



Content analysis of China's environmental policy instruments on promoting firms' environmental innovation

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ABSTRACT

Environmental policy instruments play an important role in promoting environmental innovation. They can not only solve the problem of externalities in environmental innovation, but also provide support for its development through subsidies, tax incentives, etc. This study constructs an analytical framework from the dimensions of policy type and policy targets of two stages of environmental innovation, and selects 231 environmental policies issued by the Chinese government as well as various ministries and commissions from 1987 to 2016 to promote environmental innovation as the research sample. The results show that the issue of environmental policy is mainly in the form of notification and lacks of authority. The use of market-based instruments is more frequent than that of command-control and information-based instruments. Environmental policy instruments focus on environmental innovation adoption rather than environmental innovation research and development; the use of government procurement, information disclosure and other policy measures are relatively inadequate.

1. Introduction

'Environmental innovation' is new or improved processes, technologies and products that aiming at avoiding or reducing environmental damage (Kemp and Oltra, 2011). Environmental innovation can achieve the goal of clean production, energy-saving and emissions reduction, it becomes an important means to cope with climate change (Doran and Ryan, 2016). However, the "R&D spillover effect" and "positive external environmental effect" of environmental innovation are two important causes of market failure (Jänicke and Lindemann (2010)). In order to mitigate market failure, each country has issued a large number of environmental policies, especially China. Environmental policy can prevent market failure, but there are still problems; for example, some enterprises resist environmental policy or be negative accepted, seek ways to weaken environmental regulation, or focus on the technological innovation of end treatment, which affects the enterprises' competitive advantage. Therefore, analysis of existing environmental policies to identify existing problems can provide a basis for developing reasonable, scientific environmental policy to guide enterprises and encourage them to carry out environmental innovation, and enhance their own competitive advantage (Quitow, 2013).

Many scholars have studied environmental policies aiming to promote environmental innovation, and concentrated on examining their effects by using the proxy variable to represent environmental policies. For example, Brunnermeier and Cohen (2003); Kesidou and Demirel (2012), and Borghesi et al. (2015) studied the effect of environmental policy intensity on environmental innovation using emission reduction costs to represent the intensity of environmental regulation. Costantini

et al. (2015), Desmarchelier (2013), and Veugelers (2012) examined the effect of environmental taxes and subsidies as well as other environmental policy tools on environmental innovation using fuel authorization, R&D expenditure, etc. to represent policy tools. In addition, a few studies have discussed environmental policy explicitly related to environmental innovation. For example, Goulder and Parry (2008) explored the extent to which various pollution control instruments meet the evaluation criteria of cost-effectiveness and distributional equity; Briassoulis (2017) analysed policy integration for complex environmental problems.

Although studies on environmental policy have been rich, there are still three gaps. First, most studies have focused on the impact of environmental policy instruments on environmental innovation using proxy variables to characterize the strength of the environmental policy instruments, while ignoring the inherent characteristics of environmental policy. Second, previous studies have tended to use qualitative methods to analyse the types and development stages of environmental policy, but environmental policy involves many aspects, such as the issuing department, and issuing forms will have an impact on the environmental innovation of enterprises. Therefore, comprehensive analysis of environmental policy is still lacking. Third, previous studies have neglected to combine the different aspects of environmental policy and stages of environmental innovation in a policy framework. For example, whether market-based instruments focusing on environmental innovation's R&D or adoption stage lack a comprehensive analysis.

The objective of this paper is three-fold. First, based on policy instrument theory, this study analyzes environmental policy by incorporating policy instruments and environmental innovation

characteristics into a framework to provide the theoretical framework for the study of environmental policy. Second, the content analysis of environmental policy from the perspective of policy instruments provides reference for public policy analysis, and support of methodology and theory for the construction and implementation of environmental policy. Third, this study attempts to implement policy instrument theory in the field of environmental innovation policy formulation to analyse China’s environmental policy instruments on promoting firms’ environmental innovation over the past thirty years to make up for previous gaps.

2. Methods

2.1. Data sources

Environmental policies related to enterprise environmental innovation were derived from the following sources: public data, mainly from the State Environmental Protection Administration, the Chinese Ministry of Science and Technology, the National Development and Reform Commission and other relevant ministries and commissions; the China Environmental Protection Network, Peking University law database, Lexis Nexis China Online database, etc.; and related environmental policy compilation books.

In order to ensure the comprehensiveness and representativeness of environmental policy selection, this study followed four principles to collect data:

(1) This study only chose environmental policies issued by the State and related ministries, including the National People’s Congress and its Standing Committee, the State Council, the Development and Reform Commission, The State Environmental Protection Administration and the Ministry of Science and Technology, which alone or jointly issued a variety of environmental policies. We did not include environmental policy issued at the provincial level.

