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The Research on the Impact of VAT Additional Deduction Policy on Innovation Output in the Production and Service Industries

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Abstract

In 2019, to deepen the VAT reform and promote substantial VAT reduction, the Ministry of Finance, the State Taxation Administration, and the General Administration of Customs jointly issued the VAT additional deduction policy. This study uses data from A-share listed companies in the productive and life services sectors from 2017 to 2022, with the 2019 additional deduction policy shock as the core explanatory variable. Using the difference-in-differences method, we conduct baseline regression and analyze firm heterogeneity to investigate the impact of the additional deduction policy on innovation output in these sectors. The study finds that the 2019 additional deduction policy significantly increased the innovation output of firms in the productive and life services sectors, and the policy effects exhibit significant heterogeneity. In these sectors, non-state-owned enterprises benefited more from the policy, showing a more pronounced increase in innovation output compared to state-owned enterprises; high-tech industries experienced better innovation output improvement than non-high-tech industries; and growth-stage firms had a more significant promotion effect on innovation output compared to mature firms. The study suggests further deepening the VAT additional deduction policy reform, expanding the scope of applicable industries, enhancing policy precision, strengthening policy promotion and supervision, and fully leveraging the policy's incentive effect on innovation output. It also recommends refining the policy to provide varying levels of support to different types of enterprises.

Keywords

VAT Additional Deduction, Corporate Innovation Output, Difference-in-Differences, China

1. Introduction

Since 2018, China's economic growth has gradually slowed down amid a complex and volatile external environment, intensified international trade frictions, and arduous domestic economic structural adjustments and transformation tasks. In 2019, facing the pressure of economic slowdown, stabilizing growth became a government priority, urgently requiring policy adjustments and reform measures to stimulate economic vitality and promote stable development. Concurrently, the global economy in 2019 faced numerous uncertainties, such as the rise of trade protectionism, increasing geopolitical risks, and diverging monetary policies among major economies. These factors led to an unclear global economic growth outlook, weak external demand, and significant pressure on China's exports and foreign trade, compelling China to intensify efforts to advance an internal demand-driven economic development strategy. Under economic downturn pressure, enterprises faced increased operational difficulties, making the reduction of tax burdens, cost reduction, and the enhancement of profitability and market competitiveness crucial means to drive economic growth. As China's economic development phase transitions, the proportion of the service sector in the national economy continues to rise. The development of the service sector is crucial for promoting economic structural adjustment and improving economic development quality. However, service sector enterprises, especially in the productive and life services sectors, face substantial tax burdens, affecting their innovation and expansion capabilities.

As one of China's primary taxes, VAT has undergone several reform measures since 2018, including reducing the VAT rate for industries such as manufacturing from 17% to 16%, further releasing reform dividends. However, some scholars argue that the tax system structure still needs optimization, and the VAT chain needs further refinement to enhance fairness and neutrality, stimulating market vitality (Guo & Li, 2023; Liu, Cao, Cao, Lu, & Shan, 2024). Therefore, the CPC Central Committee and the State Council have issued a series of tax reduction and fee reduction policies to alleviate the financial pressure on enterprises. President Xi Jinping has repeatedly issued important instructions on implementing larger-scale tax and fee reduction policies, emphasizing the need for these policies to be truly implemented, ensuring that enterprises can operate with lighter burdens. To lower the cost of technological innovation for enterprises, share their R&D investment risks, and guide and incentivize them to innovate, China has implemented a series of tax reduction and fee reduction policies. Most scholars believe that VAT transformation reform helps enterprises release innovation dividends (Cao, Wang, & Cao, 2022; Nie, Fang, & Li, 2010; Lan, Wang, & Cao, 2020). Since April 1, 2019, productive and life services taxpayers have been allowed to deduct an additional 10% of the current deductible input tax, which was increased to 15% for life services in October of the same year.

