

# Cooperative Emission Reduction Decision-making in Supply Chain Under the Difference of Carbon Quota Trading Paths

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## **Abstract**

In recent years, the greenhouse effect has been intensifying, carbon emission reduction policies have been tightened, and the pressure on carbon emission reduction of enterprises has increased. Under the low-carbon background, how the upstream and downstream enterprises of the supply chain carry out carbon trading path selection and carbon emission reduction input decision-making is the main issue related to the interests of the supply chain. To study the carbon emission reduction decision-making and cooperative emission reduction willingness of supply chain enterprises, we constructed the Stackelberg game model of supply chain member enterprises only in the external carbon market trading and internal and external carbon trading paths coexisting situation, and obtained the optimal cooperative carbon emission reduction strategy of enterprises in different situations, and analyzed the conditions of enterprises' internal and external carbon quota trading, and the relationship between internal and external carbon trading prices and carbon emission reduction decision-making and cooperative emission reduction willingness of supply chain member enterprises. The study analyzes the conditions for enterprises to trade internal and external carbon allowances, the relationship between internal and external carbon trading prices and the carbon emission reduction willingness of supply chain members, and provides theoretical basis for the upstream and downstream enterprises in the supply chain to formulate their carbon trading path selection strategies and carbon emission reduction decisions. The study shows that when enterprises only trade in the external carbon market, their emission reduction behavior will prompt other enterprises to reduce emissions as well, and suppliers are more sensitive to the trading price in the external carbon market. Under the coexistence of internal and external carbon trading paths, the carbon emission reduction rate of enterprises is positively proportional to the trading price in the external carbon market, and internal carbon trading will increase the wholesale price of intermediate products and reduce the profit of manufacturers and their willingness to trade internally; the carbon emission reduction rate of enterprises is inversely proportional to the price of internal carbon trading, and trading carbon quotas internally and externally will reduce the wholesale price of intermediate products and increase the profit of manufacturers, and the price of carbon trading will be lower than the price of intermediate products and increase the profit of manufacturers. When the internal and external carbon trading price meets certain conditions, the willingness of enterprises to cooperate in emission reduction rises.

## **Keywords**

Supply Chain Management, Cooperative Carbon Emission Reduction, Carbon Trading Pathways, Carbon Trading Prices