

How Fiscal and Tax Policies Determine Technological Innovation

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Abstract: With the environmental pollution and the depletion of fossil fuels in recent year, the rise of the new energy vehicles has aroused profound influence. This study intends to examine the relationship between government fiscal and taxation strategies and the level of technological innovation, specifically in terms of R&D investment financing, within China's new energy vehicle industry. The results of our study show: (1) The government's fiscal and tax incentives are positively related to the technological innovation of new energy vehicles. (2) R&D investment funding is confirmed as an intermediary in the relation between fiscal and tax policies and technology innovation; (3) Fiscal incentives have more impact than tax incentives in fostering technological innovation in new energy vehicles.

Keywords: fiscal policy, tax policy, new energy vehicles, technology innovation.

1. Introduction

1.1. Research Background

Amidst the backdrop of worldwide environmental contamination and the exhaustion of conventional fossil energy sources, the sector of new energy vehicles has materialized as a pivotal and swiftly expanding industry. New energy vehicles use clean energy and emit less exhaust, which play a crucial role in reducing air pollution, alleviating energy shortage and enhancing energy efficiency. Therefore, nations globally have initiated favorable schemes to advance the technological development of new energy vehicles. Under the background of "carbon peak" and "carbon neutrality", China, as the world's second-most robust economic power, prioritizes the progression of new energy vehicle technological advancement with great importance. Over the past few years, the market for new energy vehicles in China has achieved significant advancements. In 2023, China is projected to produce 9.587 million NEVs and sell 9.495 million units, representing year-on-year increase of 35.8 per cent and 37.9 per cent, respectively. Additionally, China's new energy vehicle industry has also shown strong competitiveness in the international market, with exports reaching 1.735 million units in 2023, up 55 per cent year-on-year.

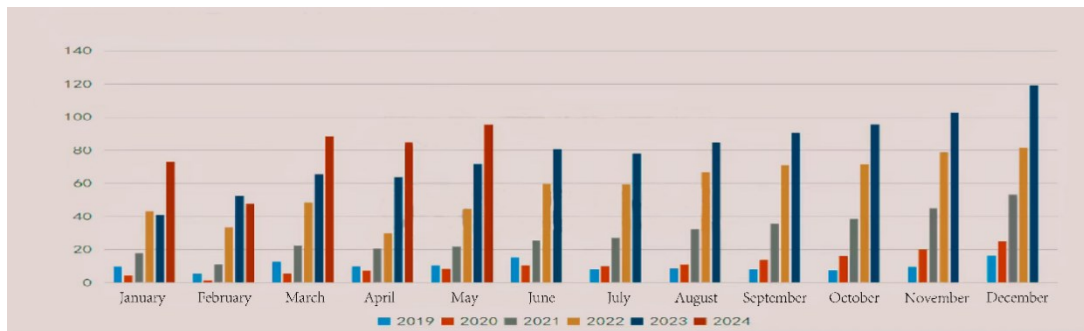


Figure 1: New Energy Vehicle Sales (in ten thousand units)

Source: AssetInfo.com Millennium Investment Bank China Association of Automobile Manufacturers, Inc



Figure 2: New Energy Passenger Vehicle Exports (in ten thousand units)

Source: AssetInfo.com Thousand Inter Investment Bank Joaquin Securities

Although new energy vehicles have made remarkable progress in China over the past few years, relative to the progress in international markets, China's new energy vehicles sector began its trajectory at a subsequent phase, and it persists in facing a wide array of difficulties. The new energy automobile industry demands a lot of research funds for its early development, and enterprises often stagnate in technological innovation due to lack of funds. At the same time, low performance, short range and incomplete infrastructure facilities make it difficult to popularise new energy vehicles[1]. Based on this status quo, the evolution of new energy vehicles in China urgently needs the government to introduce relevant policies to guide, and related policies, fiscal policy and tax policy occupies a dominant position.

