Research on the Impact of Sci-tech Finance Pilot Policy on Corporate ESG

Zhanying Zheng

Nanjing Agricultural University, No. 1 Weigang, Xiaolingwei Subdistrict, Xuanwu District, Nanjing, China

zhengzhanying2005@163.com

Abstract. Since the advent of the new era, China's economy has undergone a profound transformation from high-speed growth to high-quality development. The introduction of science and technology pilot policy represents a strategic initiative to address the demands of economic transition and technological innovation. Its implementation aligns profoundly with the dual imperatives of the innovation-driven development strategy and financial supply-side structural reform in the new era. This paper employs a quasi-natural experiment and utilises a multi-period difference-in-differences model to empirically examine the impact of this policy on corporate ESG performance and conduct heterogeneity analysis. The results indicate that the policy significantly enhanced the ESG performance of enterprises within the jurisdiction, with this conclusion remaining robust after stability testing.

Keywords: sci-tech finance; pilot policy; corporate ESG; green Innovation

1 Introduction

With the rapid expansion of Chinese enterprises, the traditional development model prioritising scale and profitability while neglecting environmental protection has precipitated severe ecological challenges. Confronted by the dual pressures of stringent ecological conservation constraints and the imperative demands of green development, Chinese enterprises urgently require transformative pathways to embrace sustainable business practices. The 14th Five-Year Plan and the Outline of Long-Range Objectives Through the Year 2035 advocate for 'advancing green development and achieving harmonious coexistence between humanity and nature.' The report from the 20th National Congress of the Communist Party of China reiterates the necessity to promote the carbon peaking and carbon neutrality strategy proactively and prudently. These policy directives not only call for comprehensive green transformation across the entire industrial chain but also underscore the fundamental shift towards low-carbon and environmentally sustainable production models, providing foundational guidance for China's nationwide green transition.

The imperative for high-quality green development is integrating social responsibility into the core of corporate philosophy. Business advancement is no longer confined

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to singular improvements in performance and operational efficiency, but increasingly prioritises the synergistic advancement of environmental protection and the fulfilment of social responsibilities. As a pivotal tool for measuring corporate sustainability, ESG disclosure is emerging as the predominant international metric for evaluating enterprises' green development. Whilst overall corporate ESG standards show an upward trajectory, individual entities still face a lack of commensurate financial backing. Consequently, how to enhance corporate ESG performance through financial support represents a significant challenge currently confronting governments.

Finance is the lifeblood of the real economy and the living water that nurtures outstanding enterprises to flourish and bear fruit. Major leaps in productivity originate from technological revolutions, flourish through industrial revolutions, and benefit from financial impetus. Finance must enhance its support for green innovation within enterprises. As a vital bridge connecting technological innovation with financial capital, sci-tech finance is increasingly becoming a core supporting force in driving innovation-driven development strategies and cultivating new productive forces. China implemented pilot programs in 2011 and 2016 across selected regions, including Beijing, designed to improve the quality of technology and finance development. Against the backdrop of China's parallel push for technology, finance and green economic development, a thorough investigation into whether pilot sci-tech finance policies enhance corporate ESG performance holds significant practical importance for accelerating green innovation and refining future policy frameworks. However, existing research predominantly concentrates on economic dimensions, specifically performance and innovation outputs, while largely neglecting non-economic effects like corporate social responsibility. Can sci-tech finance pilot policy(SFPP) influence the overall development of corporate ESG? And does this influence vary across enterprises with different characteristics? Overall, existing studies have not adequately addressed these questions. Clarifying how SFPP influence corporate ESG levels is critically important in the digital economy, offering substantial policy insights for enhancing the sustainability of Chinese enterprises. Consequently, this paper employs a double difference model based on city-level panel data to comprehensively evaluate the impact of SFPP on corporate ESG levels.

The marginal contributions of this study encompass three principal aspects: Firstly, at the theoretical level. Based on the synergistic relationship between sci-tech finance and corporate sustainable development, this study analyzes the non-economic effects of SFPP on corporate ESG performance. Second, research methodology. On the one hand, by treating the establishment of SFPP as a quasi-natural experiment, a multi-period double difference model is employed to assess policy effects on corporate ESG. This approach effectively circumvents endogeneity issues, enhancing the credibility of research conclusions. Second, multiple robustness tests reinforce the reliability of findings. Heterogeneity analyses across four dimensions—geographical location, macro-regulatory environment, technological attributes of industries, and pollution characteristics of industries—comprehensively reveal differentiated policy effects, enriching the study's depth and breadth. Third, from a policy perspective, this study explores how SFPP enable and differentially affect corporate ESG levels. The findings provide

crucial empirical evidence for overcoming financial constraints on ESG improvement and facilitating the economy's green transition.

