Research on finance and tax management innovation of new energy industry under the "carbon peaking and carbon neutrality" goal

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Abstract. Carbon dioxide emissions from countries have led to an unstoppable rise in global temperatures. China put forward the goal of "Carbon peaking and Carbon neutrality" - to achieve carbon peak by 2030 and carbon neutrality by 2060. Under the goal, the development of new energy industry is very important to the reconstruction of energy structure and the transformation and upgrading of economic industry. Fiscal subsidies and tax incentives, as two important tools for the government to regulate the macro economy, can help the new energy industry to break down development barriers. Using the multivariate regression model to 2010-2019, 174 companies listed on the new concept of energy sector of the test data, studies the internal relationship between the fiscal and taxation policies and business performance, and on the analysis of the clarity of the current in the process of new energy industry status quo and existing problems of the fiscal and taxation policy. The following conclusions are drawn: fiscal subsidies in the new energy industry are negatively correlated with enterprise performance, while tax incentives are positively correlated with enterprise performance. This shows that under the background of "Carbon peaking and Carbon neutrality" goal, in-depth research on the incentive effect of fiscal and tax policies implemented by the government on the new energy industry is conducive to realizing the reshaping of the energy structure and the transformation and upgrading of the economic industry.

1 Introduction

In 2021, "carbon neutrality" was written into the government work report for the first time, which means that environmental issues such as pollution reduction and carbon reduction have once again received high attention from the government. The proposal of the "dual-carbon" target will also reduce carbon emissions and achieve green and low-carbon transformation to an unprecedented height. 2021 will also be the first year to launch the "dual-carbon" target. In addition to China, most developed countries such as Finland, the United Kingdom, Austria and some developing countries such as Chile have also expressed that they want to achieve carbon peak and carbon neutrality, and given a

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specific timetable. Against this backdrop, countries around the world are working together to address the growing climate problem.

China, as the world's largest developing country, is particularly vulnerable to environmental degradation caused by industrial activities. Therefore, the concept of carbon neutrality, characterized by "low consumption, low pollution and low emissions", has received a rapid response from all walks of life. Companies play a key role in achieving these low-carbon economic goals (Bai et al., 2019) [1]. As a large carbon emitter, electric power enterprises make great contributions to the national economy, but also cause great damage to the environment, and with the development and utilization of new energy, will greatly reduce China's carbon emissions. In 2019, global energy carbon emissions reached 33.1 billion tons, a historical high [2]. According to the Research Report on China's Carbon Peak before 2030 released by the Global Energy Internet Development Cooperation organization, China's carbon emission (including LULUCF) in 2019 was about 10.5 billion tons, of which the carbon emission.

The "14th Five-Year Plan" period is a key period for China to realize the transformation from traditional energy to new energy. We need to make full preparations for realizing the carbon peak by 2030 and carbon neutral by 2060 as soon as possible. In order to implement the government work report mentioned in the implementation of the dual-carbon work, fiscal and tax policies play a crucial role. Specifically, fiscal and taxation policies promote the adjustment of the energy structure and the realization of the dual-carbon targets through research and development and encouragement of low-carbon, environment-friendly and energy-saving technologies. Therefore, the government has accelerated the adjustment and optimization of the industrial structure and energy structure and vigorously developed new energy resources by strengthening the study of macroeconomic policies, especially fiscal and taxation policies. It is of great significance to promote the early realization of the "30 (60") dual-carbon target.

2 Literature review

2.1 "Carbon peaking and Carbon neutrality" target and new energy

The goal of "Carbon peaking and Carbon neutrality" is to improve the climate environment, reduce energy consumption, and strive to control the rise of global temperature within 2℃, to achieve the ultimate goal of the Paris Agreement. In order to help achieve this goal as soon as possible, scholars at home and abroad have started to explore the "Carbon peaking and Carbon neutrality" goal in recent years. To achieve the goal of "Carbon peaking and Carbon neutrality", the most critical point at present is to reduce carbon. The first step of carbon reduction is to have a scientific and unified standard for the determination of carbon neutrality. At present, the international standard uses ISO14064 standard, PAS 2060 standard and INTE B5 standard to provide specific provisions for carbon neutrality standard [3]. With the standard, domestic and foreign from different angles to seek effective ways to achieve the goal of "Carbon peaking and Carbon neutrality". Mojtaba and Alireza (2020) have taken Finland as an example and found that carbon tax policy will have a negative impact on social welfare while reducing carbon dioxide emissions [4]. And with the continuous improvement and development of carbon emission trading market, carbon tax under the market mechanism cannot effectively reduce carbon emissions. In order to solve the fundamental problem of human society -- energy problem, the most fundamental approach lies in energy transformation. Transition from traditional fossil energy with high pollution and emissions to "new energy" + "smart energy" energy system with clean and carbon-free core [5]. As the main force of the third energy conversion, new energy will also

play a leading role in realizing the goal of "Carbon peaking and Carbon neutrality" in the future. The low-carbon clean energy market, including natural gas, will also be in a period of stable growth in the future [6]. The energy system should be reconstructed from the parallel perspective of four major paths of carbon emission reduction, carbon substitution, carbon cycle and carbon sequestration, which are mainly based on carbon substitution, to promote the conversion of new and old economic drivers in China [7]. In view of the solidification of carbon emission efficiency in China's industry at present, industries with low emission efficiency should be supported from the perspective of improving carbon emission efficiency to help achieve carbon reduction and Carbon peaking and Carbon neutrality goals [8].

