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The effect of China 's environmental regulation evolution on economic growth and the role of industrial structure upgrading and transformation

--Analysis of environmental regulation policy based on the background of structural reform

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Abstract

From the perspective of industrial economics, this paper discusses the development process of China 's environmental regulation and the evolution direction of environmental regulation system by referring to the environmental regulation policies and regulations under the background of China 's structural reform. It summarizes the relevant theories of environmental regulation economics and its application in China ; through the study of policies, the effect of China 's environmental regulation on economic growth is discussed in depth. It is divided into three levels to deeply summarize the role of environmental regulation in the upgrading and transformation of China 's industrial organization structure ; this paper reviews the relevant literature on the theoretical and empirical research of environmental regulation by scholars at home and abroad in recent years, reviews it from the perspective of China 's environmental regulation practice, and puts forward the feasible direction of theoretical and policy research. This paper holds that the correct environmental economic regulation policy is very important to realize the sustainable development of economy, and the future social development should pay close attention to the research of environmental regulation.

Keywords

Environmental regulation theory ; history of environmental regulation ; economic effects ; industrial organization upgrading ; the evolution of regulation system.

1. Introduction

Economy is an important foundation for the development of a country. China 's development strategy based on heavy industry has promoted the rapid economic growth. While China 's economy is growing at a high speed, environmental problems are becoming more and more serious. According to the ' 2020 China Ecological Environment Bulletin ', 135 of the 337 prefecture-level and above cities in China exceeded the environmental air quality standard in 2020, accounting for 40.1 % of the total number of cities[3]. Serious environmental pollution not only leads to the reduction of social welfare, but also causes economic losses of about 8 % ~ 15 % of GDP in China. It has become the consensus of the whole society to strengthen environmental governance, reduce environmental pollution, and build a beautiful China with blue sky, green land and clear water. How to achieve a win-win situation of economic growth and environmental protection has become the focus of attention from all walks of life.

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2. Contents of the study

2.1. The origin and development of environmental regulation

2.1.1. The emergence and development of regulatory economics

In a certain sense, Western economics is a summary of the experience of capitalist market economy, and its history is a history of struggle between government interventionism and liberalism. Influenced by it, regulation economics itself has become such a history of thought, and its development and reform reflect the interaction and isomorphism process of regulation practice and theory of modern market economy. Before the end of the 19th century and the beginning of the 20th century, the capitalist market economy was in the stage of free competition. The major developed countries in the West have always pursued a laissez-faire policy. The neoclassical economics represented by Marshall and Pigou prevailed in the mainstream economics of the West.During this period, the role of government regulation was very limited. At this time, there was less research on regulation. It was mainly under the framework of neoclassical economics to design the regulation mechanism of certain markets and analyze the regulation effect and its impact on the economy and consumer welfare. At the end of the 19 th century and the beginning of the 20 th century, the capitalist market economy developed from free competition capitalism to monopoly capitalism, monopoly organizations occupied a dominant position in the economic field, and regulatory economics gradually appeared. However, the Great Depression in the 1930s promoted the rapid development of state monopoly capitalism. The state enacted laws, established regulatory agencies and implemented finance[2].

Compared with the ups and downs of economic regulation practice, social regulation first appeared in the fields of food and medicine in the late 19 th and early 20 th centuries. Since the 1960 s and 1970 s, it has been carried out in the fields of environmental protection, personal health and safety guarantee, and has been continuously strengthened since then. Even in the context of the large-scale relaxation of economic regulation in the 1980 s, the decline in social regulation was not significant, and in the mid-1980 s, its proportion in the regulatory industry eventually exceeded economic regulation[7]. In general, in view of the increasingly serious threat of market failures such as externalities and information asymmetry, the proportion of social regulation in government regulation is still generally increasing, and the theory of social regulation has developed and flourished. Regulation economics is an economic field promoted by regulation practice. The development of its theory stems from regulation practice.

2.1.2. The development history of China 's environmental regulation

From the founding of the People 's Republic of China to the end of the 1970 s, the environmental regulation system grew out of nothing. After the founding of the People 's Republic of China, industrialization has been carried out on a large scale, and pollution problems have begun to appear. However, the government has not established a special environmental protection agency. With the development of the economy, the rapid deterioration and expansion of the environment in some industrial developed areas has attracted more and more attention. The state has begun to put forward environmental protection plans and formulate environmental protection laws and regulations ; in March 1979, the " Environmental Protection Law of the People 's Republic of China (Trial) " promulgated by the government marked the full development of China 's environmental protection cause ; from the late 1970 s to the late 1980 s, the environmental management organization system has been formed, and the functions of environmental management institutions have been strengthened. From the late 1980 s to 1996, the promulgation and implementation of the " Environmental Protection Law of the People 's Republic of China " established that China 's current environmental regulation system is a combination of unified supervision and hierarchical sub-sectoral regulation ; in the mid-1990

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s, with the rapid development of China 's industrialization, urbanization and foreign investment, the pressure on environmental governance increased. After 1996, the State Council issued a series of environmental laws and regulations, clearly the importance of sustainable development strategy, environmental regulation into the deepening stage.[1]

2.1.3. The evolution of China 's environmental regulation system

Firstly, Order and control policy is that the government determines the objectives and standards of environmental regulation through legislation or formulating the rules and regulations of the administrative department, and requires enterprises to comply with it in the form of administrative orders, and punishes enterprises that violate the corresponding standards. China 's order and control policies are mainly regulated by the following four types : the establishment of the environmental impact assessment system, the " Several Provisions on the Protection and Improvement of the Environment (Trial Draft) " adopted at the first National Environmental Protection Conference in 1973, which first stipulated the " three simultaneous " system, the time-limited governance system, and the full implementation of the pollutant discharge permit system.