The VAT additional deduction policy has a short implementation period, and

its effects are beginning to appear. Thus, studies and literature directly related to the additional deduction policy are limited and mainly analyze its policy effects. Wan Ying et al. (Wan & Chen, 2020) used the 2018 VAT system as a reference to construct a 42-sector VAT CGE model to simulate and estimate the policy effects of the 2019 VAT reduction reform in terms of tax burden, economic growth, income distribution, and social welfare. The results showed that implementing the 10% additional deduction policy on the basis of the rate reduction further improved the tax revenue effect, economic effect, income distribution effect, and welfare effect. Some scholars believe that the additional deduction policy reduces the VAT burden on enterprises. Hu Haisheng et al. (Hu, Wang, & Liu, 2021) constructed a dynamic computable general equilibrium model with a VAT deduction mechanism to measure the economic effects of VAT reform policies since 2018. They found that as a tax amount-based preferential policy, the VAT additional deduction has a very good targeted tax reduction effect, partially offsetting the tax burden increase in the productive and life services sectors, thereby increasing enterprise profits and household income levels. Wang Cong et al. (Wang, Zhu, Hu, & Liu, 2024) used a difference-in-differences (DID) model to study the additional deduction policy and found that it generally reduced the VAT burden on enterprises in the productive and life services sectors. The larger the investment scale of the enterprise, the more significant the VAT burden reduction; the tax reduction effect was better for productive services enterprises than for life services enterprises; and in productive services, modern services enterprises, excluding R&D and technical services, experienced VAT burden reductions across other sub-sectors.

Currently, there are fewer studies on the VAT additional deduction policy, and the impact of the VAT additional deduction policy is mainly measured from the perspectives of enterprise value and tax burden. In this paper, the impact of VAT additional deduction policy on enterprise innovation output is studied from the perspective of VAT additional deduction policy, which broadens the research perspective, further enriches the research results of VAT additional deduction policy on enterprise level, and has important theoretical and practical significance. Taking the mechanism of the VAT additional deduction policy on the innovation development of the production and living service industries as the research object, we study the process of the interaction between the two, and construct the research framework of the VAT additional deduction policy and the innovation output of the production and living service industries. It is of great practical significance to study the relationship between the VAT additional deduction policy and the innovation output of the production and living service industries to help the high-quality development of the production and living service industries. The high-quality development of the production and living service industries can further reduce the production costs of the relevant industries, stimulate their job-absorbing capacity and enhance the level of employment, and it is also conducive to boosting China's consumption demand and

economic growth and promoting the optimization and upgrading of the economic structure. Based on this, this study focuses on the VAT additional deduction policy to examine its impact on the innovation output of productive and life services enterprises.

2. Theoretical Analysis and Research Hypotheses

2.1. Theory of Tax Regulation

Tax regulation is a way for the state to participate in the process of national income distribution by means of taxation, and to regulate the economic interests of all parties in a compulsory and gratuitous way, so as to regulate the social and economic life. It affects production and circulation by regulating consumer demand, and is characterized by a wide range of regulation. Taxation can not only penetrate into the various fields and links of social reproduction, but also taxation can reach all sectors and units of the national economy, from the state down to enterprises, so as to realize the regulation of the speed and direction of economic operation. Tax regulation can also be purposeful to an object for special regulation, set up different taxes, tax items, tax rates to distinguish between different tax objects, plus adjusting the tax rate, tax exemptions, or additive levies to regulate the way. At the same time, the tax is based on the law, has the mandatory, similarly, the tax regulation also has the unquestionable authority. Tax regulation regulates the relationship between supply and demand and the income level by changing the tax burden and tax rate structure. The implementation of the VAT additional deduction policy can realize tax and fee reduction, encourage enterprises to invest the refunded amount in R&D and production, accelerate transformation and upgrading, and improve the vitality of enterprises.

