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Warranty Costs Sharing in a Supply Chain

Abstract: We consider a supply chain where a buyer (manufacturer) sources a component from multiple suppliers. The buyer uses the component to make a product that she sells to end customers. When the component fails in the field, warranty costs are incurred. We are interested in understanding how the way the warranty expenses are shared among the buyer and the suppliers impacts supply chain decisions and profits. In particular, two sharing rules are considered. One is the Equal Sharing Rule (ESR), whereby the buyer pays for a fixed percentage of the total warranty expenses with the remainder equally shared by the suppliers. The other is the Target Sharing Rule (TSR), whereby the buyer still pays for a fixed percentage of the total warranty costs but the rest of the warranty expenses are charged back to the originating suppliers of the defective components. The suppliers each exert efforts to improve the quality of their product. Such efforts not only reduce the total warranty costs but also generate larger market shares for the effort-exerting suppliers. Therefore, the suppliers are engaged in a multi-person game where each supplier independently chooses his quality-improvement effort. Based on the equilibrium outcomes of the suppliers' game under both sharing rules, we provide conditions under which the buyer prefers one sharing rule over another. We also show how the comparison between the sharing rules changes if the buyer can set the wholesale price to maximize her own profits. Finally, we compare the performance of the decentralized supply chain with the centralized scenario and provide conditions for supply chain coordination through proper warranty costs sharing and wholesale pricing. Numerical examples are used to illustrate various sensitivity analyses.