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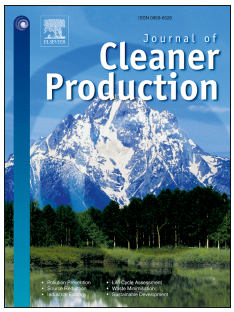

The effect of governmental policies of carbon taxes and energy-saving subsidies on enterprise decisions in a two-echelon supply chain

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Highlights:

- Study the effect of the government subsidies and carbon tax on the decisions of supply chain members.
- The energy-saving subsidies stimulate reduction of carbon emissions and energy consumption
- Government should levy carbon taxes against manufacturers according to their pollution levels.
- Blind levying of a perceptibly high carbon tax may generate counter-productive effects.
- A carbon-cost-sharing contract is proposed to improve energy savings and emissions reductions.

The effect of governmental policies of carbon taxes and energy-saving subsidies on enterprise decisions in a two-echelon supply chain

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Abstract: Many countries have implemented carbon taxes to reduce carbon emissions, and provided subsidies for products that consume less energy. These governmental policies force manufacturing enterprises to emit less carbon during production and develop more energy-saving products. To examine how carbon taxes and energy-saving products subsidies affect enterprises' operational decisions, this study considers a manufacturer–retailer channel in which the manufacturer has the options to design a product to emit less carbon during production and use less energy when the product is consumed by customers. It is showed that governments' energy-saving products subsidies stimulate reduction of carbon emissions and energy consumption, but this is not always true for carbon taxes, government should levy carbon taxes against manufacturers according to their pollution levels. Both carbon tax and subsidy policies can promote energy conservation and emission reduction if the initial carbon emission level of a manufacturer is low, but they have different promotional effects. Finally, in order to ensure the supply chain members cooperate and realize larger energy savings and emissions reductions, we propose a carbon-cost-sharing contract.

Keywords: Carbon emissions; Carbon tax; Energy saving subsidy; Supply chain

1 Introduction

With the gradual development of global warming and increasing scarcity of resources, environmental protection has become a matter of great concern to the international community (Friedler, 2010; De et al., 2016; Choudhary et al., 2017; Hariga et al., 2017). In such a context, energy saving and emission reduction have become important means with which to promote sustainable development in the global economy, and countries around the world are actively taking a wide range of measures (Varbanov et al., 2015; De et al., 2017; Wu et al., 2017). With regard to energy saving, this paper considers energy-saving products, which consume less energy than usual when used by consumers, such as inverter air conditioners, flat-panel TVs, and so on (Zhou and Huang, 2016). To encourage both production and purchase of energy saving products, governments provide financial subsidies. For example, the United States Government offers a federal subsidy programme for electric vehicles, and consumers can receive a one-time bonus of up to a maximum of $7500 (USD) upon purchasing (Helveston et al., 2015). Similarly, China has implemented people-benefit projects for consumers who purchase efficient energy-saving products including inverter air conditioners and liquid crystal televisions (Zheng et al., 2016). Furthermore,