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Analysis of Research Trends and Progress on the Impact of Environmental Protection Tax on Listed Companies in China

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Abstract: The implementation of environmental protection tax increases the protection of the environment at the legal level, but also increases the input of enterprises and affects the final output of enterprises. If enterprises cannot make timely adjustments to reduce operating costs and improve operational efficiency, it will lead to longer turnaround time in the market, which in turn will lead to a broken capital chain or even bankruptcy. Therefore, based on the current stage of research on the impact of environmental protection tax on enterprises, the results of this paper show that (1) domestic research on environmental tax has entered a plateau in research from focusing on the basic theory of environmental tax and foreign experience in environmental tax collection to constructing China's environmental tax system and then exploring the collection and management of environmental tax and its effects. (2) Some scholars believe that scientific and suitable environmental regulations can appropriately stimulate enterprises to innovate and make their operational capacity and profitability improve, which in turn can offset or even exceed the negative effects brought by environmental regulations. (3) Some scholars believe that the imposition of environmental protection tax will increase the cost of products and operating costs of enterprises, which will inhibit the efficiency of enterprises and have a negative impact on the operation and future development of enterprises.

Keywords: Environmental Protection Tax; Enterprise efficiency.

1. Introduction

The economic development is growing while the ecological environment is deteriorating, and this phenomenon has led to the increasing concern of environmental protection issues around the world. Since the reform and development of China, the economy has made a sudden development, however, some of the economic development is brought at the expense of the ecological environment. The crude economic development mode of "high input, high consumption and high pollution" is contradictory to the protection of ecological environment, and the development brought by environmental pollution and resource depletion is not the sustainable and high-quality development that China needs. In the new era, this way of development at the expense of the ecological environment will not only obstruct the process of economic development, but will also lead to a series of ecological and environmental problems. For the development method that does not adapt to the times, the change of ecological environment is only a superficial phenomenon, behind which reflects the lack of quality of economic development and the inadequate construction of economic structure. That is to say, the environmental problems in the development process is in fact closely related to economic issues, to manage the environmental problems in the development process should be clarified economic issues, both through the means of repair to reduce the stock of pollution, but also through preventive means to reduce the increase in pollution, in order to achieve coordinated development of the economy and ecology.

The preventive means to solve environmental problems is to solve environmental problems by changing the backward economic mechanism that leads to pollution. For this reason, China is paying more and more attention to environmental protection and has introduced several laws and regulations related to environmental protection, and China's environmental protection tax, which was officially introduced on January 1, 2018, is a relevant tax law established to protect the environment. Before the official introduction of the environmental protection tax law China has been using the sewage charging system, from sewage charges to environmental protection tax, which shows that China has been strengthening its environmental protection policy at the legal level. In particular, the introduction of the pilot environmental protection tax in 2007, the finalization and release of the "Environmental Protection Tax Law of the People's Republic of China (Draft for Public Comments)", and the eventual introduction of environmental protection tax in China all show the importance of ecological civilization in China and the pursuit of an environmentally friendly society in China.

The concept of environmental protection tax was first introduced in 1920 by the British economist Pegu in his book "Welfare Economics". In order to solve the problem of negative externalities, Pegu proposed to tax polluters to alleviate the inequity and inefficiency of resource allocation, which is the famous Pegu tax. From the 1990s to the present, environmental protection taxes have gradually become popular in Western countries and have become an important tool for governments to control the environment. According to Zhu Qingmin (1999), environmental protection tax is a tax on the production and consumption behavior that causes environmental pollution, as well as a tax exemption on the behavior of natural resource conservation and resource utilization. According to Yu Jin (2007) and Zhao Yunqi (2009), environmental protection tax has a broader connotation and is a general term for taxes that can raise funds for environmental protection for the government with the goal of achieving specific environmental treatment, and have a regulatory effect

