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Multilateral Bargaining and Downstream Competition

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We examine multilateral bargaining in vertical supply relationships that involve an upstream manufacturer who sells through two competing retailers. In these relationships the negotiations are interdependent, and bargaining externality may arise across the retailers. In addition, the timing by which the manufacturer negotiates with the retailers becomes important. In simultaneous bargaining the retailers negotiate without knowing if an agreement has been reached in the other retail channel, whereas in sequential bargaining the retailer in the second negotiation is able to observe whether an agreement was reached in the first negotiation. We show that simultaneous bargaining is optimal for the manufacturer when the retail prices (and profitability) are similar, and sequential bargaining is preferred when the dispersion in the retail prices is sufficiently large. As a result of ex post renegotiations, the manufacturer may strategically stock out the less profitable retailer who charged a relatively low retail price and exclusively supply only the retailer who charged a relatively high retail price and maintained high channel profitability. Moreover, ex post multilateral bargaining can buffer downstream competition and thus lead to positive retail profits even in markets that are close to perfect competition.

Key words: multilateral bargaining; bargaining timing; bargaining externality; vertical relationships; retail competition
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1. Introduction

Vertical supply arrangements commonly involve multilateral negotiations between an upstream supplier and multiple retail intermediaries who compete in the end consumer market. One common example is that of manufacturers (e.g., Procter & Gamble) who sell to consumers through several competing retailers. Consider also the following scenarios that illustrate some of the common aspects of multilateral bargaining in vertical channel relationships that we examine in this paper.

Example 1 (Department Stores). Target and Walmart compete intensely to sell popular products such as the Barbie Video Girl doll, the iPad2, and the Kindle Fire (MSNBC 2010). This is particularly exemplified by retail competition during the holiday season. The retailers often advertise prices and collect consumer preorders before the holiday season and then have to negotiate with manufacturers such as Mattel and Apple in order to satisfy the holiday season demand.[1]

Example 2 (Electricity and Gas). In deregulated electricity and gas markets in the United States, independent upstream power generators and utilities sell to retail intermediaries through negotiated power purchase agreements. These intermediaries in turn compete for both residential and business customers. Forward contracts with guaranteed utility rates are commonly seen in these markets.

Example 3 (Healthcare Services). Healthcare providers (e.g., hospitals) negotiate supply terms with health insurance organizations who compete for potential care receivers.

These examples capture the importance of multilateral negotiations and retail competition. Such multilateral negotiations involve several features that are the subject of this paper. First, the outcome of negotiation between a manufacturer and a retailer depends on the parties' outside options when bargaining breaks down. In multilateral relationships with competing downstream retail firms, the manufacturer's outside options are endogenous, and thus the bargaining outcomes are interdependent and can be influenced by retail competition, yielding a "bargaining externality" across the retail channels. For example, when Apple negotiates with Walmart on its supply of the iPad2, it should keep in mind the possible alternative negotiation with Target. In turn, both Walmart and Target also need to consider how their

[1] For multilateral relationships in the toy market, see http://www.wikinvest.com/stock/Mattel_%28MAT%29/Major_Customers (accessed February 26, 2009).

interaction in the retail market is related to these multilateral negotiations. Second, the analysis of multilateral bargaining leads naturally to a timing question: Should the manufacturer negotiate simultaneously with all the retailers, or should the negotiations be sequential and with one retailer at a time? This then implies the investigation of how the timing of negotiations affects the bargaining externality across the retailers. Third, retailers may collect preorders or offer forward contracts to customers in which they commit to retail prices and would potentially affect the negotiations with the upstream party for procurement of the product.

We address these issues in a setup in which a manufacturer sells through two ex ante symmetric retailers who compete by choosing a market action (e.g., retail price) to sell the product to the end consumer market. The consumer market is modeled in a manner similar to those in Varian (1980) or Narasimhan (1988). Consumers have unit demands as long as the product is sold below their reservation price, and they are heterogeneous in their preferences over the retailers. Each retailer has a group of loyal consumers who consider purchasing only from their favorite retailer, and the remaining consumers comparison shop between the two retailers and buy at the lowest price. Thus the proportion of the comparison shopping consumers is a measure of the degree of retail competition.

We first consider the case where retail pricing to consumers precedes the ordering and the physical delivery of the product from the manufacturer. This case is called *late ordering*, and it represents some important realities of retail markets. First, late ordering is commonly observed in many markets such as appliances, automobiles, electronics, furniture, information, and services (Iyer and Villas-Boas 2003). An essential aspect of these markets is that retailers have pricing agreements with consumers before they procure the product. As mentioned in Example 2, this practice is prevalent in industries such as electricity and gas, where customers are frequently acquired using forward contracts before the retailers strike supply agreements with the upstream utility producer (Stahl 1988, Gans 2007). Another well-known example is that of Dell (Magretta 1998), whose strategy is to order from suppliers only when demand is received from customers. In general, late ordering is relevant whenever it is infeasible or suboptimal for the retailers to build up inventory before demand realization.[2] Second, it may be difficult to fully specify all aspects of a transaction in an ex ante procurement contract based on which the retailers set prices. For example, it may be hard to agree on who is responsible for product damages, incorrect specifications, delays in delivery, etc. Therefore, the terms of trade in ex ante agreements may be subject to ex post renegotiation—after retail price offers to consumers and at the time of product ordering and delivery. That is, because of the inability to fully specify contract terms, the parties can be ex post opportunistic, yielding the possibility of renegotiation of the initial agreements.

