Volume: 10 Issues: 59 Issue [March, 2025] pp. 157 - 168
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.academicinspired.com/ijafb
DOI: 10.55573/IJAFB.105913

FINANCIAL SUBSIDIES AND TAX INCENTIVES MECHANISMS IN PROMOTING INNOVATION QUALITY IN STRATEGIC EMERGING INDUSTRIES

Qiuhong Liu[1]
Rani Diana Othman[2*]
Siti Nurhazwani Kamarudin[3]

[1]Faculty of Accountancy, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[1]School of Economics and Management, Panzhihua University, China
[2]Faculty of Accountancy, Universiti Teknologi MARA, Cawangan Melaka, Kampus Alor Gajah, Malaysia
[3]Faculty of Accountancy, Universiti Teknologi MARA, Cawangan Terengganu, Kampus Dungun, Terengganu, Malaysia
* Corresponding Author: Rani Diana Othman (Email: diana067@uitm.edu.my)

Article history
Received date : 4-3-2025
Revised date : 5-3-2025
Accepted date : 2-4-2025
***Published* date** : 15-4-2025

To cite this document:
Liu, Q., Othman, R. D., & Kamarudin, S. N. (2025). Financial subsidies and tax incentives mechanisms in promoting innovation quality in strategic emerging industries. *International Journal of Accounting, Finance and Business (IJAFB)*, 10 (59), 157 - 168.

Abstract: *In the context of global economic development, innovation is widely recognized as a crucial driver of economic progress. Currently, the entire globe is undergoing a surge in the digital era and significant scientific advancements, accompanied by a heightened level of global investment in research and development. The Chinese government advocates that innovation should be the primary driving force for development. Enterprises play a crucial role in driving innovation and can effectively facilitate the translation of scientific and technological advancements. The quality of innovation in strategic emerging industries is directly linked to the achievement of broader scientific and technological development objectives. China has consistently provided financial subsidies and tax incentives to foster the growth of innovative quality in strategic developing industries. Extensive studies have been conducted to determine the efficacy of policies in enhancing innovation quality and addressing market failure. Nevertheless, the differences in the studies' perspectives and inconsistencies in their conclusions, resulting in a lack of united opinion. This study aims to provide a clearer understanding of the practicality and importance of improving innovation quality in strategic emerging industries. It does so by examining the development and mechanism of financial subsidies and tax incentives that are used to promote innovation in these industries.*

Keywords: *financial subsidies, tax incentives, innovation quality, strategic emerging industries*

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Introduction

From the standpoint of China's innovation-driven development strategy and new development concept, China demands a shift in economy from a high-speed growth stage to a stage of high-quality development. In 2021, the "14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035" was announced by the Chinese government, which further emphasized the core position of innovation in the overall modernization of China. The statement highlights the importance of bolstering the nation's strategic science and technology capacities, enhancing the innovation capabilities of businesses, fostering the creative energy of skilled individuals, refining the institutional frameworks for technological innovation, and consistently augmenting investments in research and development. According to the latest figures from China's National Bureau of Statistics, the overall spending on R&D in 2022 increased by more than 10%, surpassing the significant milestone of 3 trillion yuan. The R&D spending intensity reached a new peak of 2.55%, representing an increase of 0.12 percentage points compared to the previous year. China's level of investment in R&D is ranked as the 12th highest among major nations when compared globally. The percentage is greater than that of creative nations such as France (2.35%) and the Netherlands (2.32%), and it is approaching the average level of OECD nations (2.67%). However, there is a significant disparity when comparing it to countries such as the United States and Japan. According to the Global Invention Index 2023, the leading countries in the world for innovation are Switzerland, the United States, Brazil, India, Singapore, Israel, and Mauritius (WIPO, 2023). In 2023, China is ranked 12th, which is one position lower than its ranking in 2022. China's innovation skills still lag behind those of traditionally strong innovation economies. The regional ranking of global innovation leaders is shown in Table 1.

Table1: Top three innovation economies by region of Global innovation leaders in 2023

Europe	**Northern America**	**Latin America and**	**Central and Southern Asia**
1. Switzerland	1. United States	1. Brazil	1. India
2. Sweden	2. Canada	2. Chile	2. Iran
3. United Kingdom		3. Mexico	3. Kazakhstan
South East Asia, East Asia, and Oceania	**Northern Africa and Western**	**Sub-Saharan Africa**	
1. Singapore	1. Israel	1. South Africa	
2. Republic of Korea	2. United Arab Emirates	2. Botswana	
3.China	3.Türkiye	3.Senegal	

Source: Global Innovation Index Database, WIPO, 2023.

