Evaluating Manufacturer’s Wholesale Price Policy Under Order Postponement With Buyback Option

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ABSTRACT

In this article, a decentralized newsvendor model is analyzed in the presence of demand uncertainty, where the retailer wishes to postpone his ordering decision by few days until the most accurate demand information is available. The impact of such order postponement on the equilibrium profits of both manufacturer and retailer with and without a buyback contract is subsequently examined to obtain a range of wholesale prices within which the marginal profits for both manufacturer and retailer which are non-negative. Furthermore, it is observed that the possibility of implementing order postponement is higher when it is done in the presence of a buyback contract as it increases the marginal profits for both manufacturer and the retailer and expands the feasible region of wholesale price, which leads to a provision of higher flexibility for negotiation between the manufacturer and the retailer.

KEYWORDS

Buyback Contract, Manufacturer, Marginal Profit, Optimal Order Quantity, Order Postponement, Postponement, Retailer Manufacturer Dyad, Retailer, Wholesale Price

INTRODUCTION

Today’s business environment is characterized by increasing product proliferation, shrinking product life cycles, increasing demand for customized products and growing service level requirements. On one hand consumers demand high customization in their products and on the other hand they want the products to be delivered quickly (Akinc & Meredith, 2015; Ferreira, Tomas, & Alcântara, 2015; Jafari, Nyberg, & Hilletofth, 2016; Seth & Panigrahi, 2015). It is extremely challenging for the firms to handle uncertainties resulting from such dynamic changes in the consumer demand patterns and service level requirements. However, over the years firms have adopted innovative approaches such as mass customization, flexible/agile manufacturing systems, strategic sourcing of production process etc. to deal with these uncertainties. One such approach which has acquired immense importance in the recent times for its ability to manage uncertainty is postponement. Postponement entails delaying of operations/activities until the latest possible point in time (Ferreira et al., 2015; Yang, Burns, & Backhouse, 2004). By delaying the activities more accurate information about the consumer demand

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can be acquired and thus the impact of uncertainty can be minimized. Though the conceptualization of postponement started with delayed differentiation (Alderson, 1950), it has found its application in other areas such as logistics, manufacturing, product development, purchasing, packaging, labelling, pricing, and services (Akinc & Meredith, 2015; Herbon, 2018; Iacocca & Liberatore, 2018; Jafari et al., 2016; Seth & Panigrahi, 2015; Varas, Maturana, Cholette, Mac Cawley, & Basso, 2018). In this paper we focus on purchasing postponement, also referred as order postponement. In order postponement, a buyer delays his ordering decisions as close as possible to the selling season until he has the most accurate information about the demand uncertainties. By postponing the purchasing activities, the buyer ensures that the inventory of goods remains under the seller’s ownership where the cost of holding the inventory is much less as compared to that in his own premises. However, such approach has adverse implications on the seller’s cost structure and thus requires appropriate supply chain incentive mechanisms to motivate the seller to participate in the postponement process.

Though order postponement has drawn the attention of academic researchers only recently, it has been extensively used in the industry for a long time. Dell, Benetton, and Zara are some of the commonly cited examples of companies that use postponement in their purchasing operations (Dapiran, 1992; Yang et al., 2004). Dell, for example, orders PC component from its suppliers only after receiving the orders from the customers. Similarly, Zara and Benetton do not finalize the designs of the apparels and thus do not release the production orders until accurate information about the latest fashion trends is available.

Literature on order postponement provides enough evidences of its benefits for the buying firm. However, impact of such postponement on seller’s cost and profits have not been studied much. Additionally, though supply chain incentive contracts such as buyback contract, play a positive role in creating supply chain coordination, their role in establishing coordination in the order postponement environment remains to be explored.

In this paper, we try to evaluate the impact of order postponement on both seller’s and buyer’s expected profits. In general, we are interested in studying the following issues related to order postponement in a decentralized system comprising of a single retailer and a single manufacturer:

1. What wholesale price choices does the manufacturer have when order postponement is proposed by the retailer?
2. What is the impact of order postponement on the equilibrium profits of the manufacturer and the buyer? Can supply chain coordination be established in the presence of order postponement?
3. How do the wholesale price choices for the manufacturer change when the order postponement is implemented in the presence of buyback contract?

To answer the above question, we consider a decentralized newsvendor model wherein the manufacturer sells a single product to an independent retailer who is facing demand uncertainty and wishes to postpone his ordering decision by few days in anticipation of the most predictable demand information. The demand is assumed to be uniformly distributed. The manufacturer controls the wholesale price and both the manufacturer and the retailer maximize their expected profits independently. We further extend the model to include buyback contract within the order postponement environment. We analyze the impact of order postponement on the equilibrium profits of both retailer and the manufacture with and without buyback contract.

We show that order postponement is always beneficial for the retailer if the additional cost due to postponement is not considered. Such a situation is possible when either the manufacturer’s profit margin is large or the manufacturer, in anticipation of future stream of business, absorbs the additional costs arising from postponement. On the other hand, if the manufacturer increases his wholesale price, retailer’s profit is adversely affected. As the wholesale price increases retailer’s profits are always sub-optimal and never reach optimality. We derive a range of wholesale price within which the marginal profits for both manufacturer and the retailer are non-negative and implementing order
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