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The R&D Expense Deduction Policy and Enterprise Innovation: A Literature Review

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Abstract: *Adhering to innovation stands as the core of national modernization endeavors. Innovation is seen as a key driver of high-quality economic development, with businesses playing a crucial role in advancing technology and innovation. The R&D expense deduction policy is a tax incentive aimed at promoting enterprise innovation and easing the financial burden of R&D costs. This policy has been in place in China for 28 years. To examine the effectiveness of China's R&D expense deduction policy and its impact on enterprise innovation, this paper conducts a literature review on "R&D expense deduction policy and enterprise innovation." The findings indicate that the policy has successfully encouraged increased R&D investment by enterprises, but its ability to enhance their R&D capabilities and output is limited. In essence, while the policy boosts R&D investment, it does not necessarily improve enterprises' R&D capabilities.*

Keywords: *R&D Expense Deduction Policy, Enterprise Innovation, Innovation policy*

1. Introduction

The current focus of China's social development is on high-quality development, with a key emphasis on promoting innovation. The "14th Five-Year Plan" has highlighted the crucial role of innovation in China's overall modernization. Enterprises play a significant role in research and development (R&D) and driving innovation. Innovation in enterprises is often accompanied by technological advancements and knowledge accumulation. According to endogenous economic growth theory, technological and knowledge progress is essential for sustained economic development. [1] This is because technology and knowledge have characteristics of public goods and positive externalities, meaning that the innovation outcomes of enterprises may benefit other enterprises, bringing additional economic benefits. However, enterprise R&D activities are characterized by high uncertainty, long cycles, high risks, and high costs, which can reduce enterprises' willingness to engage in innovation and R&D activities and increase the difficulty of external financing, thereby hindering their R&D activities.[1]

The R&D expense deduction policy is a government tax incentive designed to promote enterprise innovation, reduce R&D costs, and transform the social and economic growth model. This policy allows for a certain percentage of the taxable income generated by R&D activities to be deducted based on the amount of enterprise R&D expenditures, thereby easing the financial burden on enterprises. China's R&D expense deduction policy was first introduced in 1996 and has since undergone several adjustments in line with the country's social and economic development. Key adjustments to the policy have included expanding the scope of eligible entities, increasing the deduction rate, and simplifying application procedures. In recent years, the policy has been widely implemented. As a result, it is important to explore the effectiveness of China's R&D expense deduction policy, its impact on enterprise innovation, whether it stimulates or inhibits innovation, how scholars perceive these effects, and how the policy can be optimized in the future. This paper aims to summarize and review scholars' research through a literature review approach, providing valuable insights for the reform and implementation of innovation policies, with a focus on the R&D expense deduction policy.

2. Basic Information on Literature

Firstly, The R&D expense deduction policy serves as a tax-based incentive to promote scientific and technological innovation within businesses. This review examines the correlation between the R&D expense deduction policy and enterprise innovation. Utilizing "R&D expense deduction and enterprise

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innovation" as search terms in the CNKI database, a total of 303 papers have been found since 2009, with 44 of them published in high-quality journals indexed by PKU Core, CSSCI, and AMI. The number of studies on this subject has notably risen in the last five years, especially following the expansion of the R&D expense deduction policy's coverage to include enterprises not on the negative list in 2018.[2]

Secondly, most studies exploring the impact of the R&D expense deduction policy on enterprise innovation have used empirical research methods. The chosen research models include the continuous Difference-in-Differences (DID) model (Li Yuan, 2022). [2], the Propensity Score Matching combined with the Double-Difference (PSM-DID) model (Jin Weidong, 2023) [3] (Feng Ze et al., 2019) [4], and the Mediation Effects model (Tang Ming et al., 2021) [5]. The selection of research subjects includes private enterprises, high-tech enterprises, A-share listed companies, A-share listed manufacturing companies, and high-tech enterprises in specific regions.