Based on the global demand for innovation and changes in its own strategic objectives, China has embarked on a vigorous development for strategic emerging industries (SEIs). In 2010, China elevated the development of SEIs to the status of a national strategy through the publication of the "Decision of the State Council on Accelerating the Cultivation and Development of Strategic Emerging Industries." SEIs is a new concept proposed by China according to its national conditions, the biggest feature is technology-driven and technological innovation. It is a technology-intensive industry with nine industries, including new generation information technology industry, high-end equipment manufacturing industry, new materials industry, new generation bio-industry, new energy automobile industry, new energy industry,

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energy conservation, and environmental protection industry, digital creative industry, and related service industries (Strategic Emerging Industries Classification, 2018). The development of SEIs relies on both technological innovations by enterprises and the ongoing enhancement of the marketplace. In particular, directing the growth of industrial innovation by financial subsidies and tax incentives allows the government to exert a positive impact. Through tax incentives, the government can reduce the tax burden on enterprises, enhancing their innovation vitality. These measures contribute to stimulating technological innovation by enterprises and promoting the development of SEIs. The government of China plays a pivotal role in fostering the creation of SEIs. It facilitates the expansion of industries, enforces economic regulations, and enhances industrial frameworks by implementing industrial policies such as providing financial subsidies and offering tax incentives. In order to further promote the development of the innovation quality of SEIs through financial subsidies and tax incentives, it is necessary to have a clear development and mechanism of action

Concepts of financial subsidies, tax incentives, and innovation quality

Financial subsidies

The government's public policies for economic activities can be classified into two categories: direct intervention and indirect forms. The primary types of direct financial support encompass cash subsidies, investments, and loan subsidies. Indirect forms, on the other hand, consist of tax incentives and national guarantee loans (IRIMIE et al., 2009). The concept of financial subsidies originated from the views presented by the British economist Pigou in the book “Welfare Economics.” Financial subsidies can be attributed to a minimum of five potential causes, as stated by Peng et al. (2021). Initially, to ensure a smooth economic transition, these subsidies are specifically targeted towards enterprises that are facing financial downturns. According to Sullivan (2002), the primary objective of corporate subsidies is to mitigate excessive risk and uncertainty. Secondly, to offset losses, it is proposed to provide monetary subsidies to natural monopoly sectors. In countries such as Russia and Iran, energy sector enterprises are provided with subsidies to maintain low energy prices (Ellis, 2010). Thirdly, financial subsidies provide assistance to enterprises in their pursuit of innovation and reduce the level of risk associated with investments in research and development (Cappelen et al., 2012; Czarnitzki et al., 2007). Fourthly, to provide assistance to enterprises during times of crisis. During the 2008 financial crisis, the U.S. government implemented substantial financial subsidies within its domestic banking system to avert numerous corporations from declaring bankruptcy. Fifthly, it is common for local government officials to grant subsidies to the private sector in order to increase their chances of being reelected for a second term in office (Shleifer & Vishny, 1994). Simultaneously, financial subsidies incentivize firms to intensify their efforts in generating employment and satisfying social obligations, perhaps resulting in politicians garnering greater support during election campaigns (Shih et al., 2012; Su et al., 2012). Notwithstanding, the research topic of this article is focused on financial subsidies, which are defined according to China's "Enterprise Accounting Standard No. 16−Government Grants" (Cai Kuai [2017] No. 15). Financial subsidies relate to the government's distribution of monetary and non-monetary assets to firms without charge. However, it is important to differentiate it from government subsidies, with the exception of tax refunds, which are classified as tax incentives in this study.

Miglo (2020) suggests that financial subsidies primarily take two forms: full funding and partial funding. Full appropriations are usually allocated specifically for R&D initiatives, frequently with certain conditions, such as the requirement to collaborate with universities for R&D

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purposes. Another type of subsidy is the double gift grant, which mandates corporations to make a contribution of some kind to the project that is being supported. Financial subsidies in this study pertain to government-provided monetary and non-monetary assets given to firms free of charge. In summary, China's fiscal subsidy policies encompass various forms of financial support, such as direct investment in entrepreneurial enterprises, participation in venture capital funds using central and local fiscal funds, fiscal interest subsidies, R&D subsidies, policy subsidies, special development funds, and purchase price subsidies.