The (re)negotiation process is modeled in a manner so as to distinguish between simultaneous and sequential bargaining: There are two possible periods in which the manufacturer can negotiate with each of the retailers and beyond which the customers are not available. Simultaneous bargaining emerges if the manufacturer negotiates concurrently with both retailers in one of the two periods. In essence, this implies that the retailers negotiate without observing whether an agreement is reached in the other retail channel. In contrast, sequential bargaining arises if the manufacturer chooses to negotiate with only one retailer in each period so that in the second period, it is known whether an agreement was reached in the previous period with the rival retailer (but not the terms of the agreement). Our focus is to examine how the alternative bargaining timing can endogenously affect the manufacturer's outside options and the bargaining externality across the retailers. A contribution of this paper is then to establish the upstream incentives and the market conditions that induce the manufacturer to choose between simultaneous versus sequential bargaining.

With simultaneous bargaining, the outcomes of negotiations depend on whether the retail prices that are chosen end up being equal or different. Consider first the case with different retail prices. The manufacturer, when bargaining with the lower-priced (less profitable) retailer, can threaten to sell to the comparison shopping consumers through the other retailer. But this threat does not go in the reverse direction, because the manufacturer's expected profit in the lower-priced channel is not affected by whether there is an agreement with the retailer charging the higher price. Thus the bargaining externality is asymmetric across the retailers. When the retail prices are equal, the bargaining externality is symmetric and exists in the bargaining with both retailers.

With sequential bargaining, the order of negotiations becomes important: Should the manufacturer negotiate first with the higher-priced or the lower-priced retailer? The manufacturer's optimal choice hinges on how the bargaining order endogenously influences the bargaining externality. When the manufacturer bargains first with the lower-priced retailer, the bargaining externality exists because the

[2] Product ordering after retail pricing is also consistent with improvements in demand-tracking technologies, which allow retailers such as Walmart to postpone product procurements until enough demand information is acquired.

possibility of reallocating the demand of the comparison shoppers to the higher-priced retailer acts as a credible threat. However, if the first negotiation is with the higher-priced retailer, and should this bargaining fail, then there no longer exists the possibility of demand reallocation in the subsequent negotiation. That is, the higher-priced retailer's threat to fail the first-period negotiation can endogenously nullify the bargaining externality in the second period and thus reduce the manufacturer' disagreement payoff in the first-period bargaining. This constitutes a strategic backlash effect that results in lower equilibrium wholesale prices and works to the disadvantage of the manufacturer. Thus when the retail prices and profitability are not too different, the manufacturer has an incentive to negotiate first with the lower-priced retailer.

In contrast, when the dispersion in the retail prices is sufficiently large, it is optimal for the manufacturer to bargain first with the higher-priced retailer. In this case the manufacturer may end up not selling at all to the lower-priced retailer if a sufficiently high wholesale price has been agreed with the higher-priced retailer. Such a high wholesale price is more likely to be agreed upon if the profitability at the lower-priced retailer is low enough. This high wholesale price can serve as a credible commitment to stock out the lower-priced retailer, creating an endogenous exclusivity in retail distribution. In other words, this strategic commitment effect can be so strong that the manufacturer may choose to not sell to the loyal consumers of the lower-priced retailer at all in order to be able to sell to the comparison shopping consumers through the more profitable retailer. In this manner, our analysis provides a strategic negotiation-based rationale for exclusivity in retailing.

The next result pertains to the choice of the equilibrium bargaining timing. Note that both the strategic backlash and the commitment effects are absent under simultaneous bargaining. When the retail prices are not too different, the adverse impact of the backlash effect is most severe, and thus the equilibrium bargaining timing is one of simultaneous bargaining with both retailers. On the other hand, sequential bargaining can benefit the manufacturer because of the strategic commitment effect. The benefit of this commitment effect is more substantial if the difference in the retail prices becomes larger. Thus sequential bargaining (and negotiating first with the higher-priced retailer) can dominate simultaneous bargaining when the retail prices are sufficiently different.

Next, we trace the interaction between retail competition and multilateral bargaining. When the degree of retail competition (i.e., the proportion of comparison shopping consumers) is not very high, the equilibrium price dispersion is relatively small, which can enhance the manufacturer's preference for simultaneous bargaining and lead to a greater possibility of both retailers being served in equilibrium. As retail competition intensifies, the equilibrium retail prices become more dispersed, increasing the manufacturer's preference for sequential bargaining and its incentive to ex post stock out the lower-priced retailer. Thus the response of multilateral bargaining to retail competition can create an endogenous exclusivity outcome. Moreover, because of this stocking-out effect, the retailers' equilibrium ex ante profits can, counterintuitively, increase with the manufacturer's bargaining power and be strictly positive even when the market becomes perfectly competitive.

