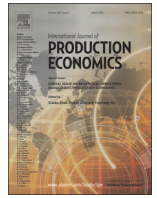




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Consumer product knowledge and intention to purchase remanufactured products

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ABSTRACT

Throughout both the developing and the developed world, lack of consumer acceptance of remanufactured products prevents closed-loop supply chains of the circular economy from realizing the full potential value from remanufacturing. In this study, we examine how knowledge of remanufactured products in terms of cost, quality, and green attributes affects consumers' perception of both risk and value associated with purchasing remanufactured products, and how these perceptions subsequently affect consumers' purchase intentions in China. Based on prospect theory and literature on consumer perceived value and perceived risk, we use a $2 \times 2 \times 2$ inter-group experiment to assess consumers' intention to purchase remanufactured products. The results of our structural equation modeling indicate that purchase intention is positively influenced by perceived value and negatively influenced by perceived risk. Perceived value is most influenced by quality knowledge, followed by cost knowledge and green knowledge. Perceived risk is most influenced by quality knowledge, followed by cost knowledge. The findings can help remanufacturers and closed-loop supply chain managers to develop management policies and marketing strategies. Our theory-based model can be used as the basis for future research regarding the consumer's role in the close-loop supply chain.

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1. Introduction

Remanufacturing is a production strategy where the goal is to recover the residual value of used products via reusing, refurbishing, and/or replacing components such that the end-item is restored to a like-new condition (Debo et al., 2005). As a critical component of the circular economy, remanufacturing has the potential to deliver economic, social and environmental benefits (Zhu and Sarkis, 2007; Tseng et al., 2015a). For instance, some advantages of remanufactured products over new products include the following: up to 70% less raw materials required to produce; up to 80% less emissions to produce; up to 60% less energy required to produce; up to 50% less total production costs; and lower prices for consumers (Wang et al., 2013). Governments and the private sector are now working to promote remanufacturing because of these benefits. For example, remanufacturing has been strongly supported by the government as one of the most important strategic and environmentally-friendly industries in China. Due in part to a strong governmental promotion beginning in 2005, Chinese companies now possess massive production

capacities capable of remanufacturing 630,000 unique automobile parts (Liang, 2011).

In November, 2014, the National Development and Reform Committee of China launched a high-visibility promotion campaign for remanufactured automobile spare parts in the seven largest cities in China. Although benefits surrounding remanufactured products have attracted much attention from both industry and the media, consumers remain generally unreceptive toward the consumption of remanufactured goods (Chen, 2011; Chinese Economic Herald Newspaper, 2015) in part due to perceptions of low quality and other undesirable attributes (Abbey et al., 2015; Hazen et al., 2012a; Tseng et al., 2015b). Considering that the profitability of the entire closed-loop supply chain is contingent upon adequate consumer adoption of remanufactured goods (Guide and Van Wassenhove, 2009), it is important to examine consumer perceptions and propensity toward participating in these closed-loop transactions.

Traditionally, remanufacturing research has focused on operational issues and product acquisition management from a supply point of view, and less attention has been paid to factors affecting the demand for remanufactured products from the end consumer (Ferguson and Toktay, 2006; Atasu et al., 2008; Jiménez-Parra et al., 2012). This paper contributes to the remanufacturing and closed-loop supply chain literature by helping to address this gap.

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Herein, this study examines the effect that consumers' product knowledge considerations have on consumers' perception of remanufactured products. Specifically, this study intends to answer the following questions: Do consumers' risk and value judgments affect their intention to purchase remanufactured products? Subsequently, does knowledge regarding certain attributes of remanufactured products affect consumers' perception of these risk and value prospects? From a practical perspective, answering these questions can help inform remanufacturing and closed-loop supply chain management decisions.

The remainder of this paper proceeds as follows. In Section 2, theory and literature are used to introduce the conceptual model and develop our hypotheses. In Section 3, the experimental design and procedures are described, and then structural equation modeling is used as a means of data analysis. The results are then presented in Section 4. In Section 5, the empirical findings are discussed and interpreted, and Section 6 consists of concluding remarks, highlighting study limitations and directions for future research.

2. Theoretical framework and hypotheses development

2.1. Theoretical framework

This study is rooted in prospect theory, which is a model of economic behavior that was originally offered as an alternative to Von Neumann and Morgenstern's (1944) expected utility theory. Recognizing shortcomings of expected utility theory as a descriptive model (Allais, 1953), Kahneman and Tversky (1979) offered a descriptive choice theory consisting of elements that might be more useful in deterministic settings (Thaler, 1980), such as those that involve consumer choice. Prospect theory characterizes cumulative uncertainties in order to predict individual choices even when expected utility theory is violated (Tversky and Kahneman, 1992; McDermott et al., 2008). This is an especially useful lens through which to consider the context of this study, where previous research indicates that expected utility theory might not be adequate for explaining consumer reactions to remanufactured products due to value and risk factors that should be accounted for (Wang et al., 2013; Hazen et al., 2012a).