2.2 Research results of new energy industry

From the pursuit of low-carbon economy to the realization of the goal of "Carbon peaking and Carbon neutrality", the development of new energy industry plays an important role in this process. The research of domestic and foreign scholars on the new energy industry has realized the transition from the remodeling of energy structure and carbon trading to how finance, finance and taxation help the development of the new energy industry.

Xiao Xianyong (2022) emphasizes that one of the important means to achieve the goal of "Carbon peaking and Carbon neutrality" is to build a new power system with new energy as the theme, and advocates to reduce the consumption and carbon emissions of traditional energy from the perspective of energy substitution on the supply side to electrification transformation on the consumption side and promote the development of new energy [9]. Ding Yun (2016) believes that in the journey of reconstructing the world energy pattern, vigorously developing the new energy industry will be the future energy outlet for China. Based on the policy innovation of developed countries, the mechanism of action between fiscal and tax policies and the development of new energy industry is detailed, and fiscal and tax policy suggestions suitable for the development of China's new energy industry are proposed [10]. Guochang Fang (2020) discussed the influence mechanism of carbon trading on new energy. It is found that carbon trading can drive the development of new energy under certain conditions, and its driving effect is closely related to threshold value. Mature carbon trading can effectively control carbon emissions and energy intensity, and a more perfect carbon trading market can better promote the development of new energy. Grasping the reasonable boundary between government and market is the key to realize carbon trading and sustainable development of new energy [11]. Zhizhong Ai (2007) analyzed and studied the new energy industry support policies formulated by Japan from the perspectives of ecological environment, economic development and energy use. Studies show that, driven by the integration of government, industry and education, the development of Japan's new energy industry has greatly promoted Japan's economic development [12]. Zhou Yahong (2015) believes that the new energy industry is the most important driving force for future innovation and development, which is related to the protection effect of ecological environment and all aspects of social development. The importance of government intervention to the development of new energy industry is emphasized. Finally, taking listed companies as the research object, the effect of the implementation of government policies on the profitability of the new energy industry is discussed in stages [13]. Cao Nannan (2021) holds that financial support plays a decisive role in promoting the agglomeration development of new energy industries. In addition, the relevant monthly indicators of the new energy industry from 2016 to 2019 were taken as samples and the Herfindahl index was used as the basis for empirical research to measure the degree of agglomeration of the new energy industry. Finally, the support strategies for promoting the

agglomeration development of the new energy industry were proposed based on the shortcomings and key points of financial support [14].

2.3 Fiscal and tax policies and the performance of low-carbon industries such as new energy

In carbon neutral, carbon peak "Carbon peaking and Carbon neutrality" target background, the development of new energy industry is pushed to the forefront, countries are actively exploring the powerful tools for the support the development of new energy industry, the government as a macroeconomic regulators are through subsidies and tax breaks to the carriage, and gradually perfect the double control of energy consumption in our country.

Liu Shangxi (2021) believes that the practical way to achieve the "Carbon peaking and Carbon neutrality" goal is to optimize fiscal and tax policies for green and low-carbon transformation. In addition, it analyzes from the perspectives of government and market, investment and financing, and pollution reduction and carbon reduction, and puts forward specific countermeasures and suggestions [15]. Zhou Qing (2011) believes that it is the general trend to promote the development of low-carbon economy, realize the transformation and upgrading of energy structure, develop new energy and promote the development of new energy industry. In addition, the fiscal and tax system arrangement for the development of new energy industry is proposed from both direct and indirect directions [16]. Li Shaoping et al. took the micro data of listed new energy companies as the research object, and took profitability, growth ability and other indicators as corporate performance indicators. Research finds that tax incentives are strongly correlated with the profitability of listed companies of new energy vehicles, while fiscal subsidies are closely related to the development capacity of enterprises [17]. In the critical period of promoting the realization of the "Carbon peaking and Carbon neutrality" goal, the government should simultaneously play different roles, such as strategic planner, policy maker, financial supporter and supervision manager. In addition, China's policy design for the new energy industry should focus on incentive policies and transition to incentive policies, supervision and management policies, industrial policies and market service policies [18].

3 New energy industry fiscal and tax policy status quo and existing problems

3.1 New energy industry

New energy (NE) stands for all forms of energy other than traditional energy. At present, geothermal energy, ocean energy, biomass energy and nuclear fusion energy, which are rarely used in our country, are still in the stage of development and research or are vigorously promoting solar energy, wind energy and other new energy sources. New energy can be divided into different types according to different sources, attributes, transformation and transmission processes as well as development and utilization. The specific manifestations are as follows :(1) according to different sources, it can be divided into solar radiation energy, earth internal energy and celestial body gravitational energy; (2) It can be divided into renewable energy and non-renewable energy according to their attributes; (3) According to the transformation process, it can be divided into primary energy and secondary energy; (4) According to the degree of development, it can be divided into conventional energy and new energy.

