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An Empirical Study on the Impact of Science-Technology Finance on Enterprise Innovation Output

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Introduction

Technological innovation drives high-quality economic development, but enterprises face financing constraints. Science-technology finance integrates technology and finance to alleviate this, yet regional heterogeneity in its impact is underexplored. This study uses a two-way fixed effects model to examine its influence on innovation output of GEM and SME Board listed companies (2012-2022).

Research Questions

1) Does science-technology finance promote enterprise innovation output?
2) What is the quantitative relationship between them?
3) How to optimize the science-technology finance system for better support?

Table

TABLE 1. Science-Technology Finance Indicator System

Primary indicator	Secondary indicator	Calculation method
Technology Finance Resource Index	Science and technology human resources	Number of scientific and technological personnel / Total population of the region
	Science and technology institutional resources	Number of scientific and technological companies / Total population of the region
	Increase in the financial industry	Added value of the financial industry / Local GDP
Technology finance Funding Index	Strength of local fiscal allocation	Fiscal allocation for science and technology / Local general budget expenditure
	Strength of government departments' investment in funds	Government share of R&D funds expenditure / Regional GDP
	Strength of research and development funds	R&D funds expenditure / Gross Domestic Product
Technology finance output index	Output rate of scientific and technological papers	Number of papers / R&D funds expenditure
	Output rate of exports	Export output / R&D funds expenditure
	Transformation and application ability	New product sales revenue / R&D funds expenditure
Technology finance loan index	Strength of science and technology loans	Amount of technology loans from financial institutions / R&D funds expenditure
	Potential scale of science and technology loans	Loans from banking financial institutions / Domestic GDP

Mathematical Formulas

$$\text{Patent}_{i,t} = \beta_0 + \beta_1 \text{TF}_{j,t} + \beta_2 \text{Controls}_{i,j,t} + \mu_i + \lambda_t + \varepsilon_{i,j,t}$$

$\text{Patent}_{i,t}$: Innovation output of enterprise i in year t (total patent authorizations).

$\text{TF}_{j,t}$: Science-technology finance index of province j in year t.

$\text{Controls}_{i,j,t}$: Control variables (enterprise age, ROA, cash flow volatility, revenue growth rate, etc.).

μ_i: Enterprise fixed effect.

λ_t: Time fixed effect.

Methodologies

This paper examines the impact of science-technology finance on enterprise innovation output using a two-way fixed effects model, with a sample of listed companies on China's Growth Enterprise Market (GEM) and Small and Medium Enterprise Board from 2012 to 2022.

Conclusion

This study confirms that science-technology finance significantly promotes enterprise innovation output, with a 1-unit increase in the provincial science-technology finance index associated with a 2.45-unit increase in enterprise patent authorizations (significant at the 1% level). Robustness tests (using weighted patent types) further support this conclusion. We construct a multi-dimensional support system integrating "equity, loan, bond, and guarantee" to broaden financing channels for technology enterprises. Strengthen policy incentives for financial institutions, such as tax breaks and risk compensation, to enhance their willingness to invest in technology sectors.