective to the environmental strategy level of enterprises, examining how optimizing the tax business environment influences corporate green innovation as a key decision-making behavior.

Therefore, the marginal contributions of this paper are mainly reflected in the following aspects: First, it enriches the research on factors influencing corporate green innovation. Previous literature has focused on the impacts of environmental regulations, corporate digitalization, and green credit policies on corporate green innovation (Guo et al., 2024, Yang and Wang, 2024, Ding et al., 2022). This paper takes a novel approach, using the optimization of the tax business environment as an entry point and the tax "streamlining administration and delegating power" reform as a fresh perspective to deeply analyze effective pathways for corporate green transformation, thereby enriching and expanding the academic achievements on pathways for promoting corporate green innovation in China. Second, it expands the research on the economic consequences of optimizing the tax business environment. Past studies have often examined effects such as employment stabilization and the impact of tax uncertainty on enterprises (Xue and Dong, 2023, Zhao and Li, 2021), whereas this paper elucidates the influence of the tax "streamlining administration and delegating power" from the angle of green transformation. Third, it reveals the mechanisms through which optimizing the tax business environment affects corporate green innovation, explaining how such policies promote corporate green innovation by alleviating financing constraints and reducing agency costs. Fourth, it uncovers the heterogeneity of the impacts of tax reform. This paper comprehensively examines the heterogeneous effects of the tax "streamlining administration and delegating power" reform on cross-regional capital flows from four dimensions: the ownership nature of listed companies, the degree of heavy pollution, urban economic development levels, and financial development levels.

## 2. Institutional Background and Research Hypotheses

### 2.1 Institutional Background

The policy of optimizing the tax business environment serves as crucial soil for the development of market micro-subjects and their engagement in scientific and technological innovation activities. This policy focuses on tax-related aspects closely linked to enterprise innovation, streamlining approval processes, promoting digital and intelligent tax handling, and deepening the "silver-tax interaction" mechanism, with the aim of creating a stable, fair, and transparent tax institutional environment for market entities, particularly innovation-

driven enterprises.

The institutional framework for China's tax "streamlining administration and delegating power" reform originated from the Scheme for Further Deepening Tax Collection and Administration Reform issued by the State Taxation Administration (STA) in 2012. This scheme laid the initial foundation for subsequent reforms by planning nine major aspects, including basic procedures for tax collection and administration, taxpayers' rights system, and the legal status of tax assessments. In 2015, the Scheme for Deepening the Reform of the Tax Collection and Administration System of National and Local Taxation Bureaus, jointly issued by the General Office of the CPC Central Committee and the General Office of the State Council, marked the reform's entry into a substantive phase. This document systematically elaborated on the core connotations of "streamlining administration and delegating power" at the official level for the first time and explicitly required a transformation in collection and management approaches to adapt to new economic development trends. Following 2017, the tax "streamlining administration and delegating power" reform entered a phase of systematic deepening and phased pilot implementation. In September 2017, the STA issued the Opinions on Further Deepening the "Streamlining Administration and Delegating Power" Reform in the Taxation System and Optimizing the Tax Environment (Taxation Administration Document [2017] No. 101), which designated the first batch of pilots in Beijing, Shanghai, Jiangsu, Guangzhou, Shenzhen, and other areas, signifying a shift from institutional design to practical implementation in pilot regions. In August 2018, Taxation Administration Letter [2018] No. 461 further expanded the pilots to 12 provincial-level regions including Zhejiang, Jiangxi, and Hubei, forming a pilot pattern that gradually extended from the east to the central and western regions. In September 2020, the Notice on Several Measures to Advance the Reform of Taxpayer Convenience and Optimize the Tax Business Environment (Taxation Administration Document [2020] No. 48) proposed multiple initiatives centered on taxpayer convenience and cost reduction. In March 2021, the General Office of the CPC Central Committee and the General Office of the State Council issued the Opinions on Further Deepening the Reform of Tax Collection and Administration, promoting the reform's transition from "decentralization" and "service" toward "smart taxation" and data-driven approaches. This series of policies has progressively established a modern tax governance system centered on simplifying administration, delegating power, digital supervision, and optimized services, covering the entire country with layered advancement, thereby providing the institutional background and empirical foundation for subsequent research.

