

Purchase Order Financing: Credit Capacities and Supply Chain Consequences

Anne Lange, Fehmi Tanrisever, Matthew Reindorp

Purchase Order Financing: Credit Capacities and Supply Chain Consequences

1. Introduction

Supply chain contracts with minimum purchase commitments have an established place in the study of operations management. Bassok and Anupindi (1997) were among the first to analyze the case that a customer guarantees to purchase at least a specified amount from a supplier over a given planning horizon. Scholars have subsequently shown that minimum purchase commitments can help firms create value, by enabling better planning of operations and minimizing risks of excess or shortage (see, for example, Li and Kouvelis 1999, Chen and Krass 2001, Durango-Cohen and Yano 2006). Nevertheless, these studies invariably assume - at least implicitly - that the firms can access a perfect capital market and are not subject to any financial constraints. In practice, capital markets are imperfect; and purchase order commitments can also serve to mitigate the impact of market imperfections, yielding financial and operational benefits that have not yet been studied. Especially in the case that a supplier is a small or medium-sized enterprise, a purchase order commitment from a corporate customer may constitute valuable information about the supplier's demand prospects, thereby enabling additional financing. This expands the feasible production set of the supplier, creating value for both firms. A purchase commitment implies more risk for the customer, however, who must balance this risk against the value created.

In this paper we examine a case of purchase order commitment in the presence of capital market frictions. We quantify the frictions, determine the resulting optimal commitment, and show how the operational decisions and profits are conditioned by the financial context. Our study provides a novel perspective on capital market frictions in supply chain contracting. In

particular, we show that firms may benefit from capital market frictions due to the strategic interactions arising in the supply chains.

2. Model and Contribution

Building on this scenario of capital market imperfections, we study purchase order financing by means of a stylized supply chain model that fits with literature on “selling to the newsvendor” (Lariviere and Porteus 2001). Nevertheless, ours is rather a case of “buying from the newsvendor”, since we take the customer, a corporate retailer, to be the leader in the sequential game: he must decide the terms of a purchase order commitment to offer the supplier, who will respond with a stocking decision. In making a purchase order commitment, the retailer reduces the risk of shortage by enabling the supplier to produce more. Nevertheless, a greater commitment brings a greater risk of excess. The retailer's trade-off in the commitment decision is conditioned by the two key financial parameters: the supplier's *ex ante credit limit* and her *informational transparency*. In this setting, our work contributes the following insights to research at the interface of operations and finance.

1. The equilibrium profit levels that result in a purchase order financing arrangement may exhibit properties that are not a priori evident. For example, it does not always benefit the supplier to have a high level of informational transparency: the modality of her profit as a function of informational transparency is conditioned by the relative gross margins of the firms. Likewise, in some cases the supplier's profit will increase if her *ex ante credit limit* decreases. Hence, our analysis reveals that in equilibrium the supplier can benefit from capital market frictions due to her strategic interaction with the retailer.

2. Capital market frictions condition the qualitative impact of demand uncertainty on the supplier's equilibrium profit. If the credit limit and informational transparency of the supplier are

both low, then her profit will tend to decrease with demand uncertainty. If the supplier faces less stringent financial conditions, however, then an increase in demand uncertainty can increase the supplier's profit, sometimes so much so that the profit of the supply chain (supplier and retailer together) may also increase.

3. The supplier's credit limit and informational transparency are always substitutes for the retailer but may be substitutes or complements for the supplier. The retailer's marginal benefit from the supplier's credit limit decreases with the supplier's informational transparency, and vice versa. For suppliers with low credit limit and low informational transparency, these characteristics tend to be substitutes, irrespective of whether her profit is increasing or decreasing in either one. For suppliers with higher credit limit or informational transparency, the characteristics are complements.

References

- Bassok, Yehuda, Ravi Anupindi. 1997. Analysis of supply contracts with total minimum commitment. *IIE Transactions* 29(5) 373-381.
- Chen, Frank Y., Dmitry Krass. 2001. Analysis of supply contracts with minimum total order quantity commitments and non-stationary demands. *European Journal of Operational Research* 131(2) 309-323.
- Durango-Cohen, Elizabeth Junqueira, Candace Arai Yano. 2006. Supplier commitment and production decisions under a forecast-commitment contract. *Management Science* 52(1) 54-67.
- Lariviere, Martin A., Evan L. Porteus. 2001. Selling to the newsvendor: An analysis of price-only contracts. *Manufacturing & Service Operations Management* 3(4) 293-305.
- Li, Chung-Lun, Panos Kouvelis. 1999. Flexible and risk-sharing supply contracts under price uncertainty. *Management Science* 45(10) 1378-1398.