The Impact of Dual-Fairness Concerns Under Different Power Structures on Green-Supply-Chain Decisions

Tianjian Yang, Beijing University of Posts and Telecommunications, Beijing, China
Guangdong Liu, Beijing University of Posts and Telecommunications & Fuyang Normal University, Beijing, China
Yao Wei, Fuyang Normal University, Fuyang, China
Xuemei Zhang, Fuyang Normal University, Fuyang, China
Xinglin Dong, Shandong University of Science and Technology, Qingdao, China

ABSTRACT

By analyzing the impact of different fairness concerns on a green supply chain, this study determines the optimal decisions under different power structures and conducts a comparative analysis of them. The findings of this study are summarized as follows: 1) under the manufacturer-dominated structure, retail price, wholesale price, product greenness, the manufacturer’s profit, the total profit of the supply chain, the manufacturer’s utility, and the retailer’s utility are all negatively correlated with fairness concerns, but positively correlated with the retailer’s profit; 2) under the retailer-dominated structure, fairness concerns have no impact on retail price, product greenness, or the total profit of the supply chain, are positively correlated with wholesale price and the manufacturer’s profit and utility, and are negatively correlated with the retailer’s profit and utility; 3) under the Nash equilibrium structure, fairness concerns have no impact on the green supply chain.

KEYWORDS

Different Power Structures, Dual-Fairness, Green Supply Chain, Manufacturer’s Fairness Concern, Retailer’s Fairness Concern, Stackelberg Game

INTRODUCTION

Consumers’ rising green consciousness and global green barriers provide an impetus for the rapid development of green supply chains and significantly improve social environments. This also compels manufacturers to make an investment towards launching green products to gain a competitive advantage. However, their improvements in green technologies incur additional costs in green investment but fail to maximize their benefits and even aggravate the tensions between manufacturers and retailers. Hence, the balancing of green investment and profit allocation has become the focus of fairness concerns between manufacturers and retailers.

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Fairness concerns are a universal phenomenon in peoples’ daily lives. For example, people may care about their greater workload and longer working hours but lower pay compared to their colleagues or others. This may arouse a sense of unfairness and negative moods, reducing their work efficiency (see Ho et al., 2009, 2014). Similarly, fairness concerns also exist in commercial transactions. For example, Xuzhou Wanji Trading Co., Ltd. terminated their cooperation with Procter & Gamble due to unfair pricing (see Li et al., 2018). Chrysler, a leading automobile manufacturer, treated their distributors unfairly through price discrimination, reducing the performance and consequently the competitiveness of their supply chain (see Nie and Du, 2017). Therefore, fairness concerns have a non-negligible impact on the optimality of decisions. In particular, under different game structures, fairness concerns will vary with the rights and statuses of dominators and followers.

Based on the analysis above, we raise the following questions: 1) Under different power structures, what are the differences in the impact of fairness concerns on green-supply-chain decisions? 2) Do different fairness concerns have any impact on the overall benefits of a green supply chain? 3) Do fairness concerns make any difference to a green supply chain?

To address the above questions, we build a two-tier green supply chain comprising risk-neutral manufacturers and retailers. In this green supply chain, market information is symmetrical, manufacturers assume the cost of green investment and determine the wholesale price and “greenness” of green products, and retailers sell the green products to consumers at retail price. This system uses Nash bargaining as the reference point and game models to comprise the three structures (i.e., manufacturer-dominated, retailer-dominated, and Nash equilibrium) and determines the optimal retail price, optimal wholesale price, and product greenness under the three scenarios (i.e., retailer’s fairness concerns, manufacturer’s fairness concerns, and no retailer’s or manufacturer’s fairness concerns). Hence, it is able to analyze the impact of fairness concerns on supply chain decisions under different power structures.

This study makes the following contributions: 1) using Nash bargaining as the reference point of fairness, this study analyzes two scenarios (i.e., the manufacturer has fairness concerns and the retailer has fairness concerns); and 2) this study analyzes the impact of different fairness concerns on green-supply-chain decisions under three structures of rights. Basically, existing related literature considers only one or two of the three structures of rights. In addition, the cost of green investment distinguishes a green supply chain from a traditional supply chain.

The remainder of this paper is organized as follows: Part 2 provides a literature review; Part 3 describes the green-supply-chain models based on Nash bargaining; Part 4 analyzes the impact of different fairness concerns on supply-chain-optimal decisions under three structures of rights; Part 5 compares the supply-chain-optimal decisions under three structures of rights; Part 6 describes a numerical simulation and provides verification by calculating examples; Part 7 provides a summary and specifies key points for subsequent studies.

LITERATURE REVIEW

There are three types of literature associated with this study: 1) literature on green-supply-chain management; 2) literature on the impact of structures of rights on supply-chain decisions; and 3) literature on the impact of fairness preferences on green supply chains.

Regarding green-supply-chain management, there are large quantities of research that mainly focus on carbon emissions, green product design, and governmental intervention. Jiang and Chen (2016) studied a two-tier supply chain comprising one low-carbon manufacturer and one retailer, built centralized and decentralized supply-chain models considering consumer behavior and carbon trading, analyzed the optimal price, production volume, carbon trading, and green investment ratios under the two models, and carried out supply-chain coordination through an income- and cost-sharing contract. Wang et al. (2016) studied two-tier supply-chain coordination in a low-carbon environment, analyzed equilibrium decisions in a retailer-dominated game model for carbon abatement, and carried
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