## 2.2 Research Hypotheses

Corporate green innovation, due to its high risk, often leads to insufficient innovation motivation among enterprises (Liu et al., 2025). The pilot program for optimizing the tax business environment promotes corporate green innovation by reducing institutional transaction costs and freeing up R&D resources that were previously crowded out. Traditional tax collection and administration models, such as intensified tax enforcement, suppress enterprises' tax avoidance behaviors, increase their effective tax burdens, reduce available resources and R&D investments, and thereby inhibit the level of corporate green innovation (Tang et al., 2022b). Enterprises' rent-seeking behaviors come at the expense of non-productive expenditures such as inefficient investments, charitable donations, and bribery; rent-seeking to reduce effective tax burdens crowds out R&D resources available for investment, which is detrimental to innovation activities (Bu and Huang, 2013, Tang et al., 2022a). The tax business environment addresses this through dual mechanisms of "strengthened supervision" and "reduced rent-seeking", effectively curbing corporate tax avoidance behaviors (Chen, 2024) and providing new pathways for corporate green transformation. More importantly, optimizing the tax business environment directly empowers corporate green innovation through innovative services and precise supervision. The "streamlining administration and delegating power" reform and its three dimensions (simplifying administration and delegating power, government supervision, and public services) all exert positive influences on enterprises' sustained innovation (Zheng et al., 2024), with the reform enhancing enterprise innovation vitality by providing abundant innovation resources through public service optimization (Liu and Wu, 2018). Based on this, the following hypothesis is proposed:

Hypothesis 1: Optimizing the tax business environment promotes corporate green innovation.

Green technological innovation requires substantial capital investment to seize opportunities and mitigate risks, but its inherent characteristics—such as difficulty in measurement, lack of tangible collateral, and opacity to external investors—severely constrain enterprises' ability to access funds (Bi and Yu, 2019). Given that the initial stage of corporate green transformation demands significant R&D funding, timely alleviation

of financing constraints can reduce enterprises' financial pressures and thereby drive green transformation. The reform of optimizing the tax business environment helps alleviate enterprises' financing pressures, providing necessary financial support for their green innovation activities. From the perspective of flexible tax administration, flexible tax collection exerts an "incentive effect" by reducing information asymmetry and enhancing corporate reputation, thereby easing financing constraints (Sun et al., 2019). From the "silver-tax interaction" angle, this mechanism bridges the STA's taxpayer credit ratings with banks' credit financing, helping trustworthy enterprises resolve difficulties in accessing and affording financing while effectively alleviating their financing constraints (Li and Fan, 2023). Tax business environment optimization jointly alleviates enterprises' financing pressures through the "incentive effect" of flexible administration and the credit bridging role of "silver-tax interaction", injecting critical momentum into corporate green transformation. Based on this, the following hypothesis is proposed:

Hypothesis 2: Optimizing the tax business environment promotes corporate green innovation by alleviating financing constraints.

With the separation of ownership and management, principal-agent problems arise, and managers' moral hazards and adverse selection profoundly impact corporate green innovation (Yu et al., 2019). High agency costs exacerbate conflicts between owners and managers. In such scenarios, facing the "regulatory effect" and "compliance effect" of environmental interviews, managers prioritize personal interests and risk aversion over pursuing corporate value maximization through high-risk green innovation (Hadlock and Pierce, 2010). The tax business environment optimization, through the "streamlining administration and delegating power" reform—encompassing simplifying administration, optimizing services, and strengthening supervision—effectively curbs managerial incentives for tax avoidance collusion with supply chains, and the reduction in agency costs prompts enterprises to allocate resources toward green innovation, thereby enhancing green innovation outputs (Cheng et al., 2022, Wang et al., 2025a). Based on this, the following hypothesis is proposed:

Hypothesis 3: Optimizing the tax business environment promotes corporate green innovation by reducing agency costs.

## 3. Research Design

### 3.1 Data Sources and Sample Selection

To examine the impact of optimizing the tax business environment on corporate green innovation, this paper uses the "streamlining administration and delegating power" reform in the tax system as a quasi-natural experiment and compiles the following data: green innovation and financial data for A-share listed companies in China from 2013 to 2023, as published in the CSMAR database; manual collation of the timing and locations of tax business environment optimization pilot policies based on information from the official website of the State Taxation Administration; and urban economic characteristic data from the China City Statistical Yearbook. The data are processed as follows: excluding samples of ST and PT companies in abnormal listing status; excluding financial industry samples; and applying bilateral 1% winsorization to all continuous variables on an annual basis.

### 3.2 Variable Selection

1. Explained Variable: Green Innovation ($green_{ijt}$). Following the study by Wang et al. (2025b), this paper measures the level of corporate green innovation using the number of green patent applications by the enterprise.

2. Core Explanatory Variable: Tax "Streamlining Administration and Delegating Power" Reform ($did_{it}$). The tax "streamlining administration and delegating power" reform was gradually implemented in batches starting from 2017. If city i is selected as a pilot city in year t, $did_{it}$ is assigned a value of 1 in year t and subsequent years; otherwise, it is assigned a value of 0.

