

Analysis on the Impact Mechanism of Environmental Regulation on High-quality Economic Development: A Case Study of Yangtze River Delta

Du Jingxiang

Nanjing Audit University, Nanjing City, Jiangsu Province, China

Email: 277522946@qq.com (D.J.X.)

Manuscript received May 22, 2024; revised June 10, 2024; accepted June 20, 2024; published July 22, 2024.

Abstract—The Yangtze River Delta region has always been an important engine for China's economic development. In recent years, with the deepening of the Yangtze River Delta integration development strategy, the region's total economic volume has continued to expand and the growth rate has remained stable. However, the Yangtze River Delta region is facing a series of severe environmental problems in the process of economic development. Environmental regulation has become a strategic tool and an important means to promote high-quality economic development in the Yangtze River Delta region. Therefore, this paper attempts to explore the mechanism of environmental regulation on the high-quality economic development in the Yangtze River Delta region and draw the following conclusions: in terms of direct impact mechanism, environmental regulation will affect the high-quality economic development in the Yangtze River Delta region through crowding-out effect, pollution shelter effect, green innovation effect, etc. At the same time, environmental regulations have played a positive role in promoting the transformation of industrial innovation, but strict environmental regulations have both positive and negative effects on local competitiveness.

Keywords—environmental regulation, The Yangtze River Delta region, mechanism analysis

I. INTRODUCTION

In December 2019, the Central Committee of the Communist Party of China and the State Council issued the Outline of the Yangtze River Delta Regional Integration Development Plan. Environmental regulation and green development are one of the important contents of the plan, which involves the development of environmental protection industry, green and low-carbon development, ecological environment protection, environmental supervision and green transportation and other aspects. Among them, it is proposed to improve the efficiency of resource utilization and environmental quality, promote the coordination between economic development and environmental protection, resolutely implement the green and low-carbon development strategy, and promote the development of green economy and the construction of ecological civilization. The Yangtze River Delta region, as one of the core engines of China's economy, has implemented an integrated development strategy, which is not only of far-reaching significance in leading the national economy to achieve high-quality development, but also a key strategic step in improving the spatial layout of China's reform and opening up and in shaping a strong and active growth pole for national development.

As one of the important means to deal with the

environmental pollution problem, environmental regulation, as the main policy tool of the government, can reduce the generation and emission of pollutants and restrict enterprises to develop reasonable resources. Environmental regulations also play a positive role in promoting technological innovation. Environmental regulation is helpful to realize regional sustainable development. By limiting the consumption of resources and promoting the effective use of resources, environmental regulation can promote the coordinated development of economic development and environmental protection and realize the long-term sustainable development of regional economy.

However, what is the impact of environmental regulation on the high-quality economic development in the Yangtze River Delta region? What are the advantages of different types of environmental regulations on the mechanism of high-quality economic development? Based on the above thinking, this paper will take the Yangtze River Delta region as an example to discuss the environmental regulation for high-quality economic development.

II. LITERATURE REVIEW

A. Research on Environmental Regulation

The relevant literature on environmental regulation is rich. The connotation of environmental regulation is changing with the development of people's cognition on the relationship between environmental protection and economic growth. Economist Alfred first introduced the concept of "regulation" in his research in 1970. Its core point of view is that the government aims to maintain the steady operation of the economy and promote long-term sustainable development by formulating and implementing a series of institutional measures. In the recent research, Zhang (2021) summarized the existing literature and divided the environmental regulation into three main types: command control type, market incentive type and public participation type.

Through the research on the impact of heterogeneous environmental regulations on regional carbon productivity, it is concluded that both mandatory and market-based environmental regulations have a positive impact on carbon productivity, while the impact of voluntary environmental regulations is less significant (Li *et al.*, 2020).