on the behavior of producers and consumers, as well as the role of guiding green production and consumption. Jia Kang and Wang Guijuan (2000) argue that environmental protection tax is a tax and tax policy that can be levied at the national level to achieve the dual objectives of ecological protection and raising funds for environmental protection on the one hand, and to have a policy guiding effect on the green production behavior of taxpayers on the other. Li Weihong (2018) verified the relationship between corporate innovation motivation, behavior and efficiency on the basis of Porter's hypothesis, and showed that the main factor of innovation motivation is not environmental regulation, but environmental regulation can influence the level of corporate innovation input and innovation efficiency, especially under the incentive of government environmental policy, the economic efficiency gained by corporate innovation through technological innovation can compensate to a certain extent for corporate environmental management costs. Huixia Zhang (2020) found that the stronger the dynamic innovation capability is to a certain extent the better the promotion effect on the financial efficiency of enterprises, and the environmental regulation policy has a significant positive relationship with the efficiency of enterprises, that is, environmental regulation can significantly improve the financial efficiency of enterprises.

In general, in terms of domestic and foreign scholars' exploration of the connotation of environmental protection tax, western scholars started their research on environmental protection tax earlier because of the ecological destruction and pollution brought by the industrial revolution, and in order to solve the strong negative externality of environmental pollution, Pegu first proposed to internalize the pollution externality by means of taxation, and western scholars developed this connotation that environmental protection tax is a tax on all behaviors and Domestic scholars have also enriched it by arguing that environmental protection tax can not only restrain the behavior of emitters but also indirectly regulate consumers' consumption choices, thus achieving energy conservation, emission reduction, resource recycling, and ecological environment improvement. Therefore, in order to grasp the research on environmental tax in a macro and holistic way, clarify the development history of domestic environmental tax research, grasp the characteristics of domestic environmental tax research from the academic perspective, and summarize the academic achievements on environmental tax in China, this paper will systematically summarize and scientifically analyze the theoretical views of researchers on environmental tax in different periods.

2. Research in the process of construction and improvement of environmental protection tax

The concept of environmental tax was first introduced in 1920 by the British economist Pegu in his book "Welfare Economics". In order to solve the problem of negative externalities, Pegu proposed to tax the polluters to alleviate the unfairness and inefficiency of resource allocation, which is the famous Pegu tax. After the 1980s, the concept was gradually enriched, and in the IBFD International Tax Glossary, environmental protection tax was defined as a tax imposed by the government on enterprises that emit and industries that use pollutants, and at the same time, taxpayers were given certain tax incentives and exemptions to prevent pollution and protect the environment, which reflected the role of the tax in guiding the behavior of taxpayers. Since the 1990s, environmental protection taxes have gradually become popular in Western countries and have become an important tool for governments to control the environment.

According to Zhu Qingmin (1999), environmental protection tax is a tax on the production and consumption behavior that causes environmental pollution, as well as a tax relief on the behavior of natural resource conservation and resource utilization. According to Yu Jin (2007) and Zhao Yunqi (2009), environmental protection tax has a broader connotation and is a general term for taxes that can raise funds for environmental protection for the government with the goal of achieving specific environmental treatment, and have a regulatory effect on the behavior of producers and consumers, as well as the role of guiding green production and consumption. According to Jia and Wang (2000), environmental protection tax is a tax and a tax policy that can achieve the dual objectives of ecological protection and raising funds for environmental protection at the national level, and on the other hand, it can have a policy guiding effect on the green production behavior of taxpayers.

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3. Research on the impact of environmental protection tax on enterprises

3.1. Environmental regulation can inhibit business development

Jaffe (1997) found that the increase in the cost of pollution control is not only the cost of reducing emissions, but also the indirect cost of purchasing green materials. Ramanathan (2010) finds that strict environmental regulations do not have a significant impact on the technological progress of firms, which means that environmental regulations do not bring additional benefits to firms to compensate for the increased costs of pollution control, but have a negative impact on innovation in the short term. Dechezlepretre (2017) finds that in pollution-intensive sectors, environmental regulation can have a significant negative impact in the short run. At the same time, there is evidence that environmental regulations promote innovation in clean technologies, but the resulting benefits do not appear to outweigh the costs of regulations for regulated entities.