Second, The economic incentive policy in the promotion and application stage is to provide economic incentives for enterprises through market signals and guide enterprises to achieve pollution control objectives in the process of pursuing their own interests. In China, economic incentive policies mainly include the following three categories : environmental taxes, refund deposit policy, tradable permits.

Thirdly,The stage of policy innovation characterized by information means and public participation : the information disclosure plan or project is mainly aimed at the company, organized and implemented by the government department. The voluntary agreement refers to the enterprise 's commitment to voluntarily achieve higher environmental performance than the legal or policy requirements. Environmental certification is the certification of the company 's management procedures and management structure, rather than the certification of environmental standards or environmental performance.

Fouth, The environmental hearing system began to be implemented in China in 2004. The " Environmental Impact Assessment Law " passed in 2002 requires that for planning or construction projects that may have adverse effects, opinions of relevant units, experts and the public on environmental impact assessment reports should be solicited through demonstrations, hearings or other forms. The " Interim Measures for Environmental Protection Administrative Licensing Hearings " implemented on July 1,2004 guarantees citizens ' participation in the process of environmental policy formulation in the form of regulations. The " Interim Measures for Public Participation in Environmental Impact Assessment " promulgated by the State Environmental Protection Administration in February 2006 stipulates the scope, procedures and organizational forms of public participation in environmental impact assessment.

2.1.4. The evolution direction of China 's environmental regulation system

Firstly, Although the current command and control policies can control pollution emissions quickly, they lack efficiency and are not conducive to technological innovation. Policies that use market mechanisms have the characteristics of flexibility, cost savings and incentives. The four countries mainly use command and control policies in environmental regulation, and the environmental regulation standards are low, some policies lack cost effectiveness or even feasibility, and economic incentive policies and information disclosure policies have limited application in China. Environmental regulation policy has multi-dimensional characteristics. It is impossible to provide correct suggestions for policy choices by comparing only one aspect of various policy tools.

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Second, Cost-benefit analysis system should be introduced into environmental regulation. Through the cost-benefit analysis of the proposed and effective environmental regulation policies, the total impact of regulation policies on employment, economic growth, environment and production efficiency can be comprehensively measured, and the regulation policies can be based on scientific quantitative analysis to improve the efficiency and level of policy formulation.

Thirdly, Environmental regulation policies should be integrated with science and technology innovation policies. Environmental regulation should promote technological innovation and achieve major changes in the direction of technological innovation.

2.2. Environmental regulation related theory

2.2.1. Environmental kuznets curve

The relationship between economic growth and environmental quality has always been an important issue for scholars. In the early research, Gross man & Krueger established the empirical relationship between environmental quality and national income level, and found that there is an inverted U-shaped curve relationship between pollution emission level and income, which is called the environmental Kuznets curve[9]. Many foreign literatures have empirically tested the existence of the environmental Kuznets curve, and generally used the absolute level of pollution or pollution intensity to measure the degree of degradation of environmental quality, but failed to reach a consistent conclusion. On the one hand, supporters believe that the inverted U-shaped environmental Kuznets curve does exist. On the other hand, some researchers have found that inverted U-shaped, N-shaped or inverted N-shaped environmental Kuznets curves do not exist. The study found that whether the environmental Kuznets curve can be confirmed or the difference in its form depends largely on the selection of pollution indicators : SO, NOX and other key regulatory pollutants, and carbon-oxygen mixture and solid waste. The research conclusions of pollutants that have not received widespread attention are quite different. For example, Shafik 's research results show that with the increase of per capita income, per capita carbon dioxide emissions increase linearly.

The discussion on the inflection point position of China 's environmental Kuznets curve can be summarized into two aspects : First, some scholars have proposed that the relationship between China 's pollutant emissions and per capita GDP is in the rising section of the environmental Kuznets curve, and there is still a distance from the turning point. However, some scholars believe that although most cities are currently in the rising stage of the inverted U-shaped curve, they are approaching the turning point. The second is the study of the inflection point of the environmental Kuznets curve in various provinces of China.Song Malin and Wang Shuhong found that Shanghai, Beijing and other provinces have reached the inflection point of the environmental Kuznets curve ; there is no environmental Kuznets curve in Liaoning, Anhui and other provinces.