3. Measures of the Explanatory Variable

Scholars have used different indicators to measure the explained variable "enterprise innovation." Li Yuan et al. (2019) [2] selected innovation input, the quantity of innovation output, and the quality of innovation output to reflect the innovation of private enterprises. They represented the quantity of innovation output by the number of patent applications in the current year and the quality of innovation output by the number of invention patent applications in the current year. Feng Ze (2019) [4], Jin Weidong (2023) [3], and others evaluated enterprise innovation from the perspective of the innovation chain, measuring innovation from three dimensions: "input-output-profit." Regarding specific indicators, Feng Ze et al. respectively set scale and intensity indicators to measure enterprise innovation effects at the "input-output-profit" stages. The measurement indicators for R&D input include the scale and intensity indicators of enterprise R&D expenditure (enterprise R&D expenditure/total income). The scale indicator for R&D innovation output is the number of patent applications, and the intensity indicator is the ratio of the number of patent applications to the number of employees. The scale indicator for enterprise economic benefits is the sales revenue of new products, and the intensity indicator is the proportion of sales revenue of new products to total sales revenue. Jin Weidong selected R&D input intensity (R&D investment amount/sales revenue) as the proxy variable for innovation input, and due to the lag in the timing of enterprise patent authorization, he selected the number of patent applications as the proxy variable for innovation output, while innovation income was measured using the return on total assets, a financial indicator. Tang Ming et al. (2021) [5] selected the ratio of R&D investment to operating income as the proxy variable for enterprise R&D investment. They used the sum of invention patent applications, appearance design patent applications, and utility model patent applications as the proxy variable for enterprise innovation output. Gan Xiaowu et al. (2020) [6] selected R&D expenditure funds as the indicator for measuring enterprise R&D investment."

4. The Impact of R&D Expense Deduction Policy on Corporate Innovation

Research in academia indicates that the R&D expense deduction policy has a positive impact on enterprise innovation. Li Yuan (2019) [2] studied privately owned enterprises listed on the A-share market from 2016 to 2019 and found that by 2018, China's R&D expense deduction policy had a significant positive incentive effect on the innovation of private enterprises, and this effect showed heterogeneity across industries, enterprise sizes, technology types, and life cycles. Overall, the deduction policy has a greater effect on the R&D investment and innovation output of non-manufacturing private enterprises and has a greater incentive effect on small-scale, non-high-tech, and mature private enterprises in terms of innovation investment. Tang Ming et al. (2021) [5] selected A-share listed manufacturing companies from 2014 to 2018 as samples and found that the R&D expense deduction policy has a promoting effect on both innovation output and innovation input. Moreover, R&D investment plays an intermediary role between the R&D expense deduction policy and innovation output. It not only directly promotes enterprise innovation output but also indirectly promotes it by increasing R&D investment. Furthermore, Tang Ming's further research found that the incentive effect of the R&D expense deduction policy on private enterprises is greater than that on state-owned enterprises. This is because compared to state-owned enterprises, private enterprises have lower risk resistance, higher financing constraints, and greater competitive pressure, leading to higher innovation enthusiasm and greater sensitivity to tax preferential policies. Studies by Li Wenyi et al. (2019) [7], He Kang et al. (2020) [8], and others also confirm the stronger incentive effect of the deduction policy on private enterprises. Gan Xiaowu (2020) [6] studied 286 high-tech enterprises listed on the A-share market from 2013 to 2017, exploring the impact

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of the deduction policy on high-tech enterprises of different industries, sizes, and profitability levels. The results showed that while the deduction policy promotes R&D investment in high-tech enterprises, its effects vary among different types of high-tech enterprises. Compared to high-tech service and biopharmaceutical enterprises, the deduction policy has a stronger incentive effect on high-tech enterprises in the electronic information technology and new materials technology categories. Sun Ziyuan (2020) [9] found that the innovation incentive effect of the deduction policy on high-tech enterprises is superior to that of preferential tax rate policies. Wang Yun (2023) [10], when investigating the relationship between environmental regulation and corporate green innovation, found that the deduction policy has a significant moderating effect. It significantly enhances the promotion effect of environmental regulation on corporate green innovation and weakens its inhibitory effect. Cui Yeguang et al. (2020) [11], focusing on the Beijing-Tianjin-Hebei, Pearl River Delta, and Yangtze River Delta regions, examined the effects of the enterprise income tax R&D expense deduction policy implemented in 2016, and found that the policy has a more significant incentive effect on enterprise R&D in the Yangtze River Delta region.

