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The innovative incentive effect of value-added tax retention and refund policy

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Abstract: *Innovation is the primary driving force for promoting high-quality economic development in China and the main means for enterprises to enhance their core competitiveness. At present, China has introduced a series of financial and tax policies to encourage enterprises to innovate independently and increase their innovation vitality. This article is based on annual data of listed companies from 2017 to 2023, and uses a difference in differences (DID) model to evaluate the impact of the 2019 value-added tax credit refund policy on R&D innovation in production and life service industry enterprises. Research has found that the value-added tax reform has an incentive effect on the research and development innovation of production and life service enterprises. Heterogeneity testing found that after the implementation of the self retention tax rebate policy, the larger the investment scale of the enterprise, the more obvious the innovation incentive effect it receives. This study provides some effective suggestions for value-added tax reform.*

Keywords: *Value added tax reform; Productive service industry; Life service industry; China; Innovation incentives*

1. Introduction

On March 21, 2019, the Ministry of Finance, the State Administration of Taxation, and the General Administration of Customs jointly issued the "Announcement on Deepening the Policies Related to Value added Tax Reform" in China, and implemented the system of refunding the end of period retained VAT amount from April 1, 2019. Since the implementation of the self retention tax rebate policy, many enterprises and industries in China have benefited from it, especially in the manufacturing, electricity, heat, gas, and water production and supply industries.

The balance of the current value-added tax output tax minus the current value-added tax input tax is taken as the taxable amount of China's current value-added tax. Value added tax, as a turnover tax, implements a chain deduction mechanism and is levied multiple times during the turnover process. The generation of value-added tax credit is due to the fact that when the input tax amount of value-added tax is greater than the output tax amount, the input tax amount that has not been fully deducted in the current period will be carried forward to offset the value-added tax output tax amount in the next stage. The policy of retaining and refunding value-added tax is to refund the input VAT that has not been deducted temporarily in advance, thereby increasing the free cash flow of enterprises, alleviating financing constraints or insufficient funds, and enabling enterprises to have more sufficient funds for innovation and development. The policy of retaining tax refunds is beneficial for the long-term development and planning of enterprises.

2. Scholar research and theoretical analysis

In existing literature, most scholars believe that value-added tax policies have an incentive effect on technological innovation of enterprises. Yu Wei's research found that the policy of retaining tax refunds significantly reduces corporate financial fraud behavior, and effectively targets the core elements of the fraud triangle by addressing motivational pressure, limiting opportunities, and challenging legitimate reasons to deter corporate financial fraud[1].Yingyin S used a sample of traditional Chinese medicine listed companies in the industry classification of Zhongtai Securities from 2015 to 2023, and conducted multiple regression analysis to examine the impact of the deferred tax refund policy on the stock prices of listed companies. Research has found that policies have a significant positive impact on stock prices,

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and the market responds positively; Meanwhile, there are significant differences in the impact of this policy on the stock prices of different types of pharmaceutical listed companies[2].From the perspective of enterprise quality management, Huang X conducted research and analysis on the incentive effect of the policy of reducing value-added tax rates on enterprise innovation. It was found that the reduction of value-added tax rates has an incentive effect on enterprise innovation activities and a positive regulatory effect on enterprise innovation research and development activities[3].Chen J has put forward some suggestions regarding the policy of deferred tax refund: further expanding the scope of deferred tax refund, increasing the capital circulation of enterprises, reducing the pressure of enterprise lending and supply-demand balance, in order to adapt to new developments. At the same time, auditing non-standard corporate accounts, raising the entry threshold for accounting, and promoting the harmonious growth of tax revenue and corporate activities[4].

The theoretical basis of this article is the theory of financing constraints and the theory of information transmission. The theory of financing constraints proposes that there are two financing methods for enterprises to obtain working capital, namely external financing and internal financing. External financing is often limited by factors such as information asymmetry and company size, making it difficult to meet financing needs. In this case, companies rely more on internal financing. If the internal financing of a company cannot meet its production and operational needs, the company will face financing constraints. Generally speaking, the higher the financing constraint index of a company, the less free cash flow it has, which to some extent inhibits the company's investment behavior and R&D innovation motivation. The implementation of the value-added tax retention and refund policy can directly increase the free cash flow of enterprises, alleviate financing constraints, and increase R&D innovation investment of enterprises. Secondly, from the perspective of signal transmission theory, the value-added tax retention and refund policy, as an important means of government support for innovation, conveys a positive government support effect to other enterprises, which is conducive to expanding their financing channels, alleviating information asymmetry in R&D innovation, and helping enterprises break through the funding bottleneck of scientific and technological R&D innovation.