Tax Incentives

Tax incentives are defined as, special deductions, exclusions, or exemptions that provide specific credits, preferred tax rates, or a postponement of tax obligations (Easson & Zolt, 2002). Further, Zhu et al. (2023) defined tax incentives as measures prescribed by tax laws and administrative rules that employ tax strategies to ease or exempt specific firms and taxpayers from tax obligations. Combining the above definitions within the Chinese context, and acknowledging the summary from the Baidu Encyclopedia, this study views tax incentives as measures employed by the government through tax means in accordance with tax laws and administrative regulations to lighten or exempt specific enterprises and taxable entities from tax burdens. This encompasses targeted strategies such as tax reduction or exemption, preferential tax rates, tax offset, additional deductions, and deferred taxation, with the objective of fostering the growth of particular industries, regions, and enterprises. When it comes to tax incentives, they can be classified into two primary groups from a policy standpoint: monetary tax incentives and non-monetary tax incentives. When it comes to fiscal incentives in the form of monetary advantages, experts mostly concentrate on direct or indirect tax incentives that offer financial subsidies to businesses, such as tax credits, exemptions, and refunds.

Innovation Quality

Innovation quality evolved from the concept of research and development quality. Juran (1951) argued that the quality of research and development refers to the extent to which it is able to effectively meet the demands and requirements of the intended customers. R&D quality primarily pertains to the technical excellence of a company's product development and its influence, as well as its contribution to the business goals. Keogh & Bower's (1997) highlighted the correlation and significance of innovation and quality, recognizing them as crucial elements for achieving corporate success. Subsequently, the notion of innovation quality progressively gained attention among researchers. The analysis of innovation quality, as shown by a literature survey, demonstrates a complex interconnection between innovation theory and quality management theory. This concept emphasizes the importance of both innovation and quality components. This study will examine the evolution of the notion of innovation quality from the viewpoints of both innovation and quality.

Haner (2002) initially explained the notion and consequences of innovation quality, focussing on the evolution of innovation. He posited that the quality of innovation is the amalgamation of organizational performance across all domains pertaining to innovation potential, innovation process, and innovation outcomes. It exhibits a distinct and dynamic nature, including variables such as the level of novelty, effectiveness, dependability, timeliness, expense, consumer worth, and the intricacy of innovation. Tseng and Wu (2007) argued that innovation quality is directly linked to customer satisfaction with a firm's products or services. This, in turn, enables the company to generate additional revenues from new offerings.

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Scholars have subsequently conducted research to offer precise definitions of innovation quality, focussing on an innovation standpoint. Nevertheless, the concept of innovation quality has become diversified as a result of differing focal areas among scholars. Prior studies on the concept of innovation quality, analyzed from an innovation standpoint, can be primarily classified into the following three dimensions:

Firstly, the innovation quality is regarded as an indicator of how effective the innovation is. Mu et al. (2018) argue that innovation quality is a measure of how well a company's innovation efforts are performing and how well they align with other aspects of the innovation process.

Secondly, innovation quality is regarded as a measure of the influence of innovation outcomes. Several researchers contend that the quantification of a company's innovation quality can be determined by calculating the total number of times that each of the company's patents is referenced or mentioned. According to Lahiri (2010) and Huang & Rice (2009), it is believed that a patent that is mentioned by a larger number of future inventors holds more impact than one that is cited by a smaller number of inventors. The quality of innovation can be measured by the effectiveness of a company's innovation, the frequency with which invention patents are referenced, and the rate at which patents are granted (Mu et al., 2018).

Thirdly, the innovation quality is regarded as a manifestation of the ability to innovate. According to certain experts, innovation quality refers to a company's capacity to innovate in terms of both management and procedures, as well as its ability to create new goods and processes. The concept refers to the ability to provide superior quality new products and services compared to prominent competitors (Wang et al., 2016; Wang et al., 2021).