We consider some extensions to the basic model. First, we capture the possibility that, when retailers commit their prices to consumers but fail to fulfill the demand, they may bear some negative consequences (e.g., financial penalty, loss of goodwill). The main results are qualitatively the same as the basic model. Second, we investigate the alternative case of early ordering where the product is delivered and owned by the retailers before retail prices are set. In this case all transactions between the channel members are completed through ex ante bargaining, and as a result, ex post renegotiation after price setting is not relevant. We find that, in comparison to the late delivery case, the manufacturer has a greater incentive to adopt simultaneous bargaining. This is because, in contrast to ex post renegotiation, ex ante bargaining responds to anticipated rather than actual retail prices, resulting in greater symmetry across the retailers during the bargaining process. Finally, we consider the case when the manufacturer can bargain in an unconstrained manner with any retailer across the renegotiation periods; i.e., they can bargain again in the second period even when the first-period bargaining failed. This can increase both the manufacturer's and the retailers' disagreement payoffs in the first-period bargaining. As a result, it is only when the retail price dispersion is intermediate that the strategic commitment effect allows the manufacturer to negotiate for a higher wholesale price under sequential bargaining. In addition, the equilibrium retail price range is narrower, the retailers offer less frequent promotions, and retail stockouts are more frequent.

1.1. Related Research

There is a literature on the design of take-it-or-leave-it contracts for a manufacturer to coordinate retailer actions and to achieve the first-best outcome (e.g., Jeuland and Shugan 1983, Mathewson and Winter 1984, Rey and Tirole 1986, Moorthy 1987, Lal 1990,

Winter 1993, Chu and Desai 1995, Iyer 1998).[3] In contrast, the starting point of our paper is that many vertical relationships involve multilateral bargaining with downstream retailers where the manufacturer's outside options are endogenous and the negotiation outcomes are interdependent. In addition, to the extent that retail actions precede product ordering and physical delivery and that product characteristics may not be fully specifiable, the manufacturer can behave opportunistically and renegotiate any ex ante contract even after the market actions are chosen by the retailers.[4] We analyze how the retail market interaction may endogenously influence the bargaining externality in the ex post renegotiations.[5]

We contribute to the literature on the timing of multilateral bargaining.[6] Clark and Pereau (2009) study a different bargaining problem of how to divide a fixed surplus among multiple players whose unanimity is required for bargaining success. They show that a dominant player who can determine the timing of negotiations would strictly prefer simultaneous bargaining. Starting from Aghion and Bolton (1987), there is a stream of research that examines how a buyer can contract with a seller to jointly extract surplus from a second seller in a subsequent contracting. Marx and Shaffer (2007) show that, all else being equal, the buyer prefers to bargain first with a seller with relatively lower bargaining power and/or less stand-alone surplus in order to gain a larger share of the to-be-extracted surplus (from the second, more efficient seller). In a related study, Marx and Shaffer (2010) find that the second seller's payoff can increase with the buyer's bargaining power because then there will be more equilibrium surplus that remains to be divided in the second negotiation. The current research differs from these studies in the nature of bargaining externality and in how it can be influenced by alternative bargaining timing arrangements. The negotiations are interdependent in Clark and Pereau (2009) because the terms to divide the fixed pie need to be agreed by all parties and in Aghion and Bolton (1987) and Marx and Shaffer (2007, 2010) because the contract form is assumed to be sufficiently general such that the transfer price in each negotiation is dependent on the purchase quantities from both sellers. However, we consider multiple bilateral negotiations between an upstream manufacturer and two retailers that compete in the downstream market, where the bargaining externality results from the demand reallocation of the comparison shopping consumers across the channels. This allows us to identify the strategic backlash and the commitment effects that are absent in the above studies, yielding the results that the manufacturer can benefit from sequential bargaining (in contrast to Clark and Pereau 2009) and from negotiating first with the more efficient retailer (in contrast to Marx and Shaffer 2007, 2010). Note also that another distinguishing feature of this paper is that these strategic effects arise under sequential bargaining only because the success or failure of the previous negotiation (but not the exact terms of trade) becomes known in the later negotiation.

This paper is also related to the literature on the effects of vertical integration in multilateral supply relationships (e.g., Hart and Tirole 1990).[7] Bolton and Whinston (1993) investigate the effect of vertical integration on supply assurance concerns when downstream firms compete for limited inputs. More recently, de Fontenay and Gans (2005) show that there is greater incentive for strategic vertical integration under upstream competition than under monopoly. Gans (2007) shows that, when retail competition for customers precedes ordering, vertical integration is a mechanism through which an upstream manufacturer exercises market power to the detriment of consumers.

The remainder of this paper is organized as follows. In the next section we lay out the model assumptions. Section 3 presents the main analysis and results, and some model extensions are offered in §4. Section 5 concludes the paper.

[3] Several papers examine the effects of bargaining in markets (e.g., Horn and Wolinsky 1988, Dukes et al. 2006, Chen et al. 2008). Dobson and Waterson (1997) analyze the effect of retail concentration on channel bargaining, and Shaffer (2001) considers channel efficiency when multiproduct retailers bargain bilaterally with upstream parties.

[4] The effects of product nonspecifiability in a bilateral distribution relationship have been addressed in Iyer and Villas-Boas (2003) and analyzed in more general terms in the incomplete contracting literature (Grossman and Hart 1986; Hart and Moore 1988, 1990; Aghion et al. 1994). Contracts on product characteristics can also be incomplete because of transaction costs arising out of unforeseeable contingencies at the contracting date, too many contingencies to specify in the contract, and high monitoring or legal costs of enforcing the contract (Coase 1937, Williamson 1975).

