



Contents lists available at ScienceDirect

European Journal of Operational Research

journal homepage: www.elsevier.com/locate/ejor

Production, Manufacturing and Logistics

Preferences for contractual forms in supply chains

Lijian Lu^a, Yaozhong Wu^{b,*}^a Graduate School of Business, Columbia University, New York, NY 10027, United States^b National University of Singapore Business School, Singapore 119245, Singapore

ARTICLE INFO

Article history:

Received 23 February 2014

Accepted 29 July 2014

Available online 7 August 2014

Keywords:

Supply chain management

Competition

Contracting preferences

ABSTRACT

The supply chain contracting literature has focused on incentive contracts designed to align supply chain members' individual interests. A key finding of this literature is that members' preferences for contractual forms are often at odds: the upstream supplier prefers relatively complex contracts that can coordinate the supply chain; however, the downstream retailer prefers a wholesale price-only contract because it leaves more surplus (than does a coordinating contract), which the retailer can capture. This paper addresses the following question: Under what circumstances do suppliers and retailers prefer the *same* contractual form? We study supply chain members' preferences for contractual forms under three different competitive settings in which multiple supply chains compete to sell substitutable products in the same market. Our analysis suggests that both upstream and downstream sides of the supply chain may prefer the same "quantity discount" contract, which would eliminate the conflicts of interest that otherwise typify contracting situations. More interesting still is that both sides may also prefer the wholesale price-only contract; this finding provides a theoretical explanation for why that inefficient (but simple) contract is widely adopted in supply chain transactions.

© 2014 Elsevier B.V. All rights reserved.

1. Introduction

Contracts are commonly used in supply chains to coordinate the activities of parties whose local objectives are not always perfectly aligned with one another. It is widely recognized that the wholesale price-only (or "WP") contract fails to achieve full supply chain efficiency. In the most common setting—a single supply chain wherein a supplier makes a contract offer to a retailer—the supplier can coordinate the supply chain by inducing the retailer to make decisions that are optimal for the supply chain as a whole. Such contracts may take a nonlinear form (e.g., quantity discount contracts) or include a fixed-payment component in addition to the wholesale price (e.g., two-part tariff contracts).

Although contract design has been extensively studied in the supply chain contracting literature, little attention has been paid to the contractual form preferences of supply chain members. When supply chain members are profit maximizers, they should prefer a contractual form that yields the highest profits. As a consequence, a profit-seeking supplier should prefer more sophisticated coordinating contracts to simple wholesale price-only contracts; with the former, the supplier can extract the entire

supply chain surplus and leave none to the retailer. In contrast, the retailer should prefer the WP contract because it allows him to secure a positive surplus (a result of the double marginalization effect). Thus, existing studies suggest that the contractual form preferences of supplier and retailer are not aligned and so there exist conflicts of interest among supply chain members with respect to contract design.

This paper focuses on the *congruence* of members' contractual form preferences. In particular, we focus on a market environment characterized by deterministic demand and study the circumstances under which suppliers and retailers share the same preferences for a certain type of contract. Our analytical results suggest that both suppliers and retailers can be simultaneously better-off when using wholesale price-only contracts than when using other contractual forms. Hence supplier and retailer preferences can be *coordinated* via WP contracts. That being said, there are also situations in which both suppliers and retailers may be better served by more complex contracts. We describe the conditions under which supply chain members share the same preferences for a particular contract type, whether it be a wholesale price-only contract or quantity discount (QD) contract.

The structure of a supply chain affords its members different degrees of market power. In order to understand how supply chain members' preferences change across different settings, we consider three forms of supply chain structure. In each structure,

* Corresponding author. Tel.: +65 6516 3022.

E-mail addresses: l12755@columbia.edu (L. Lu), yaozhong.wu@nus.edu.sg (Y. Wu).

the same number of products are sold but the number of suppliers and retailers is varied. Thus, we consider: (i) an n -supplier and n -retailer supply chain in which each supplier has an exclusive retailer; (ii) an n -supplier and 1-retailer supply chain in which all suppliers sell through a common retailer; and (iii) a 1-supplier and n -retailer supply chain in which one supplier sells through multiple retailers. The supply chain members in these three settings hold different levels of market power as determined by the (horizontal) competition among multiple members.

We start by analyzing optimal decisions at the retailer level. We then analyze equilibrium decisions at the supplier level for a given type of contract while accounting for retailers' responses. We choose two types of contracts for our analysis: the wholesale price-only contract and the quantity discount contract. Studies of a single supply chain have shown the QD contract to be more efficient but also more complex. Our analysis reveals that if all supply chains are restricted to a common contractual form (i.e., either a QD or a WP contract), then suppliers and retailers may *both* prefer either of these contract types—provided that (a) the intensity of competition (as measured by the rate of product substitution) falls within a certain range and (b) the number of supply chains is large. Thus the structure of the supply chain network plays a crucial role in determining which type of contract is preferred by supply chain members.

