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The extension of the Porter hypothesis: Can the role of environmental regulation on economic development be affected by other dimensional regulations?

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ABSTRACT

China's ecological civilization construction is committed to promoting ecological construction and regional development from multiple dimensions, and some scholars have proposed that the role of environmental regulation in the Porter hypothesis may be affected by other regulations. Therefore, this study proposes to expand the Porter Hypothesis from a single environmental regulation to multi-dimensional regulations. We propose the interaction mechanism of different dimensional regulations—economic, social, and environmental—of the ecological provinces in China. Through empirical analysis using provincial panel data for 1999–2016 in China, we made the following observations: First, multi-dimensional regulations of China's ecological province construction have a significant positive impact on regional development, which shows that China's comprehensive construction from multiple dimensions is generally successful. Second, environmental regulation is more likely to play a role through the channel of multi-dimensional regulations, which supports that other dimensional regulations have a significant effect in the Porter hypothesis. Third, environmental regulation may increase costs and have potential inhibitory effects on economic development. It may be an effective way to reduce the negative impact of environmental regulation through matching with other reasonable dimensional regulations. In summary, expanding the Porter hypothesis from single environmental regulation to multi-dimensional regulations is applicable and valuable in China's ecological province construction.

1. Introduction

China is experiencing a huge transformation of its regional development patterns in this new era, in which ecological civilization has a profound influence on green transformation. China is giving full importance to the role of the government and comprehensively advancing the construction of an ecological civilization. In 1999, China carried out the first eco-province construction (EPC) in Hainan, working to officially practicing create an ecological civilization at the provincial level. The content of the EPC comprised three main aspects: economic development, environmental protection, and social progress (Wang et al., 2015). By 2017, China had ratified more than 30 conventions or protocols related to environment protection and had formulated the *Overall Plan for the Reform of the Ecological Civilization Institution* in 2015 (as stated by Minister Li Ganjie of the Ministry of Environmental Protection on October 23, 2017). To avoid devastating environmental problems in the course of development, it is necessary for China to take steps towards environment protection and economic development simultaneously. Therefore, a wide range of measures on sustainable construction is being implemented in China.

In the 1990s, scholars put forward the Porter hypothesis (PH) based on the government's specific actions for sustainable development in developed countries. However, due to China's different stage of development, its purpose and action as a developing

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country are different from those of developed countries. According to the data released by International Monetary Fund, China's per capita gross domestic product (GDP) in 2017 was only 8643 dollars, only 14.5% of that of the United States. Therefore, China's desire for economic development is stronger than that of developed countries. In practice, China's development has always been an extremely important goal, and policymakers attach great importance to the formulation and implementation of environmental regulation and social regulation. At the same time, consultation and cooperation of various government departments is extremely important. From the position of the environmental protection department, it was not until 2008 that the Ministry of Environmental Protection (MEP) officially became a constituent department of the State Council (like the Ministry of Finance). Even in the implementation process, the government's enforcement of economic regulation may be higher than that of environmental regulation. Therefore, it is not enough to consider only the impact of environmental regulation in China, and it is necessary to study the combined effects of related economic and social regulations.

In the context of the worsening environment, China has proposed that the mode of economic growth must be transformed from unsustainability to sustainability and launched a full range of actions. Powerful government regulation plays an important role in the environmental protection in China (Wang et al., 2011). EPC is a major and innovative strategy (or action) in China that involves systematic thinking, and it aims to achieve regional sustainable development (Li, 2004) that is led by the MEP and has a demonstrative significance in China. EPC has been consistently building in the three major areas of environment, economy, and society. The basic requirement of EPC is the coordinated development of the socio-economic and ecological environment. The Chinese government hopes to achieve a win-win result regarding ecological environment as well as achieve competitiveness through the implementation of EPC, and the tie is obviously technological innovation (In 2015, the State Council of China issued *The Opinions on Speeding up the Construction of Ecological Civilization*", which emphasized that scientific and technological innovation should be used to play the central role in the construction of the ecological civilization.). This is the focus of the 'Strong Porter Hypothesis' (Strong-PH), and what this study also aims to test the expansion of Strong-PH. Moreover, the regulations of other departments are likely to affect the implementation of environmental regulations. While implementing environmental regulations, the Chinese government has adopted a series of relevant economic and social regulations to support and jointly promote China's green transformation, which also plays a great role in reality. Therefore, in China's green transformation, the regulations of different dimensions are interrelated systems, and environmental regulation is not independent.