China's new energy vehicles started to take shape at the turn of this century. Since 2009, the Chinese government has implemented a series of incentive measures to foster technological advancement in the new energy vehicle sector, including the vehicle acquisition tax reduction and exemption initiative, as well as the financial subsidy program for the popularization and utilization of new energy vehicles[2]. These strategies are designed to stimulate innovation in new energy vehicle technology and to drive the high-quality growth of the industry. Nonetheless, the current fiscal and taxation measures are clearly not adequate to comprehensively stimulate innovation in new energy vehicles. In light of this, this study investigates the impact of fiscal and taxation policies on the technological innovation within the new energy vehicle field, examining both theoretical and practical dimensions.

1.2. The significance of the study

Scholars worldwide have thoroughly investigated the linkage between fiscal and tax measures and technological advancements in the new energy vehicle industry. However, there is a scarcity of research focusing on the extent to which fiscal and tax incentives drive technological innovation in new energy vehicles by leveraging corporate R&D investments. This study delves into the financial data of representative A-share listed firms, examining the influence of fiscal and tax policies on these companies' R&D funding. From this analysis, the study infers the role of fiscal policy in bolstering technological innovation within the new energy vehicle sector. At the same time, this study proceeds to analyze the impact of fiscal and tax measures on stimulating technological innovation in the new energy vehicle industry, with the aim of contributing to the refinement of fiscal policies pertaining to new energy vehicle firms. The goal is to motivate these companies to develop proprietary technologies, enhancing their market competitiveness and increasing their market presence.

2. A review of the literature

2.1. Fiscal policy and technological innovation of new energy vehicles

In the context of China's dynamic economic expansion and the "carbon neutral" era, new energy vehicles, with their green, features such as reduced energy usage and diminished emissions correspond with the evolutionary path of the eco-friendly economy. Consequently, in recent years, advancements in new energy vehicle technology have garnered significant public interest. At the same time, the governmental policy support is the leading factor to advance the development of new energy vehicle technology, with nations actively implementing fiscal measures to encourage investment in NEV research and development[3]. In China, the creation of financial and taxation policies aimed at new energy vehicles falls under the main purview of the Ministry of Industry and Information Technology, the Ministry of Finance, and the State Administration of Taxation[4]. These policies are aimed at fostering the high-quality growth of new energy vehicles, promoting industrial technological innovation, and facilitating the transition from a large automobile country to a strong automobile country. For example, according to the announcement of the Ministry of Finance and the State Administration of Taxation, since 1 January 2023, enterprises to carry out R & D activities in the actual incurred R & D costs, not formed intangible assets in the current profit and loss, in accordance with the provisions of the actual deduction based on the basis of the actual amount of deduction in accordance with the actual amount of 100% in the pre-tax deduction; the development of intangible assets is based on the expenditure associated with intangible assets, amortisation of 200% of the cost in the pre-tax. This measure is designed to further encourage companies to enhance their expenditure on research and development, thereby providing more robust backing for scientific and technological advancements.[5]The Government of the Republic of Korea has also made a number of changes to its vehicle purchase tax exemption policy. For example, pursuant to the Notice Regarding the Extension and Improvement of Tax Incentives for the Acquisition of New Energy Vehicles, those acquiring new energy vehicles from January 1, 2024, to December 31, 2025, will be granted a waiver on vehicle purchase tax, with the maximum exemption capped at 30,000 RMB per new energy passenger car. For new energy vehicles bought from January 1, 2026, to December 31, 2027, a 50% reduction on the vehicle purchase tax will be applied, of which the tax reduction amount is no more than RMB 15,000 per new energy passenger vehicle. For the period from 1 January 2026 to 31 December 2027, the acquisition tax for new energy vehicles will be subject to a 50% cut, with the tax savings not exceeding 15,000 yuan per new energy passenger vehicle. This measure will further enhance the advancement of new energy vehicles[6].