[5] McAfee and Schwartz (1994) consider another type of ex post opportunism in multilateral contracting that, if the contract arrangements are not publicly observable, each retailer will fear that the manufacturer may opportunistically renegotiate a rival retailer's contract to increase bilateral profits at the focal retailer's expense.

[6] Banerji (2002) considers wage negotiations between a union and duopoly firms, where the default option during periods of no negotiation (under sequential bargaining) is some exogenous preexisting contract. There is also a separate literature on the timing of bilateral bargaining over multiple projects between two parties (e.g., Inderst 2000).

[7] Inderst and Wey (2003) examine how downstream mergers affect the cost reduction incentives of upstream parties, and Inderst and Shaffer (2007) examine the effect of downstream mergers on upstream product variety.

2. The Model

We begin by describing the demand and market structure with downstream competition. The sequence of actions in the game is then described. We also discuss the bargaining framework characterizing the negotiations with multiple retailers in the presence of retail competition.

2.1. The Market

Consider a market where a manufacturer (M) produces a product with constant marginal cost, which is normalized to 0. The manufacturer sells to the final consumer market through two retail intermediaries ($i = 1, 2$). The retailers compete in price in the consumer market and their selling costs, both fixed and marginal; are assumed to be identical; and, without loss of generality, set to 0.

There is a unit mass of consumers, and each consumer demands at most one unit of the product. The consumers have an identical reservation value r but may differ in their search or transaction costs of buying from different retailers. A segment of size β consumers have zero costs of comparison shopping across the two retailers. When the product is available at both retailers, only the retailer charging the lower price can sell to these consumers. When only one retailer sells the product, the consumers will purchase as long as the price is below the reservation value. If both retailers offer the same price, we assume that these consumers will buy from either retailer with equal probability 1/2. Thus these consumers are akin to the informed consumers as in Varian (1980) or the switchers as in Narasimhan (1988). We denote this consumer segment as S.

The remaining $(1 - \beta)$ consumers are divided into two segments. A segment of consumers, denoted as $L1$, consider buying only from retailer 1 as long as the price is below their reservation value and have prohibitively high costs of considering retailer 2. When only retailer 2 offers the product, or the price charged by retailer 1 is above the reservation value, they do not make any purchase. Similarly, the remaining segment of consumers, denoted as $L2$, have zero costs of shopping at retailer 2 but prohibitively high costs at retailer 1. These consumers are akin to the uninformed consumers as in Varian (1980) or the loyal consumers as in Narasimhan (1988). The size of these loyal segments are identical: $\gamma_1 = \gamma_2 = \gamma = (1 - \beta)/2$. So if both retailers can offer the product, the demand is symmetric across the two retailers. This standard demand structure constitutes a parsimonious setting in which to analyze the bargaining externality across retailers in the presence of competition.

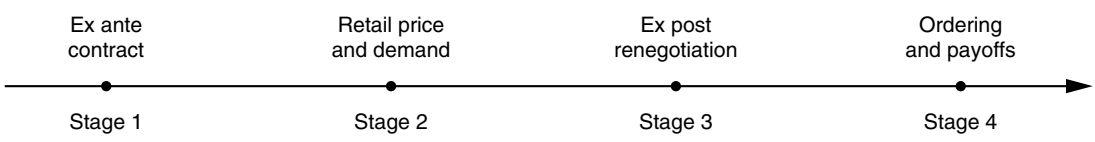
2.2. The Game

Our objectives are to investigate the bargaining externality in multilateral bargaining between a manufacturer and downstream retailers and to analyze the retailers' strategic pricing decisions in the presence of the bargaining externality (in addition to demand externality). To this end, we formulate a multistage game that is shown in Figure 1. In the first stage, the manufacturer negotiates with the retailers on the transfer of the product to meet consumer demand. The negotiation between the manufacturer and a retailer ($i = 1, 2$) may potentially lead to an ex ante contract specifying a per-unit nonnegative wholesale price ω_i to be paid to the manufacturer for delivering the product.

In the second stage, the retailers make their retail pricing decisions P_i, $i = 1, 2$, which determine consumer demand. We assume that the pricing decisions are simultaneously made, and once a retailer determines its price offer to the consumer market, it will be committed and not be modified. Next, we allow any ultimate transaction between the manufacturer and a retailer to be subject to the renegotiation of the stage 1 ex ante contract. This ex post renegotiation occurs in the third stage of the game. In the final stage the retailers order the good from the manufacturer, demand is fulfilled, and the parties' transactions are cleared according to the ex post renegotiated contracts. We assume that all the parties' moves in a previous stage become common knowledge in a later stage.

The above setup represents the scenario when the retail pricing decisions precede the physical delivery of the product from the manufacturer to the retailers, which we call late ordering. It captures the case in which it is either infeasible or suboptimal for the retailers to build up inventory before demand realization. In practice, this selling format is commonly seen in many markets such as appliances, automobiles, electronics, furniture, information, and services, which are characterized by consumer order taking. Further, it is consistent with the market situations highlighted by Gans (2007), where retailers compete and secure consumer orders with committed prices before negotiating with suppliers (e.g., utilities). Note

Figure 1 Sequence of Moves



also that the ex post renegotiation between the manufacturer and a retailer captures the parties' opportunism, at the time of retail ordering and product delivery, to not honor the per-unit transfer price that is agreed in an ex ante contract. This opportunism would arise if the product cannot be completely specified in the ex ante agreement. Thus in stage 2 when the retail prices are set, all parties expect that there may be ex post renegotiations to determine the final transfer prices based on which retail orders will be chosen.