2.2. Schumpeter's Theory of Innovative Economic Development

Schumpeter believes that innovation is the fundamental driving force of economic development, which not only refers to technological innovation, but also includes the new combination of production factors and production conditions (De Sao Pedro Filho, Lima, Moreira Da Silva Neto, Andre Da Silva Muller, & Batista Da Costa, 2017). This new combination can be introduced into the production system and form a new production function, thus promoting the development of the economy. With the development of global economic integration and the continuous progress of society, innovation occupies a core position in the economic development of all countries, and is taken as the basic national policy to promote the economic development of all countries. As an important indicator to measure the economic development of a country, all countries in the world need to systemize the corresponding innovation strategy and build a reasonable institutional structure to vigorously develop their own innovation activities, so as to promote the further development of the economy. In the chain of enterprise innovation activities, government tax incentives are also essential.

2.3. Cash Flow Effect and Information Transfer Theory

First, the VAT additional deduction policy directly reduces the actual VAT paid by enterprises by increasing their input VAT, thus lowering their tax burden, saving their tax cash outflows, and increasing their free cash flow. Research has shown that corporate cash flow significantly promotes innovation. Studies have found (Cincera, Ravet, & Veugelers, 2016) that adequate cash flow can reduce the risk of R&D, thereby positively impacting corporate R&D innovation. The additional cash flow brought by the VAT additional deduction policy makes enterprises more willing to invest in innovation activities that benefit their long-term growth and maximize corporate value. The increased cash flow can substitute for some high-cost external financing, serving as internal financing to reduce the overall capital cost of enterprises. Alleviating financing constraints reduces the investment risk of innovation activities, making the management more inclined to decide on pursuing innovation activities (Li, Liu, Jia, & Ma, 2024; Wang, Li, & Wang, 2022; Zhao & Wang, 2022).

Secondly, some scholars believe (Li & Zhang, 2009) that according to information transmission theory, when the government conveys favorable information about the overall development trend of enterprises to the market, market investors will shift their investment decisions toward increased investment. The implementation of the VAT additional deduction policy in 2019 positioned the production and life services sectors benefiting from the policy as favorable prospects in the eyes of market investors. Therefore, to continue reaping the benefits of the policy, enterprises will pay more attention to their market competitiveness, which will drive them to intensify their innovation efforts.

Based on the above analysis, this paper proposes the following hypothesis:

H1: The VAT additional deduction policy significantly promotes innovation output in the production and life services sectors.

3. Study Design

3.1. Data Sources and Sample Selection

This paper evaluates the impact of the VAT additional deduction policy on innovation in the production and life services sectors by analyzing changes in innovation output of listed companies before and after the policy's implementation. The sample selection follows these steps: Industry classification is based on the "Annotations on Sales of Services, Intangible Assets, and Real Estate" (Cai Shui [2016] No. 36), with the productive services sector including postal services, telecommunications services, and modern service industries. The life services sector includes cultural and sports services, education and medical services, catering, and accommodation services. This study selects listed companies that are not simultaneously affected by the additional deduction policy and changes in VAT rates, using listed financial companies as the control group.

The sales behavior of most service sector enterprises in the first five months of

2016 was subject to business tax, not the first full year of full VAT collection in the service sector, and more relevant data are missing in 2023, so this paper adopts the data of enterprises in 2017-2022 as the experimental interval. The data for listed companies mainly come from the Cathay Pacific database (abbreviation CSMAR) and the iFinD enterprise database, covering the period from 2017 to 2022, and are processed and analyzed using STATA. To ensure data accuracy and sample representativeness, the raw data were processed as follows: 1) Samples with missing key variables were excluded; 2) Companies that went bankrupt before 2022 and those listed after 2017 were excluded; 3) Companies with ST or *ST status during the study period were excluded. Due to a small amount of missing data during the experimental period for some firms, in order to retain more observations and improve the precision of the model estimation results, this paper uses unbalanced panel data for regression. Ultimately, 444 research samples and 2411 observations were obtained.