B. Research on High-quality Economic Development

Based on the provincial data of China from 2013 to 2018, constructed an evaluation index system of high-quality economic development from six dimensions: stable

economic development, innovation-driven level, coordinated development level, ecological environment level, opening-up level and social development level (Tang *et al.*, 2020). Based on the comprehensive analysis of the existing evaluation index system, combined with the actual data resources available in the city, carefully constructed a multi-dimensional evaluation system, which covered many important aspects such as industrial structure, Total Factor Productivity (TFP), technological innovation, residents' quality of life and ecological environment (Zhao *et al.*, 2020). Ren (2022) further pointed out that the wide application of Internet of Things technology in industry, agriculture, service industry, environmental governance and other fields plays an important role in promoting China's economy to a high-quality stage of development. Therefore, in order to ensure the healthy and orderly development of the Internet of Things industry, China should continuously improve and optimize the construction of relevant industry standards, technological innovation, personnel training and public services and other support systems to provide them with a high-quality and efficient material and institutional environment.

C. Research on the Impact of Environmental Regulation on Economic Development

Agbola (2014) puts forward a view that environmental regulation can guide enterprises to green technological innovation, which not only helps enterprises achieve higher efficiency, but also plays a positive role in promoting the overall economic development. Further, Zhang *et al.* (2020) found a nonlinear relationship between different types of environmental regulations and green economy efficiency after in-depth research through the threshold model. Specifically, there is a U-shaped curve between administrative environmental regulation and green economy efficiency, which means that regulation may bring a certain decrease in efficiency before a certain critical point, but beyond this point, regulation can significantly improve green economy efficiency. At the same time, market-based and public participation-based environmental regulations show the characteristics of inverted U-shaped curve, indicating that these two types of regulations may help to improve the efficiency of green economy in the initial stage, but after exceeding a certain extent, their promotion effect may gradually weaken. It is worth noting that under different anti-distance matrix conditions, there are significant differences in the roles played by different types of regulatory instruments.

III. RELEVANT THEORETICAL BASIS

A. Porter's Hypothesis of Heterogeneous Environmental Regulation

According to Porter's hypothesis, the flexibility of environmental regulation policies may increase the cost of pollution control in the short term to meet the requirements of end-of-life pollution treatment. However, with the gradual strengthening of environmental regulation, enterprises will have to intensify the research and development of green technologies and the optimization of production processes to mitigate the negative impact of production activities on the environment. This

transformation is not only helpful to enhance the technological value and added value of products and enhance the market competitiveness and core advantages of enterprises, but also has positive significance for realizing environmental sustainable development. Porter and Linde (1995) have further supplemented the theory on this basis. They believe that environmental regulation can trigger the "innovation compensation" effect. This effect shows that when the environmental regulation policy is reasonably formulated and implemented, it can motivate enterprises to carry out technological innovation, so that the benefits brought by the innovation partially or completely offset the cost of innovation.

B. Porter's Hypothesis and Pollution Shelter Hypothesis

The Pollution Shelter Hypothesis holds that the operating costs of enterprises increase with the increase of environmental regulation intensity. The high intensity of environmental regulation makes enterprises transfer their industrial organization to regions with relatively weak intensity of environmental regulation, while regions with relatively undeveloped economy hope to obtain more foreign investment and encourage foreign-funded enterprises to enter, thus becoming "pollution refuge".

C. Local Government Competition

Local government competition refers to the competition between different political entities (such as cities, districts and counties) in a region to attract investment, talents and resources. One is the "resource endowment theory". According to this theory, the competitive advantage of local governments depends on their own natural resources. These resources include natural resources, human resources, material resources, etc. Local governments can improve their resource endowments by developing local characteristic industries, optimizing the investment environment and promoting scientific and technological innovation, so as to enhance their competitiveness.

IV. ANALYSIS OF IMPACT MECHANISM

A. Direct Impact Mechanism

● Crowding-out effect

Environmental regulations may have crowding-out effect. From a micro perspective, this means that the increased cost of enterprises to comply with environmental regulations may crowd out investment in other areas, resulting in a decrease in investment in other areas. Macroscopically, enterprises are facing the increase of production cost, which may be passed on to consumers, resulting in the increase of product price, thus affecting consumers' purchase decisions, even affecting the overall inflation level and inhibiting the economic growth in the region. Crowding-out effect is mainly manifested in two aspects, one of which is that in order to comply with environmental regulations to ensure legal production, enterprises often have to purchase inefficient sewage disposal equipment to reduce pollution emissions, which inevitably takes up valuable funds that could otherwise be used for current and future technology research and development. Enterprises do not obtain the core green technology and only rely on the purchase of end-of-life technology-intensive products to meet the environmental