2.2.2. Porter hypothesis

In the literature that explores how local government environmental regulation affects corporate innovation behavior, the Porter hypothesis is an important turning point. Prior to this, most of the early studies of neoclassical economics believed that environmental regulation would crowd out the productive investment of enterprises, which was not conducive to the innovation investment of enterprises. However, Porter & Van der Linde believes that strict and appropriate environmental regulations will lead to technological innovation, which can partially or completely compensate for the cost of compliance with the environmental standards, thereby improving the productivity and market competitiveness of enterprises. Since then, many literatures have verified the existence of the ' Porter hypothesis '. On the one hand, many literatures have confirmed the positive relationship between environmental regulation and innovation. On the other hand, some literatures have questioned the Porter

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hypothesis and believe that technological progress itself is difficult to reconcile the contradiction between economic development and environmental protection. Some new technologies will reduce pollution, while others will increase pollution, and industries with stricter environmental regulations may experience a decline in competitiveness. Specific to the study of the Chinese situation, whether the Porter hypothesis is established has not reached a consensus in the literature, but in general, most of the conclusions of the literature support the Porter hypothesis. Many scholars analyze China according to China 's specific environmental regulation policies.

2.2.3. Pollution haven hypothesis

The pollution haven hypothesis holds that when a country strengthens environmental regulation, in order to reduce the cost of pollution control, polluting enterprises will migrate to countries with low environmental regulation, which provides a refuge for polluting enterprises. On the one hand, many literatures have confirmed the existence of the pollution haven hypothesis and found that developing countries with looser environmental regulations have " pollution haven problems. " On the other hand, some literature has questioned the pollution haven hypothesis, believing that the pollution haven is only a transient phenomenon. Most of the early literature on the effect of pollution havens was carried out at the national level. The core issue is to study whether foreign direct investment prefers countries with weaker environmental regulation. Later, the discussion around the pollution haven hypothesis gradually deepened, and the research perspective was no longer limited to transnational samples, but went deep into the pollution transfer between regions within a country.

2.3. The effect of China 's environmental regulation on economic growth

From a macro perspective, the existing literature mainly focuses on the impact of Chinese-style environmental regulation on economic growth, trade patterns, environmental pollution control and other macroeconomic variables.

2.3.1. Chinese-style environmental regulation and economic growth

In general, the relationship between environmental pollution and economic growth has a variety of manifestations, mainly showing five types of monotonic decreasing, U-shaped, inverted U-shaped, N-shaped and inverted N-shaped.

In terms of the impact of government administrative directive environmental regulation tools on economic growth, many literatures believe that they will promote economic growth, but a small number of literatures do not agree. On the one hand, supporters believe that the implementation of appropriate and stringent environmental regulation can promote economic development and achieve a win-win situation between environmental protection and economic growth. On the other hand, some scholars have questioned that the two can not achieve a ' win-win '. Under Chinese-style environmental regulation, even if environmental governance indicators are added to the binding assessment, local governments may still pursue economic growth to the greatest extent. Yang Danhui and Li Hongli comprehensively measured the environmental degradation caused by economic activities based on the damage-based pollution loss assessment method and index system[6].

In terms of the impact of government performance appraisal environmental regulation tools on economic growth, the relevant literature mainly includes two aspects : First, in general, government performance appraisal environmental regulation tools have promoted economic growth. For example, as a new river governance model, the river chief has directly incorporated the effect of river environmental governance into the performance assessment of the main party and government leaders in the region. While reducing environmental pollution, it will inhibit the economic development of the region in the short term, but can achieve double dividends in the long run. Second, analyze the impact on the economy from the perspective of

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the effectiveness of policy promotion. China 's environmental regulation tools mainly adopt the pilot-re-promotion model, and some scholars have analyzed the effectiveness of the promotion of existing environmental regulation tools. After evaluating the effectiveness of the promotion and diffusion of the river chief system, Wang Banban et al.found that the regulation of industries with large-scale emissions was slightly looser, which could increase their output and compensate for the economic losses caused by some policies[4].

In terms of the impact of market-oriented environmental regulation tools on economic growth, there are two main viewpoints in the current literature : one is that it is not conducive to economic growth. Based on the past extensive mode of economic development, China 's economic growth is largely dependent on the consumption of coal resources. Tu Zhengge and Chen Renjun believe that the emission trading has limited the use of energy in China to a certain extent, and cannot achieve a ' win-win ' between the economy and the environment. The second is that it can promote economic growth. Supporters believe that the establishment of carbon market can effectively reduce the energy cost of the whole society, improve the welfare and allocation efficiency of production factors, thus narrowing the regional economic gap and promoting regional coordinated development.[10]

2.3.2. Chinese-style environmental regulation and trade model

The resource and environmental problems of a country can affect the production cost, factory location, trade mode of enterprises, and ultimately affect the trade profit. Therefore, some scholars began to explore the impact of environmental regulation on China 's trade mode.