3. Control Variables. To control for the influence of other factors on corporate green innovation, this paper selects the following control variables at the enterprise and city levels: (1) Managerial shareholding ratio ($Mshare$); (2) Total asset turnover ($TAT$), expressed as the ratio of operating revenue to average total assets;

(3) Proportion of independent directors ($Indep$), expressed as the ratio of the number of independent directors to the total number of directors; (4) Return on equity ($ROE$); (5) Inventory ratio ($INV$), expressed as the ratio of net inventory to total assets; (6) Fixed asset ratio ($FIXED$), expressed as the ratio of net fixed assets to total assets; (7) Urban area ($strict$), expressed as the logarithm of the land area of the administrative region; (8) Communication level ($mobile$), expressed as the number of mobile phone users at year-end; (9) Education level ($student$), expressed as the logarithm of the number of full-time students in regular higher education institutions; (10) Openness level ($forcap$), expressed as the actual amount of foreign capital utilized in that year.

The definitions of the main variables and descriptive statistics are presented in Table 1.

*Table 1: Descriptive Statistics*

| | Full Sample | | | | Treatment Group | | | | Control Group | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mean | sd | min | max | mean | sd | min | max | mean | sd | min | max |
| green | 0.370 | 0.778 | 0.000 | 3.638 | 0.374 | 0.784 | 0.000 | 3.638 | 0.362 | 0.767 | 0.000 | 3.638 |
| Mshare | 14.295 | 19.414 | 0.000 | 67.761 | 15.419 | 19.747 | 0.000 | 67.761 | 12.314 | 18.649 | 0.000 | 67.761 |
| TAT | 0.622 | 0.410 | 0.079 | 2.372 | 0.624 | 0.409 | 0.079 | 2.372 | 0.617 | 0.411 | 0.079 | 2.372 |
| Indep | 37.801 | 5.347 | 33.330 | 57.140 | 37.889 | 5.312 | 33.330 | 57.140 | 37.645 | 5.406 | 33.330 | 57.140 |
| ROE | 0.053 | 0.134 | -0.611 | 0.332 | 0.056 | 0.132 | -0.611 | 0.332 | 0.048 | 0.137 | -0.611 | 0.332 |
| INV | 0.136 | 0.124 | 0.000 | 0.778 | 0.135 | 0.124 | 0.000 | 0.778 | 0.138 | 0.123 | 0.000 | 0.778 |
| FIXED | 0.202 | 0.152 | 0.002 | 0.721 | 0.185 | 0.145 | 0.002 | 0.721 | 0.233 | 0.160 | 0.002 | 0.721 |
| strict | 9.057 | 0.784 | 7.439 | 11.319 | 8.962 | 0.795 | 7.439 | 11.319 | 9.226 | 0.735 | 7.439 | 11.319 |
| mobile | 17.241 | 13.006 | 1.190 | 45.940 | 21.871 | 13.530 | 1.190 | 45.940 | 9.079 | 6.346 | 1.190 | 30.330 |
| student | 12.281 | 1.156 | 9.195 | 14.161 | 12.467 | 1.022 | 9.195 | 14.161 | 11.954 | 1.297 | 9.195 | 14.147 |
| forcap | 588.001 | 618.524 | 0.652 | 2433.000 | 772.519 | 628.817 | 0.652 | 2433.000 | 262.670 | 440.547 | 0.652 | 2433.000 |

## 3.3 Model Specification

This paper employs a multi-period difference-in-differences model to test the causal effect of the tax "streamlining administration and delegating power" reform on corporate green innovation. The model is specified as follows:

$$green_{ijt} = \beta_0 + \beta_1 did_{it} + \beta_2 Control_{ijt} + \theta_j + \pi_t + \varepsilon_{ijt} \quad (1)$$

Subscripts $i,j,$and $t$ represent the city where the listed company is located, the listed company, and the year, respectively. The explained variable $green_{ijt}$is corporate green innovation, and the core explanatory variable $did_{it}$indicates whether the tax "streamlining administration and delegating power" reform pilot is implemented in city $i$. $Control_{ijt}$ is a set of control variables that may influence corporate green innovation. In addition, this paper incorporates firm fixed effects ($\theta_j$) and time fixed effects ($\pi_t$), with $\varepsilon_{ijt}$ denoting the random error term. To obtain robust standard errors, this paper clusters the standard errors at the city level where the listed company is located.