protection standards. Although they can continue to produce and even earn profits in the short term, in the long run, it will reduce the overall competitiveness of the enterprise in the market. On the other hand, due to the crowding out of production costs, the current capital of the enterprise's activities is reduced, and the demand for human resources is reduced, which may cause high-level talents to leave the enterprise and thus produce technology outflow, which is not conducive to the future technology research and development and long-term development of the enterprise and reduces the innovation ability. At this time, the cost of environmental regulation is more crowding out than the ability of green technology innovation, which has a restraining effect on the economic development of the region.

● **Pollution refuge effect**

According to the "Pollution Shelter Hypothesis", after being restricted by strict environmental protection policies, some enterprises with high pollution and high energy consumption may choose to transfer their production to areas with relatively loose environmental protection policies, which can reduce production costs and avoid environmental protection requirements. However, this kind of behavior may lead to the transfer of environmental pollution and resource consumption from one region to another, i.e., the effect of environmental dumping. In this case, the environmental conditions in the areas with strict environmental protection policies are improved, but the areas with larger environmental capacity may bear additional environmental pressure.

● **Green innovation effect**

Environmental regulation, as a key means to solve the market failure, not only increases the operating costs of enterprises, but also potentially promotes the efficiency of green innovation. This is mainly achieved through two effects: innovation compensation effect and compliance cost effect. The innovation compensation effect refers to the environmental regulation prompting enterprises to increase investment in research and development of environmental protection technology, reduce pollution emissions, and improve the efficiency of green innovation, which may lead to profit growth. However, whether this effect is significant depends on whether the innovation revenue can cover the regulation cost. According to the "Porter Hypothesis", moderate environmental regulation can stimulate technological innovation, and its benefits can make up for the increased costs. In the long run, enterprises that increase investment in research and development and improve their innovation ability will be more competitive in the market under environmental regulations. On the other hand, following the cost effect reveals another possible impact of environmental regulation. It points out that environmental regulations will increase the production burden of enterprises and reduce their operating profits, thus weakening their market competitiveness. From a static and short-term perspective, traditional economics believes that environmental regulation may divert investment from production or research and development, adversely affecting corporate profits and innovation activities.

Therefore, in the implementation of environmental regulation, it is necessary to balance the increase in

corporate burden with the promotion of green innovation efficiency to ensure that environmental regulation policies can not only protect the environment, but also promote the sustainable development of enterprises.

B. The Mechanism of Industrial Structure Orientation

The Yangtze River Delta region has always been dominated by manufacturing industry, especially the traditional heavy industry and labor-intensive industry. This single industrial structure is easy to cause problems such as excessive concentration of resources, overcapacity and environmental pollution. At the same time, although the manufacturing industry in the Yangtze River Delta region is large in scale, its innovation and research and development capabilities in the high-tech industry field are relatively lagging behind. This makes the Yangtze River Delta region in the global value chain position is relatively low. Environmental regulation helps to promote the development of green industry and the optimization and upgrading of economic structure. From the perspective of industrial innovation transformation, environmental regulation can promote technological upgrading and production efficiency of enterprises to a certain extent.

In the face of strict environmental constraints, some highly polluting enterprises actively responded to the policy and made use of technological and technological improvements to reduce pollutant emissions. They invest in research and development of more efficient production equipment and systems, the adoption of more environmentally friendly raw materials and energy, or the introduction of cleaner production technologies to minimize the negative impact on the environment. Through these efforts, they not only meet the requirements of environmental regulations, but also improve production efficiency, reduce costs and enhance their competitiveness. However, due to the high cost of pollution control, some pollution-intensive enterprises may not be able to maintain their operations and thus face the risk of being eliminated in the fierce industrial competition. This has led to survival competition among enterprises. Only those enterprises that can adapt to environmental regulations and improve their own environmental protection status can survive in the market. In this way, the surviving enterprises will reallocate production resources and optimize the production structure so that production factors will flow to low-pollution industries. This transformation not only helps to reduce environmental pollution, but also promotes the optimization and upgrading of the local industrial structure.

