The Strategic Use of a Wholesale-Price Contract in a Decentralized Assembly System

Zhaoqiong Qin, Department of Applied Engineering Technology, North Carolina A&T State University, Greensboro, NC, USA

ABSTRACT

Increasing global competition provides the opportunity for companies to pursue cost reduction. Therefore, a decentralized assembly channel structure has been widely adopted by many manufacturing firms. The author studies an assembling system where one party needs to pay the wholesale price to order one component from the other party and assembles the final product. They assume that there is enough capacity for the two parties to provide the components and assemble the final product. Based on each party pursuing its own maximized profit, the author develops a model and analyzes different mechanisms of deciding the wholesale price of the component. The author’s objective is to optimize the whole supply chain for improving the customer service level. Results are derived for the author to recommend the optimal mechanism.

Keywords: Decentralized Assembly Channel, Global Competition, Optimal Mechanism, Supply Chain, Two-Party

INTRODUCTION

Recently the fast development of outsourcing has made it possible for the manufacturer to outsource components-manufacturing to other independent suppliers. In the computer industries, Lenovo Inc. as an example mostly outsources memory drives, monitors, key boards, etc. for assembling personal computers. Dell is another typical example. It launched valuechain.dell.com, a secure extranet that joins Dell with its suppliers. With information on the extranet, each supplier knows what to do to guarantee sufficient inputs for Dell’s production. In the aerospace industry, such as Boeing, the largest aircraft manufacturer relies on independent suppliers for various components. There are some reasons for outsourcing: 1) The manufacturer can improve the product quality dependent on the key components from suppliers who specialize in the components; 2) The manufacturer can lower the cost by outsourcing the components from suppliers who produce in large quantities; 3) As a consequence of global economy, outsourcing has lent companies more opportunities to achieve supply chain cost reduction by the huge differentials in labor-costs between different regions and countries.

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In this paper, we consider a supply chain in which a manufacturer (assembler) outsourcing a key component from a supplier with a wholesale price and then assembles this component into an end product. When the wholesale price is announced either by the supplier or manufacturer, they invest in their own capacities to maximize their respective profits before demand is known. After the demand is realized, the manufacturer orders the quantity of the key component. From the sequence of the events during the process, the supply chain capacity is the smaller one between the manufacturer’s and supplier’s capacities.

When a manufacturer or assembler outsources components from suppliers who will be involved in supply chains, supply chains are becoming more complicated. In today’s complex marketplace, the competition is between supply chains rather than individual companies. While the individual companies pursue their own maximized profits through behaving strategically under a wholesale price contract, our primary consideration is to help a supply chain to achieve higher profit by deciding which party announces the wholesale price of the key component to the other party.

Our study is done under a general setting as follows. The wholesale price is announced before the demand is realized. The manufacturer and supplier make their own capacity-decisions based on a market with uncertain demand. After the demand is realized, the assembler procures key components from suppliers, assembles the final product and sells it to a market. Without loss of generality, we make the following assumptions:

1. One unit of the final product consists of one unit of components from the supplier and the manufacturer;
2. Unit production costs $c_s$ occurred by the supplier and $c_m$ by the manufacturer are fixed. Also unit assembling cost $c_a$ fixed;
3. Unit retail price $r$ is fixed.

From the events of the whole process, it is obvious that the specific capacity decisions each party makes will depend on the wholesale price. We consider two models: 1) the first model includes two cases: either the manufacturer announces the wholesale price to the supplier; or the supplier announces the wholesale price to the manufacturer. We are interested in the effects of each case on the whole supply chain capacity and further supply chain profit, and choosing the case with higher supply chain profit; 2) the assembler is independent of the manufacturer and supplier and will announce the wholesale price to order the components from them. We discuss the possible coordination in this model.

In this paper, we first create models and analyze the supply chain capacity. This constitutes the first key contribution of the paper, in the sense that ours is the first to consider the supply chain capacity in each case. As the second major contribution of the paper, we investigate the effects of the parameters such as unit production costs, unit assembling cost and unit retail price on the supply chain capacity by computation. Finally, the coordination is discussed under the wholesale price contracts.

The paper proceeds as follows. We briefly review the related literature in Section “Literature” followed by the section where the model is formulated for two cases and discusses the supply chain capacity for each case. We analyze the impacts of the parameters on the supply chain capacity by computation and the coordination under the wholesale price contract when the assembler is independent on the manufacturer and supplier. The last section concludes the paper.

LITERATURE

This paper investigates the supply chain capacity under the wholesale price contract in an assembly decentralized system. We mainly make a literature review relative to other papers in the channel coordination performance and the application of the contracts. Supply chain coordination gained attention from a practical point of view. Hur, Hartley, and Hahn (2004) analyzed coordination from the supply chain structure. Boyaci (2005) studied a multiple-channel dis-
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