

Chapter 17

Supply Chain Coordination

Supply chain performance depends on the actions taken by all of the organizations in the supply chain; one weak link can negatively affect every other location in the chain. While everyone supports in principle the objective of optimizing the supply chain's performance, each firm's primary objective is the optimization of its own performance. And unfortunately, as shown in this chapter, self-serving behavior by each member of the supply chain can lead to less than optimal supply chain performance. In those situations, the firms in the supply chain can benefit from better operational coordination.

In this chapter we explore several challenges to supply chain coordination. The first challenge is the *bullwhip effect*: the tendency for demand variability to increase, often considerably, as you move up the supply chain (from retailer, to distributor, to factory, to raw material suppliers, etc.). Given that variability in any form is problematic for effective operations, it is clear the bullwhip effect is not a desirable phenomenon. We identify the causes of the bullwhip effect and propose several techniques to combat it.

A second challenge to supply chain coordination comes from the *incentive conflicts* among the supply chain's independent firms: An action that maximizes one firm's profit might not maximize another firm's profit. For example, one firm's incentive to stock more inventory, or to install more capacity, or to provide faster customer service, might not be the same as another firm's incentive, thereby creating some conflict between them. We use a stylized example of a supply chain selling sunglasses to illustrate the presence and consequences of incentive conflicts. Furthermore, we offer several remedies to this problem.

17.1 The Bullwhip Effect: Causes and Consequences

Barilla is a leading Italian manufacturer of pasta. Figure 17.1 plots outbound shipments of pasta from one of its Cortese distribution center over a one-year period along with the orders Cortese placed on Barilla's upstream factories. Think of the outbound shipments as what was demanded of Cortese by its downstream customers and the orders as what Cortese demanded from its upstream suppliers. Clearly, Cortese's demand on its upstream suppliers is more volatile than the demand Cortese faces from its customers.

This pattern, in which a stage in the supply chain amplifies the volatility of its orders relative to its demand, is called the *bullwhip effect*. If there are several stages (or levels) in the supply chain (e.g., retailer, wholesaler, distributor, factory), then this amplification can feed