Chapter 18
Strategic Behavior in Supply Chains: Information Acquisition

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Abstract Reducing the financial impact of supply–demand mismatches is a central objective of supply chain management. Modern supply chains have multiple independent self-interested actors each with different information about the demand uncertainties facing the supply chain. Strategic behavior by these self-interested actors often enhances the supply–demand mismatches in the supply chain. In this chapter, we present the case of a fashion products supply chain with multiple strategic actors each of which has different information. Traditional contracting strategies in this supply chain lead to excessive supply–demand mismatches. We then propose an alternate contracting strategy. Specifically, we propose that the supply chain starts offering “Advanced Purchase Discounts” in addition to the traditional wholesale price based contracts. We demonstrate that strategic responses to these contracts by agents in the supply chain lead to better information sharing, superior risk bearing, reduced supply–demand mismatches and can lead to Pareto-improving outcomes for all actors in the supply chain. In contrast with conventional wisdom that strategic behavior in the supply chain leads to poorer supply chain performance, our results illustrate that appropriately designed supply chain practices can actually exploit the strategic behavior of actors to improve supply chain performance. We conclude by illustrating the application of the proposed contracts to our motivating example of the fashion products supply chain.

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18.1 Introduction

Supply chains are made up of multiple strategic actors – manufacturers, wholesalers, retailers, and most importantly customers. Prevalent macroeconomic trends favoring skill and geographical specialization are making it increasingly common that each of these tiers is owned and operated by different agents. Each of these strategic agents acts independently with its best information to maximize its benefits. As a consequence, such supply chains are often plagued by financial losses due to supply–demand mismatches. Often, different tiers in the supply chain produce, buy or stock too much and are stuck with excess inventory. In other situations, firms produce or stock too little and are consequently unable to meet demand from their customers, thus losing potential profits. Minimizing the financial impact of these supply–demand mismatches is a central objective of supply chain management. In this chapter, we present the case of a fashion products supply chain, that is struggling with extensive losses due to such supply–demand mismatches. We then present a strategy that exploits the strategic behavior of individual actors in the supply chain to mitigate these supply–demand mismatches.

One of the primary reasons for supply–demand mismatch is imprecise demand information – If all agents knew exactly how much demand would be, they would all produce or stock exactly as much as demand and there would be no leftover inventory or unmet customer demand. While each tier of the supply chain individually suffers from the consequences of imprecise demand information, a supply chain with independent strategic actors also suffers from the additional consequences arising out of the lack of information sharing between different tiers of a supply chain. In many instances, the tiers of a supply chain closest to the customer may have the best demand information, but they do not have the incentives to share information with other agents in the supply chain. In other instances, the supply chain tier with the best information may not have the decision rights. Further, at times different tiers may each have some private information and consolidating that information may lead to superior decision making than utilizing the information independently.

We propose a strategy to ameliorate the losses due to lack of information sharing by designing contracts that exploit the strategic behavior of independent actors in the supply chain. Our strategy involves offering “Advance Purchase Discounts” (APDs). Under such a scheme an upstream tier offers downstream tiers the opportunity to place orders well in advance of demand. Acting in its own best interest, the downstream tier uses the best information available to it when making these early orders. From observing these orders, the upstream tier can infer the information available to the downstream tier and can make its decisions on the basis of the demand information inferred and its own private information. The strategic behavior of agents in this setup leads to improved information sharing and consequently, higher profits for the supply chain. Further, these profits can be redistributed to make each agent in the supply chain better off. Finally, such an arrangement also leads to improved sharing of risks in the supply chain; agents that have private information also bear some risks.