In §4.2 we will also consider the selling format where the retailers have to physically carry the product prior to setting the retail prices and selling to the market. Under this alternative setup, which we term as *early ordering*, the retailers in the second stage simultaneously decide how much to order based on the contractual terms specified in the first stage. The retailers then simultaneously make their pricing decisions and satisfy consumer demand using the ordered inventory.

2.3. The Bargaining Process

Next we specify the bargaining process that characterizes all the channel (re)negotiations. We model the bilateral negotiation between the manufacturer and each retailer, while accounting for any bargaining externality that may exist as a result of the presence of retail competition. Let us denote the set of bargaining outcomes as $\omega = (\omega_1, \omega_2)$. A breakdown or disagreement in the negotiation with retailer i is denoted as $\omega_i = \bigotimes$. So we have $\omega_i \in \{\bigotimes\} \cup [0, +\infty)$. Following Nash (1950), the generalized bargaining process in retail channel i solves the following problem:

$$\begin{aligned} &\max_{\omega_i} [\pi_M(\omega) - \pi_{Mi}^0(\omega)]^{\alpha} \times [\pi_i(\omega) - \pi_i^0(\omega)]^{1-\alpha} \\ &\text{s.t.} \quad \pi_M(\omega) \geq \pi_{Mi}^0(\omega) \quad \text{and} \quad \pi_i(\omega) \geq \pi_i^0(\omega), \end{aligned} \tag{1}$$

where ω_i is the bargaining outcome; $\pi_M(\omega)$ and $\pi_i(\omega)$ are the (anticipated) profits of the manufacturer and the retailer $i = 1, 2$, respectively; $\pi_{Mi}^0(\omega) \equiv \pi_M(\omega_i = \bigotimes, \omega_j)$ and $\pi_i^0(\omega) \equiv \pi_i(\omega_i = \bigotimes, \omega_j)$ are the firms' disagreement payoffs, if the negotiation in retail channel i breaks down; and finally, α and $1 - \alpha$ are the relative bargaining powers for the manufacturer and each of the retailers, respectively.[8]

This characterizes a fairly general noncooperative approach to multiple channel bargaining. It stipulates that the split of surplus should reflect the parties' payoffs and opportunity costs arising from the negotiated contract, as well as the relative bargaining powers. Conditional on ω, the transaction payoffs $\pi_M(\omega)$ and $\pi_i(\omega)$ take into account the interaction in the retail market. In the basic model, we normalize the retailers' payoff of no transaction (i.e., $\pi_i^0(\omega)$) to 0. However, given the manufacturer's stake in both channels, its disagreement value (i.e., $\pi_{Mi}^0(\omega)$) needs to be determined endogenously. That is, while negotiating, the parties envision what would happen to the manufacturer's overall payoff should the threat of breakdown in the current bargaining come true.

2.4. The Timing of Multilateral Bargaining

In multilateral bargaining, the question of the timing of negotiations arises naturally: Should the manufacturer negotiate simultaneously with both retailers or sequentially with one retailer at a time? That is, how should the manufacturer use bargaining timing as a strategic instrument in dealing with the retailers? This implies the analysis of how the alternative bargaining timing affects the bargaining externality in multilateral negotiations across the retailers.

We model the stage 3 bargaining (and similarly the ex ante bargaining in the early ordering case) as follows. Within stage 3 there are two possible periods in each of which the manufacturer can decide whether to negotiate with a retailer. The idea behind this two-period assumption is that the consumer demand is not present forever and will not be available if there is no trade by the end of the two periods. In addition, across the two periods, the negotiation between the manufacturer and a retailer can take place in at most one period. If a contract was agreed in the first period, it cannot be negotiated again (in the second period). We also assume that a retailer can observe whether an agreement was reached in a previous period between the manufacturer and the rival retailer but that the specific contract terms are unobservable, which will have to be inferred. This is a milder assumption than what is currently used in the literature (e.g., Marx and Shaffer 2007, 2010), because it does not require the revelation of the contract terms to the parties during a subsequent bargaining.

Thus the manufacturer's strategic choice of whether and when to bargain with each retailer can endogenously lead to the emergence of the simultaneous versus the sequential bargaining.[9] If the manufacturer

[8] We intentionally assume that the retailers have the same bargaining power. This allows us to show that, even with ex ante symmetric retailers, downstream competition and ex post renegotiation can lead to the equilibrium emergence of sequential bargaining. Nevertheless, we also investigate the case when the manufacturer has differential bargaining powers across the channels. We show in the supplementary appendix (available as supplemental material at http://dx.doi.org/10.1287/mksc.1120.0766) that the manufacturer's equilibrium incentives for bargaining timing are qualitatively similar to the case with symmetric manufacturer bargaining power.

