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Study on the Impact of Fiscal and Tax Policies on the Commercialization of Scientific and Technological Achievements

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Abstract: *The world is currently undergoing a once-in-a-century transformation, with technological innovation emerging as a crucial driver of economic growth. The process of transforming scientific and technological achievements is characterized by high risks, substantial investments, and information asymmetry. Market mechanisms alone are insufficient to effectively propel this transformation, necessitating government intervention and incentives through fiscal and tax policies. As a vital tool for government economic regulation and innovation guidance, fiscal and tax policies play a pivotal role in the commercialization of scientific and technological achievements. Existing research indicates that these policies primarily influence the efficiency and scale of technology transfer by reducing corporate R&D costs, sharing commercialization risks, optimizing the innovation environment, and guiding resource allocation. The effects of fiscal and tax policies are multidimensional, offering positive promotion while potentially presenting latent challenges and efficiency issues.*

Keywords: *Fiscal and Tax Policies, Commercialization of Scientific and Technological Achievements, Technology Transfer, Innovation Policy, Market Failure*

1. Literature Review

1.1. The Incentive Role of Tax Incentives

Tax incentives are a widely adopted means by governments worldwide to encourage enterprises to commercialize scientific and technological achievements. These policies directly stimulate increased R&D investment by reducing innovation costs and promote the commercialization of scientific and technological achievements. Using a regression discontinuity design, Dechezleprêtre et al. found that tax breaks significantly increased the number of patent applications and the intensity of R&D investment by enterprises, with policy effects exhibiting strong persistence [1]. A U.S. study found that R&D tax credits did not substantially increase patent quantity or scientific value but significantly enhanced patent novelty and market value, guiding firms toward innovations with greater private value [2]. The implementation effects of tax incentive policies also exhibit pronounced industry and firm heterogeneity. Research indicates that R&D tax credits have relatively limited promotional effects on high-tech, high-R&D-intensity firms, while their "additional effects" are more pronounced for SMEs and low-R&D-intensity firms [3].

1.2. The Guiding Role of Fiscal Subsidies

Fiscal subsidies and grants constitute a crucial means of direct government support for the commercialization of scientific and technological achievements, with their influence spanning various stages of the process. During the R&D phase, fiscal support exhibits high sensitivity to technological innovation [4]. Governments support basic research and frontier technology development through measures such as establishing special funds and providing R&D subsidies. During the commercialization phase, fiscal funds primarily support industrialization, pilot testing, and market promotion of scientific achievements, helping enterprises overcome high risks and uncertainties in the technology transfer process. This phased support strategy helps ensure that innovation activities receive necessary financial backing throughout the entire journey from concept to commercialization. Simultaneously, countries are focusing on the efficiency and management performance of fiscal fund utilization. For instance, research indicates that despite multiple fiscal policies implemented in some nations, challenges persist in

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technology conversion rates and the scarcity of high-quality scientific achievements, underscoring the need for enhanced management of fiscal fund performance [5].

1.3. The Guiding Role of Government Procurement

Government procurement serves as another crucial policy tool. By purchasing innovative products and services, governments create market demand for emerging technologies, thereby supporting the commercialization of scientific and technological achievements. By procuring innovative products and services, governments can provide stable market demand for emerging technologies, thereby supporting the commercialization process of scientific and technological achievements [6]. This not only creates early-stage markets for innovative products but also drives private-sector investment and adoption through government demonstration effects, reducing the risks for enterprises in bringing new technologies to market.

2. Theoretical Foundations and Mechanism Analysis

2.1. Theory of Externalities

Externalities theory serves as the core rationale for government intervention in technological innovation through fiscal and tax policies. Pigou noted that externalities—additional costs or benefits not reflected through market mechanisms—can cause market failures [7]. Arrow emphasized that R&D activities possess positive externalities, where knowledge spillovers generate societal benefits exceeding private gains [8]. This disparity leads to insufficient corporate innovation investment and hinders the commercialization of outcomes. Therefore, governments must "internalize" externalities through fiscal instruments: fiscal expenditures (e.g., subsidies) directly reduce corporate R&D costs and risks; tax incentives (e.g., additional deductions) indirectly improve corporate cash flow and profit expectations [9].Furthermore, fiscal and tax policies can serve as signaling mechanisms, directing societal resources toward innovation sectors and fostering a policy ecosystem that facilitates the commercialization of research outcomes. This theory provides a comprehensive logical foundation for the necessity, rationality, and operational mechanisms of fiscal and tax policy interventions.

