

EMISSION PERMITS ALLOCATION, MARKET POWER AND COST-EFFECTIVENESS OF ETS—A THEORETICAL ANALYSIS

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Overview

Emissions trading system (ETS) has become an important policy instrument in the post-Kyoto period of climate change ([González-Eguino, 2011](#)). Most of the current carbon markets proved to be successful in helping the corresponding countries and regions reduce CO₂ in a cost-efficient way ([Hahn and Stavins, 2011](#)), while problems were also observed in the existing carbon markets. For example, the carbon price in the first period of EU ETS experienced high fluctuation, consequently the carbon price fell to zero in 2007. And the pilot carbon markets in China emerged market downturn to certain degree with big variation of carbon price (4.2-123 Yuan/ton) and low liquidity in trading market (Only about 2% of the allowances were traded).

Many studies have been devoted to study the possible reasons for high fluctuation and variation of carbon price in carbon markets. The main reasons include over-allocation and market power in carbon market. The over-allocation helps explain why the carbon price fell to zero in the end of the first period of EU ETS. The market power could be the reason why the carbon price was not zero at the beginning of the EU ETS.

The presence of market power in the carbon market can deviates the carbon price from the cost efficient equilibrium price ([Hahn, 1984](#); [Westskog, 1996](#)). If a firm with market power is a likely allowance seller, it has an incentive to act as a monopolist and hold back allowances from the market to drive up allowances prices ([Malik, 2002](#)), and if it is a likely allowance buyer, it has an incentive to act as a monopsonist and buy fewer allowances to keep the price lower ([Hahn 1984](#)). [Hintermann \(2011\)](#) examined the effect of free allocation on price manipulation with market power in both product and permit market from theory and practice point of view. [Hintermann \(2017\)](#) showed that some firms' excess allowance holdings were consistent with strategic price manipulation even if the dominant firm perceives market power in the permit market alone.

Since the market power depends critically on the initial allocation, it is possible that the allocation method affects the carbon price and allowance trading quantity. The main purpose of this paper is to theoretically analyze the impact of CO₂ emission permits allocation methods on the cost-effectiveness of ETS from the perspective of market power.

The paper is organized as follows: After the introduction, we describe the CO₂ emission permits allocation methods (grandfathering, benchmarking and auctioning). Then we present a Stackelberg model in carbon market when a single firm has market power and the rest of the firms in the market are price taker. The third section provides the results, including the efficiency loss in the carbon market under different CO₂ emission permits allocation methods. Policy suggestions are provided in the final section.

Methods

Stackelberg model.

Results

First, the CO₂ emission permits allocation method plays an important role in the cost-effectiveness of ETS from the perspective of market power.

Second, the market power is highly dependent on the initial allocation permits when the emission permits are allocated by grandfathering. The more the initial allocation permits deviate the emission, the more the efficiency loss occurs in the carbon market.

Third, when benchmarking is adopted in emission permits allocation, only the benchmark is set close to the emission intensity of the firm, the cost-effectiveness of ETS can be approached. Since it is impossible, the application of benchmarking rule would affect the cost-effectiveness of ETS.

Fourth, considering market power, resulting from free initial allocation, may lead to market distortion, the auctioning is the most efficient allocation method. Given the proper carbon price, the market equilibrium in a cap-and-trade system will be cost-effective.

Conclusions

CO₂ emission permits allocation method plays an important role in the cost-effectiveness of ETS from the perspective of market power. Our results suggest that grandfathering 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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