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Will R&D Expenses and Deduction Policies Promote Company Innovation?

Jiaxin Sun[1, a], Jie Long[1, b]

[1]SiChuan University, Chengdu, China

[a]13258231131@163.com, [b]805268323@qq.com

Abstract

This paper uses the PSM-DID model as a tool to explore the impact of the implementation of the "R&D Expenses Deduction" policy on corporate innovation behavior. The results show that the above effects are significant, and the policy itself has an overall positive impact on corporate innovation. Based on the conclusions, recommendations were made for the R&D expenses plus deduction policy.

Keywords

Policy evaluation; Enterprise innovation ability; difference in difference.

1. INTRODUCTION

Innovation is the first driving force for development and the strategic support for building a modern economic system. As a major national strategy, encouraging innovation has become the consensus of the whole society. According to the new economic growth theory, technological progress is the most important driving force for economic growth, and enterprises are the main drivers of technological innovation and technological progress; some countries have long been in a low-level growth path, mostly due to insufficient innovation investment and low technological progress rate.

Chinese fiscal [2015] No. 119 document relaxes the scope of R&D activities and R&D expenses for preferential enterprises. In terms of standardizing management and research and development expenses, the basic orientation of the policy allows more enterprises, more R&D activities, and more R&D expenditures. Enjoy the state's tax incentives and encourage all types of enterprises to attach importance to research and development and enhance their ability to innovate. In management, reduce the approval process, strengthen follow-up management, and improve the requirements for corporate compliance, so that more truly qualified enterprises can enjoy the benefits of preferential policies. The fiscal [2015] No. 119 document has been implemented since 2016. Does the policy of expanding the research and development expenses plus the deduction of the scope of the company promote the innovation capability of the enterprise?

2. RESEARCH DESIGN

2.1. Research Hypothesis

According to the market failure theory, the market is the most effective means of resource allocation in the assumption that the market structure is in perfect competition. However, in the real economic society, the enterprise R&D activities have market failures such as risk, externality and information asymmetry. phenomenon. Therefore, government intervention is needed. The R&D expenses plus deduction policy can reduce the pressure on the company's cash flow and reduce the R&D cost of the enterprise. The government becomes the "partner" of

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the R&D activities of the enterprise, thereby reducing R&D risks and enhancing the enthusiasm of R&D activities. This raises the hypothesis:

H1:R&D expenses plus deductions can promote innovation.

2.2. Data Sources

This paper selects the data of Shanghai-Shenzhen A-share listed companies in 2013-2017 as the initial research sample. Due to the particularity of the financial industry management methods, the enterprises in the financial industry were eliminated, and a total of 1,132 enterprises were obtained, for a total of 5326 for 5 consecutive years. Initial data. All data are from the listed company's annual report and CSMAR. Exclude companies that have missing any data for the selected year to get complete panel data.

2.3. Variable Selection

1. Interpreted variables

Enterprise innovation capability (Innov). In the past research literature, the number of patent applications, the number of new products developed, and the ratio of high-tech products to income were generally used as indicators for measuring the innovation ability of enterprises. In the empirical analysis conducted by CIS in 2008, high-tech products accounted for the income ratio and the income of each stage of the cycle as indicators for measuring innovation ability. However, China's innovation system has not been perfected, and these two data are difficult to obtain accurately. ACS (2009) and Chen Guanghan (2011) used the patent quantity as an evaluation index of innovation performance in their respective research. The number of patents is divided into the number of patent applications and the number of patents granted, but the authorization of patents has a certain lag, which cannot reflect the research and development capabilities of the enterprise in a timely manner, and the authorization of patents is often limited by the efficiency and preference of patent agencies. Therefore, this paper selects the number of patent applications as a substitute for the innovation ability of enterprises.

2. Explanatory variables

The explanatory variables in this paper are recorded as DIDs, which are used to indicate whether the company enjoys the “R&D Expenses Deduction” policy. In addition, DUM indicates that the company implemented the R&D expense plus deduction policy DUM=1, and vice versa. POST indicates the year in which the company is located. The “R&D Expenses Plus Deduction” policy is fully implemented nationwide for 2016 and beyond: POST=1, and vice versa. DID=DUM*POST.