The development of financial subsidies and tax incentives in promoting the innovation quality of seis

The Development of Financial Subsidies

Since 2010, when the country decided to speed up the growth of SEIs, these industries in China have experienced consistent and rapid expansion, resulting in significant achievements. In order to expedite the progress and promotion of SEIs, China has implemented the “Twelfth Five-Year Plan” and SEIs development strategies. The objective of these programs is to create SEIs that will enable substantial progress in crucial technologies, industrial innovation, development, and major application demonstrations. Furthermore, the innovation quality of the creation of SEIs investment funds and special development funds for regional agglomeration development is intended to bolster central financial investment in industrial development by establishing a reliable framework for fiscal investment expansion. The main objective of the subsidy policy is to counterbalance the negative effects on society caused by corporate innovation. This is achieved by implementing methods such as providing direct financial support, tax incentives, and subsidies for purchasing. This approach seeks to produce a mutually beneficial outcome of maximizing company profits while simultaneously meeting government regulatory objectives (Wang et al, 2019). When the government provides direct subsidies to support or protect specific firms, selection bias inevitably occurs, the role of the market is suppressed, and rent-seeking and arbitrage behaviors prevail in the economy (Cheng et al, 2020). The special fund for the development of SEIs established by the central government was first launched in 2011, mainly for high-end equipment manufacturing, new energy vehicles, and new materials. The subsidy standard is determined by 15% of the fixed asset investment of the project. In addition,

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the local governments of various provinces have also gradually launched and implemented special development funds for provincial-level SEIs.

The financial subsidies for the new generation of the information technology industry and high-end equipment manufacturing business can be categorized into the following four aspects. Firstly, there is a strong backing for information technology and high-end equipment manufacturing in the prominent national science and technology initiatives, particularly focussing on technological research and development, such as the 863 plan (National High Technology Research and Development Program of China) and 973 plan (National Key Basic Research and Development Program of China). Secondly, the government has established dedicated projects or funds to support industrial development and provide policy assistance for technological research and development in the industry. Thirdly, efforts have been made to establish a national software industry base, as well as a platform for service outsourcing announcements. Lastly, there is a concerted effort to integrate with the emerging new generation of the information technology industry and high-end equipment sector. The National Natural Science Foundation of China focuses on issues and initiatives relevant to the manufacturing industry. In order to support the energy-saving, environmental protection, and new energy industries, special funds are established along with loan discounts for companies in these sectors. Additionally, price subsidies are provided to buyers in order to encourage the production and development of energy-saving and environmental protection industries. Local governments will establish industry guide funds to incentivize greater participation of social capital in company technology development projects. These funds will also assist independent research and development and the transformation of scientific and technological achievements by enterprises.

The Development of Tax Incentives

China’s tax reform has gone through several stages. Prior to 1994, China implemented several forms of taxation in order to alleviate the strain on fiscal resources. China's tax reform, implemented after 2003, aimed to alleviate the burden on both businesses and individuals. During the period from 2003 to 2012, significant efforts were made to reform and enhance the tax system. In response to the economic repercussions of the 2008 financial crisis, China implemented certain advantageous tax measures. Since 2013, the tax system reform has been referred to as the stage of reform in the new era. Currently, the tax system reform is undergoing a phase of comprehensive deepening reform. The objective of offering tax incentives is to encourage a significant number of enterprises to participate in R&D, while also providing direct funding for specific R&D initiatives undertaken by individual companies (Czarnitzki, Hanel, & Rosa, 2011). Developed governments often utilize tax incentives to encourage innovation, but correctly assessing their impact has proven to be difficult. These incentives enable a portion of earnings to be reinvested in product innovation or used to offset research and development expenses without being subject to taxes (Liakhovets, 2014). China has implemented a tax structure that focuses on technology at this point. The scope of R&D tax incentives has expanded to include all firms, irrespective of their type of ownership or location, which was previously limited to state-owned enterprises or high-net-worth enterprises (Ding & Jun, 2015). Regarding taxation, there exist numerous categories of taxes, and each tax category has distinct methods for decreasing or exempting the tax. Various SEIs have been granted distinct favorable tax schemes that align with their specific industrial features.

The tax advantages provided for SEIs primarily consist of turnover tax and corporate income tax exemptions. Upon analysis of the preferred tax policies for turnover tax, it is evident that

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the emerging information technology enterprises of the new generation are granted further tax advantages in this regard. These incentives primarily comprise exclusions, reductions, and reimbursements upon payment. In order to encourage technological research and development in companies, the government grants a value-added tax exemption for the purchase of high-tech equipment. Moreover, the input tax deduction is augmented to provide additional motivation for firms to participate in advanced technological research and development. To facilitate the industrialization and commercialization of R&D results, certain tax discounts and exemptions are granted for the sales revenue generated from newly developed high-tech items. In addition, new items with high technological content may be subject to low-level value-added tax rates or may qualify for tax exemptions for a specified duration.