[9] Note that it is natural that the manufacturer is the only one who decides on the alternative bargaining timing, because it is the only party that is common to both of the bilateral negotiations. In contrast, it is infeasible for the retailers to influence the timing of negotiations, because a retailer cannot observe or decide whether and when the manufacturer is bargaining with the rival retailer.

chooses to bargain with both retailers in the same period, then simultaneous bargaining obtains where each retailer negotiates with the manufacturer without knowing if a contract in the other channel has been reached. In contrast, sequential bargaining arises if the manufacturer decides to bargain with only one retailer in the first period and to postpone the potential negotiation with the other retailer to the second period. Under sequential bargaining, the parties in the latter bargaining know whether the previous bargaining succeeded or failed, but the reverse is not true for the parties in the first-period bargaining. Therefore, the key difference between the two bargaining timing arrangements lies in whether the retailers' information about the success or breakdown in the other channel bargaining is symmetric across the two negotiations. Given that this information can endogenously influence the parties' disagreement payoffs, this setup can help us capture the effect of bargaining timing on the bargaining externality that may arise in multilateral contracting.

We implicitly assume that, if an initial negotiation (in the first period) failed, the parties in this off-equilibrium path cannot be involved in another negotiation in the second period. However, in the equilibria we derive, a negotiation, once started, will always succeed. Nevertheless, in §4.3 we will also investigate the alternative case in which the negotiation between the firms can occur in an unconstrained manner in both periods. That is, the parties can negotiate again in the second period even if they have bargained but failed to reach an agreement in the first period.

3. The Analysis and Results

Given that any transaction between the firms is to be cleared according to the ex post renegotiated contract, we can, without loss of generality, concentrate on deriving the equilibrium renegotiations in the third stage, conditional on the retail prices that are set in the second stage. In characterizing the third-stage equilibrium, we start with analyzing the bargaining outcomes when the timing of bargaining is given. Next, in §3.3 we derive the equilibrium bargaining timing. We then investigate the retailers' equilibrium pricing decisions in the second stage, in anticipation of how the charged prices will influence the parties' payoffs in the ex post renegotiations.

3.1. Simultaneous Bargaining

Conditional on the retail prices $P = (P_1, P_2)$, the parties in either channel are involved in simultaneously renegotiating the wholesale prices ω. Recall that under simultaneous bargaining, each retailer does not know whether an agreement is to be reached in the alternative channel bargaining. The two bilateral negotiations then constitute a simultaneous-move (bargaining) game of imperfect information. We follow the standard procedure to solve the Nash equilibrium for this simultaneous-move game. In particular, we first characterize, for each channel bargaining, the response function $\omega_i(\omega_j; P)$, $i = 1, 2$, $j = 3 - i$, where $\omega_j \in \{\bigotimes\} \cup [0, +\infty)$. Note that this response function is conditional on the parties' belief about all the possible outcomes in the alternative bargaining, i.e., whether an agreement is reached as well as what wholesale price is agreed between the manufacturer and the rival retailer. We can then obtain the equilibrium renegotiated wholesale prices $\omega^*(P) = (\omega_1^*(P), \omega_2^*(P))$ by solving the response functions simultaneously: $\omega_1^* = \omega_1(\omega_2^*; P)$ and $\omega_2^* = \omega_2(\omega_1^*; P)$. We consider two alternative scenarios where the retail prices are unequal or identical.

1. *Unequal retail prices ($P_1 < P_2$)*: Consider first the negotiation between the manufacturer and retailer 1. Note that conditional on $P_1 < P_2$, the comparison shopping S consumers who consider both retailers prefer to buy from retailer 1 over retailer 2. Therefore, we have $\pi_M = ((1+\beta)/2)\omega_1 + ((1-\beta)/2)\omega_2$ and $\pi_1 = ((1+\beta)/2)(P_1 - \omega_1)$. Now consider the manufacturer's disagreement value in the channel 1 bargaining. If it is expected that the channel 2 bargaining fails (i.e., $\omega_2 = \bigotimes$), then $\pi_{M1}^0 = 0$. If, instead, $\omega_2 \geq 0$, then the S consumers would move to retailer 2 if the product were not to be sold through retailer 1, which leads to $\pi_{M1}^0 = ((1+\beta)/2)\omega_2$. Noting that the participation constraint $\omega_1 \leq P_1$ must be satisfied, we have

$$\omega_1(\omega_2; P) = \begin{cases} \alpha P_1, & \text{if } \omega_2 = \bigotimes; \\ \alpha P_1 + \dfrac{2(1-\alpha)\beta}{1+\beta}\omega_2, & \text{if } \omega_2 < \dfrac{1+\beta}{2\beta}P_1; \\ \bigotimes, & \text{if otherwise.} \end{cases}$$

This response function captures the bargaining externality that may be present in multiple channel contracting. As the expected wholesale price ω_2 increases, it becomes more profitable for the manufacturer to sell to the S consumers through retailer 2. As a result, the value of the manufacturer's outside option in channel 1 negotiation becomes larger, which allows to negotiate a higher wholesale price from retailer 1. In addition, the strength of bargaining externality increases with the proportion of comparison shopping consumers. However, because retailer 1 should earn at least its disagreement payoff, if the expected channel 2 wholesale price is sufficiently high (i.e., $\omega_2 \geq ((1+\beta)/(2\beta))P_1$), the negotiation in channel 1 will break down.[10] This is because then the manufacturer

[10] When $\omega_2 = ((1+\beta)/(2\beta))P_1$, the manufacturer is indifferent between selling through channel 1 or not. To break the tie, we use the rule that in this case the manufacturer will sell only through channel 2.

prefers all the comparison shopping consumers to buy from channel 2, which has a higher retail profit margin.