The new energy industry generally has the following basic characteristics :(1) green, clean and pollution-free. The main culprit of excessive carbon emissions and global

warming is the over-exploitation and utilization of fossil energy. How to reduce carbon emissions and damage to the ecological environment while developing and using energy is the primary problem we need to consider and solve under the "Carbon peaking and Carbon neutrality" goal. The "Carbon peaking and Carbon neutrality" target makes energy transformation and upgrading already on the horizon. Compared with traditional energy, new energy has the characteristics of clean, environmental protection and safety, and the vast majority of new energy is a recyclable resource. This also determines that the new energy industry has the characteristics of green and clean industry. (2) High cost and high requirement. New energy industry is a technology-intensive industry, which requires high technology. Enterprises must rely on technological innovation if they want to achieve qualitative leap development. The realization of the "Carbon peaking and Carbon neutrality" goal requires the following three requirements for the technology of the new energy industry: First, the technology to ensure the safe and stable operation of a high proportion of renewable energy grid, including energy storage technology, transmission and distribution technology, energy Internet technology, etc.; The second is the electrification technology of terminal energy; Third, safe new generation nuclear power technology. Therefore, the development of new energy industry must be supported by improving technology. Technological progress is inseparable from the investment of talents and capital, and the long construction cycle of the new energy industry determines that the new energy industry has the characteristics of high cost and high technology requirements.

3.2 Development status of new energy industry

Since the 21st century, carbon emissions have become increasingly prominent worldwide, and the contradiction between energy supply and demand has become increasingly acute. For the concept of sustainable development, countries all over the world have incorporated new energy development into their national development strategies, and adjusted their energy policies accordingly on this basis. Compared with traditional energy, new energy has the characteristics of abundant stock, wide distribution, renewable, sustainable use for human beings, no carbon or low carbon content, and friendly to the environment. Vigorously developing new energy industry is of great significance to China's future economic growth, ecological balance and optimization of energy structure. In recent years, China has become a major producer of new energy. In terms of China's power generation structure, the proportion of new energy has gradually increased, as shown in Table 3-1:

Table 1. Total power generation of all energy sources from 2011 to 2020.

Year	Total generating capacity	Thermal power	Water electricity	Nuclear power	Wind	The solar energy
Unit: Gigawatt hours						
2011	47130.19	38337	6989.4	863.5	703.3	6
2012	49875.53	38928.1	8721.1	973.9	958.8	36
2013	54316.35	42470.1	9202.9	1116.1	1412	84
2014	57944.57	44001.1	10728.8	1325.4	1599.8	235
2015	58145.73	42841.9	11302.7	1707.9	1857.7	395
2016	61331.6	44370.7	11840.5	2132.9	2370.7	665
2017	66044.47	47546	11978.7	2480.7	2972.3	1178
2018	71661.33	50963.2	12317.9	2943.6	3659.7	1769
2019	75034.28	52201.5	13044.4	3483.5	4057	2240
2020	77790.6	53302.5	13552.1	3662.5	4665	2611

Note: Thermal power generation includes coal-fired power generation, oil-fired power generation, gas-fired power generation, residual heat, residual pressure, residual gas power generation, garbage incineration power generation, biomass power generation.

Sources: China National Bureau of Statistics, China National Energy Administration, China Telecommunication Union.

As can be seen from Table 3-1, thermal power generation in China's total power generation is decreasing year by year, from 38,337 in 2011 to 53,302.5 in 2020, and its proportion also decreases from 81% in 2011 to 68% in 2020. New energy generation, including solar power generation, wind power generation, nuclear power generation and hydropower generation, has increased significantly, accounting for an increasing proportion year by year, and new energy has gradually become the main force of power generation. However, it should not be ignored that although the proportion of new energy power generation has increased, thermal power generation still accounts for 68.5%, which means that China still needs to strengthen the power generation of new energy in the future. The following is a detailed exposition of the development status and existing problems of several major new energy industries:

3.2.1 Water electricity

Hydroelectric power generation is an activity that converts water energy into electric energy by virtue of the height difference from high to low water flow. Hydroelectric power requires the construction of hydropower stations, DAMS and other man-made structures coupled with the rotation of turbines to drive generators. Therefore, hydropower generation is generally characterized by long construction period and large initial investment. Meanwhile, hydropower generation also has the advantages of green, clean and efficient.

Hydraulic power generation is a relatively mature technology in China's current new energy industry, which can achieve large-scale development of energy. By the end of 2020, China's installed hydropower capacity was about 370 million kw, accounting for about 17% of the country's total installed power generation capacity. Generating capacity is about 1,355.2 billion kWh, accounting for more than 60% of the total renewable energy generation. The installed capacity of the Three Gorges hydropower station in China is the largest in the world. It can be seen that hydropower is still the main force of renewable energy generation.

At present, China has abundant water resources, but the actual utilization rate is less than 50%. The newly installed hydropower capacity dropped from 10.43 percent in 2015 to 6.93 percent in 2020, indicating that the momentum of hydropower development is slowing down. In addition, the development of hydropower needs to take into account ecological protection and how to resettle migrants, and develop hydropower according to local conditions.

