[MANIPULATION VIA ENDOWMENTS-AN ALTERNATIVE APPROACH TO CHARACTERIZE THE STRATEGIC BEHAVIOR IN THE PERMIT MARKETS]

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Overview

This article points to a current research direction which establishes an appropriate model to describe the interaction among economic agents in an emissions trading scheme (ETS). Specifically, the strategic behavior of all agents included in an ETS is described as manipulation via endowments, i.e., initial allowances. Therefore it is no longer necessary for us to distinguish price-takers from strategists in the market, as in the traditional Hahn-Westskog model. Then we build an alternative dynamic model, named the MvE (Manipulation via endowments) game model to emissions trading, drawing on noncooperative equilibrium theory for exchange economies. A framework for this two stage noncooperative-cooperative game model is provided in this article. We first give the sufficient conditions for existence of uniqueness of Cournot-Nash-Walras equilibrium in this dynamic game. Then we also propose the approach to solving the coalition game at the second stage, as well as the whole dynamic game. Finally, we give a case study to discuss the allowances trading among the regions in China, when the declared eight key sectors are included in the upcoming national ETS. The relevant abatement cost curves are generated in an aggregated approach based on data derived from the computable generalized equilibrium (CGE) model. The numerical case study results confirm the validity of our economic model to characterize the strategic behavior of the agents in an ETS.

Methods

MvE (Manipulation via endowments) game model, a two-stage game model with complete information is proposed to characterize the strategic behaviors of the agents included in an allowance market. In details, at the first stage, each agent simultaneously chooses its new endowments, without any concern for overall efficiency or cooperation; at the second stage, each agents are engaged in allowances trading when they have commited their respective endowments.

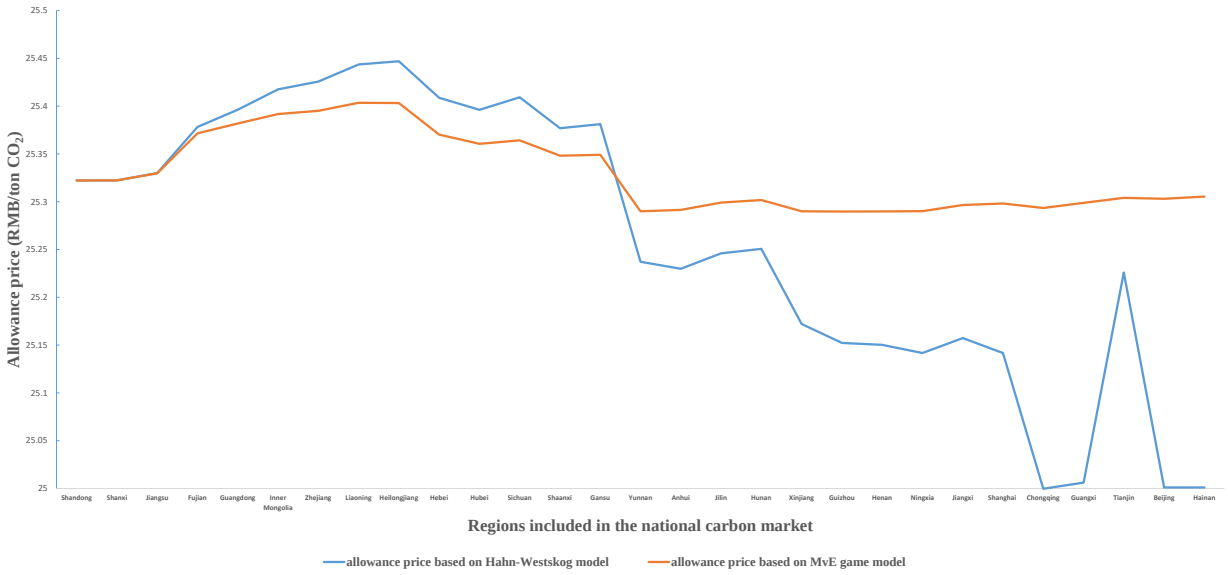
Therefore, since we have proved the exisence and uniqueness of the Cournot-Nash-Walras (CNW) equilibrium in this game, the backward induction method is proposed to determine the final results of the game. The progame associated with the coalition is also considered to compute the core solution at the second stage of the game model.

Furthermore, the regional abatement cost curves in China, generated in an aggregated approach based on the derived from the CGE model, are chosen to give the simulation about the strategic behaviour of the agents in the carbon market.

Results

We have proved that a unique CNW equilibrium exists in our MvE game model.

Furthermore, our numerical case study results confirm the validity of our game model to characterize behaviours of the agents in an ETS. The changes in equilibrium allowance price when more regions included in the national carbon market, in decreasing order of their market power, are presented in the following figure. Then we find that there exists less pronounced effect from the enlargement of strategic set on the equilibrium allowance price in our MvE gane model, relative to the Hahn-Westskog model. Then prices are less dependent on the behavioural model of each agemt in our model.



Conclusions

First, we have proposed a MvE game model to chactraterize the strategic behaviour of the all gents in an allowance market. It is no longer necessary for us to distinguish price-takers from strategists in the market based on this model.

Second, we have found that a strategic allowance seller has a lower final MACs than the equilibrium allowance price, while a strategic allowance buyer faces a final MACs higher than the equilibrium allowance price in our MvE game model.

Third, our case study results indicate that there will exist a relatively obvious effect from the regional market power in the upcoming national carbon market in China.

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