3. Control variable

In foreign studies, asset-liability ratios, circulation ratios, etc. are generally selected as control variables. However, due to the late opening of China's GEM, the development of the company is not mature, and the management mechanism is not perfect. Therefore, based on the actual characteristics and development of China's GEM enterprises, this paper will take the enterprise size Size, the listing age Age, the return on net assets from ROE, the asset-liability ratio LEV, and whether it is a high-tech enterprise Hi-tech as the control variable of this paper.

2.4. Research Method--Double Differential Propensity Matching (PSM-DID)

Difference in difference (DID) is currently the primary method used for policy effect assessment. DID regards institutional change and new life policy as a quasi-natural experiment exogenous to the economic system, which can solve endogenous problems to the greatest extent and avoid reverse causality. Adding a fixed effect on this basis can also alleviate the problem of missing variable bias to a certain extent. Compared with the traditional method represented by

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the least squares estimation to evaluate the policy effect, the model of the double difference method is more scientific and can more accurately estimate the policy effect.

Table 1. Variable description table

variable	name	symbol	variable declaration
dependent variable	enterprise innovation ability	INNOV	Number of patent applications in the current period
Independent variable	Whether to enjoy the R&D expenses plus deduction policy	DUM	If the company enjoys the policy of 1 in the current year, otherwise it is 0.
Control variable	Enterprise scale	SIZE	Natural logarithm of total assets of enterprises
	Term of listing	AGE	Listing time of an enterprise
	asset-liability ratio	LEV	Total assets / liabilities of an enterprise
	Return on net assets	ROE	Net profit / owner's equity
	Whether it is a high-tech enterprise	HI-TECH	The assignment of high-tech enterprises is 1, otherwise the assignment is 0

The most important premise of using the DID method is that the processing group and the control group must meet the common trend assumption, that is, if there is no R&D expense addition deduction policy, the trend of change in the innovation ability of the policy enterprise and the non-enjoyment policy enterprise does not change with time. There are systematic differences, but this assumption of the DID method is likely to be unsatisfactory. Based on this, this paper uses the PSM-DID method to solve this problem. The idea of PSM-DID is derived from the matching estimator. The double difference model is used to analyze the net effect of the policy. This method can remove the individual differences by two differential methods. And deal with the bias caused by the time trend unrelated to the effect. Using a propensity score to match the processing and control groups avoids selection bias due to self-selection.

The basic idea of this paper is to find a company in the control group that does not enjoy the deduction of R&D expenses, so that the observable variables of the enterprises in the treatment group that enjoy the broad deduction policy are as similar as possible, when the individual characteristics of the enterprise The effect of whether or not to implement the R&D expenditure plus deduction policy depends entirely on the observable control variables. The two companies have similar probabilities of enjoying policies and can therefore compare each other. When matching individuals in the control group and the processing group, it is necessary to measure the distance between individuals. The propensity score matching method is not only a one-dimensional variable, but also has a value between [0, 1]. This paper uses the nearest neighbor matching method to determine the weight. (1) Estimate the propensity score according to the processing group variable and the control variable, and use Logit regression to achieve; (2) DUM is the division of the processing group and the control group. This paper adopts whether it is the target enterprise that enjoys the "R&D expenses plus deduction" policy in 2016, and assigns DUM=1 to the "R&D expenses plus deduction" enterprise in 2016, forming a treatment group. (3) After the matching is completed, we delete the samples in which the common support hypothesis is not satisfied, and then perform the DID regression.

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First, using the Logit model, we calculate the propensity score of each company in the year, and match each enterprise that does not enjoy the policy with a company that enjoys the policy with the closest preference. The model is shown in (1).

$$DUM_{i,t} = \partial_1 + \partial_2 LEV_{i,t-1} + \partial_3 AGE_{i,t-1} + \partial_3 SIZE_{i,t-1} + \partial_4 ROE_{i,t-1} + \partial_5 HI - TECH + \varepsilon_{i,t} \quad (1)$$

In the use of DID to analyze whether the experimental group and the control group enterprises enjoy the impact of policies on the innovation capability of enterprises, the first step is to determine the period before and after the implementation of the policy. 2013-2014 is the period before the implementation of the policy, and 2016-2017 is the period after the implementation of the policy. The matching group is used to find matching control groups for the treatment groups of each year. The corresponding control group also used the same implementation period as the experimental group. The second step is to use the variables to analyze the impact of the R&D expense plus deduction policy on the R&D investment of the company. The basic model of the correlation regression test is shown in (2).

$$INNOV_{i,t} = \beta_1 + \beta_2 DUM + \beta_3 POST + \beta_4 DUM \times POST + Control\ \text{var}\, iables_{i,t-1} + \varepsilon \quad (2)$$

Dependent variable: Enterprise Innovation Capability (INNOV), take the number of patent applications applied by the enterprise in the current period.