3.2. Variable Selection and Modeling

The paper treats the implementation of the VAT additional deduction policy as an event shock and uses the difference-in-differences method to evaluate and analyze the policy's impact on corporate innovation output. To accurately estimate the policy's effects, control variables such as asset-liability ratio were introduced, and the basic regression model constructed is as follows.

$$lnpatent_{it} = \alpha + \beta_0 TP_{it} + \beta_1 X_{it} + \gamma_i + \tau_t + \varepsilon_{it} \quad (1)$$

Here, the subscript i denotes the enterprise and t denotes the year. The dependent variable $lnpatent_{it}$ measures the level of corporate innovation output. β_0 is the coefficient of primary interest, indicating the effect of the additional deduction policy on corporate innovation output. Its sign and significance reflect whether and how the additional deduction policy impacts corporate R&D output. X_{it} represents control variables, with β_1 as their regression coefficient. γ_i and τ_t denote individual and year fixed effects, respectively, while ε_{it} is the random error term.

3.2.1. Dependent Variable—Corporate Innovation Output (lnpatent)

Patents are important outcomes and direct manifestations of innovation. The number of patents is often used in academia to measure corporate innovation output. Given the long approval time for patents, patent grants are somewhat lagged. Therefore, this study uses the number of patent applications to measure innovation output. Patent application types include invention patents, utility model patents, and design patents. Considering that invention and utility model patents have higher technical content and better represent corporate innovation levels, this study uses the natural logarithm of the total number of utility model and invention patent applications plus one, following Q. Li, Ma and Shevlin (Li, Ma, & Shevlin, 2021).

3.2.2. Explanatory Variable—VAT Additional Deduction Policy (TP)

The explanatory variable is the VAT additional deduction policy (TP), essentially the interaction of the dummy variables for time (Policy) and sample (Treat). The dummy variable for the enterprise sample is Treat, which equals 1 if the enterprise belongs to the experimental group, otherwise 0. The time dummy variable is Policy, which equals 1 after the VAT additional deduction policy implementation, otherwise 0.

3.2.3. Explanatory Variable—VAT Additional Deduction Policy (TP)

The definitions of the control variables are detailed in Table 1.

Table 1. Control variables.

Variable Symbol	Variable Name	Variable Definition	Data Sources
Age	Company Age	ln (current year − year of establishment + 1)	CSMAR and iFinD
Size	Company Size	Natural logarithm of total assets at year-end	CSMAR and iFinD
Lev	Leverage Ratio	Total liabilities at year-end/Total assets at year-end	CSMAR and iFinD
Cashflow	Cash Flow Ratio	Net cash flow from operating activities/Total assets	CSMAR and iFinD
REC	Accounts Receivable	Net accounts receivable/Total assets	CSMAR and iFinD
AssetGrowth	Asset Growth Rate	Growth in total assets at year-end/Total assets at the beginning of the year	CSMAR and iFinD
ROA	Return on Assets	Net profit/Average total assets	CSMAR and iFinD
FIXED	Fixed Assets Ratio	Net fixed assets/Total assets	CSMAR and iFinD
Board	Board Size	Natural logarithm of the number of board members	CSMAR and iFinD
Top1	Shareholding Ratio of Largest Shareholder	Number of shares held by the largest shareholder/Total shares outstanding	CSMAR and iFinD
Indep	Independent Directors	Number of independent directors/Total number of board members	CSMAR and iFinD
Balance1	Ownership Balance	Number of shares held by the second-largest shareholder/Number of shares held by the largest shareholder	CSMAR and iFinD
Mshare	Management Shareholding	Number of shares held by management/Total shares outstanding	CSMAR and iFinD
SOE	State Ownership	Value is 1 if the enterprise is state-owned, otherwise 0	CSMAR and iFinD

4. Empirical Results and Analysis

4.1. Descriptive Statistics

After the data of variables were aggregated and filtered, we obtained data from 444 listed companies in the production and life services sectors, resulting in a total of 2411 observations. The descriptive statistics are shown in Table 2. From these results, it is evident that from 2017 to 2022, the innovation output (lnpatent) of Chinese listed companies in the sample had a minimum value of 0 and a maximum value of 7.04, with an average innovation output of 2.41. This indi-

cates that the overall level of innovation among Chinese listed companies is relatively low, demonstrating insufficient innovation motivation. Regarding control variables, the standard deviations of the return on total assets, net cash flow from operating activities, and total asset growth rate all exceed their means, indicating significant differences in profitability, internal financing capacity, and growth rates among the sample enterprises. Overall, the descriptive statistics of the variables are consistent with expectations.