2.2. Market Failure Theory

Market failure theory was further developed by economist Arrow (1962) in his research on imperfect information and innovation market characteristics. Market failures typically arise from factors such as public goods attributes, externalities, imperfect competition, and information asymmetry [10]. Information asymmetry is a key cause of market failure in technology transfer [11]. Information asymmetry primarily causes market failure through two mechanisms—adverse selection and moral hazard [12, 13]. For instance, evidence from European fund markets shows that once funds are disbursed, recipients may fail to use them entirely as intended or reduce their level of effort [12].

2.3. New Schumpeterian Growth Theory

The New Schumpeterian Growth Theory distinctly diverges from neoclassical growth theory, centering on the view that innovation emerges endogenously as firms pursue profit maximization. This theory posits knowledge as a unique factor of production capable of continuous reconfiguration and sustained value creation through diverse pathways [14]. Heterogeneity in innovation activities arises from firms' varying capacities for knowledge restructuring and absorption, leading to divergences in productivity and competitive advantage. Innovation does not depend on individual "geniuses" but is built upon organizational learning mechanisms, requiring knowledge to continuously flow, accumulate, and be recreated within organizations [15]. At a more macro level, economic growth manifests as a "learning economy," where the collective learning capacity of different actors constitutes a crucial source of national competitiveness [16]. The new growth theory further internalizes technological progress, emphasizing the critical role of R&D investment, human capital accumulation, and knowledge spillovers in driving sustained economic growth [17]. Within this theoretical framework, governments mitigate innovation uncertainty and promote knowledge diffusion through fiscal and tax policies, providing essential institutional support for the commercialization of scientific and technological achievements.

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3. Analysis of Current Status and Challenges

3.1. Insufficient Market Orientation

Over an extended period, China's technology transfer has remained predominantly government-led, with the market's decisive role in resource allocation yet to be fully realized. Some research projects exhibit insufficient attention to market demand and industrial application prospects during project initiation and implementation, resulting in a disconnect between technological achievements and practical needs, and consequently low conversion efficiency. Existing research indicates that while government leadership can partially compensate for market failures, insufficient market mechanism participation tends to weaken the endogenous momentum of technology transfer and constrain performance improvement [18]. Therefore, how to more effectively guide market entities to participate in technology transfer through fiscal and tax policies remains an urgent issue to address.

3.2. Policy Implementation Effectiveness Needs Improvement

Despite continuous strengthening of national-level policy support for technology transfer, institutional constraints persist in practical implementation. Some universities and research institutions face limitations in state-owned asset valuation, property rights demarcation, and profit distribution during the transfer process, leading to widespread reluctance or hesitation to engage in technology transfer [19]. Simultaneously, different fiscal and tax policy tools exhibit varying incentive effects on investment in scientific and technological achievements. Research indicates that deferred taxation or temporary tax exemption policies are more effective than immediate taxation in alleviating short-term tax burdens for enterprises, thereby enhancing their willingness to invest in achievement transformation [20]. This suggests that existing fiscal and tax policies still have room for optimization in both implementation and design.

3.3. Insufficient Policy Synergy

The transfer and commercialization of scientific and technological achievements inherently constitute a complex systemic endeavor involving multiple stakeholders, including research institutions, enterprises, and governments. Its implementation outcomes depend not only on the incentive intensity of individual policy instruments but also on multiple factors such as regional economic development levels, variations in innovation foundations, and policy execution capabilities [21]. As China's innovation system gradually shifts from a traditional top-down linear model toward a "market-oriented national innovation ecosystem," policy formulation and implementation increasingly demand synergy and systemic coherence. However, current policies for transforming scientific and technological achievements still involve multiple departments, including science and technology, education, finance, taxation, and state-owned asset management. Ineffective coordination among departments regarding policy objectives, implementation rules, and management boundaries, compounded by the limited legal authority of local policies, collectively weakens policy synergy and implementation effectiveness. Consequently, policy fragmentation and inadequate institutional coordination have become significant practical challenges hindering the effective promotion of STI commercialization through fiscal and tax policies [18].