Consider then the negotiation in channel 2. Conditional on $P_1 < P_2$, the S consumers have a relative preference for retailer 1, and therefore the manufacturer's expected channel 1 profit is not affected by whether the channel 2 negotiation fails. This leads to $\omega_2(\omega_1; P) = \alpha P_2$. Thus the bargaining externality, arising from the endogenous change in the manufacturer's outside options, is *asymmetric* and may exist in the channel 1 but not in the channel 2 negotiation. This asymmetric bargaining externality is caused by the asymmetry in demand: when both retailers carry the product, only the lower-priced retailer 1 can sell to the S consumers. Therefore, the manufacturer's threat to reallocate the S-segment demand across channels can work only in negotiating with retailer 1.

2. *Equal retail prices ($P_1 = P_2$)*: Given equal retail prices, the S consumers will be split equally between the retailers. Therefore, the bargaining externality is symmetric and present in both negotiations. Note also that $\pi_M = (1/2)\omega_1 + (1/2)\omega_2$, $\pi_i = (1/2)(P_i - \omega_i)$, and $\pi^0_{Mi} = ((1+\beta)/2)\omega_j$, $i = 1, 2$, $j = 3 - i$, which yields

$$\omega_i(\omega_j; P) = \begin{cases} \alpha P_i, & \text{if } \omega_j = \bigotimes; \\ \alpha P_i + (1-\alpha)\beta\omega_j, & \text{if } \omega_j < (1/\beta)P_i; \\ \bigotimes, & \text{if otherwise.} \end{cases}$$

Summarizing the above, we can then characterize the renegotiation equilibrium in simultaneous bargaining for the case of $P_1 \le P_2$ (the case of $P_1 \ge P_2$ is analogous).

Proposition 1. *The equilibrium simultaneous renegotiation outcome is given by the following*:

(i) *When the retail price dispersion is sufficiently large* ($P_1 \le (2\alpha\beta/(1+\beta))P_2$), *the manufacturer sells only through retail channel* 2, *and the equilibrium negotiated wholesale prices are* $(\omega_1^*, \omega_2^*) = (\bigotimes, \alpha P_2)$.

(ii) *When the retail price dispersion is smaller* $((2\alpha\beta/(1+\beta))P_2 < P_1 < P_2)$, *the manufacturer sells through both retail channels, and the equilibrium negotiated wholesale prices are* $(\omega_1^*, \omega_2^*) = (\alpha P_1 + (2\alpha(1-\alpha)\beta/(1+\beta))P_2, \alpha P_2)$.

(iii) *When the retail prices are equal and there is no price dispersion, again the manufacturer sells through both retailers, and* $(\omega_1^*, \omega_2^*) = ((\alpha/(1-(1-\alpha)\beta))P_1, (\alpha/(1-(1-\alpha)\beta))P_2)$.

Proposition 1 shows that the renegotiation outcome under simultaneous bargaining depends on the retailers' ex post relative profitability, which is influenced by the retail price dispersion. When the price dispersion is sufficiently large, the manufacturer sells only through the more profitable channel. When the price dispersion is not sufficiently large, both retailers sell the product in equilibrium.

The presence of the bargaining externality allows the manufacturer to extract more surplus from the overall channel profits, Π_i, $i = 1, 2$. Given the equilibrium negotiated wholesale prices, we can easily calculate the parties' profits. In particular, when $(2\alpha\beta/(1+\beta))P_2 < P_1 < P_2$, we can show that $\pi^*_{M1} > \alpha\Pi_1$ and $\pi^*_1 < (1-\alpha)\Pi_1$, implying larger manufacturer surplus extraction from the lower-priced and less profitable channel 1. However, the absence of bargaining externality in the channel 2 bargaining leads to $\pi^*_{M2} = \alpha\Pi_2$ and $\pi^*_2 = (1-\alpha)\Pi_2$. In the same vein, we have $\pi^*_{Mi} > \alpha\Pi_i$ and $\pi^*_i < (1-\alpha)\Pi_i$, $i = 1, 2$, when the bargaining externality is present in both channels (i.e., $P_1 = P_2$). In other words, the channel members' equilibrium payoffs do not necessarily correspond to their relative bargaining powers. The manufacturer can extract a greater share of the channel profits than what is dictated by its relative bargaining power. This is because the manufacturer can exploit the threat of bargaining failure to reallocate sales from one retailer to the other one. This bargaining externality arises because the manufacturer's outside option in each channel bargaining is endogenously determined. Throughout the paper, we will highlight the endogeneity of the disagreement payoffs in multilateral bargaining, which is otherwise absent in bilateral bargaining.

The extent to which the manufacturer can extract retail profits increases with the intensity of retail competition as represented by the size of the S segment. Intuitively, the larger the fraction of the consumers who search across the retailers, the greater the extent of retail competition and the higher the bargaining externality. This reinforces the monopoly power of the manufacturer in supplying the consumer market, which in turn can be used strategically along with its bargaining power to extract more surplus in multilateral bargaining.