Table 2. Descriptive statistics of the sample.

Variable	Observations	Mean	Std. Dev.	Min	Median	Max
lnpatent	2411	2.417	1.802	0	2.485	7.042
SOE	2411	0.354	0.478	0	0	1
Size	2411	22.41	1.475	19.83	22.14	29.95
Lev	2411	0.416	0.202	0.0749	0.391	0.934
ROA	2411	0.0237	0.0847	−0.342	0.0320	0.213
Cashflow	2411	0.0401	0.0688	−0.161	0.0374	0.244
REC	2411	0.152	0.132	0.000390	0.122	0.554
FIXED	2411	0.100	0.113	5.58e−05	0.0617	0.763
AssetGrowth	2411	0.115	0.273	−0.368	0.0689	1.611
Board	2411	2.098	0.211	1.609	2.197	2.773
Indep	2411	38.21	5.438	33.33	37.50	57.14
Top1	2411	30.04	14.86	6.692	26.88	73.66
Balance1	2411	0.390	0.285	0.00434	0.320	1
Age	2411	3.019	0.279	2.303	3.045	3.584
Mshare	2411	13.57	17.36	0	3.721	63.87

4.2. Baseline Regression Results Analysis

Table 3 presents the baseline regression results. Column (1) shows the regression analysis without control variables, where the coefficient of TP is positive and significant at the 1% level, indicating that the additional deduction policy has a significant positive impact on corporate innovation output. Column (2) includes financial characteristic control variables in the econometric model, and the coefficient of TP remains significantly positive at the 1% level. Column (3) includes both financial characteristic and corporate governance control variables, and the coefficient of TP remains significantly positive at the 1% level, confirming the stable positive impact of the additional deduction policy on corporate innovation output. Since the implementation of the VAT additional deduction policy pilot in 2019, the innovation output of treatment group enterprises has increased by approximately 11.3% compared to the control group enterprise(0.274/2.417 × 100%), indicating that the incentive effect of the VAT

Table 3. VAT additional deduction policy and corporate innovation output.

Variable	(1) lnpatent3	(2) lnpatent3	(3) lnpatent3
TP	0.381***	0.300***	0.274***
	(0.0510)	(0.0581)	(0.0632)
Size		0.484***	0.401***
		(0.129)	(0.136)
ROA		−0.418	−0.422
		(0.319)	(0.319)
Cashflow		0.112	0.0296
		(0.362)	(0.365)
AssetGrowth		−0.0430	−0.0147
		(0.0832)	(0.0866)
Lev		−0.514	−0.566
		(0.347)	(0.355)
REC		0.365	0.313
		(0.488)	(0.470)
FIXED		1.352	1.394
		(1.005)	(0.976)
Board			0.535*
			(0.315)
Indep			0.00565
			(0.00818)
Top1			0.0115
			(0.0104)
Mshare			0.00867**
			(0.00421)
Age			0.889**
			(0.379)
SOE			−0.0427
			(0.135)
Balance1			0.519**
			(0.257)
_cons	2.186***	−8.585***	−11.36***
	(0.0309)	(2.901)	(3.204)
Individual Fixed Effect	YES	YES	YES
Year Fixed Effect	YES	YES	YES
N	2411	2411	2411
Adj.R2	0.0504	0.0823	0.0940

additional deduction policy on corporate innovation output is also economically significant. In summary, the baseline regression empirical results support Hypothesis H1, i.e., the VAT additional deduction policy significantly promotes innovation output in the production and life services sectors.