3.2.2 Nuclear power

The most valuable advantage of nuclear power is its cleanness. In the process of nuclear power production, no pollutants such as SO_2 and CO_2 will be generated, which makes it an ideal energy for carbon reduction. Nuclear power generation is powered by the heat produced by nuclear fission. At present, the total amount of nuclear power generation in China is increasing year by year, and the annual power generation will reach 366.25 billion KWH in 2020. Among the five nuclear power units to be started in the world in 2020, four are located in China and the other one is in Turkey, with a total installed capacity of more than 50 million kw. But in terms of the world, the total amount of nuclear power generation in China is lower than the world average level, and the overall status of nuclear power generation in China needs to be further improved in the future. Compared with nuclear power, hydropower is limited by weather and other objective conditions, and it is more difficult to develop. However, the development of renewable energy such as solar energy

and biological energy has high requirements for technology and is easy to encounter bottlenecks. Therefore, nuclear power, as an efficient and pollution-free clean energy, will have a broader space for development in the context of the "Carbon peaking and Carbon neutrality" goal. In addition, once the nuclear fuel leaks, the country's economy, ecology and people's lives will have inestimable results. In the process of using nuclear power generation, safety must be given priority, and the production process of nuclear power must be strictly controlled to avoid the occurrence of nuclear leakage events.

3.2.3 Wind

The use of wind energy originated from agricultural activities such as grinding, pumping irrigation, in recent years, the use of wind energy to transform mechanical energy into electrical energy is sought after by countries all over the world. Under the catalysis of "Carbon peaking and Carbon neutrality" goal, wind power generation is gradually becoming a powerful weapon for countries to reduce carbon emissions because of its clean and pollution-free characteristics.

China's wind energy reserves are not only large and widely distributed, only on land about 253 million kilowatts of wind energy reserves, is the world's fastest wind power development of the country. Wind has another advantage over other forms of power generation: for every doubling of capacity, costs fall by 15%. Therefore, the wind and other new energy power generation industry has a very broad development prospect and is expected to maintain rapid development for a long time in the future, while profitability will steadily improve with the gradual maturity of technology. However, due to blindly stimulating the development of the industry in recent years, the wind power industry is the problem of overcapacity, blind expansion of enterprises, the number of projects and other phenomena, resulting in part of the installed capacity of power plants do not meet the standard, further resulting in a waste of resources.

3.2.4 The solar energy

Solar energy is one of the clean energy sources we are most familiar with. It has the advantage of extensive distribution and sufficient resources, which is the key to realize energy transformation at present. China's total solar power capacity has increased from 600 billion kilowatt hours in 2011 to 261.1 billion kilowatt hours in 2020. The development of solar energy in China is gradually increasing. However, there are some problems in the actual utilization process, such as low conversion efficiency, high development cost and easy to be influenced by day and night, sunny and rainy, and season, which seriously restrict the development of solar power industry. In the future, as low carbon becomes a concept, coupled with the upgrading of technology and the improvement of the power grid, the use of solar power is bound to become an important energy to promote social development.

3.3 New energy industry fiscal and tax policy status quo

Through reviewing relevant literature and fiscal and tax policies, we find that fiscal subsidy policies related to the new energy industry are mainly reflected in the following aspects:

3.3.1 Fiscal policy

New energy vehicles. New energy vehicles that meet the requirements can not only enjoy

purchase subsidies at the time of purchase, but also enjoy partial operating subsidies in the process of use. Local governments will also adjust subsidy standards in a timely manner according to local conditions. For example, in order to cope with the impact of COVID-19, The Development and Reform Commission of Shenzhen Municipality issued several Measures and Promote the Promotion and Application of New energy Vehicles in Shenzhen (Draft for Comments). According to the draft, a subsidy of 20,000 yuan will be given to each car that meets the requirements.

Power generation subsidies. The state provides a certain degree of financial subsidy according to the amount of electricity generated by enterprises that use new energy to generate electricity, such as Marine and biomass power, large-scale wind power, photovoltaic power and geothermal power.

Equipment R&D and innovation. The state may enjoy preferential policies such as financial discount interest for introducing design and manufacturing technologies of key equipment in the field of new energy into the new energy industry.

In terms of tax incentives, China has few tax incentives specifically for the new energy industry, and most of them are applicable to the manufacturing industry:

3.3.2 Tax policy

Additional deduction policy for R&D expenses. Starting from January 1, 2021, the deduction standard will be changed from 75% and 175% to 100% and 200% respectively.

Tax incentives for specific industries. According to the different industries in which enterprises operate, the government provides tax incentives with low tax rates for some special industries. The enterprise income tax applicable to 15% tax rate includes: high-tech industries supported by the state and advanced technology service enterprises; Applicable to the 10% tax rate of enterprise income tax are: key software enterprises, integrated circuit design enterprises, etc.

Accelerated depreciation preference. For products with rapid upgrading, rapid technological progress, and perennial high corrosion and strong vibration characteristics, enterprises have the tax preference to accelerate the accumulation of depreciation, for example, depreciation can be changed from straight line to double decreasing balance method or sum of years method.

Preferential technology transfer. In the process of technology transfer, enterprises may enjoy exemption or halving of enterprise income tax depending on the transfer amount.

