

## Supply Chain Analysis with Product Returns: Pricing and Quality Decisions

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**Abstract :** Wal-Mart has allocated considerable human resources for its quality assurance program, in which the largest retailer serves its supply chains as a quality gatekeeper. Asda Stores Ltd., the second largest supermarket chain in Britain, is now investing £27m in significantly increasing the frequency of quality control checks in its supply chains and thus enhancing quality across its fresh food business. Moreover, Tesco, the largest British supermarket chain, already constructed a quality assessment center to carry out its gatekeeping responsibility. Motivated by the above practices, we consider a supply chain in which a retailer plays the gatekeeping role in quality assurance by identifying defects among a manufacturer's products prior to selling them to consumers. The impact of a retailer's gatekeeping activity on pricing and quality assurance in a supply chain has not been investigated in the operations management area. We draw a number of managerial insights that are expected to help practitioners judiciously consider the quality gatekeeping effort at the retail level. As in practice, when the retailer identifies a defective product, she immediately returns it to the manufacturer, who then replaces the defect with a good quality product and pays a penalty to the retailer. If the retailer does not recognize a defect but sells it to a consumer, then the consumer will identify the defect and return it to the retailer, who then passes the returned 'unidentified' defect to the manufacturer. The manufacturer also incurs a penalty cost. Accordingly, we analyze a two-stage pricing and quality decision problem, in which the manufacturer and the retailer bargain over the manufacturer's average defective rate and wholesale price at the first stage, and the retailer decides on her optimal retail price and gatekeeping intensity at the second stage. We also compare the results when the retailer performs quality gatekeeping with those when the retailer does not. Our supply chain analysis exposes some important managerial insights. For example, the retailer's quality gatekeeping can effectively reduce the channel-wide defective rate, if her penalty charge for each identified defect is larger than or equal to the market penalty for each unidentified defect. When the retailer implements quality gatekeeping, the change in the negotiated wholesale price only depends on the manufacturer's 'individual' benefit, and the change in the retailer's optimal retail price is only related to the channel-wide benefit. The retailer is willing to take on the quality gatekeeping responsibility, when the impact of quality relative to retail price on demand is high and/or the retailer has a strong bargaining power. We conclude that the retailer's quality gatekeeping can help reduce the defective rate for consumers, which becomes more significant when the retailer's bargaining position in her supply chain is stronger. Retailers with stronger bargaining powers can benefit more from their quality gatekeeping in supply chains.

**Keywords :** bargaining, game theory, pricing, quality, supply chain

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