Income tax encompasses a range of comprehensive policies, especially those that are favorable. These regulations are universally applicable to all businesses, with a particular emphasis on energy-saving and environmental protection industries, as well as new-generation information technology industries. These policies primarily aim to reduce taxes and provide exemptions, as well as offer significant deductions for research and development expenses. These regulations can facilitate tax minimization and enhance funding opportunities for profitable enterprises. Nevertheless, the majority of innovative enterprises are unprofitable. From this standpoint, it appears that it may not provide a fundamental solution to the problem.

The mechanism of financial subsidies and tax incentives in promoting the innovation quality of SEIs

Financial Subsidies and Innovation Quality

Based on a previous study, it has been found that financial subsidies can have a favorable influence on the quality of innovation in businesses. These subsidies can also lead to particular impacts such as complementary, spillover, or stimulating effects (Carboni, 2011; Kang et al., 2012). The main points are as follows:

a. Several experts argue that providing financial subsidies has a beneficial effect on the level of innovation in firms. In their study, Ladinska et al. (2015) suggested that direct subsidies play a crucial role in promoting innovation and helping small and medium-sized organizations. These subsidies incentivize companies to increase their investments in research and development, which in turn leads to greater innovation, productivity, and overall national economic growth.
b. Additional forms of subsidies, such as regional subsidies and partial exemptions of prepayments for R&D staff, have had a favorable impact on encouraging increased R&D activities within corporations (Dumont, 2013). According to Li (2014), a study conducted in Guangdong Province found that financial subsidies, tax incentives, and government procurement are beneficial for enhancing the innovation efficiency of critical industries. Among them, financial subsidies were found to have the most notable impact. Yao & Huang (2022) conducted a study using A-share listed State-Owned firms from 2010 to 2019 as samples. They discovered that China's R&D subsidies have a positive impact on the sustainable innovation performance of strategic emerging firms. Guo et al. (2018) conducted a study to examine the influence of public R&D subsidies on the efficiency of Chinese companies, their findings revealed favorable outcomes.

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Tax Incentives and Innovation Quality

Previous studies indicate that tax incentive policies have a positive impact on firms by lowering innovation expenses, boosting operational cash flows, and encouraging investment in research and development at the company level (Czarnitzki & Rosa, 2011). These incentives result in increased investments in innovation (Bloom et al., 2002; Dechezleprêtre et al., 2016) and the successful creation of new manufacturing processes and products (Cappelen et al., 2012). The main points are as follows:

a. Tax incentives encourage behaviors such as a higher propensity to take risks, increased spending on research and development, and improved quality of innovation. These behaviors are all motivated by tax policies (Avellar & Botelho, 2016; Kao, 2018; Wonglimpiyarat, 2018). Multiple pieces of evidence from both developed countries (Agrawal et al., 2020) and developing countries (Ivus et al., 2021) substantiate the beneficial impact of tax incentive programs in promoting research and development expenditures. Research also indicates that tax incentives have a positive impact on the level of R&D activities, including the rate of growth in R&D and the size of R&D departments (Tian et al., 2020; Guceri, 2018).
b. Studies focused on Chinese businesses have shown that tax incentive policies have a positive impact on innovation investments by encouraging firms to allocate more funds towards research and development (Xu et al., 2021). Research examining the correlation between tax incentives, tax enforcement, and Chinese companies' investments in R&D indicates that China's tax incentive policies have a beneficial effect on firms' innovative endeavors. Specifically, consistent and long-lasting tax incentives encourage greater investments in R&D (Sun, 2022).

Financial Subsidies, Tax Incentives, and Innovation Quality

Falk (2004) identified two important tools used by governments to encourage R&D in enterprises. These tools include direct cash subsidies and specific tax benefits provided to corporations who invest in R&D. Falk's analysis was based on data from several OECD nations. Nevertheless, there is a scarcity of research on the correlation between R&D tax incentives and direct subsidies, as well as studies that examine the concurrent utilization of both (Larédo et al., 2016). It is widely accepted among scholars that different policies have the potential to interact with one another (Martin, 2016). Direct and indirect support have distinct characteristics and can be employed concurrently, resulting in an interaction between these two policy tools (Neicu, 2019). The main points are as follows:

a. According to Westmore's (2013) study on 19 OECD nations, subsidies have a greater impact on the quality of innovation compared to tax incentives. Zhou et al. (2020) suggested that financial subsidies have a more significant stimulating impact on independent innovation in China's SEIs compared to tax incentives. Simultaneously, they discovered a correlation between government interference and the total efficiency of firms' independent innovation that follows an inverted U-shaped pattern. According to Li (2014), a study conducted in Guangdong Province, China, found that providing financial subsidies, tax incentives, and government procurement can enhance the effectiveness of financial assistance for SEIs. Among these measures, financial subsidies were found to have the most significant impact.
b. Nevertheless, several scholars present a contrasting perspective, contending that tax reductions have a unique impact on corporate economic motivations and operational strategies, separate from direct subsidies. The primary advantage of tax incentives is their "market-oriented" nature, which implies that the government does not selectively finance specific activities (Hall et al., 2000). Therefore, by preserving business