Independent variable: Whether to enjoy the R&D expense plus deduction policy (DUM), if the enterprise enjoys the deduction policy in the current year, it is 1, otherwise it is 0.

POST is a dummy variable. If the enterprise enjoys the R&D expenses plus the deduction, the year is taken as 1, otherwise it is 0, and ε is the error term.

3. RESULT ANALYSIS

3.1. Descriptive Analysis

variable	N	mean	sd	p50	min	max	range
innov	5326	59.999	214.077	18	1	5252	5251
size	5326	22.4	1.225	22.164	19.552	28.07	8.518
age	5326	13.161	6.42	11	6	28	22
lev	5326	0.429	0.191	0.42	0.008	0.979	0.971
roe	5326	0.053	0.236	0.061	-8.093	2.257	10.35
hitech	5326	0.721	0.448	1	0	1	1

Descriptive statistics for each variable are reported: the standard deviation of innovation capacity is 214.077, indicating a large difference between individual samples. There is a big difference between the maximum and minimum extremes between enterprise size, ROE and enterprise listing years, indicating that it is necessary to use the PSM method for control.

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3.2. Regression Result

innov	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
did	1.975	12.483	0.16	0.874	-22.497	26.447	
post	-11.227	6.748	-1.66	0.096	-24.456	2.002	*
dum	-39.349	8.742	-4.50	0.000	-56.488	-22.211	***
size	66.196	2.860	23.14	0.000	60.589	71.804	***
age	0.891	0.493	1.81	0.071	-0.076	1.858	*
lev	-59.667	17.626	-3.38	0.001	-94.221	-25.112	***
roe	14.784	11.960	1.24	0.216	-8.662	38.231	
hitech	32.924	6.548	5.03	0.000	20.086	45.761	***
Constant	-1417.783	60.769	-23.33	0.000	-1536.916	-1298.650	***

Mean dependent var	59.999	SD dependent var	214.077
R-squared	0.110	Number of obs	5326.000
F-test	82.372	Prob > F	0.000
Akaike crit. (AIC)	71671.477	Bayesian crit. (BIC)	71730.700

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

The DUM coefficient is negative, indicating that the innovation ability before the policy change is lower; the POST is negative. It means that if there is no such policy, the innovation ability of all sample companies will decrease with time; and after the implementation of the R&D expenses plus deduction policy, DUM×POST The coefficient of 1.975 indicates that after the fixed effect controls the endogeneity problem, the coefficient of the interaction term will become positive, and the enterprise enjoying the R&D expense plus deduction policy will be significantly higher after the implementation of the policy after 2016. Enterprises that do not enjoy the R&D expenses plus deduction policy. Therefore, the R&D expenses plus deduction policy will promote the company to improve its innovation ability. The H1 hypothesis is established.

4. POLICY SUGGESTION

The implementation of the R&D deduction is one of the important measures to implement the National Medium- and Long-Term Science and Technology Development Plan (2006-2020). Taxpayers look forward to the R&D fee plus deduction policy to expand the scope of preferential treatment and improve the implementation procedures, making it a powerful tool to promote enterprise innovation.

1. Change the tax incentives for research and development fees, and give tax incentives for science and technology investment by reducing the tax rate. At present, there are two main ways of preferential income tax policies widely adopted internationally. One is direct income tax exemption, and the other is to increase the deduction ratio. Based on the reality of China's tax administration and corporate accounting, the way to reduce the tax rate may be more suitable for China's national conditions.

2. Improve the deducting project identification department and certification procedures, and establish and improve the project identification work mechanism. In view of the current situation that the enterprise's deduction of deductions is not uniform and non-standard, the relevant departments should strengthen contact and cooperation, jointly solve the core problem of deducting the project identification in the pre-link, and ensure the authority and unity of project identification. Sex and accuracy.

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3. Improve the regulations on restrictive cost items, match the accounting principles and standards as much as possible, and match the accounting principles and standards in terms of project definition and calculation caliber as much as possible.

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