Research on the Impact of Tax Incentives on Total Factor Productivity of Enterprises

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Abstract. The new round of technological revolution provides strategic opportunities for high-quality development. In the pursuit of the country's new development concept and high-quality development path, total factor productivity is the core factor that determines economic output. This article takes A-share listed companies in Shanghai and Shenzhen from 2012 to 2022 as the research object, and through theoretical and empirical analysis, determines the positive impact of tax preferential policies on improving the overall production efficiency of enterprises. Finally, this article suggests fully leveraging the economic effects brought about by tax incentives policies.

Keywords: Tax incentives; Total factor productivity; Enterprise innovation.

1 Introduction

In recent years, the scale of tax incentives in China has been continuously expanding, with a total tax reduction and fee reduction of nearly 10 trillion yuan from 2019 to 2022. In 2023, tax incentives and dividends will continue to be released, and there will be over 2.2 trillion yuan in new tax cuts, fee reductions, and deferred tax refunds nationwide. Tax incentives can alleviate the tax burden on enterprises, reduce research and development costs, encourage investment in the development of new technologies, products, and processes, and are one of the key factors in improving total factor productivity.

For enterprises, reducing or exempting value-added tax and corporate income tax is a key factor in helping their production and operation. Liu et al. (2019) [1] constructed a double difference model based on a "quasi natural experiment" and empirically analyzed the positive impact of reducing the value-added tax rate on the disposable cash flow and innovative equipment investment of enterprises; Gemmel et al.(2016)[11]found that reducing tax rates can increase the production enthusiasm of small enterprises. Wu Yili et al. (2021) [2] confirmed that "retained tax refunds" can help fully leverage the tax neutralit; Hussain (2015)[12]used VAR and DSGE calibration models to verify that tax growth suppresses the improvement of total factor productivity, and this inhibitory effect persists for a long time Zheng Baohong et al. (2018) [3] studied the impact of reducing income tax rates on total factor productivity of enterprises based on income tax

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reform. Guceril Irem(2018)[13], Mitchell[14] et al.(2020) believed that tax incentives can reduce the R&D costs and risks of enterprises, thereby increasing their R&D investment level. This article draws on existing research results and uses enterprise micro data as support and basis to explore the impact of tax incentives on total factor productivity of enterprises, and specifically analyzes the ways to achieve this impact.

2 Theoretical Analysis and Research Hypotheses

As the main source of national public finance revenue, taxation directly affects the net profit of enterprises. The heavier the tax burden on enterprises, the less disposable income they have. Tax preferential policies can also release more funds for enterprises to use for daily operations or investments, reduce their dependence on external financing channels, and further promote the formation and flow of capital. [12]

Based on this, this article proposes hypothesis : Tax incentives promote the improvement of total factor productivity of enterprises.

3 Model Design and Data Source

3.1 Model Settings

To analyze the specific performance of different enterprises at different time points, a bidirectional fixed effects model is constructed for research.

$$TFP_{i,t}=\alpha_0+\alpha_1 Tax_{i,t}+\alpha_1 controls+\theta_i+\omega_t+\varepsilon_{i,t} \quad (1)$$

i represents the enterprise, t represents time, TFP represents the total factor productivity of the enterprise, Tax represents the tax benefits enjoyed by the enterprise, controls are the control variables, θ_i and ω_t represent the fixed effects and time fixed effects of the enterprise, and $\varepsilon_{i,t}$ is random interference term [4].

3.2 Variable Selection

1. Explained variable. Total factor productivity is a measure of the production efficiency of a production unit after integrating all input factors.

2. Core explanatory variable: tax incentives, refer to Liu Guangqiang (2016) [5]: received tax refunds/(received tax refunds+paid tax refunds).

3. Control variables: This article selects some enterprise development indicators as control variables [6]. The specific variables are shown in Table 1.