This paper makes the following contributions. First, we develop an industry equilibrium analysis for competing supply chains under two commonly used contractual forms in three supply chain settings. More importantly, we show that—unlike contracting in a 1-supplier and 1-retailer supply chain—suppliers and retailers may both prefer the wholesale price-only contract to more complex and efficient contracts (or vice versa) depending on the supply chain structure. Hence our study offers a theoretical explanation for a long-standing dilemma: although the theoretical literature has shown that coordinating contracts are more efficient, in practice the wholesale price-only contract is more popular. Supplier and retailer contract preferences may coincide for a wide range of parameters when the number of competing supply chains is large. This study identifies the characteristics (e.g., supply chain structure, extent of product substitution, number of horizontal competitors) that play a key role in determining whether the preferences of supply chain members are congruent—and in explaining the observed prevalence of certain contractual forms.

The paper proceeds as follows. Section 2 reviews the literature related to our study. In Section 3, we present a model of supply chain competition and contractual forms. This is followed in Section 4 by an analysis of symmetric supply chains. Section 5 concludes.

2. Literature review

Coordination by incentive contracts has been one of the core issues in the area of supply chain management because, in a simple supplier–retailer dyad, maximal profit for an entire supply chain cannot be achieved by commonly used wholesale price-only contracts. For a comprehensive review of the literature, see Cachon, 2003, chap. 6 and also Nagarajan and Sošić, 2008; for an exceptional case in which the WP contract coordinates (when interactions are repeated infinitely), see Sun and Debo (2014). Extensive study has been devoted to a variety of coordinating contracts that can align supply chain members' local incentives and thereby maximize supply chain profits. Examples include quantity discount contracts (Cachon, 2003, chap. 6; Tomlin, 2003), quantity flexibility contracts (Tsay, 1999), sales rebate contracts (Krishnan, Kapuscinski, & Butz, 2004; Taylor, 2002), two-part tariff contracts (Cachon & Kök, 2010), buyback contracts (Pasternack, 1985), and

revenue-sharing contracts (Cachon & Lariviere, 2005; Kannan & Papiuc, 2014).

Although studies have not focused on supply chain members' contractual form preferences, existing research clearly suggests that the contractual form preferred by the upstream supplier is generally not the form preferred by the downstream retailer. In particular, the supplier prefers coordinating contracts to wholesale price-only contracts, but the retailer prefers WP contracts so that he will not be left with zero surplus (as may occur under coordinating contracts). The literature on supply chain contracting thus implies that there is a conflict of interest between the supplier and the retailer in a supply chain. Furthermore, the WP contract—which is (from a theoretical standpoint) suboptimal for profit-maximizing suppliers—predominates supply chain transactions in many industries (Lariviere & Porteus, 2001).

A study by Cachon and Kök (2010) sheds some light on the congruence of contractual form preferences. They consider a supply chain structure with two manufacturers selling substitutable products through a common retailer and show that, for intermediate levels of product substitution, manufacturers and retailers share the same preferences for more complex contracts (e.g., quantity discount and two-part tariff contracts) over wholesale price-only contracts. In a 2-supplier and 2-retailer supply chain setting, Feng and Lu (2013) study a supply chain contracting game that can be structured both as a Nash bargaining game and as a Stackelberg game. These authors show that the contract choice of supply chain members is significantly affected by how the contracting game is set up.

In this paper, we examine different supply chain settings that involve multiple supply chain members engaging in horizontal competition at both the retailer and supplier levels. We find that when the substitution rate is high, suppliers and retailers both prefer wholesale price-only contracts to quantity discount contracts in an n -supplier, n -retailer setting. However, these preferences are reversed when there are n suppliers and 1 retailer; in that case, both the suppliers and the retailer prefer QD contracts to WP contracts. This finding indicates that supply chain structures affect the congruence of supply chain members' preferences for contractual forms.

Our work is also related to studies on the structure of supply chain channels—beginning with the seminal paper of McGuire and Staelin (1983). Following their basic model of two-stage competition, we extend the analysis to multiple supply chains and focus on the preferences for contractual forms in supply chain channels.

Finally, this paper is part of a growing field of research on supply chains with structures that are more complex than a simple supply chain dyad. In addition to the papers already cited, Bernstein and Federgruen (2005) and Bernstein, Chen, and Federgruen (2006) examine coordination in single-manufacturer and multiple-retailer supply chains with contracts. Netessine and Zhang (2005) consider both positive and negative externalities among downstream retailers and the effect of those externalities on supply chain performance. Corbett and Karmarkar (2001) analyze horizontal competition in multi-stage supply chains with entry decisions. DeMiguel and Xu (2009) develop an equilibrium analysis of a multiple-leader and multiple-follower oligopoly game with stochastic demand. Adida and DeMiguel (2011) consider supply chain competition with uncertain demands and risk-averse decision makers. Federgruen and Hu (2012) study sequential oligopolies in supply chains featuring multiple echelons and firms that engage in price competition with other firms of the same echelon as well as in vertical competition across echelons.

In a setting characterized by competing supply chains, Ha and Tong (2008) investigate suppliers' investment decisions on information sharing under different contract types. For suppliers whose

Download English Version:

<https://daneshyari.com/en/article/479604>

Download Persian Version:

<https://daneshyari.com/article/479604>

[Daneshyari.com](https://daneshyari.com)