# 4. Empirical Analysis

## 4.1 Baseline Regression

Table 2 reports the baseline regression results of Equation (1), namely the empirical results of the impact of the tax "streamlining administration and delegating power" reform on corporate green innovation. Column (1) controls for basic firm characteristic variables, while Column (2) further incorporates regional-level control variables on the basis of Column (1). The regression results show that the coefficient of the core explanatory variable $did$ is significantly positive in both regressions. Specifically, in Column (1) without regional variables, the coefficient of $did$ is 0.030 and significant at the 10% level; in Column (2) with full controls, the coefficient rises to 0.037 and is significant at the 5% level. These findings indicate that the pilot policy for optimizing the tax business environment significantly promotes the level of corporate green innovation, supporting the

research hypotheses of this paper.

*Table 2: Baseline Regression Results*

| | (1) | (2) |
|---|---|---|
| | green | green |
| did | 0.030* | 0.037** |
| | (0.018) | (0.018) |
| Mshare | 0.000 | 0.000 |
| | (0.001) | (0.001) |
| TAT | 0.026 | 0.024 |
| | (0.017) | (0.017) |
| Indep | 0.001 | 0.001 |
| | (0.001) | (0.001) |
| ROE | 0.071** | 0.070** |
| | (0.029) | (0.029) |
| INV | 0.034 | 0.037 |
| | (0.048) | (0.048) |
| FIXED | -0.079* | -0.081* |
| | (0.047) | (0.048) |
| strict | | 0.198 |
| | | (0.157) |
| mobile | | -0.000 |
| | | (0.000) |
| student | | 0.017 |
| | | (0.021) |
| forcap | | -0.000 |
| | | (0.000) |
| Firm Fixed Effects | Yes | Yes |
| Time Fixed Effects | Yes | Yes |
| _cons | 0.292*** | -1.651 |
| | (0.042) | (1.424) |
| N | 33023 | 33023 |
| Adj.R2 | 0.678 | 0.678 |

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

## 4.2 Pre-Treatment Trends Test

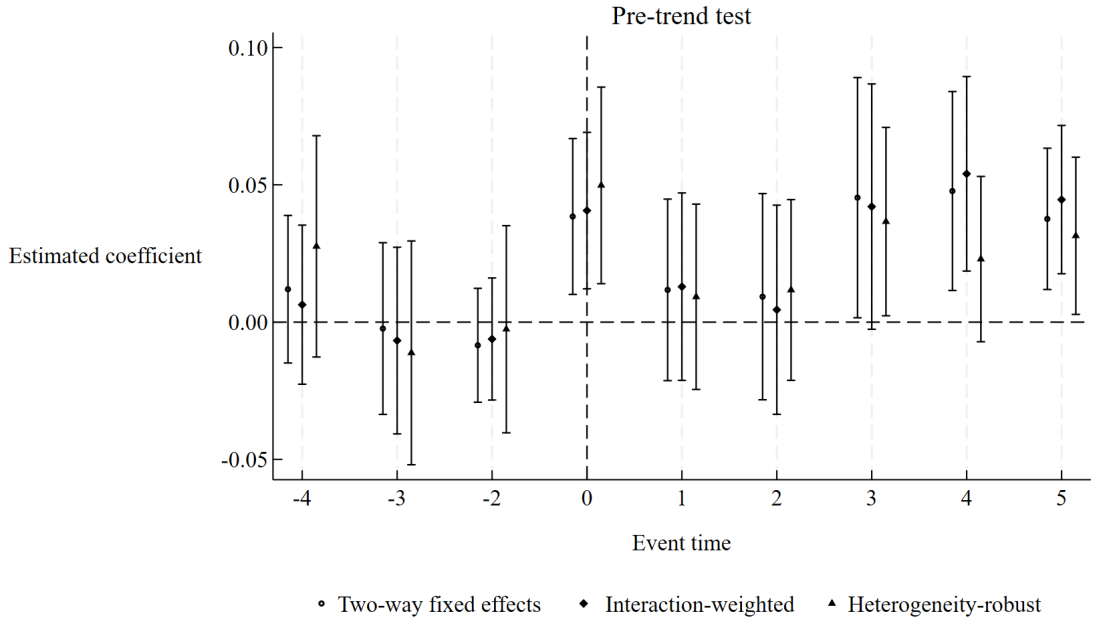
Before conducting the difference-in-differences estimation, the parallel trends assumption must be satisfied, meaning that in the absence of policy shocks, the outcome variables for the treatment and control groups should exhibit the same trend. To verify that the estimation results in this paper are indeed induced by the tax business environment optimization policy, this paper follows the approach of Yang Xueru (2025) and plots Figure 1 to illustrate the dynamic effects before and after policy implementation.