Preferential treatment for comprehensive utilization of resources. VAT on sales of self-generated electricity generated from specified resources is refunded by 50% on demand.

Indirect incentive policies. In terms of export tax rebates, the preferential treatment of export tax rebates for steel products characterized by high pollution and high energy consumption will be abolished, and this policy will be implemented from August 1, 2021. In terms of consumption tax, diesel, gasoline and other traditional energy sources are subject to consumption tax, while electric vehicles are exempt from consumption tax.

3.4 Problems existing in fiscal and tax policies for the new energy industry

At present, the new energy industry policy has not formed a sound new energy fiscal and tax policy system. Cooperation between various policies is one of the ways to improve the policy support efficiency of the new energy industry. At present, there exists one-sided phenomenon in the establishment of preferential policies in China's new energy industry. The policy focuses on reducing the tax burden of the production link, while the attention to the tax burden of the consumption link is obviously not enough. In addition, the

management of China's new energy industry is chaotic, and there are different management standards in the specific management process, leading to the lack of long-term unified planning for the new energy industry.

3.4.1 The amount of financial subsidies is not matched and unreasonable

As the new energy industry has the characteristics of large initial investment and long construction period, the government often takes the way of financial subsidies to relieve the pressure of capital flow of the new energy industry. However, in the process of actual policy formulation, the amount of financial subsidy given by the government often does not match the development status of enterprises due to the lack of understanding of the new energy industry and its development characteristics. Take the amount of subsidies, because the different life cycle of the enterprise itself, the demand for money is different, regardless of the enterprise's own development stage, if blindly blindly to give financial support, often lead to ignore the innovation ability of development, thus gradually in the market competition in a weak position, even is in danger of elimination.

3.4.2 The allocation of financial subsidies

The development and competition of the new energy industry often involve the research and development of key technologies. Due to the development characteristics of the new energy industry itself, huge capital flow and long construction cycle are needed in the early stage of development, so the financial support provided by the government for the new energy industry is crucial. In recent years, the total amount of government financial subsidies to the new energy industry shows a rising trend. However, there is an unfair distribution among the objects of government financial subsidies. If the new energy industry is divided into state-owned and non-state-owned industries, the fiscal subsidy policies issued by the government are intended to favor state-owned enterprises, and the government's main strength is focused on supporting the development of state-owned enterprises.

3.4.3 Tax preferential policies are not refined enough, the scope of application is not clear, and lack of pertinence

China's current preferential tax policies are often targeted at all enterprises, and do not reflect the government's support for the new energy industry. Secondly, as for the application of policies, the differences between enterprises in different industries and different fields within the same industry are not taken into account. Regardless of the differences between enterprises, blindly applying the same preferential tax policy often leads to the maximum effectiveness of preferential tax policy. Finally, the policy does not specify which types of new energy and which types of new energy products are eligible for tax incentives.

3.4.4 The system of preferential tax policies is incomplete

At present, the tax preferential policies related to the new energy industry are scattered, and have not formed a complete policy system. Most of the tax incentives related to the new energy industry are concentrated in the area of corporate income tax, and a few involve value-added tax, consumption tax and urban land use tax. The preferential tax policies for the new energy industry do not cover all taxes. From the perspective of industrial operation,

the current tax incentives for the new energy industry are mostly for the production link, but rarely for the sales link. From the perspective of industry segmentation, there are many tax incentives for photovoltaic power generation, wind power and hydropower, while there are few tax incentives for nuclear power and geothermal energy. To some extent, this is not conducive to the overall development of the new energy industry, but also easy to cause the development imbalance within the industry.

3.4.5 Tax incentives lack of talent incentive provisions

The development of new energy industry not only needs the support of technology, but also needs the participation of talents. In order to achieve carbon peak and carbon neutral "Carbon peaking and Carbon neutrality" goals, photovoltaic, wind power and other new energy industries in the "14th Five-Year plan" period will welcome new development opportunities, especially the wind power industry, its extensive knowledge of various disciplines, has a long industrial chain, the demand for talent is also more eager. However, the current preferential tax policies in our country are not for the incentive of talent. The lack of this part of tax incentives will seriously restrict the development of new energy industry in the future.

4 Empirical study on fiscal and tax policies promoting the performance of new energy industry

4.1 Model construction and variable description

This paper selects the financial data of 174 listed companies in the new energy industry from 2010 to 2019 as the observation value of the sample, among which the listed companies in the new energy industry come from the new energy concept board of Eastmoney.com. Sample screening principles are as follows :(1) due to possible anomalies in ST and *ST data, the data in this paper exclude ST and *ST listed companies, mainly including ST Shelley, ST huayi, *ST zhaoxin, *ST shengda, *ST colin, *ST tianlong and *ST tiancheng altogether 7 listed companies; (2) Considering that both data loss and data abnormality would have an impact on the research conclusion, the samples with data loss and data abnormality were excluded. All data came from CSMAR database, and after manual integration, a total of 1192 initial observation values of listed companies in the new energy industry were obtained.