2 Literature Review

2.1 Research on Sci-tech Finance Pilot Policy

Empirical evidence suggests that sci-tech finance pilot policies have yielded beneficial impacts in various domains. Regarding innovation, this policy not only directly stimulate innovation among pilot enterprises but also generate spillover effects through industrial chain networks [1]. Furthermore, it leverages fiscal funds to attract social capital investment in research and development[2]. Regarding high-quality development, this pilot policy enhances total factor productivity and economic resilience by incentivising entrepreneurship, driving industrial upgrading, and promoting green technological progress [3]. Regarding financing optimisation, it helps reduce corporate financing costs and constraints [4], alleviates maturity mismatch issues [5], and supports supply chain stability alongside the specialised, refined, distinctive and innovative development of SMEs[6]. Overall, existing research affirms the comprehensive effectiveness of SFPP, providing a basis for further optimising policy design and exploring institutional mechanisms.

2.2 Research on Corporate ESG

Current academic research on corporate ESG also focuses on multiple dimensions. At the external environment level, factors such as optimised business environments[7], investor green concerns[8], and infrastructure developments like the launch of China-Europe freight trains [9] all drive corporate ESG improvements. For enterprises themselves, the introduction of ESG ratings[10], state-owned shareholder holdings[11], and supply chain customer pressure enhances ESG of corporations by incentivising green innovation[12], mitigating financing constraints, and promoting management convergence mechanisms respectively. Regarding policy and financial support, green finance [13] and carbon trading policies [14] generally stimulate ESG investment, though they may also induce greenwashing behaviour due to short-term pressures.

3 Policy Context, Theoretical Framework and Research Hypotheses

3.1 Policy Context

In China's ongoing transition from rapid economic growth to high-quality development, scientific and technological innovation serves as the central driving force. Therefore, since 2010, the state has implemented systematic policies to deeply integrate science and technology with finance, initiating pilot programs that combine technological innovation with financial services. To explore differentiated models of technological-

financial innovation, Beijing and 15 other regions were designated as the first pilot zones in 2011 by the Ministry of Science and Technology and other ministries. Following the initial phase, the pilot program was expanded in 2016 with the approval of a second batch comprising nine cities, including Zhengzhou. This established a tiered advancement pattern from initial exploration to broader rollout. During policy implementation, localities progressively established diversified technology investment and financing systems guided by government funds, underpinned by bank credit, supplemented by venture capital, and expanded through capital markets. This effectively broadened financing channels for technology enterprises while reducing financing costs. As China's first specialised sci-tech finance pilot policy advanced through regional pilot schemes, these initiatives accumulated practical experience for subsequent nationwide policy rollouts, becoming pivotal points for studying the evolution of China's technology-finance system and policy impacts.

3.2 Theoretical Analysis and Research Hypotheses

Existing research generally holds that pilot policies for SFPP serve as a essential external driver for stimulating corporate innovation vitality and enhancing development quality. In terms of innovation incentives, sci-tech finance pilot policy not only substantially increases corporate R&D intensity [15], but also promotes green innovation [16] and the cultivation of new productive forces [17] through signalling and resource aggregation mechanisms. Their efficacy is further amplified in environments characterised by robust intellectual property protection and well-aligned policy frameworks. Regarding transformation and capacity building, policies can empower enterprises' digital transformation by elevating regional fintech capabilities, alleviating information constraints and financing pressures [18], optimise supply chain management, and mitigate corporate maturity mismatches [19]. Furthermore, research has examined policy effects on facilitating high-tech enterprise entry [20] and their heterogeneous impacts across property rights characteristics, industry attributes, and corporate life cycle stages. Existing research has established a foundational framework around the policy effects of SFPP schemes and the determinants of corporate ESG, with the former focusing on economic performance and innovation outputs, and the latter covering internal and external environments alongside policy support. Preliminary links between the two have been established through pathways such as green innovation, yet significant gaps remain: non-economic effects of SFPP have been overlooked; research on ESG determinants lacks a technology and finance perspective; and the direct causal relationships and heterogeneous mechanisms between the two have not been clarified. Accordingly, this paper's marginal contributions are: First, it provides a direct causal analysis of the relationship between SFPP and corporate ESG levels. Second, it broadens the scope of policy impact assessment by clarifying heterogeneous effects, thereby enriching the ESG literature. Based on the preceding theoretical framework, the following hypotheses are proposed:

H: The implementation of sci-tech finance pilot policy can significantly enhance the ESG of enterprises within the jurisdiction.

4 Empirical Analysis

4.1 Empirical Model

To empirically examine the impact of SFPP on urban green innovation, drawing upon the research of Sun Weizeng et al. [21] and Beck et al. [22], this paper establishes the following multi-period difference-in-differences model:

$$ESG_{it} = \alpha + \beta DID_{it} + \gamma Controls_{it} + Year_t + Company_i + \varepsilon_{it} \quad (1)$$

Here, i denotes individual firms, t represents time, ESG_{it} signifies firm *ESG* performance as the dependent variable, and DID_{it} indicates the SFPP variable as the explanatory variable. The coefficient β measures the extent to which the policy influences firm *ESG* performance. Additionally, $Control_{it}$ comprises a set of control variables, $Year_t$ denotes the time fixed effect, $Company_i$ represents the individual firm fixed effect, and ε_{it} constitutes the random error term.