Figure 1 depicts the dynamic impact of tax business environment optimization on corporate green

innovation under a 90% confidence interval. The results show that before policy implementation, the estimated coefficients for each period fluctuate around zero and are statistically insignificant, indicating no significant systematic differences in green innovation between the treatment and control groups, thus satisfying the parallel trends assumption and providing a validity basis for subsequent causal identification.

After policy implementation, the bi-directional fixed effects, interaction weights, and heterogeneity-robust estimates all indicate that the core variable coefficient turns positive and exhibits a gradually strengthening trend, suggesting that tax business environment optimization exerts a sustained and incrementally promoting effect on corporate green innovation. This dynamic pattern further confirms that the enhancement in corporate green innovation levels is indeed attributable to the optimization of the tax business environment, rather than inherent trend differences between the two groups.

*Figure 1: Pre-Treatment Trends Test Results*



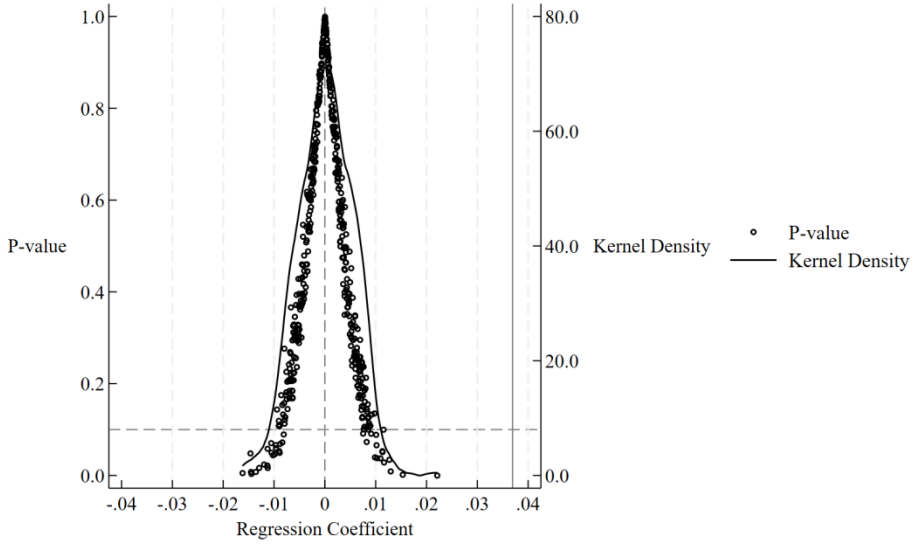

## 4.3 Robustness Tests

### 4.3.1 Placebo Test

To further rule out the possibility that the baseline regression results are influenced by random factors or omitted variables, this paper conducts a placebo test. By randomly generating pseudo-policy treatment groups and performing 500 repeated estimations on the baseline model, the distribution of the pseudo-policy variable coefficients is obtained.

Figure 2 presents the kernel density distribution of the coefficients from the aforementioned 500 simulated estimations. The results show that the vast majority of pseudo-estimated coefficients are densely distributed around zero, with a distribution shape approximating a normal distribution centered at zero. Meanwhile, the actual policy effect estimate from the baseline regression in this paper is located in the right tail of the random distribution curve, clearly deviating from the primary concentration area of the placebo coefficients. This indicates that the observed promoting effect of tax business environment optimization on green innovation in the baseline regression is not attributable to random factors or model specification biases, thereby further validating the robustness of the core conclusions in this paper.

*Figure 2: Placebo Test Results*




### 4.3.2 Replacing the Core Explanatory Variable

Column (1) of Table 3 reports the test results from replacing the policy definition. This paper adjusts the policy effective timing to assign a value of 1 starting from the second year after implementation; the coefficient of the core variable $did$ remains significantly positive, indicating that the conclusions still hold after altering the policy timing setting.

### 4.3.3 Replacing the Explained Variable

Column (2) of Table 3 reports the test results from replacing the explained variable. Here, the total number of independently and jointly applied green invention and utility model patents in the current year plus one, taken as the logarithm ($green1$), is used as the new measure of green innovation; the coefficient of the core variable $did1$ is significantly positive, demonstrating that the promoting effect of tax business environment optimization remains robust after changing the measurement of green innovation.

