



Product returns, asymmetric information, and firm performance

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ABSTRACT

There has been a scarcity of research that studies the value of product return information to supply chain firms. In this research, we assume that the online retailer has the product return information but the manufacturer does not. Our results show that a two-part price contract can motivate the online retailer to share its private information only under certain condition, but the revenue sharing contract plus profit split mechanism always is a valuable strategy to be utilized to seek sharing the online retailer's private information and create a Pareto result. Particularly when the product is highly compatible with online sales, the manufacturer has a strong motivation to seek sharing the online retailer's information. A follow-up empirical study investigates what information can be used to predict product returns and is valuable to be shared with the manufacturer. Through sharing the product return information, both the manufacturer and the online retailer can achieve a higher performance.

1. Introduction

“Product returns” is an essential aspect of consumers’ post-purchase decision-making processes. As online shopping becomes more commonplace, the return policy is a critical part of doing business in the market today. Unlike visitors to brick-and-mortar stores, online consumers don’t have the chance to touch or physically inspect the product before buying it. Allowing consumers to return the products protects consumers who experience product misfit, a wrong order, and other problems. Having a well-thought-out return policy is the key to attracting and keeping consumers (Rogers and Tibben-Lembke, 1999). A lenient return policy potentially increases consumers’ willingness to purchase the products (Chu et al., 1998) and leads to more product purchases, which in turn creates a competitive advantage for firms. However, product returns also increase monetary costs for companies. According to Stock et al. (2006), the value of products consumers returned to online retailers exceeds \$100 billion each year in the US market. Therefore, the return policy is a set of tradeoffs for a firm - a generous return policy can increase sales revenue by inducing more consumers to purchase but it also increases the quantity of product returns and leads to substantially higher costs. As a result, accurate information on product returns becomes critically important to firms.

As an efficient tool in improving information accuracy, information sharing between supply chain players is becoming increasingly prevalent. In the business market, Amazon has benefited from sharing its information with the suppliers to provide the customers with product

availability and order processing to save time and reduce inventories (Chopra and Meindl, 2001). The CD retailer Spun.com has been implementing information sharing with its wholesale distributor Alliance Entertainment Inc. to fulfill the online orders. However, there has been a scarcity of research that investigates the important topic – sharing the retailer's private information about consumers’ product returns. Only few research addresses information sharing about consumers’ product returns in the current literature. Chen and Bell (2013) show that the manufacturer and the retailer can decide whether or not to share the consumer returns information when different market structures (Stackelberg and vertical Nash) are considered. However, they didn’t consider the effect of return policy on market demand and the influence of return policy on product returns. More importantly, prior research did not empirically address what specific and valuable consumer return information can be shared, while we do.

In this study, we consider a manufacturer-online retailer supply chain in which the online retailer offers a return policy to consumers and in the meantime, the manufacturer offers a buyback policy to the online retailer to buy back the returned products. Our research focuses solely on the products with the return policy. The products without the return policy (e.g., final sales products, online fresh foods, etc.) are not the focus of our research. We assume that the online retailer has the private information about product returns but the manufacturer does not. Consequently, asymmetric information about product returns exists between the manufacturer and the online retailer. Asymmetric information could play a negative effect on the performance of supply

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chain (Mukhopadhyay et al., 2008; Yan and Pei, 2015). Hence, the manufacturer would like to use a two-part price contract or revenue sharing contract plus profit split mechanism to motivate the online retailer to share its private information. When the manufacturer seeks sharing the online retailer's private information about product returns through two-part price or revenue sharing plus profit split mechanism, the important questions arise:

- (a) Is it beneficial for the manufacturer to seek sharing the online retailer's private information about product returns?
- (b) Is the online retailer willing to share its information with the manufacturer?
- (c) How does the product compatibility to the web, which measures the extent of synergy between the characteristics of a product and the Internet (Yan and Bhatnagar, 2008), influence the value of information sharing?
- (d) If the manufacturer benefits from sharing the online retailer's private information but the online retailer would not, what effective mechanism can be utilized to motivate the online retailer to implement information sharing arrangement, and thus achieve a win-win result?
- (e) Once the online retailer agrees to share its private information with the manufacturer, what specific and valuable information can be shared with the manufacturer?

In our research, we employ both analytical and empirical models to examine these questions and provide important managerial implications to business managers. With valuable information about product returns at hand, business managers can establish optimal strategies, improve decision-makings, and benefit from it.

