Using game theory for analysing pricing models in closed-loop supply chain from short- and long-term perspectives

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Abstract

Closed-loop supply chain (CLSC) management is an environmental approach to supply chain management that aims to prevent hazardous material from entering the nature by means of creating a reverse flow. This paper studies the short- and long-term behaviour of agents in implementing the appropriate collecting strategy in a two-echelon CLSC. In short-term, based on the Stackelberg game, several novel pricing models for different collecting strategies are proposed and compared. Then, the optimal policies of the pricing decisions are determined for each model. The long-term behaviour of companies in implementing collecting process is examined by evolutionary game theory and the most stable strategy is selected. Furthermore, a numerical example is presented to compare the different collecting structures. Finally, a managerial insight is provided to indicate the effect of key parameters such as remanufacturing rate, marketing elasticity and government subsidies on selecting the appropriate strategy.

Keywords: closed-loop supply chain, pricing models, Stackelberg game, evolutionary game

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