

## Pooled Versus Reserved Inventory in a Two-Echelon Supply Chain

Xiaoli Ling<sup>1,\*</sup>, Shu-Cherng Fang<sup>1,2</sup>, Herry L.W. Nuttle<sup>1</sup>, and Xiuli Chao<sup>1</sup>

<sup>1</sup>Department of Industrial Engineering, North Carolina State University, Raleigh NC 27695, USA

<sup>2</sup>Mathematical Science Department and Industrial Engineering Department of Tsinghua University, Beijing, China

---

**Abstract**—We consider a two-echelon supply chain with two retailers and one supplier. The retailers are supplied by the supplier who makes all the decisions and bears all the inventory risk. Throughout this paper, we consider two different inventory systems: a reserved inventory system and a pooled inventory system. With the reserved inventory system, the supplier keeps separate inventories for each retailer. In contrast, the pooled inventory is shared by the two retailers and the supplier makes the inventory decision based on the joint demand. Under different scenarios such as whether wholesale price is a decision variable, we study and analyze the supplier's decisions in the reserved and the pooled inventory systems. In addition, we compare the profit of the supplier and retailers in the two different systems under normally distributed demands.

**Keywords**—Inventory, Pooled inventory, Pricing, Supply chain

---

---

\* Corresponding author email: xling2@ncsu.edu