

The Choice of Sustainable Coproduction Technology in A Supply Chain

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Abstract

Coproduction is recognized as a sustainable technique that promotes the optimal use of resources. It does this by extracting value from leftover materials that would otherwise be wasted in traditional manufacturing processes. However, the sustainability of coproduction technology in supply chains remains uncertain, subject to fluctuations in suppliers' raw material prices. In this paper, we model a decentralized supply chain consisting of a raw material supplier and a coproduction manufacturer and investigate how the interaction between these players affects economic and environmental performance of coproduction. We find that manufacturers should consider adopting coproduction technology when the size of the green consumer segment is either relatively small or significantly large. This result offers novel insights into the choice of coproduction technology within a supply chain, particularly considering that a significant motivation for manufacturers to embrace coproduction is to capture value from green consumption. We also find, when the size of green consumer segment is sufficiently large, the supplier can benefit from coproduction by raising the wholesale price for raw materials; and in this case, coproduction creates a win-win outcome for both the supplier and the manufacturer. Finally, we find coproduction technology is not always beneficial to the environment. The manufacturer may produce large quantities of coproducts due to high demand from green consumers, leading to increased total material consumption and waste generation.

Keywords: Coproduction, sustainable operations, supply chain management, environmental performance, game theory