DOES EMISSION PERMITS ALLOCATION AFFECT CARBON COST PASS-THROUGH? A THEORETICAL ANALYSIS

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Overview

Emission trading system (ETS) plays an important role in achieving the emission reduction targets cost-efficiently. Several major CO_2 emission permits allocation methods at firm level are grandfathering, benchmarking and auctioning (Zetterberg et al., 2012). In order to avoid putting domestic carbon intensive industries at a disadvantage relative to competitors in non- or less carbon-constrained countries, policy makers consider free allocation of CO_2 emission permits as an appropriate measure (Alexeeva-Talebi, 2011). However, evidence shows that power firms covered in the EU ETS pass through the CO_2 costs to its electricity prices, resulting in windfall profits (Smale et al., 2006; Sijm et al., 2012). A higher pass-through rate indicates consumers bearing most of the emission costs, a lower rate shows that the emission costs would be mainly undertaken by power firms, subsequently encouraging the investment of carbon-efficient technologies (Nelson et al., 2012; Nazifi, 2015). Past studies show that the degrees of CO_2 cost pass-through rate are influenced by a range of factors, such as definition of the pass-through rate, production supply elasticity and demand elasticity, market structure, the emission intensity, availability of low carbon-emission substitutes and technologies, availability of offsets or international credits, and the extent of government assistance (Sijm et al., 2012; Nelson et al., 2012). The main purpose of this paper is to theoretically analyze the impact of CO_2 emission permits allocation methods on the pass-through rates of CO_2 costs under different product market structures.

The paper is organized as follows: After the introduction, we describe the CO_2 emission permits allocation methods and present a Cournot model, including monopoly and duopoly market. The third section provides the results, including the pass-through rates and the output changes after ETS under different CO_2 emission permits allocation methods and product market structures. Policy suggestions are provided in the final section.

Methods

Cournot model.

Results

First, the CO_2 emission permits allocation method plays an important role in CO_2 cost pass-through rate. The pass-through rates of grandfathering and auctioning are the same, more than that of benchmarking, which reveals that the implementation of the ETS could lead to windfall profits in oligopolistic markets (e.g., power industry), when grandfathering is used.

Second, the degree of CO_2 cost pass-through rate is dependent on the product market structure. Under the constant production cost, linear demand assumptions and Nash–Cournot competition, the more competitive the industry is, the greater the CO_2 cost pass-through rate becomes.

Third, the CO_2 cost pass-through rate is related to carbon intensity of participating industry. In different industries, the high carbon intensity gives rise to production price. In the same industry, the firm with lower carbon intensity will take this advantage to expand its product market share.

Fourth, we also find the abatement strategy is only determined by the carbon price and abatement coefficient of the firm. The carbon price also influences the output of the firm. With the carbon price increases, the output will fall.

Conclusions

CO_2 emissions allocation plays a significant role in determining CO_2 cost past-through rate. Our results suggest that benchmarking rule is a better choice, when the policy makers want to adopt one kind of free allocation method to attract firms to participate in the ETS at the early time. And auctioning rule would be suggested when the ETS is well developed.

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