In order to test the impact of fiscal subsidies and tax incentives on the performance of enterprises in the new energy industry, OLS method was used to establish the following regression equation:

$$TQi,t=\beta0+\beta1lsubi,t+\beta2tpi,t+\beta3sizei,t+\beta4leveli,t+\beta5capinti,t+\beta6agei,t+\theta i,t \quad (1)$$

Explained variable: Enterprise performance (TQ) reflects the operating benefits of an enterprise during a certain operating period. Generally, profitability, solvency and the ability to operate and develop assets are used to measure operating efficiency. Through combing relevant literature, it is found that current scholars prefer to use financial performance to represent enterprise performance. There are three common ways to measure financial performance, namely accounting index, market index and comprehensive index. The so-called accounting indicators mainly include return on total assets and return on net assets; Market indicators are tobin's Q value and earnings per share; And the comprehensive index obtained by factor analysis. Tobin's Q theory was put forward by the

famous economist James Tobin in 1969. Its specific calculation formula: Q= the market value of the company/the replacement cost of assets.

Explanatory variables: The explanatory variables used in the empirical research are fiscal subsidies and tax incentives. Financial subsidy (LSUB) refers to a kind of subsidy provided to enterprises or individuals by special funds arranged by finance for designated matters in order to achieve specific political and economic goals. Price subsidy, loss subsidy, staff living subsidy and interest subsidy are the main financial subsidies in China. For the company, the financial subsidy received by the company in the current year is represented by the amount disclosed by the government subsidy item in the company's annual report. Tax preference (TP) refers to the level of tax preference obtained by enterprises from the government. There are many ways to measure the intensity of tax incentives in academia. The main measurement methods are as follows: First, the intensity of tax incentives for income tax is measured by the actual income tax rate of the company, which is embodied as: tax incentives = income tax expense/eBIT. The second common measure of tax benefits is the tax differential. For example, Zou Xiaodan (2016) took the ratio of the difference between payable income tax and paid income tax and total assets to represent tax preference, and tax preference = (payable income tax - paid income tax)/total assets. The third measure relies on the tax rebate received by the company and the various taxes paid. For example, Liu Guangqiang (2016) measured the intensity of tax incentives enjoyed by enterprises by tax rebates received /(tax rebates received + taxes paid). The third measurement method is adopted in this paper to measure the intensity of tax incentives, that is, tax incentives = various tax refunds received/(various tax refunds received + various taxes paid).

Table 2. Descriptive statistics.

variable	obs	mean	median	SD	min	max
TQA	1192	1.661	1.372	0.938	0.771	11.461
lsub	1192	16.179	16.353	1.984	4.912	21.603
tp	1192	0.151	0.076	0.190	0	0.291
size	1192	1.727	0.616	3.777	0.028	32.348
level	1192	0.526	0.534	0.233	0.048	3.262
capint	1192	2.642	2.073	2.010	0.337	17.556
age	1192	17.168	17.000	5.660	2.000	35.000

Control variables: Generally speaking, in order to improve the accuracy of model design and the accuracy of model test results, control variables are added in the process of model design. Based on the model construction of fiscal and tax policies and enterprise performance studied by previous scholars, this paper sets control variables as other variables that may affect enterprise performance in the new energy industry, including enterprise size, asset-liability ratio, enterprise age and capital intensity. Enterprise size (SIZE) is expressed by the total amount of assets at the end of the balance sheet of the listed company. It is generally believed that the larger the company is, the stronger its financing ability, business status and risk resistance will be. Asset-liability ratio (level) refers to the ratio of total liabilities to total assets at the end of the period, which measures the strength of a company's debt paying ability. Capital intensity (CAPINT) measures how much a company invests in its total assets as a percentage of its income. It is calculated by dividing the value of its total assets during a given period by the amount of operating income it earned during the same period. Capital intensity is generally thought to be positively correlated with risk and the cost of capital, with the higher the former, the higher the latter.

The age of the business is expressed as the difference of the current year minus the year the business was founded. It is generally believed that the older an enterprise is, the greater its ability to resist risks will be and the higher its performance will be accordingly. However, some scholars have found that after enterprises enter the mature stage, corporate performance will decline.

Table 1. Descriptive statistics of relevant variables.

Data source: The authors compiled the data using Stata14.0.

Table 3. Regression analysis and conclusion.

The variable name	Variable symbol	The overall sample regression	Main board companies	Sme board and gem enterprises
		(1)	(2)	(3)
Fiscal subsidy	lsub	-0.098***	-0.103***	-0.022
		(-6.29)	(-6.10)	(-0.52)
Tax incentives	tp	0.584***	0.673***	0.134
		(2.97)	(3.01)	(0.36)
Asset-liability ratio	level	0.886***	0.949***	-0.932*
		(6.44)	(6.52)	(-1.71)
Capital intensity	capint	-0.086***	-0.093***	-0.023
		(-4.89)	(-4.90)	(-0.53)
Scale	size	-0.079***	-0.076***	-0.417
		(-3.19)	(-2.97)	(-1.63)
Enterprise age	age	-0.083***	-0.087***	0.051
		(-6.58)	(-6.47)	(1.20)
	_cons	4.493***	4.628***	1.910**
		(12.18)	(11.63)	(2.01)
observations	*N*	1192	1065	127
Goodness of fit	r2_a	0.161	0.166	0.187
F	F	28.667	26.138	4.423

Note: ***, ** and * represent significant correlation at the level of 1%, 5% and 10% respectively.