3. Research Design

3.1. Sample selection and data sources

This article takes the annual data of A-share listed companies from 2017 to 2023 as the sample period. Considering the implementation of the "business tax to value-added tax" policy from May 1, 2016, the first complete year for the comprehensive collection of value-added tax in the service industry was in 2017. The financial data in this article is sourced from the Tonghuashun Enterprise Database, CSMAR Database, and annual reports. The number of patents of listed companies is sourced from Qichacha.

Given that the financial data of some companies is insufficient to reflect the specific implementation effects of policies in the enterprise, this article, based on the practices of Wang Cong [5], screens the original data as follows: (1) excludes listed companies (ST, *ST) and deleted companies that were specially processed during the inspection period; (2) Exclude samples with significantly abnormal financial indicators such as a return on total assets greater than 1 and an asset liability ratio not between 0-1; (3) Exclude samples with missing key information such as the number of patent applications; (4) Exclude companies that have undergone significant asset restructuring during the sample period. After screening, a total of 415 samples and 2905 observations were obtained. All continuous variables were truncated at the 1% level.

3.2. Model setting and variable selection

To examine the impact of the value-added tax retention and refund policy on corporate R&D innovation, this article uses the number of patent applications filed by enterprises as an indicator to measure their R&D innovation capabilities. Production and life service enterprises that implement the retention and refund policy are selected as the experimental group, while financial enterprises are selected as the control group. Referring to the research of Wang Cong, the benchmark double difference regression model is designed as follows:

$$\mathrm{Patent}_{i,t} = \alpha + \beta \mathrm{Treat}_i \times \mathrm{Policy}_t + \gamma X_{i,t} + \delta_i + \tau_t + \varepsilon_{i,t}$$

The subscript i represents the individual enterprise, and t represents the year. The dependent variable 'Patent' represents the total number of patent applications filed by a company. Referring to the approach

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of Li S[6], this article uses the number of patent applications filed by a company to measure its R&D and innovation capabilities, in order to verify whether the additional deduction policy has an incentive effect on corporate innovation. Treat is an industry dummy variable that represents whether an individual has been intervened by the 2019 deferred tax refund policy. If the sample is subjected to intervention, i.e. the experimental group, Treat is set to 1, otherwise set to 0. Policy is a policy dummy variable, with Policy set to 0 before policy implementation and 1 after policy implementation. This model focuses on the estimated coefficient β of the interaction term Treat × Policy. If the estimated coefficient β is significantly greater than 0, it indicates that after the implementation of the value-added tax credit policy, compared to enterprises that did not enjoy the credit policy, the innovation ability of enterprises affected by the policy has significantly improved. The control variables mainly include Size, Growth, FA, Cashflow, Soe, Indep, Age. In the model, β, γ represents the regression coefficient, δ_i represents the individual fixed effect, τ_t represents the year fixed effect, and $\varepsilon_{i,t}$ represents the random error term.

4. Empirical results

4.1. Descriptive statistics

Descriptive statistics were conducted on the selected variables, and the results are shown in Table 1.

Table 1: Descriptive Statistics of Samples.

Variable	N	Mean	SD	Min	P50	Max
Patent	2 905	17.627	57.828	0	0	988
Size	2 905	8268756.1	3.62e+07	50050.579	478336.7	2.898e+08
Growth	2 905	10.408	33.036	-63.918	7.742	169.618
Cashflow	2 905	189101.7	2753459	-5.88e+07	14756.991	4.34e+07
FA	2 905	9.581	11.567	0.006	5.487	77.908
Soe	2 905	0.410	0.492	0	0	1
Indep	2 905	0.265	0.441	0	0	1
Age	2 905	21.715	6.115	9	22	38

4.2. Correlation analysis

This article uses the number of patent applications of enterprises to measure their R&D innovation capabilities. It compares the changes in the total number of patent applications before and after policy implementation between production and life service enterprises as the "experimental group" and financial enterprises as the "control group". Then, t-test method is used to examine whether there are systematic differences between the experimental group and the control group before and after policy implementation. The results showed that in terms of the total number of patent applications, the total number of patent applications in the experimental group increased by 8.117 percentage points compared to before the implementation of the policy, while the total number of patent applications in the control group increased by 2.999 percentage points after the implementation of the policy. Overall, the 2019 value-added tax reform has promoted patent output in the production and life service industries, improved the research and development innovation capabilities of enterprises, and has an incentive effect on enterprise innovation. The test results are shown in Table 2.

Table 2: The impact of value-added tax reform on the total number of patent applications by enterprises: a univariate difference in differences test.

