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Lifei Sheng, Daniel Granot, Woonghee Tim Huh, Mahesh Nagarajan

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A Dynamic Price-Only Contract: Exact and Asymptotic Results

Lifei Sheng[1], Daniel Granot, Woonghee Tim Huh, Mahesh Nagarajan
Sauder School of Business, University of British Columbia

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Abstract

We consider a two echelon supply chain with a single seller and a single buyer. We propose what we call a generalized price-only contract, which is a dynamic generalization of the simple wholesale price-only contract. We derive some interesting properties of this contract and relate them to well known issues such as double marginalization, relative power in a supply chain due to stackelberg leadership, contract structure and commitment.

Keywords: price-only contract, strategic inventory, commitment issues

1. Introduction

Consider a simple supply chain with two firms with symmetric information, wherein a seller trades with a downstream buyer who faces customer demand for the product. This system is perhaps the most well understood decentralized model and has been analyzed in the extant literature in industrial organization and operations management among others. In this note, we revisit this simple system under what we call a generalized price-only contract. We demonstrate several interesting properties of this system under this easy to understand contract, show interesting connections to established results in the literature and explore the implications of our findings to future research.

A price-only contract, otherwise known as a simple linear wholesale price contract, specifies a per unit price w at which the seller offers her product to the buyer who then buys some quantity q. The buyer uses this quantity (and potentially other levers such as selling price when relevant) to generate revenue from customer demand. Therefore, in the simplest setting where players are strategic, these decisions are arrived at as an equilibrium of a corresponding game. The common paradigm is one where the seller moves first, setting a wholesale price w, which is followed by the buyer's decision of purchasing a quantity q. This is referred to as a Stackelberg game (with the seller as the leader in this case). It is well known that the resulting vertical competition between the players in this model leads to inefficiencies referred to as double marginalization. This loss of efficiency (failing to get to the first best) can be addressed by numerous contracting recipes when there are no information asymmetries. Our interest is not in addressing this inefficiency, although one consequence of our analysis is related to achieving first best. Rather, we explore what would be the

[1]Corresponding author. Email address: fay.sheng@sauder.ubc.ca