Zhang Man (2005) found through his study that environmental regulations increase the cost of environmental resource use by firms because they have to pay a costly price for the corresponding resources, thus having a certain impact on the cost of production, leading to further adverse effects on the development situation of firms. By measuring the opportunity cost of industrial environmental regulation in

China, Yuan Peng and Cheng Shi (2010) found that environmental regulation can lead to a certain degree of loss of potential output of Chinese industry, while the opportunity cost of environmental regulation shows an inverse relationship with the degree of industrial development. By establishing a research framework of SCP to study the impact mechanism of environmental regulation on enterprise efficiency, Hu Yuanlin and Zheng Wen (2015) found that enterprises tend to pursue short-term performance as well as accomplish their short-term environmental responsibility goals especially state-owned enterprises in order to fulfill their responsibilities, which tends to make them focus on small immediate benefits and neglect to develop long-term environmental management strategies. In an analysis of panel data of listed companies in China's heavily polluting industries over a 3-year period, Hongyu Ye (2017) concluded that the implementation of environmental regulations increases the costs associated with firms in the short term, thereby inhibiting their financial efficiency. Lili Fan and Yuanyuan Chu (2019) found that environmental regulation policies are negatively related to firm efficiency through a study of metallurgical firm data, i.e., environmental regulation policies inhibit the improvement of firm efficiency.

3.2. Environmental regulation will promote the development of enterprises

Some scholars believe that environmental protection tax can promote the development of enterprises. Theoretically, the Porter hypothesis proposed by the American economist Porter (1991) suggests that environmental protection tax will lead to higher private production costs for enterprises, which will have an impact on their competitiveness, but it will also stimulate them to engage in more technological innovation activities and increase their productivity, thus reducing pollution. Porter and Linde (1995) find that environmental regulation policies indirectly promote firms to increase their technological and managerial innovation, thus contributing to the increase in firm productivity. Eiadat (2007) found that environmental innovation strategies can play a role in the relationship between environmental regulatory pressure and operational efficiency in Jordan. Eiadat (2007) found that environmental innovation strategies can play a moderating and transmitting role in the relationship between environmental regulatory pressure and operational efficiency of firms, and can contribute to the improvement of operational efficiency.

Qun Fang (2015) studied the effect of environmental protection policies on the efficiency of low-carbon technology innovation enterprises in China's manufacturing industry through a questionnaire design, and the study showed that voluntary environmental policies and incentive environmental policies have a significant positive effect on the development of low-carbon technology innovation in China's manufacturing industry, and play an important role in the development of low-carbon technology in manufacturing industry, which is beneficial to the development of enterprises. Zhao and Sun (2016) empirically found that environmental regulation has a significant positive effect on innovation of pollution-intensive firms in China, which is consistent with Porter's hypothesis. It also shows that there are some differences across regions, with the eastern region being due to a high conversion of R& D expenditures to firm efficiency, which is consistent with Porter's hypothesis of increasing firm efficiency through technological innovation, while the central region is due to the government providing fiscal subsidies and tax returns to firms to compensate for the cost of environmental regulations. Wang, Guoyin, and Wang, Dao (2011) studied the central and eastern regions of China and found that environmental regulations can stimulate technological innovation of firms in any region to some extent. In the long run, strict and reasonable means of environmental regulation can stimulate technological innovation of enterprises, thus improving their innovation and development capacity. Jie, Maohua (2014) takes a sample of listed heavy polluters in A-shares in Shenzhen and Shanghai from 2008-2013 to study the interaction between environmental regulation, firms' innovation investment and firms' operational efficiency. The results of the study, as described by Porter's hypothesis, show that environmental regulation does promote firms' investment in innovation, but innovation investment does not immediately affect firm efficiency, and the impact results are manifested after a period of time. Li Weihong (2018) verified the relationship between firms' innovation motivation, behavior and efficiency on the basis of Porter's hypothesis, and the study showed that the main factor of innovation motivation is not environmental regulation, but environmental regulation can influence the level of firms' innovation investment and innovation efficiency, especially under the incentive of government environmental policies, the economic efficiency gained by firms through technological innovation can compensate to a certain extent for the environmental management costs. Huixia Zhang (2020) found that the stronger the dynamic innovation capability is, to a certain extent, the better the promotion effect on the financial efficiency of enterprises, and the environmental regulation policy has a significant positive relationship with the efficiency of enterprises, that is, environmental regulation can significantly improve the financial efficiency of enterprises.

