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Research on Supply Chain Coordination Mechanism Considering Government Low-Carbon Subsidies

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Abstract

The low-carbonization of supply chains has become an important direction for business development. Meanwhile, government low-carbon subsidies help to build low-carbon supply chains. Low-carbon supply chains not only can reduce operating costs, but also can effectively cope with the risks of increasingly strict carbon emission policies. This paper takes a two-level supply chain system composed of a single upstream supplier and a single downstream manufacturer as the research object. Using the Stackelberg game model, considering government low-carbon subsidies and the carbon reduction level of supplier, the research is conducted on the supply chain coordination mechanism. The manufacturer purchases raw materials from the supplier based on market demand and sells the products to the final market. We studied three supply chain contract models: the cooperative contract model in a cooperative situation, the profit margin contract model and profit-sharing contract model in a non-cooperative situation. We studied decision-making issues such as carbon reduction level, wholesale prices, retail pricing, order quantity, and the expected profit of the supply chain system. Then, we analyzed and compared the impact of low-carbon subsidies on carbon reduction level, order quantities, and the expected profit of the supply chain system. Numerical analysis shows that government low-carbon subsidies are directly and effectively effective in improving the carbon reduction level, order quantity, and profit of the supply chain. At the same time, the research shows that among these three contracts, the profit-sharing contract model can achieve supply chain coordination in a non-cooperative situation.

Keywords: Coordination Mechanism; Game Theory; Low-Carbon Subsidies; Supply Chain