As an important policy instrument of macro-control, fiscal measures exert a beneficial impact on spurring technological advancements in new energy vehicles. Numerous researchers both domestically and internationally have examined the correlation between fiscal and tax policies and corporate research and development investments. Foreign studies regarding the influence of fiscal and taxation policies on corporate R&D expenditures are fairly extensive. For example, Hall and Reenen studied the impact of tax system on R&D expenditures in OECD (Organization for Economic Co-operation and Development) countries. The study shows that tax relief reduces the cost of production and thus increases the R&D investment of enterprises, which further promotes enterprise innovation. Nola analyzes the dataset from Ireland and Northern Ireland covering the period from 1994 to 2002 to explore the effect of state subsidies on business R&D expenditures. Findings reveal that governmental support can elevate research and development funding, consequently advancing corporate innovation[7]. There is also a large group of scholars in China who are committed to studying the relationship between fiscal policy and enterprise R&D investment. The majority of findings confirm that fiscal policy is instrumental in driving research and development investments by businesses. For example, Xie Weimin and others, after analysing the management information data of all listed companies in China from 2003 to 2005, the analysis led to the conclusion that monetary incentives have a pronounced boosting influence on the R&D spending of small and medium-sized enterprises[8]. Several academics argue that the stimulative impact of fiscal policy on corporate R&D investments is quite restricted. Zhang Hui and colleagues (2016) employed the threshold regression technique to investigate the correlation between government subsidies and corporate research and development investments, the empirical evidence indicated that once government grants surpassed a specific limit, enterprises might divert part of the subsidy funds to other uses instead of using all of them for R&D activities, which led to the inefficient use of funds[9]. At the same time, some scholars believe that tax policy has a better effect on promoting R&D activities of enterprises. At the same time, some scholars believe that tax policy has a better promotion effect on the R&D activities of enterprises. For example, Shi Shaobin and other scholars, in their 2017 study, utilized the Propensity Score Matching (PSM) approach and multiple linear regression analysis to examine the association between income tax incentives and corporate R&D spending, with the findings indicating that both methodologies confirm a beneficial effect of income tax concessions on corporate R&D investment[10]. This implies that tax measures can motivate businesses to allocate more capital towards R&D initiatives, thereby spurring technological innovation. It implies that tax measures can stimulate firms to enhance their capital outlays in R&D initiatives, subsequently advancing corporate technological advancements. Of course, some scholars believe that the promotion effect of tax policy on enterprise R&D activities is not so significant, such as Ma Wencong and other researchers used the propensity score matching model to analyse the data of Chinese listed companies from 2008 to 2019, and the study shows that when enterprises face financing constraints, it is difficult to effectively play the role of innovation promotion of tax policy[11].

Therefore, we tend to study the relationship between fiscal policy and new energy, as well as the mediating relationship between R&D investment costs. During the nascent phase of new energy vehicle companies' growth, they often face difficulties in capital turnover due to the low market penetration, incomplete establishment of infrastructure, and high investment in R&D. New energy vehicle enterprises are often unable to obtain sufficient financial support at the initial stage, and are prone to insufficient R&D funding. Insufficient R&D funding may limit the enterprises' investment in technological innovation, thus affecting the innovative development and long-term competitiveness of new energy vehicle enterprises. Therefore, the government can help new energy automobile enterprises overcome the difficulties of capital shortage by introducing fiscal and tax incentives, this will prompt companies to boost their R&D investments, cultivating technological

advancements within the new energy vehicle field, and encouraging the robust growth of the entire industry.

In addition, it is found through the search that most companies' R&D investment funds are related to the technological innovation of new energy vehicles. For example, Zhou Wei, taking SAIC Group's new energy vehicles as an example, examined the correlation between R&D expenditures and patent yields, and comprehensively detailed how the structure of R&D investments influences patent generation across the six key technological domains of new energy vehicles[12]. This research assesses the level of technological innovation in new energy vehicles based on the R&D expenditures within the new energy vehicle sector.