3.3. Uncertainty about the impact of environmental regulation on enterprises

It has also been argued that the impact of environmental regulation on firms varies depending on the time of implementation of environmental policies, the type of policies implemented and the intensity of government regulation. Sylvain Plouffeetal (2010) studied 30 small and medium-sized firms through a semi-structured questionnaire and found that the cost of green involvement could be compensated by the revenue from the sale of ecologically designed products under environmental regulation, thus increasing the firm's profit. Bohringer (2012) empirically investigated the production effects of environmental investment and energy expenditure, but maintains a cautious attitude towards the results, arguing that the ability of environmental regulation to have an impact on the ability of firms to grow depends on the type of regulation and is linked to government supervision and management are also linked. jiangetal. (2018) studied technology-intensive enterprises in China from both industry and region separately and found that environmental regulation inhibits the innovation efficiency of industries, while the innovation efficiency of enterprises is enhanced under regional environmental regulation instead.

Fu, Jingyan and Li, Lisa (2010) investigate whether strict environmental regulations affect the international competitiveness of Chinese polluting industries by using 1996-2004 panel data of 24 manufacturing industries in China, and the findings show that environmental regulations

negatively affect the comparative advantage of firms, while the quadratic term of environmental regulations is positively related to comparative advantage, and the relationship between these two shows a " U" shape. U" type. Bing Zeng (2016) studied the magnitude of the inhibitory effects of different types of environmental policies on different categories of environmental pollution from different levels and regions, and the study showed that the effects of different types of regulatory policies are different and of different intensities. Liu and Wei (2017) found that the impact of environmental regulation on enterprises is not a simple linear relationship, but a "U" shaped curve between them, and different types of industries should adopt differentiated environmental regulation policies. The trend of the relationship is "U" shaped, and different policies of environmental regulation are needed for different types of industries. Wu, Gezhi, and You, Damien (2019) conducted an empirical analysis of 30 provincial-level data in China through a spatial econometric model and showed that under the influence of fiscal decentralization, environmental regulations inhibit firms' technological innovation from a national perspective, and the Porter hypothesis is not valid, and the impact of different types of environmental regulations is significantly different and accompanied by regional heterogeneity, while the geographical location of polluting firms also has a certain trend of shift trend.

4. Research on environmental regulation and corporate environmental investment and innovation capacity

4.1. Research related to environmental regulation and corporate investment in environmental protection.

Farzin and Kort (2000) argue that an increase in emissions tax has a catalytic effect on firms' investment in emission reduction, and that firms are able to make more investment in emission reduction when the emissions tax continues to increase after reaching a certain threshold. Yingzhi Xu and Guan (2011) use a super-efficient DEA model to measure energy efficiency and argue that under an environmental tax, if the amount of pollution control investment required by firms is much lower than the amount of environmental tax, firms will be more inclined to purchase pollution control equipment or make environmental innovations in their production lines to reduce environmental pollution. Peng Yi et al. (2013) used generalized differential moment estimation GMM to explore the extent to which industrial waste gas is affected by environmental protection investment, and concluded that the emission fee can improve environmental protection investment as well as directly improve environmental quality. Tang, Li and Wu (2013) investigate the relationship between environmental protection investment and environmental control, and conclude that environmental protection investment is a kind of behavior that enterprises are "forced" to meet the government, and the intensity of environmental control and environmental protection investment show an inverted "U" shape relationship. Before a certain "threshold", the relationship is positive, and after a certain "threshold" is exceeded, the relationship is negative. The empirical results of Li and Bing (2016) show that environmental regulation has a significant contribution to the investment in environmental protection, and it is more significant in the sample of heavily polluting enterprises, and the relationship between government and enterprises positively regulates the relationship between the two. Yang, Liu, and Yingdan Jia (2018) find that public participation has a significant inverted U-shaped relationship with the scale of environmental investment, and argue that public participation can complement the promotion of environmental regulation on corporate environmental investment before a certain threshold. Wu, Xun, and Wang, Yan (2019) conclude that environmental taxes can have an impact on environmental quality, and this impact is likely to be achieved by changing the level of corporate environmental investment, which means that corporate environmental investment plays a mediating role in the process of environmental taxation to improve environmental quality.