### 4.3.4 Excluding Other Policies

During the sample period, the development of corporate green innovation may be influenced by the superposition of multiple contemporaneous policies, which could interfere with the causal effect identification between the tax "streamlining administration and delegating power" reform and corporate green innovation. Following the approach of Ma et al. (2025), this paper compiles potentially interfering policies within the sample period and excludes their influences, as detailed below:

**(1) Environmental Protection Tax Policy**

The implementation of the Environmental Protection Tax Law can promote the quantity of green innovation in manufacturing enterprises and enhance the quality of their green innovation (Yang and Xue, 2024). Following the method of Liu et al. (2025), this paper uses the year 2018, when the Environmental Protection Tax Law took effect, as the demarcation point: if in 2018 or later, $e\_post$ is assigned 1; otherwise, 0. The Environmental Protection Tax Law primarily targets heavily polluting industries; if an enterprise belongs to a heavily polluting industry, $e\_treat$ is assigned 1; otherwise, 0. The implementation of the Environmental Protection Tax Law ($did2$) is the interaction term of $e\_post$ and $e\_treat$.

**(2) Resources Tax Policy**

The Resource Tax Law implemented in 2020 serves dual functions of environmental regulation and ecological compensation, adjusting resource development and utilization behaviors through tax levers while reinforcing policy orientations for resource conservation and environmental protection in legal form. Existing research finds that the implementation of the Resource Tax Law enhances the green governance performance of resource-based enterprises. Following the method of Zhang et al. (2025), if an enterprise is a resource-based

enterprise and the year is 2020 or later (the year of Resource Tax Law implementation and subsequent years), $did3$ is assigned 1; otherwise, 0.

**(3) Value-Added Tax Policy**

Referring to the study by Du (2025), based on the Ministry of Finance and State Taxation Administration's Fiscal and Taxation [2018] No. 70 document issued in the second quarter of 2018 as the exogenous shock event for the VAT credit refund reform, dummy variables $z\_post$ and $z\_treat$ are established respectively. If the listed company's industry is specified in Document No. 70 as an "industry eligible for VAT end-of-period credit refund" or a power grid enterprise, it is defined as the treatment group sample, with $z\_trea$ = 1; others are control group samples, with $z\_trea$ = 0. Years 2018 and later are defined as post-implementation of the credit refund policy, with $z\_post$ = 1; pre-2018 years are pre-implementation, with $z\_post$ = 0. The interaction term of Treat and Post is $did4$, reflecting the net effect of the VAT credit refund reform.

Columns (3) to (5) of Table 3 control for the environmental protection tax policy ($did2$), resource tax policy ($did3$), and value-added tax policy ($did4$), respectively. The results show that after incorporating these policy variables, the coefficient of the core explanatory variable $did$ remains significantly positive at the 5% level, with the coefficient magnitude highly consistent with the baseline results. This indicates that the identified effect in this paper indeed stems from the tax business environment optimization policy, rather than being driven by other related policies.

In summary, a series of robustness tests all support the core conclusions of this paper, namely that optimizing the tax business environment significantly enhances the level of corporate green innovation, and this conclusion demonstrates strong robustness.

*Table 3: Robustness Tests Results*

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Replacing Explanatory Variables | Replacing Explained Variables | Controlling for Environmental Tax | Controlling for Resource Tax | Controlling for Value-Added Tax | Controlling for All Three Policies Simultaneously |
| did | 0.057*** | | 0.035** | 0.036** | 0.036** | 0.034* |
| | (0.018) | | (0.018) | (0.018) | (0.018) | (0.017) |
| | | | | | | |
| did1 | | 0.037** | | | | |
| | | (0.018) | | | | |
| | | | | | | |
| did2 | | | -0.032 | | | -0.019 |
| | | | (0.020) | | | (0.022) |
| | | | | | | |
| did3 | | | | -0.026 | | -0.009 |
| | | | | (0.026) | | (0.030) |
| | | | | | | |
| did4 | | | | | 0.032** | 0.027* |
| | | | | | (0.016) | (0.016) |
| Control | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 33023 | 33023 | 33023 | 33023 | 33023 | 33023 |
| AdjustedR² | 0.717 | 0.678 | 0.678 | 0.678 | 0.678 | 0.678 |

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

# 5. Further Analysis

## 5.1 Mechanism Analysis

### 5.1.1 Reducing Financing Constraints

The "streamlining administration and delegating power" reform in the tax system, by deeply advancing the "silver-tax interaction" mechanism, shares enterprises' tax credit information with banks, effectively reducing information asymmetry between banks and enterprises as well as banks' lending risks (Tang and Huo, 2022). This significantly increases the scale of enterprises' debt financing and the likelihood of obtaining external financing, thereby alleviating their financing constraints and internal cash flow pressures (Zhang and Song, 2023). This not only enhances enterprises' debt repayment capacity and sustained operational capabilities but also creates favorable conditions for long-term investment activities. Industries or enterprises supported by relevant government policies typically exhibit strong growth potential; such policies convey a signal of national endorsement of their development prospects to society, helping to reduce external investors' uncertainty about their future development and further alleviating financing constraints, thereby providing stable financial support for enterprises' green investments (Li et al., 2025). Following existing research (Chen and Yuan, 2020), this paper uses the FC index to represent corporate financing constraints. The results in Column (1) of Table 4 show that the tax "streamlining administration and delegating power" reform is significantly negatively correlated with corporate financing constraints, indicating that the pilot policy for optimizing the tax business environment can reduce financing constraints and thereby promote corporate green transformation.