4.3. Further Tests

4.3.1. Nature of Corporate Ownership

Given the significant differences in financing resources and innovation motivations between different ownership types, the impact of the VAT additional deduction policy on innovation output may vary. Referring to the classifications of some scholars (Yu, Shen, & Jiang, 2022), we divided the sample into state-owned and non-state-owned enterprises based on the nature of the actual controller, then conducted subsample regressions. Columns (1) and (2) of **Table 4** show the regression results. The policy variable coefficient for non-state-owned enterprises is much larger than that for state-owned enterprises, indicating that the incentive effect on innovation output is more significant for non-state-owned enterprises under the VAT additional deduction policy. The estimated coefficient for non-state-owned enterprises is 0.306 and significant at the 1% level, while the impact for state-owned enterprises is only 0.199 and significant at the 10% level. State-owned enterprises generally have better financing conditions and more abundant collateralizable assets, so the tax reduction brought by the VAT additional deduction policy has a smaller impact on the relatively ample internal cash flow of state-owned enterprises. Compared to state-owned enterprises, non-state-owned enterprises have disadvantages in collateral and financing resources, face financing difficulties and high financing costs, and thus the promotion effect of the additional deduction policy on innovation output is greater at the margin.

Table 4. Heterogeneity analysis (distinguishing by property rights nature).

	(1) state-owned enterprise	(2) non-state-owned enterprise
TP	0.199*	0.306***
	(0.104)	(0.0803)
control variables	YES	YES
_cons	−17.32***	−8.403**
	(6.284)	(3.480)
Individual Fixed Effect	YES	YES
Year Fixed Effect	YES	YES
N	853	1558
Adj.R^2	0.1852	0.0814

4.3.2. Industry Differences

Scholars believe (Lee & Pati, 2017) that industry differences also affect the policy

implementation effects, with different industries facing varying policy environments, input combinations, and R&D processes. Therefore, it is necessary to study the heterogeneity of the VAT additional deduction policy implementation effects from an industry perspective. Referring to the high-tech industry classifications issued by the National Bureau of Statistics (manufacturing and services), we categorized industries such as chemical raw materials and chemical products manufacturing, railway, shipbuilding, aerospace, and other transportation equipment manufacturing, electrical machinery and equipment manufacturing, computer, communications, and other electronic equipment manufacturing, instrumentation manufacturing, telecommunications, radio, television, and satellite transmission services, internet and related services, software and information technology services, research and experimental development, and professional technical services as high-tech industries, with others being non-high-tech industries, and conducted regressions separately. Columns (1) and (2) of Table 5 show the regression results, where the policy effect for high-tech industries is 0.237, higher than 0.211 for non-high-tech industries, indicating that the VAT additional deduction policy has a more significant promotion effect on innovation output in high-tech industries. Compared to non-high-tech industries, high-tech industries are more willing to innovate due to multiple factors, reflecting their unique advantages in technological innovation, market demand, policy support, and industry characteristics. High-tech enterprises usually have professional technical teams and R&D institutions, possessing strong capabilities in technology development and transformation. These teams can stay at the forefront of technology, continually exploring new technologies and applications, providing strong support for corporate innovation. Governments around the world generally prioritize the development of high-tech industries by formulating various policy measures to support corporate innovation activities. These policies include tax incentives, funding subsidies, and R&D support,

Table 5. Heterogeneity analysis (distinguishing industry differences).

	(1) High-tech	(2) Non-high-tech
TP	0.237***	0.211**
	(0.0733)	(0.104)
control variables	YES	YES
_cons	−16.21***	−9.089**
	(2.992)	(4.593)
Individual Fixed Effect	YES	YES
Year Fixed Effect	YES	YES
N	1418	993
Adj.R2	0.1376	0.0987

providing strong guarantees for high-tech enterprises' innovation. High-tech products usually have high added value, bringing higher profits to enterprises, prompting them to increase R&D investment and engage in technological innovation, leading to more innovation output.