Policy events		Patent (%)	S.Err.	| t |	P>| t |
Before(a)	Control(1)	1.713	—	—	—
	Treat(2)	22.121	—	—	—
	Diff(2)-(1)	20.407	2.560	7.97	0.000***
After(b)	Control(1)	4.712	—	—	—
	Treat(2)	30.238	—	—	—
	Diff(2)-(1)	25.526	2.322	10.99	0.000***
Diff-in-Diff(b)-(a)		5.119	2.704	1.89	0.058*

Note: * * * indicates significant at the 1% level.

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4.3. Analysis of Basic Regression Results

The preliminary conclusion can be drawn from the results of the univariate double difference test mentioned above: after the implementation of the value-added tax retention and refund policy in 2019, the number of patent applications for production and life service enterprises increased, which stimulated their research and development innovation. In order to comprehensively observe the impact of value-added tax retention and refund policies on enterprise R&D innovation, this paper uses a high-dimensional fixed effects model for further analysis, and the regression analysis results are shown in Table 3. Among them, column (1) is the regression result that only controls for bidirectional fixed effects and does not include any control variables; Column (2) shows the regression results with both individual and time fixed effects and control variables. In Table 3, columns (1) and (2) report the regression results with the total number of patent applications of the enterprise as the dependent variable. The results showed that when no control variables were added, the estimated coefficient of the interaction term was 0.083, which was significantly positive at the 10% level; After adding control variables, the baseline regression result is 0.011, which is significant at the 5% level. The results show that the value-added tax retention and refund policy has an incentive effect on the research and development innovation of production and life service enterprises.

Table 3: Regression analysis of retention tax refund policy and enterprise innovation incentives.

Variable	Patent	
	(1)	(2)
Treat×Policy	0.083*	0.011**
	(1.73)	(2.55)
Controls	NO	YES
Constant	0.000***	0.722
	(13.32)	(0.36)
Ind FE	YES	YES
Year FE	YES	YES
N	2 905	2 905
R^2	0.839	0.840

Note: The values in parentheses are t-values, * * *, * *, and * respectively indicating significance at the 1%, 5%, and 10% levels. Same below.

4.4. Mechanism analysis

The theory of financing constraints proposes that there are two financing methods for enterprises to obtain working capital, namely external financing and internal financing. External financing is often limited by factors such as information asymmetry and company size, making it difficult to meet financing needs. In this case, companies rely more on internal financing. If the internal financing of a company cannot meet its production and operational needs, the company will face financing constraints. Generally speaking, the higher the financing constraint index of a company, the less free cash flow it has, which to some extent inhibits the company's investment behavior and R&D innovation motivation. The implementation of value-added tax retention and refund has increased the free cash flow of enterprises, eased financing constraints, and increased their investment in research and innovation. This article takes the logarithm of the proportion of net cash flows generated from operating activities as the dependent variable for regression analysis, and the data comes from the Tonghuashun Enterprise Database.The results are shown in Table 4.The results of column (1) show that the estimated coefficient of the multiplication term is 0.000, which is significantly positive at the 1% level. This result indicates that the value-added tax retention and refund policy implemented in 2019 significantly alleviated the financing constraints of production and life service industry enterprises, increased their free cash flow, and enabled them to have more funds for research and development investment, thereby enhancing their R&D innovation capabilities. The policy of retaining and refunding value-added tax has an incentive effect on the research and development innovation of production and life service enterprises.

The VAT rebate policy can increase the free cash flow of enterprises, enable enterprises to have sufficient funds for equipment upgrading, encourage enterprises to expand the scale of fixed assets investment, and provide a material basis for enterprise innovation. According to the principle of complementary capital skills, the increase of fixed assets may promote the upgrading of human capital in enterprises and to some extent enhance their research and innovation capabilities. The dependent variable of this article is the proportion of fixed assets to total assets, and regression analysis is conducted

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according to the previous text. As shown in the second column of Table 4, the estimated coefficient of the interaction term is 0.090, which is significantly positive at the 10% level. This result indicates that the implementation of the value-added tax retention and refund policy has expanded the investment scale of fixed assets, and enterprises have more equipment for research and development innovation, which has an incentive effect on the research and development innovation of production and life service industry enterprises.

Table 4: Discussion on Mechanism of Action: Financing Constraints and Corporate Investment.