In terms of the impact of government administrative directive environmental regulation tools on trade patterns, most of the literature believes that environmental regulation inhibits the development of China 's trade. Labor-intensive products such as leather, down products and textiles are China 's traditional export advantage products. The development of these industries will lead to serious regional water pollution. After the government adopted the policy of " two control areas, " the export of cities in " two control areas " decreased significantly, and the export of polluting industries decreased. However, some scholars have questioned this, arguing that environmental regulation is beneficial to China 's trade. Sheng Dan and Zhang Huiling believe that environmental regulation has a significant positive impact on the improvement of China 's export product quality. Li Xiaoping also pointed out that the intensity of environmental regulation can enhance the trade comparative advantage of China 's industrial industry. Only when the intensity of environmental regulation exceeds a certain threshold, its impact on the comparative advantage of industrial trade will be reduced.

In terms of the impact of market-oriented environmental regulation tools on trade patterns, most of the current literature believes that environmental regulation will inhibit China 's trade development. In the past, China maintained a growing trade surplus at the expense of self-energy resource consumption and environmental pollution emissions. Export products were mostly commodities with high resource and energy input and low product added value. The embodied carbon emissions in foreign trade are not only huge, but also unbalanced. The embodied carbon in net exports has reached a considerable amount. In particular, the imbalance of embodied carbon emissions in the metal smelting and rolling processing industry has an important impact on the overall imbalance. China 's implementation of environmental regulation tools for carbon trading will reduce carbon emissions to a certain extent, which is not conducive to foreign trade.

2.3.3. Chinese-style environmental regulation and pollution control

In terms of the impact of government administrative directive environmental regulation tools on pollution control, many literatures believe that joint supervision and collaborative governance in various regions can effectively improve environmental pollution. Local governments naturally have the tendency of " free rider " in the process of environmental

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governance, resulting in the inefficiency of environmental governance and the difficulty of central government 's constraints on local governments. 8 It is difficult to effectively improve the environmental quality only by territorial governance and end-of-pipe governance. Only under the principle of unified planning, unified monitoring and unified supervision, can the effective governance of pollution be realized by building a regional cooperation and coordination mechanism.

In terms of the impact of government performance appraisal environmental regulation tools on pollution control. From the perspective of performance appraisal, the political periodicity of environmental pollution control is significant. The five-year plan plays an important role in public environmental governance. Based on the setting of energy intensity targets in the government 's five-year plan, the study finds that the government 's guiding goals can constrain industrial emissions and significantly reduce energy consumption per unit of GDP.

In terms of the impact of market-oriented environmental regulation tools on pollution control, there are two main points of view : on the one hand, most of the literature believes that it has a significant effect on pollution control. From the perspective of enterprises, emission trading policies can reduce the transaction costs of enterprises and affect regional pollutant emissions through two channels : energy structure effect and technological innovation effect. Even if the dynamic effects of carbon emissions trading on different industrial pollutants are different, the overall emission reduction effect is still increasing year by year. From the perspective of consumers, the central government proposes that carbon trading can encourage consumers to choose low-carbon products and reduce carbon emissions. On the other hand, some scholars have found that market-oriented environmental regulation tools are ineffective. Li Yongyou and Shen Kunrong found that after the emission trading was launched in 2002, the pollution emissions in the pilot areas increased. Specifically within the industry, it is found that carbon trading can effectively promote carbon emission reduction in the coal, heavy industry, power and light industry sectors, but the emission reduction effect on the transportation and construction industries in the high-emission sectors is not obvious[12].

2.3.4. The relationship between Chinese-style environmental regulation and labor income distribution, green consumption and regional development differences.

Chinese-style environmental regulation policies will also have an impact on workers ' income distribution, green consumption and regional development differences.

As far as the impact of Chinese-style environmental regulation on income distribution is concerned, Chinese-style environmental regulation will promote the differentiated development of different industries, mainly reflected in the two sectors of cleaning products and polluting products, which will affect the income distribution differences between the two sectors. The combination of gradually increasing environmental protection tax and government compensation rate can promote the triple dividend of sustained economic growth, environmental quality improvement and income distribution pattern improvement. However, excessive government compensation policies will inhibit economic growth and delay the improvement of income distribution pattern[11]. The insufficient government compensation policy will lead to the imbalance of income distribution pattern, and the expanded output scale will not bring about the improvement of social welfare.

In terms of the impact of Chinese-style environmental regulation on consumers ' green consumption, scholars have analyzed the impact of government subsidies on consumers under different subsidies. In terms of the impact of Chinese-style environmental regulation on regional development differences, China 's provincial green development efficiency is on the rise as a whole, the regional differences in green development efficiency are shrinking, and the overall development is in the direction of equalization.

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2.4. The role of China 's environmental regulation on the transformation of industrial organization

Chinese-style environmental regulation will also have an impact on industrial transfer and upgrading, technological innovation, industrial efficiency, product quality and product export technology complexity.

2.4.1. Chinese-style environmental regulation and industrial transfer and upgrading

In terms of industrial transfer, due to economic growth and technological gaps in different regions, industrial echelon undertaking will naturally occur between regions, triggering the transfer of polluting industries. Specifically, within the industry, environmental regulation will increase the cost of pollution-intensive industries and affect the entry and exit of enterprises. In order to reduce costs, there may be a ' pollution haven ' effect. In terms of industrial upgrading, there is a conflict between environmental regulation and the development of pollution-intensive industries[17]. Only by completing the adjustment of industrial structure can they achieve common development. At present, environmental regulation mostly realizes the transformation and upgrading of industrial industry by affecting industrial production activities, mainly showing J-type characteristics, but the regional differences are large, showing the lowest in the east and the highest in the west[16].

