Economic Systems 37 (2013) 369–386

Contents lists available at SciVerse ScienceDirect

Economic Systems

journal homepage: www.elsevier.com/locate/ecosys

What is the potential impact of a taxation system reform on carbon abatement and industrial growth in China?

Shiyi Chen *

China Center for Economic Studies, School of Economics, Fudan University, China

ARTICLE INFO

Article history:
Received 21 November 2012
Received in revised form 13 March 2013
Accepted 25 March 2013

JEL classification:
H23
Q52
O44

Keywords:
Environmental taxation system
Industrial carbon tax
Marginal abatement cost
Economic and environmental influence

ABSTRACT

Economists have long argued that market-based environmental policy such as an environmental tax is beneficial to abate pollution emissions. This study aims at investigating the impact of carbon tax levy on carbon dioxide (CO_2) abatement and industrial growth in China. To this end, the marginal abatement cost (MAC) of industrial CO_2 emissions is estimated as the benchmark of setting the carbon tax rate by using the directional distance function (DDF). This paper employs the polynomial dynamic panel model to forecast the impact of carbon tax levy on target variables such as sectoral value-added and CO_2 intensity. The results reveal that the levy of a CO_2 tax has a negative impact on industrial output only in the short term. In the long term, the impact of CO_2 tax levy on output will become positive. The levy of a CO_2 tax is always beneficial to reduce CO_2 intensity. Corresponding policy suggestions for an environmental taxation system reform are given in the concluding section.

1. Introduction

To transform the economic development model and challenge global warming, in November 2009 the Chinese state council decided to abate CO_2 emission per GDP, namely CO_2 intensity, by 40–45% until the year 2020 as opposed to the benchmark level in 2005. This is the first time for China to officially release such quantitative carbon abatement goals. Though it is only relative carbon abatement rather than the absolute reduction employed by most other countries, it is still challenging for China to realize due to the country's coal-oriented energy consumption structure, its extensive

* Tel.: +86 21 65642050.
E-mail address: shiyichen@fudan.edu.cn.

0939-3625/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.ecosys.2013.03.001

factor-driving growth model, and so on. Now, the question is how to reform the traditional regulatory environment policy in China in order to successfully realize the new carbon intensity goal.

Traditional environmental policy is normally implemented through the administrative fiats in China. However, economists have long argued that environmental policy must be based more firmly on the use of market-based mechanisms so as to introduce the cost of pollution clearly into economic analysis and impose ceaseless price pressure on the polluters to reduce pollution (Bailey, 2002). Environmental tax and emission right trade are the main instruments of market-based environmental policy, based on the Pigovian Tax and Coase Theory, respectively. Environmental tax, also referred to as ecological or green tax, was first proposed by the British economist Pigou in his book on Welfare Economics, published in 1920. The central idea is to levy a tax on pollution emissions that have a negative externality so as to accurately reflect the social cost of production and internalize the cost into the market price. The tax on a negative externality is termed Pigovian tax and should equal the marginal damage costs. The environmental taxation reform may be understood as a reform process from a sub-optimal taxation system to an optimal one by continuously adjusting or removing the tax distortion effect. It is becoming the issue of a heated debate in the field of international environmental policy (Bosquet, 2000; Patuelli et al., 2005).

Environmental taxes levied in advanced countries, including energy tax, carbon tax, sulfur tax, water pollution tax, solid waste tax, noise tax, etc., have already played an important role in promoting sustainable development, which provides a positive experience of environmental tax reform for China. In fact, as far as known, environmental measures are implemented mainly by collecting pollution fees and less by tax in China. The few taxes are scattered in resource tax, consumption tax, value-added tax, vehicle and vessel tax, etc., and there is no precisely defined environmental tax (Andrews-Speed, 2009). For example, pollution charges have been collected in China since 1982 and currently attain an annual amount of RMB 20 billion yuan, which is just the actual cost of dealing with pollution without including external environmental cost. The resource tax already levied in China serves only to adjust the resource differential income, and does not correlate much with environmental protection. The situation shows the urgency of an environmental taxation reform in China. Of course, this is not to say that such a regulatory environment policy carried out in China is anything but effective. The country achieved a sustained decline of energy intensity in the period 1980–2001, with the largest decline between 1997 and 2001, corresponding with the ownership right reform which then caused the first reduction of total energy consumption accordingly, but this trend is reversed from 2002. Exemplified by the absolute change in CO_2 emission reported in Table 1, relative to the positive growth for almost all industrial sectors between 1981 and 1995, there are 32 sectors among all 38 samples that decreased their CO_2 emissions in the period of the 9th Five-Year Plan. In the same period, the averaged annual output growth attained 12.7%, much greater than the 7.6% averaged over the period 1981–1995. The number of sectors that reduced CO_2 emissions fell to only 9 in the period of the 10th Five-Year Plan (2001–2005) and 6 during the 11th Five-Year Plan (2006–2010).

Factors like the rapid urbanization and industrialization and the update of the consumption structure driven by the fanatical expansion of the housing and car industries attribute to the reappearance of heavy industrialization in China. In 2007, China became the largest emitter of CO_2 in absolute terms in the world, which puts China under continuously increasing pressure from the rest of the world to abate carbon emissions. Though inconsistent with the WTO rules and the spirit of the Kyoto Protocol, there exists the possibility that the developed countries will impose carbon tariffs on imports from countries without mandatory carbon abatement. In this case, as an example of an environmental tax, the levy of a carbon tax is more urgent than other kinds of environmental taxes in China and could be appropriately regarded as a first step to reform the traditional environmental taxation system. Though a carbon tax has been levied in such countries as Finland, Sweden, Norway, the Netherlands, Denmark, and others and performs well in those countries, it is still necessary to analyze its economic and environmental effect in the foreseeable future in China, which is particularly useful for environmental policymakers even though the theoretical foundation of environmental taxation is solid enough. This is the motivation of this study. This paper concentrates on the industry in China because its output, energy use and carbon emission account for most of the state level. In addition, as Jorgenson and Stiroh (2000) denoted, it is essential to disaggregate analysis to the sectoral level to find the true pattern behind the aggregation. Following this, the paper avoids the limitations of