Evolutionary game analysis of green innovation in E-commerce closed-loop supply chain WEEE recycling

Ma, R.M.[a], Yao, L.F.[b], Wang, H.[c,*]

[a]School of Management, Guangzhou University, Guangzhou 510006, P.R. China
[b]School of Geography and Tourism, Guangdong University of Finance and Economics, Guangzhou 510320, P.R. China
[c]School of Finance, Guangdong University of Finance and Economics, Guangzhou 510320, P.R. China

A B S T R A C T

The accumulation of waste electrical and electronic equipment (WEEE) has become a critical global issue. E-commerce platforms offer new opportunities for WEEE recycling, making it a subject of interest for researchers. This study focuses on the E-commerce Closed-Loop Supply Chain (E-CLSC) WEEE recycling system, led by remanufacturers, and develops a dual-sided evolutionary game model with remanufacturers and platforms as participants. The model considers the influence of factors such as green innovation, service level, recycling price, and government subsidies. A profit matrix is constructed to analyze the strategic choices of remanufacturers and platforms. Then, this paper conducts a simulation using MATLAB, obtaining data based on the sales and recycling prices of smartphones. Based on evolutionary numerical analysis, the following findings were obtained: (1) Government subsidy policies are formulated based on the required investments for green innovation and service levels, which differ at each stage. (2) The decision of whether remanufacturers engage in green innovation depends largely on the extent to which the technology can reduce remanufacturing costs. They are more inclined to choose green innovation if it can significantly lower costs. (3) Consumer sensitivity to recycling prices also influences the strategic choices of remanufacturers. The more sensitive consumers are to prices, the more waste products remanufacturers can recycle, making green innovation more attractive.

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