Below, we have reviewed the sales rankings of several prominent automobile brands. For instance, BYD continues to hold a dominant stance in the new energy vehicle sector, with a number of its models at the top of the sales charts. For example, BYD Seagull and BYD Song PLUS are ranked first and third in the monthly sales chart. For example, Tesla's Model Y and Model 3 are outstanding in the new energy vehicle market, with Model Y ranking second in the monthly sales charts and Model 3 at the top of the list. The leading sales of these new-energy vehicle companies are closely related to their strong investment in R&D and technological innovation.

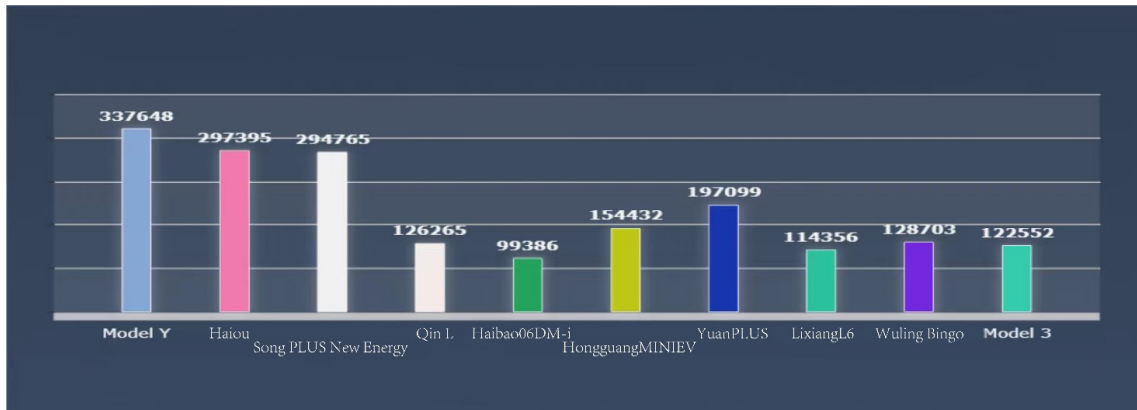


Figure 3: 2024 New Energy Electric Vehicle Sales Ranking

Accordingly, the following assumptions are made.

Hypothesis 1: There is a positive correlation between the government's fiscal and tax incentives and the technological innovation within the new energy vehicle industry.

Hypothesis 2: The fiscal and tax incentives provided by the government are associated with technological innovation in new energy vehicles, with R&D investment funding serving as an intermediary mechanism.

2.2. Fiscal and tax policies

Fiscal policy encompasses the government's methods of managing the macroeconomy through direct or indirect manipulation of taxation and public spending. Based on the study of new energy vehicles in this paper, we mainly divide fiscal policy into two major parts: fiscal subsidies and tax incentives. Fiscal subsidy means that the government provides financial assistance or economic compensation to specific regions, industries, businesses or private entities are targeted to fulfill particular policy goals. Within this study, fiscal policy offers monetary backing to the new energy vehicle sector via financial grants, reduces the production cost of enterprises, thereby encouraging firms to engage in technological advancement and product enhancement. At the same time, the fiscal policy can guide enterprises to improve product quality and technology content by setting the threshold of subsidy standards and technical indicators, and promote the transformation of the industry to high-quality

development. Tax incentives refer to the tax exemptions and reductions granted by the state to certain enterprises through the tax law and relevant administrative regulations. The objective of this measure is to lessen the tax liabilities for companies, thereby underpinning their business operations. Through tax incentives, the government can effectively influence economic behaviour. Based on the study of new energy automobile enterprises' R&D investment cost in this paper, we mainly explore the tax policy to add deduction for enterprises' R&D cost, so as aiding businesses in enhancing their R&D investment and advancing technological innovation. These two types of policies play complementary roles in the new energy automobile industry. Fiscal policy focuses more on direct financial support, while tax policy promotes the development of the industry by reducing the tax burden and incentivising technological innovation.