In terms of the impact of government administrative directive environmental regulation tools on industrial transfer and upgrading, different scholars have different views on the mode of China 's industrial transfer. On the one hand, from the perspective of industrial transfer, strict environmental regulation has led to the evacuation of some commercial activities and changed the location choice of corporate economic activities. On the other hand, from the perspective of industrial upgrading, the government 's administrative directive environmental regulation tools have a positive effect on the optimization of industrial structure in the eastern and central cities[5]. The eastern region has the most significant effect, while the " two control zones " policy in the western and northeastern regions has a significant negative impact on the change of urban industrial structure.

In terms of the impact of government performance appraisal environmental regulation tools on industrial transfer and upgrading, the effect of industrial transformation and upgrading of local governments facing environmental target constraints is more obvious[14]. Because local governments will introduce more stringent environmental regulation policies when facing strong environmental target constraints, in order to complete the assessment objectives of environmental target constraints. In addition, there is intergovernmental competition between provinces, and environmental target constraints will strengthen intergovernmental environmental regulation and indirectly promote industrial restructuring.

In terms of the impact of market-oriented environmental regulation tools on industrial transfer and upgrading, with the acceleration of urbanization in the central and western regions, the demand for high-energy-consuming products has increased ; the prices of labor, land and other factors in the eastern coastal areas have gradually increased, which has promoted the inward movement of high-energy-consuming industries. Under the carbon trading mechanism, emission control enterprises need to bear the cost of emission reduction regardless of their own emission reduction or purchase of emission permits[8]. The price of carbon emission permits tends to be equal among regions, and the supply and demand of permits are highly separated in space, which is no longer directly determined by the distribution of emission reduction targets. This has promoted the economic growth of the central and western industrialized transition regions. In addition, this emission reduction policy also affects the regional industrial structure from both the production side and the demand side[17]. From the production side, emission reduction policies limit corporate emissions and increase energy input costs. Due to the different emission intensity of different industries, the impact of

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production costs is also different, which leads to the adjustment of capital accumulation path and industrial structure. From the demand side, policy shocks will be transmitted to downstream industries and consumers through the price mechanism[13]. In addition, market-based tools can induce technological innovation, so as to achieve a ' win-win ' between ' de-capacity ' and green upgrading of industrial production methods.

2.4.2. Chinese-style environmental regulation and technological innovation

In terms of the impact of government administrative directive environmental regulation tools on technological innovation, most scholars mainly focus on China 's innovation in water pollution and air pollution prevention and control technology. In terms of water pollution prevention and control technology, although Chinese scholars have done a lot of work, some studies have ignored the actual situation and lacked practicality, which is difficult to promote the improvement of environmental quality. In terms of air pollution prevention and control technology, some scholars have found that China 's air pollution prevention and control policy tools have insufficient endogenous motivation for technological innovation, and the output effect of technological innovation is not enough.

In terms of the impact of government performance appraisal environmental regulation tools on technological innovation, it has a positive effect. Since the implementation of the Eleventh Five-Year Plan, China 's green technology innovation activities have become significantly more active, and the number of green patent applications has increased by leaps and bounds. Although opponents believe that the five-year planning environmental protection target assessment only promotes the expansion of the number of green patent applications, the quality of related innovation activities is declining ; it is believed that the quality of China 's green patent applications does not seem to have been significantly improved, and there may be a certain bubble phenomenon in China 's green patent applications[20]. The number of patents has soared and the quality of patents has declined. However, from a long-term perspective, the government should formulate reasonable environmental regulation policies, so that enterprises can not only achieve the improvement of pollution control technology, but also achieve the progress of production technology, and then provide technical support for China to achieve a ' win-win ' situation of environmental protection and economic growth.

In terms of the impact of market-oriented environmental regulation tools on technological innovation, most of the literature believes that it will promote technological innovation. Qi Shaozhou et al.found that the pilot of emission trading can induce the green invention patents of enterprises. Ren Shenggang also agreed, and found that in terms of emission reduction, sulfur dioxide emission reduction in pilot areas was significantly higher than that in non-pilot areas. However, some scholars have questioned that Li Qingyuan and Xiao Zehua found that in order to obtain subsidies, enterprises will cater to the government 's environmental protection direction and allocate resources under the government 's control, resulting in a part of the waste of resources[18]. Therefore, sewage charges will force enterprises to innovate, but environmental subsidies will inhibit enterprise innovation.

2.4.3. Chinese-style environmental regulation and industrial efficiency

Domestic scholars mainly study the effect of environmental regulation on industrial efficiency from three aspects : China 's industrial two-digit industry, provincial region and enterprise level. Although the level of energy and environmental efficiency in China 's industrial sector is not high, the overall trend is on the rise[27].