Strong-PH recognizes the impact of environmental regulation on ecological innovation and competitiveness, and gives explanations. However, there are intersections between the regulations of different dimensions in reality, and studying only the impact of environmental regulation is idealized and unobjective. Some scholars also support this view. Kemp's research points out that eco-innovation is likely to be affected by multiple policies, not just environmental regulation (Kemp and Pontoglio, 2011). Bianco and Salies (2016) propose that competition regulation and environmental regulation may reinforce each other. The transformation of a development model is thus a systematic project. The Chinese government also comprehensively promotes green transformation from different dimensions in reality such as the environment, economy, and society. From the regional level, it is obviously not enough to only focus on the impact of environmental regulation, because other regulations can inevitably affect the role of environmental regulation in the reality of coexistence. Therefore, it is valuable to expand the scope of PH, which has important theoretical and practical meaning for green transformation in China. Based on the actual situation in China, this study focuses on the expansion of Strong-PH from a single dimension to multiple dimensions and attempts to analyse the interplay between different regulations; it then examines the existence of the channel effect of multi-dimensional regulations through empirical research on EPC. Channel effect means that factor A can exert an effect on dependent variable Y more significantly through channel B. For example, Zeng (2012) showed that asset price fluctuation (factor A) affects investment behaviour (dependent variable Y) through mortgage value fluctuation (channel B) rather than its own role, in which the mortgage guarantee channel effect existed. To discuss whether environmental regulation can be influenced by other regulations and plays a role through the channel of other dimensional regulations, this study introduces the multi-dimensional regulation channel effect into the research of PH.

The structure of this paper is as follows: In Section 2, we review the progress of EPC and the literature on PH from environmental regulation to multi-dimensional regulations. Then we propose how multi-dimensional regulations interact with each other in practice in China. In Section 3, we describe the selection, calculation methods, and data sources of indicators for multi-dimensional regulation in EPC. In Section 4, we present empirical results that support the existence of the multi-dimensional regulations channel effect. In Section 5, we summarize the main findings of this study and put forward further research thinking.

2. Research background and theoretical basis

2.1. Progress of EPC and the concept of system construction

Ecological civilization is the main strategy for China to promote green transformation and sustainable development. From the level of government, ecological civilization must ultimately achieve sustainable development of the economy, society, and ecology. This covers four major targets: target of the economic system, target of the social system, target of the ecosystem and the overall coordination target (Bian et al., 2004). In academic theory, the complex ecosystem theory advanced by Ma and Wang (1984) is the main guiding theory of ecological civilization construction. The complex ecosystem theory also focuses on the role of the three major aspects of nature, economy, and society as well as their intrinsic links to achieve sustainable development.

China realized the importance of environmental problems in the 1970s, but actually began to focus on environmental issues since the 1980s. In 1983, China put forward that environmental protection was a basic national policy. After the Rio Summit in 1992, China immediately announced the top-ten strategic policies for the environment and development and built the first sustainable development agenda. As the China's major environmental management department, MEP issued the *National Ecological Demonstration Zone Construction Plan (1996~2050)* in 1996, which began to lay out the ecological regional construction. In 1999, MEP approved the first EPC in Hainan Province. In 2003, 2007, MEP issued the pilot and the revised versions of *Ecological County, Ecological City, Ecological Province Construction Index*, as well as put forward the environmental, economic, and social construction goals, in which environment construction was the main one. In 2010, MEP issued *the Opinions on Further Deepening the Work of Demonstration Area of Ecological Construction*, clarifying the construction direction of the ecological industry, resource security, and ecological environment system. Moreover, in 2013, MEP issued the *National Ecological Civilization Pilot Demonstration Zone Indicators (for Trial*