Owing to the underdeveloped state of technology in the new energy vehicle sector at present, most of the core projects still require further research. As a result, new energy vehicle enterprises need to invest in high research and development costs. In this case, financial subsidy is the government's direct investment in the R&D projects of enterprises. This can alleviate the financial burden associated with R&D for new energy vehicle companies and drive technological advancements in new energy vehicles. The key taxes encompassed by the tax policy include corporate income tax, value-added tax, and business tax, among others. Among them, Corporate tax exerts a more significant influence on firms' R&D investments, as the technological research and development in new energy vehicle companies is inherently more challenging than that in other high-tech sectors, the tax law stipulates that the R&D expenses shall be deducted by 150% in order to stimulate enterprises to increase their R&D investment.

As stated earlier, financial grants have a direct influence on a company's R&D endeavors, whereas tax incentives do not have a direct role in the R&D activities of businesses. Therefore, this research aims to delve into the varied motivational impacts of monetary and tax-related government strategies on the tech innovation within the new energy vehicle field.

Accordingly, the following assumptions are made.

Hypothesis 3: Governmental financial incentives prove to be more potent than tax-based incentives in fostering technological innovation within the new energy vehicle sector.

3. Conclusion

Drawing upon the aforementioned empirical study exploring the linkage between fiscal policy and the technological innovation of new energy vehicle firms, combined with China's new energy automobile fiscal policy and enterprise R & D development status quo, and combined with the relevant experience of developed countries, this manuscript offers the following recommendations, focusing on the dual dimensions of financial grants and tax breaks.

3.1. Improving financial subsidy policies

3.1.1. Improving financial subsidy policies

Based on the above research, the policy of providing financial grants can stimulate the R&D and innovative activities of new energy vehicle companies, but in recent years China's financial subsidy funds are used less efficiently, partly because some enterprises use the subsidy for non-technological research and development, this suggests that financial subsidies may not genuinely advance the progression of new energy vehicle technology. Therefore, the government should strengthen financial subsidies for core technology R&D projects. Within the realm of new energy vehicles, the pivotal factor for industry advancement lies in energy conservation and pollution reduction technologies, therefore, the government should provide special financial support for this research and development.

In this way, the government can enhance the efficacy of fiscal measures to more diligently foster technological innovation in the new energy vehicle sector.

3.1.2. Optimising innovative subsidy models

According to the current situation of the development of new energy vehicles, the government can obtain the amount of funds used for research and development from the annual reports disclosed by enterprises, and then deduce the technological innovation and development process of the enterprise. However, the disclosure of some enterprises' annual reports is not transparent, so the government cannot accurately check where the subsidy money goes, and cannot accurately assess the enterprise's R&D efforts and the level of technological innovation development. In addition, some enterprises still have the phenomenon of "cheating subsidies", all these problems have led to the inefficient use of government financial subsidies. Based on the current problems in the new energy automobile industry, the government should optimise its financial subsidy model, ensuring that enterprises implement specific R&D projects before providing financial support. In this way, it can guarantee that the allocated financial subsidy monies are genuinely applied to the technological research and development initiatives of new energy vehicles, thereby enhancing the productivity of subsidy allocations. Furthermore, in the process of distributing subsidies, the government can, to strengthen the supervision of subsidised enterprises, the relevant departments can often review the flow of money and the R & D process, so as to reduce the occurrence of "subsidy fraud" phenomenon.

3.2. Improving tax incentives

3.2.1. Increasing Income Tax Relief

Firstly, the government can increase the deduction of R&D expenses for new energy vehicle enterprises. Starting from 1 January 2023, the State will deduct 100 per cent of the actual amount incurred before tax on top of the actual deduction in accordance with the regulations; if intangible assets are formed, they will be amortized before tax at 200 per cent of the intangible assets[13] In the new energy automobile industry, the State can consider appropriately increasing the tax deduction. For the new energy automobile industry, the State can appropriately increase the deduction and raise the deduction ratio according to the actual situation. Secondly, the government can implement different tax incentives for different regions. For example, for the central and western regions, the government can further reduce its income tax rate to ensure that the R&D expenditure of enterprises in these regions.

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