In terms of the impact of government administrative directive environmental regulation tools on industrial efficiency, the conclusions of empirical research are inconsistent. Supporters found that using the revision of China 's " Air Pollution Prevention Law " as a quasi-natural experiment, research shows that the total factor productivity of air pollution-intensive industries has been significantly improved compared with non-air pollution-intensive

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industries. Some scholars have also found that the productivity growth of enterprises in the ' two control areas ' is significantly lower than that in the non- ' two control areas ', and the ' two control areas ' policy hinders productivity growth by increasing production costs[24].

In terms of the impact of government performance appraisal environmental regulation tools on industrial efficiency, binding pollution control targets have significantly reduced the level of resource mismatch in the polluting industry and improved the overall productivity level of the polluting industry. Some literatures consider the impact of government environmental regulation behavior on productivity from the urban level under geographical proximity and economic proximity[21]. It is found that due to the bottom-up competition and competition in the interaction of environmental regulation implementation between geographically adjacent cities, the difference in the degree of environmental regulation implementation between geographically adjacent cities continues to expand, which aggravates the spatial self-selection effect of polluting enterprises, making the improvement of a city 's productivity at the cost of the decline in productivity of its geographically adjacent cities, and forming a beggar-thy-neighbor productivity growth model between geographically adjacent cities[22]. The economic neighboring cities show a competitive form in the implementation of environmental regulation, which avoids the migration of high-polluting enterprises between economic neighboring cities, but makes the economic neighboring cities form a productivity growth model with neighbors as partners.

In terms of the impact of market-oriented environmental regulation tools on industrial efficiency, environmental regulation has not yet played a substantial inhibitory role in China 's industrial growth. Environmental total factor productivity has become the core driving force for China 's high industrial growth and pollution reduction. Since China 's reform and opening up, a series of energy conservation and emission reduction policies have effectively promoted the continuous improvement of industrial green productivity, and initially demonstrated the effectiveness of the green revolution of environmental policies.

2.5. The impact of China 's environmental regulation on corporate environmental behavior

The existing literature mainly focuses on the impact of Chinese-style environmental regulation on micro-enterprise behavior. This paper mainly summarizes the impact of Chinese-style environmental regulation on corporate governance and corporate environmental investment.

2.5.1. Chinese-style environmental regulation and corporate governance

As far as the impact of government administrative directive environmental regulation tools on corporate governance is concerned, enterprises are the micro-subject of the market and bear the heavy responsibility of energy conservation and emission reduction. More and more institutional investors, shareholders and other investors begin to pay attention to the impact of environmental regulation on companies[23]. Most of the literature believes that the government increases the environmental cost burden of enterprise production by implementing binding policy tools, forcing incumbent enterprises to improve their production and operation methods, and ultimately achieve the improvement of environmental quality in the region.

In terms of the impact of government performance appraisal environmental regulation tools on corporate governance, some scholars have found that the central environmental supervision policy can improve the performance of listed industrial enterprises through innovation-driven. However, skeptics believe that the governance pressure caused by environmental regulation is too large, and the lack of resource support will not have a significant positive impact on corporate environmental governance[22].

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2.5.2. Chinese-style environmental regulation and corporate environmental investment

In terms of the impact of government administrative directives and performance appraisal environmental regulation tools on corporate environmental protection investment, when local pollution control pressures are high, cities under environmental pressure will reduce fixed asset investment and increase environmental pollution control investment, especially for heavily polluting enterprises. Environmental protection investment[30]. However, some scholars have found that after the environmental performance appraisal standards of local government leading cadres were put forward, the cyclical law of officials ' tenure of environmental protection investment in enterprises began to become significant, while the cyclical law of five-year planning became insignificant, and the two showed an ' alternative relationship '.

In terms of the impact of market-oriented environmental regulation tools on corporate environmental investment, most of the literature finds that the intensity of market-incentive environmental regulation is significantly positively correlated with corporate environmental investment[28]. Especially in recent years, the auction price of emission rights has been rising, and the purchase and possession of emission rights has become an investment strategy for enterprises to invest in environmental protection and asset appreciation.

3. Conclusion and recommendations

If you follow the “checklist” your paper will conform to the requirements of the publisher and facilitate a problem-free publication process.

3.1. Review and Prospect of Environmental Regulation Research in China

The implementation of environmental regulation policies has significantly promoted the overall development of China 's economy. Therefore, the environmental regulation policy is conducive to the advanced transformation of China 's industrial structure to the service economy.

The existing literature has conducted extensive and in-depth research on the impact of Chinese-style environmental regulation from the perspectives of various Chinese-style environmental regulation tools and their relationship with economic development, but there are still some deficiencies, mainly in the following aspects : First, the existing literature on the impact of Chinese-style environmental regulation research, more attention is paid to its impact on the economic level, while the research on the impact of social activities is insufficient, that is, further attention should be paid to the impact of Chinese-style environmental regulation on residents ' welfare or happiness index. Secondly, many Chinese-style environmental regulations are under the government 's behavior, that is, as a tool for the government to control environmental pollution, the existing research has not well combined it with market-oriented environmental regulation tools, and there are relatively few literatures on this research. Finally, the existing literature focuses on the impact of Chinese-style environmental regulation on economic growth, industrial development and enterprise growth, while there are few literatures on welfare analysis.

