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EVOLUTIONARY GAME ANALYSIS ON CARBON REDUCTION STRATEGY FOR ENTERPRISES UNDER CAP-AND-TRADE POLICY

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Abstract

With the increasing adoption of market-based cap-and-trade policies in countries such as China, Korea, Japan, and several European nations, enterprises worldwide are placing greater emphasis on environmental protection. Concurrently, enterprises' investments in emission reduction have attracted growing attention from consumers, who are increasingly willing to pay premiums for low-carbon products. This paper develops a dual-layer game-theoretical model under the cap-and-trade framework. At the micro level, a static game is employed to examine individual enterprises' decisions on product pricing and emission reduction strategies. The outcomes from this stage are used to construct the payoff matrix for the macro-level evolutionary game. At the macro level, an evolutionary game approach is applied to analyze the dynamic behavior and strategic evolution of enterprise groups over time, as well as the stability of equilibrium states. An empirical analysis is conducted to derive managerial and policy implications. The findings suggest that cap-and-trade mechanisms can effectively incentivize multiple enterprises to adopt emission reduction strategies, particularly by enhancing long-term behavioral convergence toward low-carbon practices.

Key words: cap-and-trade policy, carbon reduction, evolutionary game, low-carbon preference

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