As can be seen from the regression results, the financial subsidy (LSUB) of the main variables in the benchmark regression equation is negatively correlated with enterprise performance, with a coefficient of -0.098, which is significant at the level of 1%. Represents that under the condition that other conditions remain unchanged, enterprise performance will decrease by 0.098 for each additional unit of government subsidy to the enterprise. The results show that the performance of listed new energy companies decreases gradually with the increase of subsidy intensity when they get financial subsidies. Among the main variables, tax preference (TP) is positively correlated with corporate performance, with a coefficient of 0.584, which is significant at the level of 1%. This shows that under the condition that other conditions remain unchanged, every additional unit of tax incentives given by the government will improve enterprise performance by 0.584 units. The results show that under the background of carbon neutrality, when new energy listed companies get tax incentives, their corporate performance gradually improves with the increase of incentives. By comparing the influence coefficients of fiscal subsidies and tax incentives -- 0.098 and 0.584, we can find that fiscal subsidies and tax incentives have different impacts on the new energy industry, specifically, fiscal subsidies can inhibit the improvement of enterprise performance, while tax incentives have a significant incentive effect on enterprise performance. According to the different listed sectors of enterprises, the enterprises are divided into the main board listed enterprises, small and medium board and

gem enterprises, and the regression results show that there is a significant relationship between financial subsidies and tax incentives and enterprise performance in the main board listed enterprises, while the two have no significant impact on enterprise performance in the small and medium board and GEM enterprises. Therefore, in the critical period of realizing the "3060" Carbon peaking and Carbon neutrality target, the government should focus on the incentive effect of tax incentives, adjust the intensity of financial subsidies in a timely and reasonable way, change the inhibition effect of financial subsidies into incentive effect, and give full play to the government's support to the main board listed enterprises.

Under the background of "Carbon peaking and Carbon neutrality" target, the development of new energy industry urgently needs policy support. Fiscal subsidies and tax preferences, as powerful means for the government to regulate the economy, need to give full play to their auxiliary functions. Through the support of fiscal and tax policies, on the one hand, it can help new energy enterprises reduce the input cost of factors, reduce the tax burden, improve the core competitiveness of enterprises, and ultimately stimulate the overall development of new energy industry; On the other hand, the development of the new energy industry will reduce the use of traditional energy such as oil, natural gas and coal, and increase the use of clean energy such as nuclear energy and renewable energy, so as to reshape the energy structure and transform and upgrade the economic industry. In general, as the new energy industry is the main force of pollution reduction and carbon reduction, the scientific formulation and implementation of fiscal and tax policies by the government is conducive to the early realization of the "Carbon peaking and Carbon neutrality" goal. Therefore, it is necessary to study the impact of fiscal subsidies and tax incentives on the performance of new energy enterprises.

5 Suggestions

At present, China is in the critical period of realizing the "Carbon peaking and Carbon neutrality" goal, and its energy system is in the transition period of switching from old to new energy. The development of new energy industry, which is characterized by safety and cleanliness, has rapidly occupied the highland of current national strategic planning. To fully promote the development of new energy industry is inseparable from the strong support of the government, and finance and taxation is a powerful means of macro-control by the government.

5.1 Improving government subsidies and incentive policies

5.1.1 Different fiscal and tax incentive policies

Under the current background of striving to achieve the goal of "Carbon peaking and Carbon neutrality", China's fiscal and tax subsidies and tax incentives should focus on the new energy industry. The government needs to adopt different preferential measures according to the different characteristics of each subdivision within the industry. Finally, different fiscal and tax policies should be formulated according to the life cycle of enterprises in the same industry and the same field. Take in the new energy industry companies, when the enterprise in the growth period, the government's fiscal and taxation support should be the most strong, at this stage of the enterprises has just started soon, money is the biggest obstacle in the development, and when the enterprise into after the mature period, the government's fiscal subsidies should be slow, It will make enterprises neglect the improvement of their own RESEARCH and development capabilities.

5.1.2 Timely adjustment of government subsidies

The government should guide new energy companies to improve their competitive edge by strengthening research and development and avoid relying too much on fiscal subsidies. In the initial stage of new energy enterprises, fiscal subsidies can relieve the pressure of cash flow, but when new energy enterprises enter the growth or maturity stage, only relying on fiscal subsidies to support enterprise operation is bound to make enterprises in a weak position in the market competition. From the perspective of long-term development, if an enterprise wants to maintain a positive development trend, it must improve its core competitiveness.

5.2 Establish and Improve preferential tax policies and mechanisms

5.2.1 Accelerate the formulation and promulgation of tax laws specifically for the new energy industry

At present, China's tax incentives for the new energy industry lack special pertinence, and the tax incentives are relatively messy, often issued at intervals, lack of systematic and planning. In the future, government departments should speed up the development and promulgation of tax laws dedicated to the new energy industry, integrate the current sporadic tax incentives, update them timely, and refine them constantly, so as to adapt to the status quo of the rapid development of the new energy industry and help the development of the new energy industry.