However, not all studies confirm the effectiveness of the R&D expense deduction policy. Feng Ze (2019) [4] examined the impact of China's R&D expense deduction policy on enterprise innovation at different stages in 2008. Although the deduction policy has a positive promotion effect on the scale and intensity of the input and output ends of the innovation chain, it only promotes the scale of innovation output and does not affect the intensity of innovation output. This indicates that while the deduction policy enhances enterprises' technology transformation capabilities, it fails to improve their R&D capabilities. Jin Weidong (2023) [3] found similar results in his study on the innovation incentive effect of China's R&D expense deduction policy in 2015. The expansion of the scope of the deduction policy increases enterprise innovation input, output, and income. However, the inclusion of some low-willingness and low-capacity innovative enterprises may trigger reverse selection behavior of false innovation, thereby undermining the incentive for enterprise innovation.

5. Recommendations

Researchers have recommended that the R&D expense deduction policy be refined to better support innovation within enterprises, based on their findings. Given the backdrop of Sino-US trade tensions and a global economic downturn, along with China's relatively low R&D expense deduction compared to other advanced nations, several studies advocate for increasing China's R&D expense deduction (Li Yuan, 2019) [2] (Gan Xiaowu, 2020) [6] (Tang Ming, 2021)[5]. Different deduction ratios should be set according to the characteristics of different R&D projects, industries, or enterprises in terms of profitability and scale. The deduction ratio for basic research projects should be increased, followed by applied research projects and experimental development projects. Thus, setting deduction ratios for R&D expenses according to the types of projects and enterprise characteristics. Activities related to R&D, such as training for R&D personnel and purchase of research equipment, should be added to the scope of the R&D expense deduction policy (Jin Weidong, 2023) [3]. The income generated by enterprises through R&D innovation should be included in the scope of preferential tax policies for enterprise income. Furthermore, tax preferential policies designed to foster innovation in businesses should not only focus on post-incentives such as deduction policies but also prioritize strengthening the technological research and development capabilities and resource allocation capabilities of businesses beforehand. This should consider the innovation process from the angles of input, output, and profit (Feng Ze, 2019) [4].

6. Conclusions

As evidenced by the preceding discussion, scholars have predominantly employed empirical methods, utilizing data from listed companies of different categories or regions, to argue the impact of the R&D expense deduction policy on enterprise innovation from the perspectives of R&D input, innovation output, or the innovation chain. Overall, most studies affirm the incentivizing effect of the deduction policy on enterprise R&D innovation, particularly evident in R&D input. However, some research suggests that the policy may not necessarily enhance the efficiency of enterprise R&D output, and expanding the scope of eligible entities for the deduction policy change might include companies with lower R&D willingness and capabilities, thereby increasing the risk of adverse selection among enterprises.

While China's R&D expense deduction policy has led to increased R&D investment, its impact on enterprise innovation output is limited. This is partly due to the lagging resource allocation capabilities

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of some enterprises and the potential inducement of "tax avoidance," which may trigger "false innovation" behaviors among certain companies. Therefore, future improvements to the R&D expense deduction policy should focus on two aspects: Firstly, the government should increase its support for R&D and innovation in enterprises to ensure the effectiveness of the policy of additional deduction. For example, it can take measures such as increasing the proportion of deduction and setting different levels of deduction proportion according to the type of R&D projects, enterprise scale, profitability, or other characteristics, to maximize the utility of the policy of R&D expense deduction. Secondly, the innovation support policy should be improved from the three key links of the innovation chain, namely R&D, output, and revenue, to ensure that the fiscal policy can cover the whole process of enterprise innovation. Currently, China's fiscal and taxation subsidy policies mostly target the input end of enterprise innovation, with innovation policies led by the R&D expense deduction policy often acting post-facto on enterprise R&D activities. At present, there is a lack of tax policies that can provide incentives in advance and during the process, guiding the rational allocation of enterprise R&D resources. Therefore, it is worth considering combining tax incentives with enterprise innovation outcomes. For enterprises with substantial innovation achievements in areas of national concern, the government can adopt fiscal subsidies or further increase the deduction ratio of R&D expenses to reward their R&D achievements, thus enhancing the tax preferential system from the perspective of innovation output.

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