4.2. Research on environmental regulation and firms' innovation capacity

"The "Porter hypothesis", a famous research conclusion, has made an important pre-theoretical contribution to the study of the impact of environmental regulation on innovation. Borghesi (2015) and other scholars found that carbon emissions trading systems promote the reduction of regional carbon emissions and also promote technological innovation through an empirical study of European companies. Rubashkina (2015) et al. conducted an empirical analysis using data from manufacturing industries and confirmed that environmental regulations have a positive effect on firms' technological innovation.Hattori (2017) found that a high carbon emission tax positively affects technological innovation. Yumei He and Qiao Luo did an empirical test on the correlation between the level of environmental regulation and technological innovation using panel data from 2007-2014 for each provincial-level region in China, and the results showed that the intensity of environmental regulation in each province and city in China was positively related to the level of technological innovation, and environmental regulation also further increased productivity in each province in China by promoting technological innovation. Miao (2019) conducted a study from the production side, where innovation agents actively respond to environmental protection tax policies that help reduce their explicit and implicit costs, and the demand side, where green consumption demand grows, simultaneously, and concluded that there is an incentive effect of environmental protection tax on innovation, which results in a significant positive impact on innovation capacity.

In contrast, some scholars argue that environmental regulations inhibit innovation capacity. scholars such as Ramanathan (2010) use equation structural modeling method to study relevant industry data in the UK and find that environmental taxes on firms are correlated with technological innovation and economic growth, and that environmental taxes increase firms' costs and reduce the funds available for R&D investment, which negatively affects firms' technological innovation. Yu, Desheng, and Li, Xing (2021) argue that environmental protection taxes increase the production costs of regional firms, when firms choose to reduce their R&D expenses, and that increased environmental protection tax intensity may also indirectly lead to a reduction in firms' technological R&D investment by increasing their degree of financing constraints, thus inhibiting innovation.

5. Conclusions

Throughout the domestic and international literature, it is found that there is no unified conclusion on the impact of environmental protection tax on firms at home and abroad, respectively environmental protection tax will inhibit the development of firms, one environmental protection tax will promote the development of firms and the relationship between the two is uncertain. It is clear from the study that environmental regulation affects the input and output of firms and thus has an impact on the efficiency of firms. Firms will increase their costs due to strong environmental regulation, so their efficiency will be reduced as a result, i.e., environmental protection tax will inhibit firm efficiency; however, in terms of Porter's hypothesis, firms will have to adjust accordingly in order to offset the adverse effects of environmental regulation. Therefore, the final impact of environmental regulations on enterprises is the improvement of their efficiency.

In China, because of the late start of environmental protection tax, related research is also limited, mainly in the early stage of the study of the feasibility of the reform of sewage charges and the establishment of a special environmental protection tax, and the comparative study of the similarities and differences between the sewage charge system and environmental protection tax. In terms of the impact of environmental protection tax on enterprises, few studies have focused on the impact of environmental protection tax on a specific dimension of enterprises, and most studies have been conducted from the perspective of enterprises as a whole, exploring the overall impact of environmental protection tax on enterprises. However, different firms have different situations in different dimensions, and studies of the overall picture often show results that are the result of positive and negative offsetting of multiple dimensions, which do not account for the specific impact of environmental protection tax on various capabilities of firms. Therefore, when exploring the relationship between environmental protection tax and enterprises, there is a need to have an overall perspective of enterprises as well as specific dimensional studies.

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