Inventory Service-Level Agreements as Coordination Mechanisms: The Effect of Review Periods

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A supplier stocking goods for delivery to a retailer may face a (finite-horizon) service-level agreement (SLA). In this context, the SLA is a commitment by a supplier to achieve a minimum fill rate over a specified time horizon. This kind of SLA is an important, but understudied coordination mechanism. We focus on the impact of two contract parameters: the length of the review period and the magnitude of the bonus for meeting or exceeding the service-level target. For a supplier following a base stock (order-up-to) inventory policy, increasing the bonus increases optimal supplier stocking levels, whereas lengthening the review period may increase or decrease optimal stocking levels. We investigate these mechanisms in a controlled laboratory setting and find that longer review periods are generally more effective than shorter review periods in inducing higher stocking levels. As in several earlier laboratory studies, the explanation lies in the improved feedback reliability that longer review periods provide. The primary managerial implication of our findings is that, in practice, longer review periods may be more effective than shorter ones at inducing service improvements.

Key words: service-level agreements; behavioral operations management; supply chain management; experimental economics

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1. Introduction and Motivation
A supplier stocking goods for eventual delivery to a customer must trade off the negative consequences of stocking insufficient inventory with those of excess inventory. Consider the case in which the supplier charges a wholesale price to a retailer who then charges a retail price to the marketplace. The markup charged by the supplier causes the retailer to order less than the supply-chain-optimal quantity. Spengler (1950) was the first to note this double-marginalization problem. A variety of coordination agreements have been implemented or proposed in the literature to address this problem. Recently, Cachon (2003) reviewed several contractual mechanisms addressing this problem.

In this paper, we investigate (finite-horizon) service-level agreements (SLAs) as coordination mechanisms. These agreements are used to improve coordination by inducing suppliers to place higher orders. In an SLA, the supplier agrees to meet some predefined service level (typically the fraction of orders filled) over a specified review period. In some cases, there are contractual financial penalties and rewards associated with failing or achieving a target service level for a particular time period. Another possibility is that the service level is part of a supplier scorecard used to evaluate supplier performance. In such a case, the negative consequences of failure may be more difficult to quantify. A recent Aberdeen survey (Kay 2005) reported that 70% of manufacturing companies declared that supplier performance, particularly on-time delivery and fill rates, is critical to their business operations.

An earlier analytical study has shown that finite-horizon SLAs can have negative consequences for both the supplier and customer in terms of long-run cost and profit if suppliers react optimally to SLAs (Thomas 2005). Furthermore, in terms of the agreement, the size of the penalty or bonus and the length of the review period can strongly affect the supplier’s stocking decisions and, thus, customer performance, often in counterintuitive ways. In this paper, we consider the effects of these two variables on suppliers’ stocking levels using controlled laboratory experi-