C. The Impact of Spatial Spillover Mechanism

There are certain regional differences in environmental regulation in the Yangtze River Delta region. This is mainly due to different levels of economic development, industrial structure and environmental conditions in different regions. For example, developed cities such as Shanghai, Nanjing and Hangzhou have relatively strict environmental regulations. These cities have high requirements on the discharge standards of industrial enterprises, the treatment of waste water, waste gas and solid waste, and have increased penalties for environmental violations. Compared with developed cities, some small and medium-sized cities may lag behind in environmental regulation. These areas may be relatively lack of environmental monitoring capabilities and

resources, and relatively weak enforcement of corporate environmental violations. Strict environmental regulations may have an impact on local competitiveness. In some places, stricter environmental protection policies may be introduced to improve the quality of the environment and the living standards of residents. However, such strict environmental regulations often require enterprises to bear higher environmental protection costs, thus affecting the production and operation of local enterprises. In this case, the enterprise may transfer the production to the region where the environmental protection policy is relatively loose, leading to the hollowing out of the industry in the original region and weakening the competitiveness of its local economy. At the same time, the local government can also improve the local competitive advantage through environmental regulation. Some local governments will formulate policies conducive to environmental protection and sustainable development in order to create an external image and attract more investment and talents. At the same time, strict environmental regulations can also promote enterprises to carry out technological innovation and transformation and upgrading, improve the overall industrial level, and enhance the competitiveness of the local economy.

V. CONCLUSION

Based on the literature review on environmental regulation and economic development, this paper analyzes the impact mechanism of environmental regulation on high-quality economic development in the Yangtze River Delta region. First, the enhancement of environmental regulation intensity will have a direct impact on high-quality economic development, namely crowding-out effect, pollution refuge effect and green innovation effect. Second, the strengthening of environmental regulations will indirectly affect the optimization of industrial structure, improve the degree of industrial rationalization, and thus promote high-quality economic development. Third, strict environmental regulations have both positive and negative effects on local competitiveness. Therefore, when implementing environmental regulations, local governments need to comprehensively consider the local industrial structure, resource endowments and development needs, and formulate environmental protection policies in line with the local actual situation. It is hoped that the

above research can produce certain practical significance for the formulation and implementation of environmental policies and economic development in the Yangtze River Delta region.

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFERENCES

- Agbola, F. W. 2014. Modelling the impact of foreign direct investment and human capital on economic growth: Empirical evidence from the Philippines. *Journal of the Asia Pacific Economy*, (2): 272–289.
- Alfred, E. K. 1970. *The economics of regulation: Principles and institutions*. New York: Wiley, 2.
- Huang, G. L., Li, Z. H. 2024. Impact of government investment in science and technology and environmental regulation on high-quality economic development. *China Business Theory*, (07): 152–155.
- Li, X. P., Yu, D. S., Yu, J. J. 2020. Spatial spillover effects of heterogeneous environmental regulations on carbon productivity: Based on spatial dubin model. *China Soft Science*, (04): 82–96.
- Ren, B. P., Miao, X. Y. 2022. Research on the path and support system of the Internet of Things enabling high-quality economic development in the new development stage. *Economic and Management Review*, (03): 14–24.
- Tang, X. B., Wang, Y. N., Tang, X. W. 2020. Research on the evaluation of high-quality economic development in China province. *Scientific Research Management*, 41(11): 44–55.
- Zhang, G. X., Feng, Y. C., Wang, A. L. 2021. Research on heterogeneous effects of different types of environmental regulations on technological innovation of industrial enterprises. *Management Review*, 33(01): 92–102.
- Zhang, J., Kang, L., Li, H. et al. 2020. The impact of environmental regulations on urban green innovation efficiency: The case of Xi'an. *Sustainable Cities and Society*, 57: 102123.
- Zhang, W., Lu, X. W. 2024. Spatial-temporal coupling analysis of environmental regulation, technological innovation and high-quality economic development in Anhui Province. *Journal of Jingchu Institute of Technology*, 39(02): 22–32.
- Zhao, T., Zhang, Z., Liang, S. K. 2020. Digital economy, entrepreneurial activity and high-quality development: Proven evidence from China city. *Management World*, 36(10): 65–76.

Copyright © 2024 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).