

Chapter 1

Introduction

In this dissertation, we consider a single-period perishable product (e.g., newspaper, bread, etc.) with uncertain demand in a supply chain consisting of one manufacturer and one retailer. The retailer purchases the product from the manufacturer using contractual mechanisms, which are usually determined by the manufacturer. The simplest form of contractual mechanism in this case is when the seller charges the buyer a fixed wholesale price per unit of product ordered. Normative analysis indicates that, in such cases, the supply chain does not fulfill its full potential in terms of the expected profits (Spengler 1950) compared to the case when the buyer and the seller are one entity instead of two separate entities. This loss of profit to the supply chain, due merely to the separation of manufacturing and retailing activities, is known as 'double marginalization.'

Various contractual mechanisms have been proposed in literature to circumvent this problem of double marginalization. These include buyback, revenue sharing (Cachon and Lariviere 2005), two-part tariff, and quantity discount (Taylor 2002), to name a few. These coordinating contracts were analytically proven to result in the supply chain attaining its maximum potential in terms of expected profit.

However, such results based on utility maximization are not consistent with the results of laboratory experiments conducted with these contractual mechanisms in recent literature. It was observed that coordinating contracts induce lower supply-

chain efficiency than was theoretically expected (Katok and Wu (2009), Ho and Zhang (2008), Niederhoff and Kouvelis (2011), Becker-Peth et al. (2013), etc.).

Previous behavioral studies on supply chain contracts have used experimental setups wherein each of these contracts is used in isolation. Contexts in which choice amongst contracts is possible, however, have not been addressed to the same extent. In this dissertation, we consider a situation in which the seller offers the buyer a menu of coordinating contracts, each yielding similar theoretical expected return. We show both empirically and analytically that, subject to certain conditions, providing contract choice to the buyer improves supply chain performance.

Chapter 2 of the dissertation will begin with a brief literature review of the relatively new subfield of behavioral operations management. We shall then move to the present relevant literature pertaining to behavioral newsvendor and experimental studies of supply chain contracts. This shall be followed by three chapters, each studying different aspects of contract choice. Chapter 3 addresses the antecedents of contract choice, and Chapter 4 deals with consequences of providing supply chain contract choice. In our fifth chapter, we incorporate the behavioral aspects that impact contract choice and ordering behavior into a mathematical model and demonstrate analytically the advantage of using contract choice as a strategy to improve supply chain performance.

1.1 Mental models of supply chain contracts

In this chapter, we explore the various factors that determine contract choice of the buyer. We propose a 'mental model' on how contract information is processed by buyers to make their contract-choice and ordering-quantity decisions. We consider various contract-specific factors: contract type, contract risk perception, and individual-specific factors overconfidence, risk attitude, and impact of cost magnitude to develop a conceptual model that explains the contract-choice and, eventually,

the ordering-quantity decisions.

We validate our model using an experimental setup in which subjects comparatively analyze these contracts and make contract-choice and ordering decisions. Risk attitude and overconfidence are measured using instruments picked from, or based on, extant literature. We make use of 120 MBA students studying the OM course as our subjects. The data collected is analyzed using path analysis performed with the partial least squares method.

Data analysis results indicate that, while the contract-choice decision is influenced only by the contract-specific factors, the ordering-quantity decision is influenced both by the individual-specific factors and contract-specific factors. The contextual risk perception of the contract is what matters in the eventual choice of the contract, and the buyers risk attitude and overconfidence do not determine the contract-choice decision. On the other hand, the ordering-quantity decision is influenced by both individual-specific factors as well as the contract-specific factors in the presence of contract choice. Therefore, we also observe that individuals are more likely to order higher in certain contracts than in others, and this tendency is independent of the individual-specific factors. This tendency, we believed, could be used to improve supply chain performance in cases in which ordering higher would improve supply chain performance. This paves the way to the next chapter.

1.2 Mere-choice effect: Using contract choice to improve supply chain performance

In our next chapter, we posit the providing of contract choice as a strategy to mitigate the impact of behavioral anomalies that cause underperformance in laboratory experiments of supply chain contracts. We hypothesize that the relative risk and return perceptions of the contracts residually nudge the ordering quantities in different contracts (over and above the individual-specific factors), resulting in higher ordering

for contracts judged favorably by the buyer. This leads to an enhanced performance in high-margin supply chains in which ordering higher than the behavioral optimal is necessary to improve supply chain efficiency.

To validate our hypotheses, we conduct two studies. While in the first study, experimental subjects (87 executive-program participants) comparatively analyze these contracts and make contract-choice and ordering decisions, in the second study we make use of two treatments: with and without contract choice. For the second study, we make use of Amazons Mechanical Turk interface to collect our data. We make use of 385 out of 655 responses received, on the basis of attention verification to ensure quality of responses.

The first study helps us understand the impact risk and return perception of the contract on the likelihood that the contract is chosen and, further, on the ordering-quantity decision. In the second study, we establish that the mere act of providing contract choice to buyers considerably improves supply chain performance in high-margin situations irrespective of the contract combination presented. This result, which we call the 'mere-choice effect,' has major supply-chain strategy implications in that it advocates providing higher flexibility to buyers in order to improve supply chain performance.

1.3 An analytical framework of supply chain contract choice from a behavioral perspective

In this chapter of the dissertation, we build an analytical framework governing the contract-choice and ordering-quantity decisions. We incorporate behavioral parameters that impact the valuation of contracts into the normative analytical model of supply chain contracts. We analytically prove that providing contract choice leads to higher ordering quantities, thus reinforcing the results from the previous experimental studies. Moreover, we analyze the impact of behavioral parameters on supply

chain performance using a numerical analysis and show how contract choice is a useful strategy in high-margin scenarios but not so much in low-margin environments. This is in convergence with our empirical investigations. Analytical modeling improves the generalizability of our results to situations beyond experimental conditions. We present directions for future work to help generalize our results further.

1.4 Conclusion

Our results hold key implications to supply chain strategy in terms of the amount of flexibility that is to be given to a buyer in a supply chain. The concluding chapter of the dissertation presents the key managerial implications, especially in the context of companies trying to capture a market share in emerging economies.