### 5.1.2 Reducing Agency Costs

The "streamlining administration and delegating power" reform, through simplifying administration and delegating power as well as optimizing services, significantly reduces the institutional transaction costs incurred by enterprises due to government regulations (Zeng and Huang, 2020), effectively curbing corporate agency costs and enabling enterprises to allocate more funds to ESG construction, increase investments in environmental protection projects, and reduce the negative environmental impacts of production (Xu et al., 2025), thereby promoting corporate green innovation. At the same time, the reform itself requires credit information sharing as a foundation, which in turn drives the establishment of national credit information sharing platforms and mechanisms. (Wang et al., 2025b) This enhances enterprises' external information sharing capabilities, reduces information asymmetry between external stakeholders and enterprises, brings more external resources to corporate green innovation, and promotes improvements in the level of corporate green R&D innovation (Du and Cao, 2023, Tang, 2022). To verify this conjecture, this paper uses the ratio of management expenses to operating revenue to represent corporate agency costs. The results in Column (2) of Table 4 show that the tax "streamlining administration and delegating power" reform can reduce agency costs for the enterprises in question.

*Table 4: Mechanism Analysis Results*

| | (1)Financing Constraints | (2)Agency Costs |
|---|---|---|
| did | -0.013** | -0.005* |
| | (0.007) | (0.003) |
| Control | Yes | Yes |
| Firm Fixed Effects | Yes | Yes |
| Time Fixed Effects | Yes | Yes |
| _cons | 0.267 | -0.199 |
| | (0.565) | (0.152) |
| N | 32287 | 32287 |
| Adj.R2 | 0.817 | 0.703 |

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

## 5.2 Heterogeneity Analysis

### 5.2.1 Firm Level

**(1) Ownership Nature**

Compared to non-state-owned enterprises, state-owned enterprises are required to shoulder more social responsibilities and have inherent political ties with the government. When facing pressures for green transformation, state-owned enterprises are more motivated and capable of responding through green innovation, and they can more fully leverage policy dividends to more effectively enhance green innovation quality (Xing Shuangmei, 2025). Columns (1) and (2) of Table 6 present the regression results. When the research sample consists of state-owned enterprises, the coefficient of $did$ is significantly positive, indicating that, compared to non-state-owned enterprises, the pilot of the tax "streamlining administration and delegating power" reform has a more pronounced effect on the green transformation of state-owned enterprises.

**(2) Heavily Polluting Enterprises**

When facing government policies, heavily polluting enterprises allocate limited funds to compliance governance and short-term speculation, crowding out innovation investments and fostering bubbles of low-quality patents, which inhibit green innovation (Xu et al., 2023). Even if prefecture-level cities implement the tax "streamlining administration and delegating power" reform, enterprises may, for survival, tend toward "greenwashing" rather than substantive green innovation. In Column (3) of Table 6, the coefficient of $did$ is positively significant, while in Column (4), the coefficient of $did$ is positive but insignificant, indicating that, compared to heavily polluting enterprises, the pilot of the tax "streamlining administration and delegating power" reform has a more pronounced promoting effect on non-heavily polluting enterprises.

### 5.2.2 City Level

**(1) Economic Development Level**

Regions with high levels of economic development typically possess more complete environmental regulatory systems and market incentive mechanisms, while the agglomeration of talent, capital, and other resources also provides support for innovation, thereby offering better conditions for enterprises to engage in green innovation (Wang and Yang, 2022). The results in Columns (5) and (6) of Table 5 validate the above viewpoint, showing that, compared to regions with low economic development levels, the pilot of the tax "streamlining administration and delegating power" reform has a more significant promoting effect on corporate green innovation in regions with high economic development levels.

**(2) Financial Development Level**

Regions with high financial development levels can guide funds through policies such as green credit, optimize the business environment, provide stable financing channels for corporate green innovation, and diversify risks, thereby effectively promoting corporate green transformation and innovation activities (Nie et al., 2024). Therefore, this paper posits that in regions with high financial development levels, the pilot of the tax "streamlining administration and delegating power" reform is more conducive to corporate green transformation. The results in Columns (7) and (8) of Table 5 indicate that, compared to regions with low financial development levels, the pilot of the tax "streamlining administration and delegating power" reform has a more significant promoting effect on corporate green innovation in regions with high financial development levels.