Table 1. Variable Declaration

Variable type	Variable name	Variable symbol	Variable definition
Explained Variable	Total factor productivity	TFP_LP	Total factor productivity of enterprises estimated by LP method

Explanatory variable	Tax incentives	Tax	Tax refund/(tax refund+paid taxes))
Intermediary variable	Technological innovation	Patent	The natural logarithm of the number of invention patent applications plus 1
Control variable	Enterprise scale	Size	Natural logarithm of annual total assets
	Asset liability ratio	Lev	Total liabilities of the enterprise divided by total assets
	Profitability	ROA	Enterprise net profit /total assets
	Development capability	Growth	Business input growth rate
	Shareholding ratio of the largest shareholder	Top1	Shareholding ratio of the largest shareholder

3.3 Data Source

This article selects panel data of A-share listed companies in Shanghai and Shenzhen from 2012 to 2022 as samples, and processes them by: (1) removing samples with missing key financial indicators; (2) Exclude ST and ST * companies; (3) To eliminate the influence of outliers, perform a 1% tail reduction on continuous variables. Finally, 1353 companies and 14883 observations were obtained[7].

4 Empirical Result Analysis

4.1 Descriptive Statistics

As shown in Table 2, the maximum and minimum values of total factor productivity are 11.236 and 4.064, respectively, with an average of 8.400, indicating that the total factor productivity of most enterprises has reached a certain standard. The maximum value of Tax is 0.809, the minimum value is 0.000, and the standard deviation is 0.198, indicating that there are certain differences in the tax relief obtained by each enterprise.

Table 2. Descriptive Statistics

Variable	Sample size	Minimum value	Mean value	Maximum value	standard deviation
TFP_LP	14883	4.064	8.400	11.236	1.403
Patent	14883	0.000	2.057	6.535	1.641
Tax	14883	0.000	0.149	0.809	0.198
Size	14883	20.259	22.660	26.344	1.322
Lev	14883	0.061	0.442	0.866	0.198
ROA	14883	-0.147	0.040	0.204	0.053
Growth	14883	-0.497	0.132	1.700	0.315
Top1	14883	0.089	0.343	0.729	0.148

4.2 Benchmark Regression Analysis

As shown in Table 3. The regression process of column (1) only explores the effect of tax incentives on the total factor productivity of enterprises. Columns (1) - (9) gradually added control variables for research, and the impact coefficients were significant at the 1% level. Column (9) indicates that after adding all control variables, for every one percentage point increase in tax incentives, the total factor productivity of enterprises increases by 0.259 percentage points. Hypothesis 1 is validated.

Table 3. Benchmark Regression Analysis

	(1) TFP_LP	(2) TFP_LP	(3) TFP_LP	(4) TFP_LP	(5) TFP_LP	(6) TFP_LP	(7) TFP_LP	(8) TFP_LP	(9) TFP_LP
Tax	0.161***	0.175***	0.153***	0.255***	0.249***	0.248***	0.249***	0.249***	0.259***
	(2.85)	(3.43)	(3.01)	(5.12)	(5.04)	(5.03)	(5.05)	(5.06)	(5.25)
Size		0.827***	0.803***	0.754***	0.742***	0.742***	0.741***	0.741***	0.745***
		(40.14)	(37.15)	(34.87)	(34.39)	(34.40)	(34.34)	(34.08)	(34.30)
Lev			0.297***	0.673***	0.575***	0.573 ***	0.565***	0.565***	0.558***
			(4.04)	(8.79)	(7.50)	(7.47)	(7.33)	(7.33)	(7.26)
ROA				2.470***	1.895***	1.910***	1.906***	1.906***	1.694***
				(16.91)	(12.42)	(12.52)	(12.51)	(12.51)	(10.83)
Growth					0.232***	0.234***	0.234***	0.234***	0.234***
					(10.92)	(10.97)	(10.97)	(10.97)	(10.99)
Top1						-0.188*	-0.175	-0.174	-0.163
						(-1.68)	(-1.56)	(-1.56)	(-1.46)
Age							0.085	0.086	0.074
							(0.77)	(0.77)	(0.67)
Board								0.012	0.014
								(0.23)	(0.25)
Cash									0.586 ***
									(5.28)
Sample size	14883	14883	14883	14883	14883	14883	14883	14883	14883
R^2	0.807	0.845	0.846	0.850	0.852	0.852	0.852	0.852	0.852

*** p<0.01, ** p<0.05, * p<0.1

4.3 Robustness Test

Replace the Explained Variable. This article further uses the OLS method to re measure total factor productivity, as shown in column (1) of Table 4. The regression coefficient of Tax is 0.215 and significant at the 1% significance level.