4.2 Relevant Variables

Dependent variable: This paper employs the Huazheng ESG Rating Index as the metric for the dependent variable.

Core explanatory variable: This study uses the SFPP policy as the principal explanatory variable, with its value assigned according to whether a city is designated by the government as a pilot. If the city where an enterprise is located is designated or has been designated as a pilot city in the current year, the policy variable is assigned a value of 1; otherwise, it is assigned a value of 0.

Control variables: This paper controlled for the following variables: Company size(Size, the natural logarithm of the enterprise's total assets), Administrative expense ratio(Mfee, administrative expenses/Operating revenue), Return on equity(ROE, return on equity ROEB), Tobin's Q ratio(Tobin Q, Tobin Q ratio A), Major shareholder fund occupation (Occupy, other receivables/total assets), Cash flow ratio (Cashflow, net cash flow from operating activities/total assets), Fixed asset ratio (FIXED, net fixed assets/total assets).

4.3 Data Sources

This study analyses listed companies from 2006 to 2024. The author manually compiled the names and establishment dates of cities participating in the two sci-tech finance programmes in 2022 and 2016 from the Chinese government website. Research data sources include Huazheng ESG Ratings, Wind Database, Guotai An Database, and the China Statistical Yearbook. Descriptive statistics of the main variables are provided in Table 1.

Table 1. Descriptive Analysis

Variable	Obs	Mean	Std.	Min	Median	Max
DID	51,159	0.5891	0.4920	0.0000	1.0000	1.0000
ESG	64,940	73.7535	5.8469	57.0300	73.5710	99.0900
Size	50,977	22.0959	1.1574	20.0103	21.9268	25.6050
ROE	50,910	0.0658	0.0956	-0.4083	0.0708	0.2947
Cashflow	50,979	0.0471	0.0593	-0.1201	0.0462	0.2067
FIXED	50,976	0.2058	0.1454	0.0041	0.1778	0.6353
TobinQ	50,976	1.8807	0.9299	0.8887	1.5790	6.2209
Mfee	50,223	0.1255	0.2342	0.0106	0.0710	2.8315
Occupy	50,951	0.0125	0.0164	0.0002	0.0065	0.1049

5 Baseline Results Analysis

Table 2 presents the baseline regression results on the impact of SFPP on corporate ESG performance. Column (1) excludes all control variables; Column (2) incorporates three control variables: company size (Size), management fee ratio (Mfee), and return on equity (ROE); Column (3) presents the regression results containing all control variables. The ESG coefficients are significantly positive across all three scenarios, indicating that China's SFPP positively influences ESG of enterprisesand demonstrate effective promotional outcomes. This is likely attributable to the policy' s emphasis on enhancing corporate access to finance and fostering green innovation within pilot regions, thereby supporting enterprises' green transitions and elevating their ESG standards. The findings align with expectations, validating Hypothesis H.

Table 2. Regression analysis

	ESG	ESG	ESG
DID	0.7970***	0.5449***	0.6066***
	(3.920)	(2.710)	(2.954)
Size		0.9924***	0.7850***
		(11.437)	(8.593)
Mfee		-0.2127*	-0.2385*
		(-1.722)	(-1.721)
ROE		4.0307***	4.2048***
		(11.801)	(11.377)
TobinQ			-0.2588***
			(-6.212)
Occupy			-9.9038***
			(-3.858)
Cashflow			-0.7310
			(-1.460)
FIXED			-0.4754
			(-1.037)

Constant	72.8686*** (600.652)	50.9567*** (26.622)	56.2673*** (27.676)
Observations	49,030	41,025	36,000
R-squared	0.427	0.441	0.451
firm FE	Yes	Yes	Yes
year FE	Yes	Yes	Yes

Note: *, **, and *** indicate significance at 10%,5%, and 1% critical values, respectively.

6 Conclusions and Policy Recommendations

6.1 Research Findings

This study analyzes the impact of China's SFPP on ESG of enterprises. Using a multi-period difference-in-differences (DID) model, we conduct an empirical analysis with panel data spanning 2006 to 2024. This study finds that China's SFPP enhances ESG of corporations, a conclusion robustly supported by multi-period difference-in-differences estimation.

6.2 Policy Recommendations

Building on these findings, we propose policy recommendations to optimize the design of SFPP, thereby enhancing ESG of corporations and promoting sustainable economic development :To consolidate policy outcomes, robust long-term safeguards must be established. Firstly, ESG performance should be deeply integrated into financial credit assessment frameworks, expanding equity financing channels like green bonds to continuously reduce financing costs for high-quality enterprises. Secondly, enterprises should be guided to optimise equity structures and enhance management efficiency. Exploring the establishment of an ESG governance evaluation system could link assessment outcomes to policy support intensity, thereby creating a virtuous cycle where governance improvements reinforce policy incentives.

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