(2) As the China Environmental Protection Network, Peking University magic data, etc. did not specifically include the “environmental innovation” classification, we used “eco”, “clean production”, “low carbon”, “pollution control”, “sustainable development” and so on as keywords to retrieve relevant sources.

(3) The forms of policies chosen were mainly laws, regulations, plans, opinions, measures, announcements and notices that directly reflect the government’s attitude towards environmental innovation; reply, approval and industry standards were not included.

(4) After reading the environmental policy documents, policy which did not emphasize the environmental innovation of enterprises was eliminated. In order to ensure the scientific integrity of the policy screening, all three researchers participated.

After the standardization of methodology, 231 environmental policies were selected.

2.2. Policy analysis framework

2.2.1. X dimension: environmental policy instruments

The environmental policy instruments has been classified by most scholars into three or four types. For example, Rogge and Reichardt (2016) divided policies for sustainability transitions into economic instruments, regulation instruments and information instruments; Pereira Sánchez and Vence Deza (2015) divided it into command and control, economic, market or flexible instruments, and voluntary agreements; Jang et al. (2015) classified eco-innovation policies in 17 Asian countries into regulatory instruments, economic instruments, informational instruments, and planning instruments.

Due to planning instruments are not a typical ingredient of environmental policy, and based on the consultation of the national environmental protection department and careful review of policies with consideration to the characteristics of China’s environmental policy, we organized environmental policies into three categories: command and

control, market-based and information-based instruments. Among these, the command and control instruments refer to laws and regulations forbidding pollutant emissions and regulating production processes or products that may affect the environment, which mainly includes environmental laws and environmental standards. Market-based instruments require enterprises to control pollution costs, force enterprises to improve the environment with the minimum cost and encourage enterprises to carry out environmental innovation; these mainly include environmental subsidies, tax incentives, etc. (Stavins, 2003). Information-based instruments require the disclosure of pollution, the establishment of green and environmental protection product standards, and education on environmental protection so that producers consciously implement environmentally friendly behaviour, which mainly include information disclosure and environmental labelling.

2.2.2. Y dimension: environmental innovation stage

As an aspect of environmental policy, environmental innovation activities are important factors that policymakers need to consider. The inherent development law of environmental innovation determines the effectiveness of policy instruments. Therefore, the category of environmental innovation is an important dimension for environmental policy analysis. There are various approaches to categorizing environmental innovation: incremental innovation and radical innovation (Río et al., 2010), active environmental innovation and passive environmental innovation (Chen et al., 2012), and product innovation, process innovation and management innovation (Cheng and Shiu, 2012). Since these categories are not fully embodied in environmental policy, this study focuses on the stages of environmental innovation, dividing it into R&D and adoption stages (Pereira Sánchez and Vence Deza, 2015).

The policy analysis framework is shown in Fig. 1.

2.3. Research methods

The content analysis method combines qualitative and quantitative analysis of text content (Krippendorff, 2012) to clearly analyse essential facts and related trends of relevant topics within the policy text, which has been used by many scholars to analyze the policy. For example, by employing T-LAB software with linguistic and statistical content analysis method, Peng and Liu (2016) analyzed cleaner production policies in China from 1997 to 2013; Liao (2016) explored the evolution of wind energy policies in China from 1995 to 2014.

This paper also used the content analysis method to analyse Chinese environmental policies for promoting enterprise environmental innovation. We used a coding table of “China’s environmental policy on promoting environmental innovation”, for which the analytical categories of the samples include “command and control”, “market”, “information”, “eco-technology R&D”, “environmental innovation adoption”, etc.

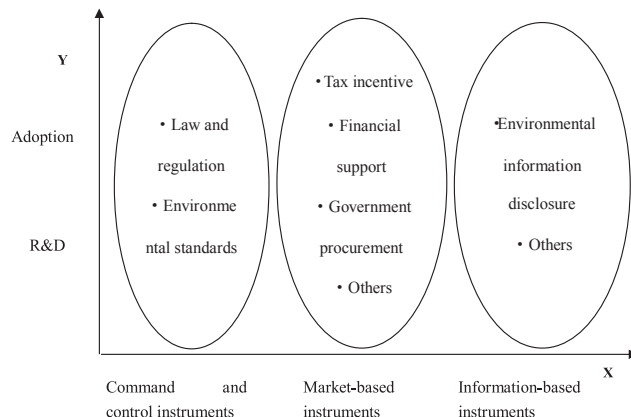


Fig. 1. The policy analysis framework.

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