I believe that further research can be carried out in three aspects in the future : First, learn from sociologists ' research on environmental regulation, pay more attention to the social function of environmental regulation, and conduct in-depth discussions on how Chinese-style environmental regulation affects the commitment of various actors to social responsibility. Second, conduct more empirical research, reasonably measure the mechanism of coordination and cooperation of different environmental regulation tools, and explain the effectiveness of establishing a diversified environmental regulation system. Third, the research perspective is

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extended to the impact of Chinese-style environmental regulation on the overall welfare of society. Analyzing the regional and industrial welfare differences in the implementation of Chinese-style environmental regulation can provide practical policy recommendations for improving overall welfare.

3.2. Policy recommendations are given from the perspective of industrial economics.

3.2.1. Guide the benign competition of environmental regulation and enhance the centralization of environmental management.

While the central government unified legislation, in order to reflect regional differences, it appropriately gave local governments the initiative to formulate collection standards and management methods within the prescribed range. The current tax competition among local governments has led to loose environmental supervision and governance standards, and there has been a destructive ' bottom-by-bottom effect ' phenomenon. Although environmental governance has been strengthened through a series of policies and regulations, environmental supervision and other measures in recent years, the basic situation of China 's severe environmental protection situation has not been fundamentally improved[13]. Therefore, it is particularly critical to regulate the tax competition behavior of local governments.

3.2.2. Promote the differentiation mechanism of environmental policies and promote the formation of a balanced state of green development among regions.

China 's regional ecological carrying capacity is different. Local governments need to consider the local ecological carrying capacity when planning and constructing. In addition, there are obvious regional differences in the economic growth effect of environmental regulation competition. The spatial spillover of government environmental regulation in neighboring cities in the eastern and northeastern regions has a positive growth effect on the local economy, while the spatial spillover of environmental regulation in the central region has a negative growth effect on the local economy. The spatial spillover of environmental regulation in the western region has no significant impact on local economic growth. Therefore, regional development strategies and environmental protection policies should be formulated according to the regional positioning of different regions. The economic effects of environmental regulation show obvious heterogeneity. After formulating the macro overall strategy, the state should pay attention to the differences in policy effects caused by regional urban factors when implementing specific environmental regulations, and cooperate with other relevant policies to promote balanced development among regions in the process of maintaining overall economic growth.

3.2.3. Unblock the channels of public environmental appeals and strengthen its weakening effect on strategic interaction.

At present, the public power in China 's environmental governance is weak. The newly revised ' Environmental Protection Law ' clearly stipulates that citizens have the right to know, participate and supervise the environment. However, the reality is that there are still some problems in the implementation of China 's environmental information disclosure system, such as limited disclosure subjects, blurred boundaries between disclosure and non-disclosure, and some regions do not disclose relevant environmental information on the grounds of ' trade secrets ' involving enterprises. Citizens ' understanding and demand for the environment is the most direct and rapid. The disclosure of government environmental information can enable citizens to provide key information and help for environmental governance. Public environmental appeals help to weaken the strategic interaction of inter-regional environmental regulation and form the constraints of government 's incomplete implementation. Therefore, we should strengthen the communication between the public and the government and

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enterprises by improving the public 's participation in environmental protection, so that all parties can form a consensus in the process of knowing and participating in the interaction, so as to eliminate misunderstanding, enhance understanding, form a joint force, and promote the benign interaction between the government and the public.

3.2.4. Flexible use of the combination of environmental regulation tools to promote the combination of Chinese environmental regulation and market-oriented tools.

The effect of environmental regulation is closely related to the choice of regulatory tools. The command-and-control environmental regulation tool is a compulsory policy tool. The government sets uniform standards for the quantity and mode of pollution emissions by enterprises, and enterprises that violate the regulations will be subject to administrative penalties. This kind of regulation can sometimes only increase the cost of enterprises. When this administrative order is revoked, enterprises will even have retaliatory pollution discharge behavior. The environmental regulation tools based on market forces have not formulated a clear level of pollution. They mainly affect the behavior of polluters through market signals, which can give enterprises continuous incentives and promote them to find better technologies and means to reduce pollution emissions. However, due to China 's emissions trading market is not yet mature, market-oriented environmental regulation has not been fully implemented. Therefore, it is of great significance to actively improve the environmental regulation system and promote the diversified combination of environmental regulation tools.

References

[1] Jiang Ke. The history, institutional evolution and improvement direction of China 's environmental regulation [J].Reform and strategy. 2010.26 (6) : 32-34

[2] Li Yong. Wang Jinnan. Comprehensive index and empirical analysis of coordinated development of economy and environment. [J] Environmental science research. 2006 (6)Guo Chaoxian. New Trends in the Development of Environmental Regulation in China [J].Economic Research Reference, 2007, (27) : 40-45.

[3] Zhao Hong. Impact analysis and reference of environmental regulation in the United States [J].Economic vertical and horizontal, 2006, (1) : 55-57.

[4] Jin Bei. Confronting Troubles - Japan Plans Major Economic Structural Reform [J]. Economic Management, 1998, (9) : 7-11.