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decision-making and resource allocation, we can reduce the distortion caused by government meddling. This type of incentive promotes strategic business planning by mitigating ambiguity (Hall, 2019). According to Castellacci and Lie (2015), tax incentives are more effective than direct subsidies in stimulating research and development. Jiang et al. (2020) argue that various forms of government support for innovation have distinct impacts on the level of R&D investment in agricultural companies. Financial subsidies in agriculture have a distinct negative impact on the investment in R&D by agricultural firms. On the other hand, government tax rebates can encourage and boost R&D investment in these enterprises. Mardones & Ávila (2020) conducted a study utilizing data from the 2007-2016 Chilean Enterprise Innovation Survey. They discovered that both R&D tax incentives and R&D subsidies had a favorable and significant impact on the likelihood of enterprises participating in internal and external R&D activities. These effects were shown to be strong and reliable. Furthermore, tax incentives had a significant influence on companies that were involved in both internal and external R&D.

To summarize, the government may effectively guide the advancement of industrial innovation by providing financial subsidies and tax advantages. This is supported by Figure 1, which is based on research conducted by Wu and He (2021); Wu et al.(2023) and Qian (2023). In this approach, the government alleviates the financial strain on enterprises by offering financial subsidies and encouraging more investment in research and development. Simultaneously, the government can alleviate the tax burden on enterprises by offering tax incentives, thus enhancing their ability to innovate. These strategies facilitate the advancement of technological innovation in businesses and encourage the growth of SEIs.

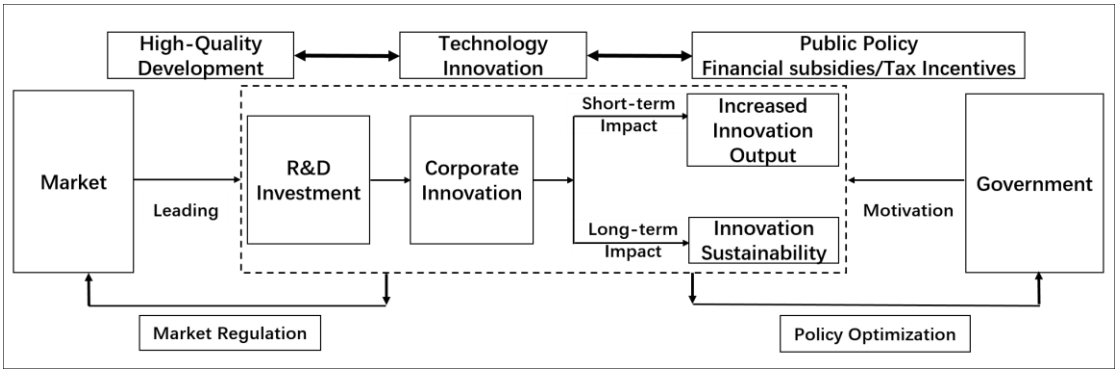

Figure 1 The basic mechanism of financial subsidies and tax incentives

Conclusions

This study examines the necessity and significance of stimulating the advancement of innovation quality through financial subsidies and tax incentives, taking into account China's current need for enhancing innovation in SEIs. This statement provides additional clarification regarding the conceptual advancement of financial subsidies, tax incentives, and the quality of innovation at this particular level. The text provides a summary of the institutional context regarding financial subsidies and tax incentives for SEIs in China. Ultimately, this study summarises the impact of financial subsidies and tax incentives on enhancing the quality of innovation in SEIs, drawing from pertinent research findings. In the future, China should persist in enhancing its financial subsidies and tax incentive policies. To further expand China's total innovation capabilities and level, it is necessary to strengthen the country's financial subsidy and tax incentive policies for SEIs development.

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Journal website: www.academicinspired.com/ijafb
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Volume: 10 Issues: 59 Issue [March, 2025] pp. 157 - 168
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.academicinspired.com/ijafb
DOI: 10.55573/IJAFB.105913

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