4.3.3. Corporate Lifecycle

According to the research (Chiang, Lee, & Anandarajan, 2013), enterprises at different lifecycle stages show significant differences in R&D capabilities, financing situations, investment strategies, and innovation needs. Therefore, the VAT additional deduction policy may have heterogeneous effects on innovation output at different corporate lifecycle stages. Using the median age of the sample enterprises as the standard, we divided them into growth-stage and mature-stage enterprises. Columns (1) and (2) of Table 6 show the subsample regression results, indicating that the incentive effect of the VAT additional deduction policy on innovation output is stronger for growth-stage enterprises. The regression coefficient for mature-stage enterprises in column (1) is 0.226 and significant at the 5% level, while the coefficient for growth-stage enterprises in column (2) is 0.306 and significant at the 1% level. This means that the implementation of the additional deduction policy has a greater impact on growth-stage enterprises compared to mature-stage enterprises, which aligns with the above expectations.

Table 6. Heterogeneity analysis (distinguishing firm life cycles).

	(1) Maturity Period	(2) Growing Period
TP	0.226**	0.306***
	(0.0985)	(0.0849)
control variables	YES	YES
_cons	−7.598*	−13.65***
	(4.500)	(4.031)
Individual Fixed Effect	YES	YES
Year Fixed Effect	YES	YES
N	1142	1269
Adj.R^2	0.0913	0.1252

4.4. Robustness Tests

4.4.1. Parallel Trend Test

To use the Difference-in-Differences (DID) model, it is necessary that the treatment and control groups exhibit the same development trends before the policy intervention. Therefore, we need to verify whether the parallel trend assumption holds to ensure robust results. Figure 1 illustrates the parallel trend test results for the VAT reform policy on the performance of production and life services enterprises. Before the policy implementation (t = 2019), the differences in in-

novation output between the treatment and control groups were not significant, indicating that both groups followed the same development trend prior to the policy implementation. Thus, the conditions for using the DID model are met.

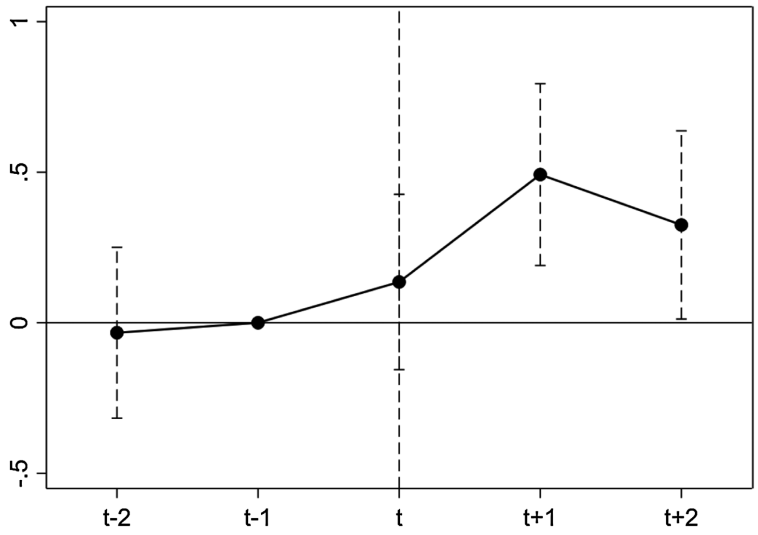

Figure 1. Parallel trend test.

4.4.2. Placebo Test

To verify the impact of other random factors on the empirical results, we conducted a placebo test by randomly selecting 123 samples from the 444 sample companies as a "pseudo-treatment group" and repeated this selection process 500 times for regression analysis. Figure 2 shows the distribution of policy regression coefficients, where the points are concentrated around 0, suggesting no significant omitted variables in the experimental model setup. Additionally,