[5] Yu Yongze, Yin Liping. The evolution of Chinese-style environmental regulation policy and its economic effects : Review and Prospect. [J].Reform, 2022, (3) : 114-130

[6] Lin Boqiang, Zou Chuyuan. Changes in the development stage and China 's environmental policy choices [J]. Chinese Social Sciences. 2014. (5) : 32-34

[7] Yu Hui.USA : Legal System of Government Regulation [J].Research on China 's Industrial Economy, 1994 (12) : 62-69.

[8] Liu Yanhua. Research on China 's Environmental Regulation Reform [D]. Shenyang : Liaoning University Ph.D. Thesis, 2007.

[9] Zheng Jie. Environmental regulation and high-quality innovation and development : theoretical discussion of the new structural Porter hypothesis. [J].Exploration of economic issues. 2020. (12) : 171-177

[10] Guo Chaoxian. New Trends in the Development of Environmental Regulation in China [J].Economic Research Reference, 2007, (27) : 40-45.

[11] Shi Beibei, Feng Chen, Zhang Yan. The marginal incremental effect of environmental regulation dividend [J]. China 's industrial economy. 2017 (12) : 40-58.

[12] Yu Tongshen. The relationship between environmental regulation and economic growth - - Cointegration test based on panel data of China 's industrial sector [J].

ISSN: 2710-0170

[13] Lu Nanquan. A Brief Discussion on the History of Soviet Economic Development and Its Enlightenment : From Stalin 's Period to Khrushchev 's Period [J].Journal of Pudong Cadre College of China, 2022, 16 (5) : 120-135

[14] Yuan Yijun, Miao Ying, Xie Ronghui.Empirical Analysis of Environmental Regulation Performance and Its Influencing Factors [J].Industrial Technology and Economy, 2016,35 (01) : 92-97.

[15] Yin Xianping. The Impact of Environmental Regulation on Trade - A Case Study of Commodity Trade between China and the EU [J]. World Economic Research, 2008, (7) : 42-46.

[16] Yan Wei, Tang Deshan.Research on supervision mechanism of pollution control cost [J].Research on science and technology management, 2007 (05) : 166-167.

[17] Zhang Juan, Geng Hong, Xu Gongwen, Chen Jian.Research on the impact of environmental regulation on green technology innovation [J].China 's population, resources and environment, 2019,29 (01) : 168-176.

[18] Zhang Tianyue.Research on green innovation incentive of environmental regulation [D].Graduate School of Chinese Academy of Social Sciences, 2014.

[19] Cao Peng, Bai Yongping. The spatial-temporal pattern and influencing factors of provincial green development efficiency in China [J]. Gansu Social Sciences, 2018 (4) : 242-248.

[20] YANG MOLIN. SOME PROBLEMS ON GREEN ECONOMICS [J]. ECONOMIC ISSUES, 2012 (09) : 4-14.

[21] Zhicaoyi.Microeconomics of rules [M].China Development Press, 1992.

[22] Yi Weiming, Li Zhilong. Analysis on the behavior choice of regulatory departments in environmental protection [J].Contemporary Finance and Economics, 2008, (4) : 23-26.

[23] Yuan Xiaoling, Li Hao, Di Qing. Analysis on the interaction mechanism of environmental regulation intensity, industrial structure upgrading and ecological environment optimization [J].Journal of Guizhou University of Finance and Economics, 2019 (1) : 73-81.

[24] Yu Kexin, Hu Yongqiang, Song Zhe.Environmental regulation, government support and green technology innovation : an empirical study based on resource-based enterprises [J].Journal of Yunnan University of Finance and Economics, 2019 (04) : 100-112.

[25] Fu Jingyan, Li Lisa. An Empirical Study on Environmental Regulation, Factor Enrichment and Industrial International Competitiveness - Based on the Panel Data of China 's Manufacturing Industry [J].Management World, 2010, (10) : 87-98.

[26] Yu Binbin. The Economic Growth Effect of Industrial Structure Adjustment and Productivity Improvement - An Analysis Based on China 's Urban Dynamic Spatial Panel Model [J]. China 's Industrial Economy, 2015 (12) : 83 - 98. Chen Jian. Government and Market : A Comparison of Industrialization Paths in Backward Countries [J].Qilu Journal, 2018, (1) : 89-95

[27] Yu Yongze, Yin Liping. The evolution of Chinese-style environmental regulation policy and its economic effects : Review and Prospect. [J].Reform, 2022, (3) : 114-130

[28] Huang Dechun, Liu Zhibiao. Environmental regulation and enterprise independent innovation - - Construction of enterprise competitive advantage based on Porter hypothesis [J].China 's industrial economy. 2006 (03) : 100-106.

[29] Han Chao, Sang Ruicong. Enterprise product conversion and product quality improvement under environmental regulation constraints [J].China Industrial Economy, 2018 (2) : 43-62.

[30] Du Tao. Theoretical Review of Domestic Low-carbon Economy Research [J].Journal of Inner Mongolia University of Finance and Economics, 2010, (3) : 26-28