4. Optimized Solutions

4.1. Strengthening Market-Oriented Incentives

To address the insufficient market orientation in technology transfer, fiscal and tax policies should further enhance the market's role in incentivizing and screening outcomes. The focus of fiscal and tax policies should shift from solely supporting R&D investment to extending support to the technology transfer and commercialization stages. Measures such as tax incentives for technology transfer and exemptions on income from technology transfer should guide research institutions and enterprises to prioritize market demand and industrial application prospects. Simultaneously, administrative intervention in specific technology transfer pathways should be reduced. Instead, greater reliance should be placed on tax incentives and market competition mechanisms to channel resources toward scientific and technological achievements with commercial potential and industrial value. Research indicates that market-oriented policy tools supplemented by tax incentives help enhance the commercialization efficiency and economic returns of innovation outcomes [22].

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4.2. Enhancing Policy Implementation Efficiency

To address the challenges of policy implementation and high operational costs in the commercialization of scientific and technological achievements, it is necessary to enhance the enforceability of fiscal and tax policies at both the institutional design and execution levels. On one hand, relevant systems for the commercialization of state-owned scientific and technological achievements should be further optimized. This includes streamlining asset valuation and approval processes, clarifying rules for property rights demarcation and profit distribution, and reducing institutional barriers for universities and research institutions engaged in commercialization activities. On the other hand, tax policy arrangements can alleviate the financial constraints faced by technology transfer entities during the initial commercialization phase by expanding the scope of policies such as deferred taxation and temporary tax exemptions, thereby enhancing the practical effectiveness of policy incentives. Relevant research indicates that the operability and implementation efficiency of policy tools are critical factors influencing the performance of innovation policies [23].

4.3. Strengthening Policy Coordination Design

To address the fragmentation of technology transfer policies and insufficient interdepartmental coordination, a holistic innovation ecosystem perspective should guide the synergistic design of fiscal and tax policies with science and technology, education, and industrial policies. By clarifying the responsibilities of each department in technology transfer, policy objectives and implementation rules can be harmonized to reduce institutional conflicts that constrain technology transfer. Simultaneously, local fiscal and tax policies should be better aligned with national institutional arrangements. Under controllable risk conditions, universities and research institutions should be granted greater autonomy in managing their outcomes. Existing research indicates that synergistic policy combinations promote knowledge diffusion and technology commercialization more effectively than individual policy tools, serving as a key driver for enhancing the overall performance of national innovation systems [24].

5. Conclusions and Policy Implications

This study examines the impact of fiscal and tax policies on the transformation of scientific and technological achievements. Findings reveal that while such policies play a significant role in facilitating technology transfer, their effectiveness is substantially constrained by market mechanisms, institutional environments, and policy coordination levels. Current challenges include insufficient market orientation, high policy implementation costs, and inadequate policy synergy, which hinder the full conversion of fiscal and tax incentives into tangible outcomes. Specifically: - Overreliance on government-led initiatives coupled with insufficient market incentives dampens the enthusiasm of enterprises and social capital to participate in technology transfer; - Institutional constraints such as state-owned asset management, property rights definition, and profit distribution increase the operational costs of technology transfer; - Fragmented multi-departmental management and limited effectiveness of local policies weaken the overall policy synergy to some extent.

Based on these findings, this paper proposes the following policy implications: First, further strengthen market orientation by optimizing the structure of tax incentives and refining tax benefits related to technology transfer. This will guide innovation entities to focus more on market demand and commercial prospects, thereby enhancing the endogenous momentum for technology transfer. Second, the government should focus on enhancing the operability of policy implementation, streamline institutional procedures related to the commercialization of scientific and technological achievements, and reduce institutional transaction costs, so that fiscal and tax policies can truly exert their incentive effects. Third, policymakers should adopt an innovation ecosystem perspective, strengthen the coordinated design of fiscal and tax policies with science and technology, education, and industrial policies, and promote cross-departmental policy alignment and institutional integration, thereby establishing a long-term mechanism to facilitate the commercialization of scientific and technological achievements. This will promote cross-departmental policy coordination and institutional integration, forming a long-term mechanism to facilitate the transformation of scientific and technological achievements. Overall, only through the combined effects of effectively functioning market mechanisms, continuously optimized institutional environments, and strengthened policy coordination can fiscal and tax policies more effectively drive the transformation of scientific and technological achievements into tangible productive forces.

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