5.2.2 Improve the system of preferential tax policies

First, based on the typical neutral characteristics of VALUE-ADDED tax and the characteristics of the new energy industry with less input tax deductible, it is still the best choice to continue to promote the tax preference of VAT. The new energy industry is characterized by high development cost and long construction period. The state may allow enterprises to deduct input tax at a certain percentage of the investment in special equipment involved in technological upgrading projects in line with state policies. A low VAT rate should be set for new energy products. Traditional energy sources, such as coal and oil, can be taxed at the highest VAT rate, while new energy sources, such as wind, solar and geothermal energy, can be taxed at a low tax rate. For new energy products enjoying low VALUE-ADDED tax rate, a standardized product catalog should also be issued to clarify which products belong to new energy products. The applicable VAT rate should be reasonably defined according to the development period of the new energy industry. For example, in the early stage of industrial development, in order to reduce the tax burden of enterprises, VAT can be applied to a low tax rate. When the industry is in the mature stage, it can be applied to a higher VAT rate. Second, we need to improve the consumption tax policy. Higher taxes apply to polluting and energy-intensive projects; The lower duty rate applies to biodiesel and diesel purchased or recovered from commissioned processing for continuous production. The tax money collected from the higher tax rate can be used for technology research and development in the new energy industry, while the lower tax rate for new energy products can also allow deduction of the consumption tax paid on raw materials.Third, The new energy industry have high requirements for materials and equipment in the process of R&d. At present, R&d materials and equipment are mostly imported, which is expensive and involves a lot of tariffs. Once the enterprise research and development failure, the enterprise must bear all the costs. Therefore, the state can reduce

some import tariffs; in the case of failed R & D, the state can refund the import tariffs and give some subsidies to enterprises.

5.2.3 Introduce relevant preferential tax policies to introduce talents

As an emerging industry, the development and revitalization of new energy industry cannot be separated from the support of talents. Government should accelerate the formulation and introduction of tax incentives related to talent incentive in the future. Tax incentives should cover a wide range, including not only the introduction of talents, but also the training and stability of talents. We can study and introduce preferential tax policies to increase the income of middle and high-end talents in the new energy industry. For example, some or all of the taxes paid by middle and high-end talents in the existing new energy industry can be returned to them by way of tax model lottery or cash reward.

5.2.4 The central government takes the lead and local governments assist to exert joint efforts

New energy generally has obvious regional characteristics, which indicates that local governments must undertake the important task of promoting the development of new energy industry, and should bring the development of new energy industry into the overall situation of regional development key projects and strategic planning when necessary.

First of all, local governments can investigate the specific development situation of the new energy industry and the intensity of financial subsidies they have received, so as to provide a certain proportion of financial support to the new energy industry that has difficulties in development and does not receive timely support. Second, local governments should scientifically select subsidy programs according to local characteristics. If a region is rich in multiple resources, the local government can consider focusing on supporting the business model with complementary advantages. Finally, the central government and local governments should have different support directions. Projects related to local economic development and closely related to people's lives, such as financial subsidies for solar water heaters, should be entrusted to local governments. The central government should take overall consideration and be responsible for fiscal and tax subsidies that affect inter-regional economic development.

5.3 Improve relevant supporting policies and measures

5.3.1 Introduction of performance evaluation mechanism

The performance evaluation mechanism of the new energy industry includes two aspects: one is the performance evaluation mechanism of the government, that is, evaluating the implementation efficiency of the fiscal policy and tax policy issued by the government; on the other hand, it aims at the performance evaluation mechanism of new energy industry, that is, by establishing scientific and reasonable performance evaluation methods, taking energy conservation and emission reduction as the standard, build a comprehensive evaluation system of financial performance, social performance and carbon emission reduction performance. To evaluate the performance of the fiscal and taxation policies of the new energy industry, we should pay attention to two points: one is economic efficiency, which mainly examines whether the fiscal and taxation policies implemented by the government have promoted the development of the new energy industry; the other is social efficiency, that is, whether the implementation of fiscal and taxation policies by the

government has promoted the realization of the "Carbon peaking and Carbon neutrality" target.

5.3.2 Introduce big data and collaborative innovation

The new energy industry deeply integrates big data, and provides data support for the government to formulate fiscal and tax policies through the development and utilization of big data with the help of the Internet and intelligent networking. 2018 the world's first based on the real-time monitoring data compiled data into a big blue book, "China's new energy automobile big data report (2018) arises at the historic moment, the book by the new energy vehicles national big data federation to China co., LTD. And Chongqing changan automotive technology research center jointly create new energy vehicle technology co., LTD. In the future, the integration of big data and new energy industry should not be limited to the field of new energy vehicles, but should be further expanded to photovoltaic, wind power and other fields.

5.3.3 Improve the carbon trading market

Establishing and perfecting the carbon trading market is the only way to realize the goal of "Carbon peaking and Carbon neutrality". As the largest trading market in the world, the EU carbon trading market accounts for 80% of the global carbon market share. Its perfect carbon trading market system plays an important role in the low carbon development of the EU. China urgently needs perfect carbon market transaction system and reasonable market management mode. The establishment of carbon trading market should not only combine with the specific national conditions of China, but also learn from the successful experience of developed countries.

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