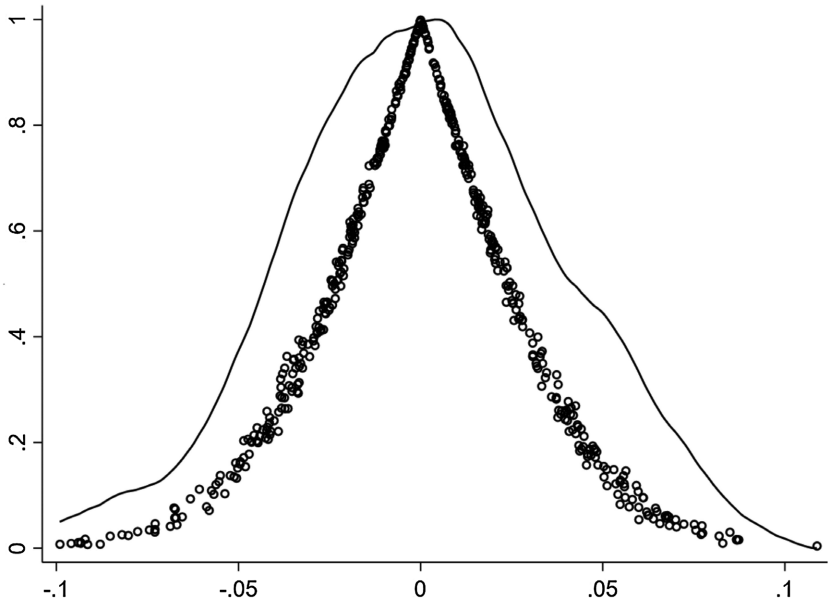

Figure 2. Placebo test.

using the 2019 additional deduction policy as the explanatory variable and corporate innovation output as the dependent variable, the distribution of regression coefficients approximately follows a normal distribution, indicating that the promoting effect of the 2019 VAT additional deduction policy on innovation output in the production and life services sectors is relatively robust.

5. Research Conclusions and Policy Recommendations

Using data from A-share listed companies from 2017 to 2022 as the research sample and the 2019 additional deduction policy as the core explanatory variable, this paper employs the DID method for baseline regression and analyzes corporate heterogeneity to study the policy effects of the additional deduction policy on corporate innovation output. The following conclusions are drawn: Firstly, the 2019 additional deduction policy significantly increased the innovation output of production and life services enterprises. Secondly, the additional deduction policy exhibits significant heterogeneity. In the production and life services sectors, non-state-owned enterprises benefit more from the policy compared to state-owned enterprises, showing more significant improvements in innovation output. High-tech industry enterprises show better improvement in innovation output than non-high-tech industries. Compared to mature-stage enterprises, growth-stage enterprises exhibit a more significant promotion effect on innovation output.

Based on the empirical results, the following policy recommendations are proposed:

1) Further Deepen the VAT Additional Deduction Policy Reform. Fully leverage the policy's incentive effect on innovation output. The study finds that the VAT additional deduction policy significantly promotes corporate innovation output, contributing to the high-quality development of the production and life services sectors. Extending the additional deduction policy and expanding its applicable industry scope is a crucial measure under the current economic conditions. Implementing measures such as clarifying industry scopes, improving policy precision, enhancing policy publicity and training, and refining policy supervision and evaluation mechanisms can further harness the positive role of the additional deduction policy in promoting industrial upgrading and reducing corporate burdens.

2) Tailor Policy Support for Different Types of Enterprises. Increase the efficiency of policy implementation by providing varying degrees of support based on enterprise types. Given that non-state-owned enterprises are more responsive to policies and show significant improvements in innovation output, policy formulation should further consider the actual needs of non-state-owned enterprises. This includes providing more incentives in tax benefits, financial subsidies, and support for innovation projects, while encouraging state-owned enterprises to introduce non-state mechanisms through mixed-ownership reforms to enhance their innovation vitality. Additionally, measures such as establishing

special funds, offering low-interest loans, and providing tax exemptions can intensify support for high-tech industries, encouraging continuous R&D and technological innovation. By enhancing the technological level and innovation capabilities of enterprises, guide non-high-tech industries towards high-tech transitions. Considering the differences in enterprise life cycles, priority should be given to supporting growth-stage enterprises, providing more flexible and convenient financing channels. Although the innovation output enhancement effect is relatively weaker for mature-stage enterprises, they remain crucial industry supports. Encourage these enterprises to increase R&D investment, maintain market competitiveness, and participate in the formulation of industry standards and the development of emerging technologies, leveraging their leading role in the industrial chain.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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