Variable	Proportion of net cash flow(CF)	Proportion of fixed assets(FA)
	(1)	(2)
Treat×Policy	0.000***	0.090*
	(4.81)	(1.69)
Controls	YES	YES
Constant	0.056*	0.022**
	(13.32)	(2.28)
Ind FE	YES	YES
Year FE	YES	YES
N	2 905	2 905
R^2	0.364	0.868

Note: The values in parentheses are t-values, * * *, * *, and * respectively indicating significance at the 1%, 5%, and 10% levels. Same below.

4.5. Heterogeneity test

Through a series of regression analyses and empirical tests in the previous section, the results show that the implementation of the value-added tax retention and refund policy has led to an increase in the number of patent applications for production and life service enterprises, which has an incentive effect on their research and development innovation. To further improve the theory, this article conducts further research on the property rights nature and investment scale of enterprises, in order to examine the policy effects exhibited by production and life service industry enterprises in different dimensions.

The results are shown in Table 5. From Table 5, it can be seen that the value-added tax retention and refund policy has a more incentive effect on the research and development innovation of non-state-owned enterprises. This article believes that there are three reasons for this result: firstly, compared to state-owned enterprises with better financing conditions, non-state-owned enterprises often find it difficult to obtain sufficient funds due to the lack of sufficient collateral assets and financing channels, thus falling into the dilemma of financing constraints. The policy of retaining and refunding value-added tax has increased the free cash flow of enterprises, effectively alleviated their financing constraints, and provided them with sufficient funds for research and innovation investment. Secondly, non-state-owned enterprises place more emphasis on profitability compared to state-owned enterprises, and expect to engage in research and development innovation to obtain significant returns. Finally, the density of research and innovation activities in non-state-owned enterprises is higher than that in state-owned enterprises. From the empirical results, it can be seen that the implementation of the deferred tax refund policy has promoted an increase in the number of patent applications by non-state-owned enterprises.

Table 5: Heterogeneity Test: Distinguishing between Property Rights and Investment Scale of Enterprises.

Variable	patent			
	state − owned enterpris	Non state − owned enterpris	Large investment sca	Small investment scale
	(1)	(2)	(3)	(4)
Treat×Policy	0.008***	0.008***	0.001***	0.077*
	(2.65)	(2.67)	(3.45)	(1.77)
Controls	YES	YES	YES	YES
Constant	0.038**	0.271	0.025**	0.459
	(-2.08)	(1.10)	(-2.24)	(-0.74)
Ind FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	1 330	2 030	1 460	1 873
R^2	0.936	0.734	0.868	0.673

Note: The values in parentheses are t-values, * * *, * *, and * respectively indicating significance at the 1%, 5%, and 10% levels. Same below.

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To further examine the heterogeneity caused by possible differences, this article divides the sample companies into two groups based on the median of their asset size: those with smaller investment scales and those with larger investment scales. The third column represents enterprises with larger investment scales, with an estimated coefficient of 0.001, while the fourth column represents enterprises with smaller investment scales, with an estimated coefficient of 0.077. The results show that the larger the investment scale of the enterprise, the more significant the innovation incentive effect of the retained tax rebate policy on it. This article believes that the emergence of this result is due to the fact that enterprises with smaller investment scales, although enjoying the benefits of the deferred tax refund policy, have limited funds returned due to their smaller scale, resulting in less improvement in their R&D and innovation capabilities.

5. Conclusion and policy recommendations

Research has found that the value-added tax retention and refund policy has an incentive effect on the research and development innovation of production and life service industry enterprises, effectively motivating them to engage in research and development innovation activities. Mechanism testing found that the value-added tax credit policy can encourage enterprises' research and development innovation behavior from two aspects: alleviating financing constraints and expanding enterprise investment. Further research has found that the additional deduction policy has significant heterogeneity: the additional deduction policy has a more incentive effect on research and development innovation of non-state-owned enterprises; The larger the scale of enterprise investment, the more obvious the incentive effect of value-added tax deduction policy.From this, it can be seen that the policy of retaining tax refunds has an incentive effect on the research and development innovation of China's production and life service industries, effectively promoting the improvement of these enterprises' research and development innovation capabilities.

The above research conclusions provide relevant recommendations for stakeholders and policy makers.For policy makers, in order to implement the policy of retaining tax refunds, it is necessary to further improve the policy by appropriately increasing the proportion of deferred tax refunds, expanding the scope of enterprises that enjoy policy benefits, promoting the coordinated development of the core technology enterprise industry chain, enhancing the international competitiveness of China's high-tech products, and promoting industrial development and upgrading.For stakeholders, it is necessary to actively enhance the core competitiveness and innovation capability of the enterprise, make good use of the free cash flow increased by the retained tax rebate policy to expand the investment and financing of the enterprise, and revitalize the enterprise.

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