Prospect theory posits that otherwise rational decision-makers undervalue outcomes that are merely probable when compared to outcomes obtained with certainty. Thus, value is assigned to both gains and losses rather than only to final assets. Probabilities are replaced by decision weights and the value function is defined by deviations from a reference point (e.g. choices that offer equal probability of utility) in consideration of expected value and risk (Tarnanidis et al., 2015).

Considering prospect theory, Puto (1987) suggests that the consumer choice process consists of (1) an "editing" stage that embodies the initial framing of a problem where a decision maker formulates a series of prospects in order to simplify the problem and (2) an "evaluation" stage where a decision maker assigns value to each prospect and chooses the prospect with the greatest value. Given this characterization of the decision making process, it follows that manipulation of the formulation of prospects can serve to frame the problem and prospects in such a way as to affect the values assigned to each prospect, and thus the decision. Literature on prospect theory provides several examples of choice reversals derived from changes to problem framing (Puto, 1987). Herein, this study posits that the addition of information regarding aspects of remanufactured products can serve to reframe participants' prospects, and thus affect decision making.

Especially useful given the research questions in this study, prospect theory can help inform investigation into consumers' propensity to choose outcomes that involve risk. Individuals are

thought to be risk averse when in a domain of gains, and more risk tolerant (or even seeking) when in a domain of losses (McDermott, 2001). For instance, Kaufmann et al. (2012) study of supplier selection decision effectiveness found that anticipated loss connected to accountability influenced the behavior of the decision-maker more strongly than the anticipated gain connected to incentives. Indeed, risk orientation and the loss aversion effect are functions, in part, of one's domain environment (Olsen, 1997; Wang, 2010). Therefore both perceived risk and perceived value are considered as important antecedents to consumers' intention to purchase remanufactured products in this study.

Research on perceived risk posits that consumers face uncertainty and potentially undesirable consequences as a result of a purchase (Taylor, 1974). Therefore, the more risk one perceives, the less likely he or she is to make a purchase (Roselius, 1971). Since theories regarding perceived risk were first used to explain consumer behavior in the 1960s, considerable research has confirmed that perceived risk affects consumer decision-making (e.g., Mitchell, 1999). Furthermore, research has shown that ambiguity surrounding the remanufacturing process might result in reduced levels of consumers' perceived quality and willingness to pay for remanufactured products (Hazen et al., 2012a).

Theories on perceived value suggest that consumers' perceived value is a powerful antecedent of satisfaction and purchase intention, and consumers will choose the purchasing option that provides them with the highest level of perceived value (e.g., Dodds et al., 1985; Zeithaml, 1988). Therefore, benefits associated with remanufactured products might enhance consumers' perceived value and further promote consumers' intention to purchase remanufactured products.

As shown in Fig. 1, the hypothesized model examines how perceived risk and perceived value affect one's intention to purchase remanufactured products. The model also contains three knowledge considerations germane to remanufactured products (cost, green, and quality) as exogenous variables that contribute to perceived risk and perceived value. These constructs are further described and the relationships in this model are developed in the following section.

2.2. Hypotheses development

2.2.1. Perceived value

A commonly accepted definition of perceived value is "the consumer's overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given" (Zeithaml, 1988, p. 14). In other words, it represents a consumer's perception of the trade-off between perceived benefit and perceived sacrifice (Lovelock, 2000). Woodruff (1997) expanded the concept of perceived value and described it as a source of competitive advantage (Chen and Dubinsky, 2003; Wong et al., 2014).

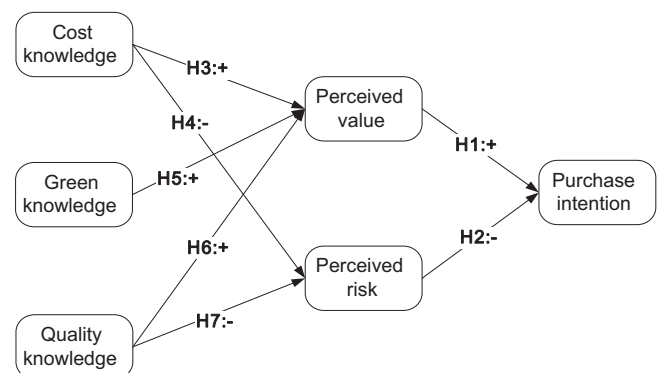


Fig. 1. Hypothesized model.

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