*Table 5: Heterogeneity Analysis Results*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | State-Owned | Non-State-Owned | Non-Heavily-Polluting | Heavily-Polluting | High Economic Level | Low Economic Level | High Financial Level | Low Financial Level |
| did | 0.055* | 0.030 | 0.046** | 0.005 | 0.047* | 0.010 | 0.086*** | 0.003 |
| | (0.031) | (0.025) | (0.022) | (0.028) | (0.024) | (0.022) | (0.030) | (0.020) |
| Control | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Constant | -0.968 | -2.320 | -0.955 | -3.125 | 1.672 | -1.022 | -2.387 | -1.328 |
| | (3.404) | (3.320) | (2.678) | (2.875) | (1.992) | (1.734) | (1.969) | (1.455) |
| Observations | 9817 | 20113 | 23754 | 9238 | 17759 | 15050 | 14527 | 18066 |
| Adjusted $R^2$ | 0.740 | 0.645 | 0.692 | 0.597 | 0.701 | 0.661 | 0.704 | 0.667 |

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

## 6. Conclusion and Policy Recommendations

This paper utilizes the phased pilots of the tax system's "streamlining administration and delegating power" reform in 2017 and 2018 as a quasi-natural experiment. Drawing on data from A-share listed companies from 2013 to 2023, it measures corporate green innovation capability using the number of green patent applications. From the perspective of the tax institutional environment, it explores the impact and mechanisms of the tax "streamlining administration and delegating power" reform on corporate green transformation, yielding the following conclusions: (1) The baseline regression results indicate that the reform optimizing the tax business environment is conducive to corporate green innovation, and this conclusion remains valid after a series of robustness tests. (2) The mechanism analysis results show that reducing agency costs and alleviating financing constraints are important mechanisms through which the "streamlining administration and delegating power" reform influences corporate green transformation. The tax "streamlining administration and delegating power" reform promotes corporate green innovation by reducing agency costs and alleviating financing constraints. (3) The heterogeneity analysis results demonstrate that the "streamlining administration and delegating power" reform has a more pronounced promoting effect on corporate green innovation in state-owned enterprises, heavily polluting enterprises, and regions with high levels of economic and financial development. Based on the research conclusions of this paper, the following policy implications can be derived:

First, further deepen the "streamlining administration and delegating power" reform in the tax system. Continuously optimize the administrative functions of tax departments, foster a fair competition environment, and provide precise public services. By strictly enforcing standards for environmental protection, safety, and other areas, eliminate "scattered, chaotic, and polluting" enterprises, thereby creating market space for high-quality enterprises genuinely engaged in green innovation. At the same time, the government can proactively offer precise public services and support for corporate green innovation. This not only promotes corporate green development but also advances local green transformation, strengthens the construction of socialist green civilization, and provides Chinese experience for more developing economies and countries.

Second, the "streamlining administration and delegating power" reform should prioritize helping corporate green innovation activities reduce agency costs and alleviate financing constraints, enhancing financial accessibility and boosting corporate green innovation capabilities through financial support. Tax departments should thoroughly advance simplifying administration and delegating power, shifting from ex-ante approvals to ex-post audits to minimize interventions in enterprises to the greatest extent possible, thereby curbing from the source the space for managerial layers to engage in inefficient decision-making or personal gain-seeking, and directly reducing agency costs. At the same time, leveraging the "Golden Tax Phase IV" system, precise supervision should be implemented using big tax data to standardize corporate governance and alleviate principal-agent conflicts between owners and managers. On this basis, deepen the "silver-tax interaction" mechanism to precisely direct financial resources toward innovation-oriented enterprises facing financing difficulties, enhancing their financial accessibility. Through this series of measures, ultimately form a virtuous mechanism of "standardized governance to reduce agency costs and precise financing to break funding bottlenecks", effectively elevating corporate green innovation capabilities.

Third, from a heterogeneity perspective, prioritize optimizing the business environment in state-owned enterprises, heavily polluting enterprises, and regions with high levels of economic and financial development to promote inclusive green transformation. Based on the "good and poor evaluation" system for government services, establish a regular evaluation mechanism for regional tax business environments. Evaluation indicators should cover all tasks and items across the three aspects of simplifying administration and delegating power, combining regulation and control, and optimizing services, comprehensively reviewing the effectiveness and shortcomings of the "streamlining administration and delegating power" reform. Track and

collect new issues and demands from taxpayers and fee payers, then promote reforms through evaluations, tailoring measures to local conditions and targetedly exploring more innovative initiatives to help enterprises overcome difficulties and alleviate burdens.

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