Lag by One Period. To reduce the adverse effects of potential endogeneity issues, the approach of lagged the core explanatory variable by one period was adopted, and the results showed that: L The regression coefficient of Tax is 0.125, which passed the 1% significance test.

Table 4. Robustness Test

Variable	Replace OLS method(1) TFP_OLS	Lag by one period(2) TFP_LP
Tax	0.215***	
	(4.501)	
L.Tax		0.125***
		(2.586)
Sample size	14,883	13,530
R^2	0.898	0.864
*** p<0.01, ** p<0.05, * p<0.1		

4.4 Heterogeneity Analysis

Heterogeneity of Enterprise Property Rights. As shown in Table 5, the regression results for both state-owned and non-state-owned enterprises are significantly positive at the 1% level, but the impact of tax incentives on state-owned enterprises is more significant because they are more likely to obtain resources and financial support. The incentive effects of fiscal and tax policies on R&D investment vary among enterprises with different equity types, and state-owned enterprises are more conducive to using fiscal and tax policies to encourage enterprises to invest in technological innovation. (Yu Xiaoyu et al., 2019 [8]; Xu Nini et al., 2020 [9]; Wei Shuyu et al., 2021 [10])

Heterogeneity of Enterprise Scale. This article divides the research objects into large-scale enterprises and small-scale enterprises based on the average size of enterprises. The results show that the regression results of small-scale enterprises are significantly positive at the 1% level, while large-scale enterprises did not pass the significance test. This is because small-scale enterprises are often more sensitive to tax incentives due to limitations in their business scale and financial capabilities.

Table 5. Heterogeneity Analysis

	(1)	(2)	(3)	(4)
Variable	State-owned	Non-state-owned	Large-scale	Small-scale
Tax	0.433***	0.159***	-0.058	0.571***
	(5.083)	(2.607)	(-1.302)	(7.531)
Sample size	6,542	8,319	6,536	8,261
R^2	0.872	0.829	0.929	0.750
*** p<0.01, ** p<0.05, * p<0.1				

5 Conclusion and Policy Recommendations

The study found that: (1) tax incentives have a significant driving effect on total factor productivity; (2) The analysis of intermediary effects reveals that some of the pathways through which tax incentives promote total factor productivity of enterprises are achieved through strengthening innovation activities. After endogeneity and robustness tests, the conclusion still holds true.

Based on the above research results, suggestions are proposed:

5.1 Deepen Tax Reform and Stimulate Innovation Vitality

Deeply study the needs and pain points of enterprise innovation and development, construct a scientific and reasonable tax preferential policy system, focus on technology innovation enterprises and manufacturing enterprises, accurately implement tax reduction and fee reduction policies, strengthen policy guidance, guide various factor resources to invest in the real economy, create a better development environment for enterprises, and promote the economy towards a high-quality development path.

5.2 Lowering the Eligibility Threshold and Relaxing Preferential Conditions

Design targeted tax incentives to expand tax policies to a wider range of industries and economically underdeveloped areas, alleviate financing constraints, and promote regional development balance. At the same time, it is necessary to balance the stimulating effect of lowering the threshold and the potential risk of tax losses to avoid policy abuse.

5.3 Collaborate with Fiscal and Tax Policies to Optimize the Development Environment

According to the needs of economic development, various policy tools should be used to moderately expand the scale of fiscal expenditure, adjust and optimize the tax structure and fiscal expenditure structure, effectively compensate for market failures, better play the regulatory role of fiscal and tax policies, and help enterprises make long-term investment and business decisions.

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