The reminder of this article is organized as follows. We review relevant literature in Section 2 and present research structure in Section 3. In Section 4, various scenarios are analyzed and the results are discussed. An empirical study to examine the determinants of product returns is included in Section 5. Implications, limitations, and future research are presented in Section 6. All relevant proofs are given in the Appendices for clarity of exposition.

2. Literature review

2.1. Return policy

Substantial research investigated consumers' responses to retailer's return policy. For example, Pfau (1997) showed that consumers who have been exposed to disconfirming information from poor product performance or negative advertisements will tend to reverse their decisions by returning the products. Davis et al. (1998) revealed that consumers will be more likely to return the product if the residual consumption value after trial is less than or equal to consumers' value from claiming the refund. Wood (2001) investigated the effect of a retailer's return policy on an online consumer's purchase decision, and found that a generous return policy motivates a consumer to place an online order. Mukhopadhyay and Setoputro (2005) found that both the consumers and the internet firm can benefit from a return policy when consumers buy the build-to-order products. This is because product returns could positively affect consumer's future buying behavior and increase consumer's future value to the firm (Venkatesan and Kumar, 2004; Petersen and Kumar, 2009). Bonifield et al. (2010) conducted an experiment study to find that high-quality e-tailers use lenient return policies as signals to consumers for non-consumable products, however, such signals don't hold for consumable products. Hjort and Lantz (2016) investigated the returns policy of an online fashion retailer in Sweden and showed that from the perspective of long-term profitability, full refund returns policies without any charge may not benefit the online fashion retailer all the times. Saha et al. (2016) considered how to collect the used products from the customers effectively in a

dual-channel closed-loop supply chain and showed that the manufacturer can use a three-way price discount mechanism to do the collection and create a Pareto result for all channel members. However, there are a couple of significant differences between our research and the aforementioned studies. First, the aforementioned studies did not consider the manufacturer's buyback policy, while we do. Second, unlike the aforementioned studies that focused on product returns with complete and symmetric information, we focus on asymmetric information about product returns, study what type of contract can be utilized as an effective incentive to motivate the online retailer to share its private information, and empirically identify what specific information is valuable for sharing.

2.2. Asymmetric information

A number of studies on information sharing in the supply chain management literature identified benefits relating to inventory and replenishment. For example, Gavirneni et al. (1999) discussed shared information of inventory policies between a manufacturer and a retailer to estimate the savings of the manufacturer as a result of information sharing. Cachon and Fisher (2000) investigated the value of information sharing between one manufacturer and multiple identical retailers. They found that information sharing led to savings due to a reduction in lead time and batch size. Lee et al. (2000) studied the value of information sharing in a two-level supply chain and found that information sharing can provide significant inventory reduction and cost savings. Ha (2001) found that the optimal order quantity is smaller and the optimal price is higher in the environment of information asymmetry than those in the environment of complete information. Raghunathan and Yeh (2001) revealed that information sharing about inventory data is beneficial to both the manufacturer and its retailers in the context of continuous replenishment program. Guo and Iyer (2010) investigated the information acquisition and sharing in a vertical manufacturer-retailer channel structure and found that the manufacturer has a motivation to acquire more information about customer preferences and demand under a voluntary sharing mechanism. Hosoda et al. (2015) studied the effect of information sharing, random yield, correlation, and lead times in closed loop supply chains (CLSC) with the consideration of the advance notice of product returns and showed that the manufacturer does benefit from the adoption of information sharing about product returns and reduced lead times. Schenkel et al. (2015) examined how to create integral value for stakeholders in the closed-loop supply chains (CLSC) and found that intra-and inter organizational information sharing influences product design, customer services, and CLSC models significantly and thus helps improve value creation. Cannella et al. (2016) investigated what reverse logistics factors impact the closed-loop supply chain (CLSC) performance and showed that CLSC can help supply chain achieve a better performance than the forward supply chain, and the remanufacturing lead-time reduction and information transparency can help improve CLSC dynamics effectively. However, our research diverges significantly from the aforementioned studies in that our research focuses on the effect of information sharing on pricing and return policy offered to consumers while the aforementioned studies focus on the inventory- and replenishment-related benefits of information sharing.

Substantial research has examined the effect of information sharing on pricing decisions in the literature of supply chain management and marketing. For example, Corbett and DeGroot (2000) studied both full and incomplete information and derived an optimal discount strategy for firms. Corbett et al. (2004) studied how to use different types of contracts to achieve the channel coordination in the environments of complete and asymmetric information. Cakanyildirim et al. (2007) showed that information asymmetry about the manufacturer's production cost may bring higher efficiency in the manufacturer and retailer supply chain. Zhou and Benton (2007) found that effective information

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