3.2. Sequential Bargaining

When the manufacturer negotiates sequentially with the retailers, the parties in the second-period bargaining can observe whether the first-period negotiation succeeded or failed. That is, unlike simultaneous bargaining, the success or the breakdown in the first-period bargaining can directly influence the subsequent negotiation. This can in turn yield two endogenous effects on the initial negotiation, and we will elaborate how they can determine the manufacturer's choice between the alternative bargaining sequences and its equilibrium payoffs.

1. *Unequal retail prices ($P_1 < P_2$)*: With sequential bargaining and unequal prices, the order in which

the manufacturer negotiates with the retailers is relevant. Suppose that the manufacturer bargains first with retailer 1. If the bargaining failed (i.e., $\omega_1 = \bigotimes$), the S consumers will purchase from retailer 2, and in the subsequent channel 2 bargaining, the threat point for the manufacturer is $\pi^0_{M2} = 0$. We then have $\omega_2 = \alpha P_2$. In anticipation of this, the manufacturer's threat point in negotiating with retailer 1 is $\pi^0_{M1} = ((1+\beta)/2)(\alpha P_2)$. If, instead, the bargaining with retailer 1 leads to an agreement, then irrespective of the contract that will be signed between the manufacturer and retailer 2, the sales in channel 1 will not be affected. So we still have $\omega_2 = \alpha P_2$. However, in this case the demand for channel 2 is only from the $L2$ consumer segment. Therefore, in channel 1 bargaining, we have $\pi_M = ((1+\beta)/2)\omega_1 + ((1-\beta)/2)(\alpha P_2)$ and $\pi_1 = ((1+\beta)/2)(P_1 - \omega_1)$. The initial channel 1 bargaining then yields

$$\omega_1 = \begin{cases} \alpha P_1 + \dfrac{2\alpha(1-\alpha)\beta}{1+\beta} P_2, & \text{if } \dfrac{2\alpha\beta}{1+\beta} P_2 < P_1 < P_2; \\ \bigotimes, & \text{if otherwise.} \end{cases}$$

Next consider what would happen if the manufacturer bargains first with retailer 2. If the negotiation with retailer 2 failed, then in the subsequent negotiation with retailer 1, we will have $\omega_1 = \alpha P_1$. If the negotiation with retailer 2 did not fail, there are two scenarios in the subsequent channel 1 bargaining. If ω_2 is not very high, then the manufacturer will sell through retailer 1 as well. However, if ω_2 is sufficiently high, from the manufacturer's point of view, it is more profitable to sell to the S segment through channel 2. This implies that retailer 1 will be stocked out in equilibrium, because otherwise, the high enough ω_2 will not be sustained (i.e., agreed upon by retailer 2). Consequently, there may exist two types of equilibrium outcomes for the case of negotiating first with retailer 2. Of course, for both cases, ω_2 must also satisfy the payoff-division condition as stipulated by (1), given the parties' expected payoffs following the subsequent response in channel 1 bargaining.

Proposition 2. *When $P_1 < P_2$, under sequential bargaining the manufacturer is better off negotiating first with retailer* 1 *if and only if the retail prices are sufficiently close* ($P_1 > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$):

(i) *Under the retailer* 1 *first bargaining, the manufacturer sells through both retail channels, and* $(\omega_1^*, \omega_2^*) = (\alpha P_1 + (2\alpha(1-\alpha)\beta/(1+\beta))P_2, \alpha P_2)$.

(ii) *Under the retailer* 2 *first bargaining, the manufacturer sells only through retailer* 2, *and* $(\omega_1^*, \omega_2^*) = (\bigotimes, \alpha(1-\alpha)P_1 + \alpha P_2)$.

When the retail prices are unequal, the profitability of the two retail channels are asymmetric. Proposition 2 characterizes how the manufacturer's choice between the alternative bargaining sequences is influenced by the channels' relative profitability. Should the manufacturer negotiate first with the more profitable, higher-priced retailer or the less profitable, lower-priced retailer? In what follows, we elaborate on the mechanisms underlying the equilibrium negotiation sequence, and we highlight the role of asymmetric bargaining externality that is generated by the unequal retail prices.

When channel 1's profitability is sufficiently close to that of channel 2 (i.e., P_1 is close to P_2), in equilibrium both retail channels can make positive sales. In this case bargaining first with retailer 1 leads to a more advantageous set of wholesale prices than those in the alternative sequence. This is due to the asymmetry in the bargaining externality across the retailers: given $P_1 < P_2$, the manufacturer can threaten to reallocate the S-segment sales to retailer 2 if it is negotiating with retailer 1, but the threat cannot go in the reverse direction if it is negotiating with retailer 2 instead. This bargaining externality effect would necessarily arise in the first-period negotiation with retailer 1, because the subsequent channel 2 bargaining would always succeed no matter whether the initial channel 1 bargaining succeeded or broke down. As a result, the presence of the subsequent negotiation with the higher-priced retailer acts as a credible threat that allows the manufacturer to extract more channel profits in the first negotiation with retailer 1. However, when the manufacturer chooses to negotiate sequentially and bargain with retailer 1 in the second period, the bargaining externality can be endogenously nullified by the failure in the first-period negotiation: the parties would know that the manufacturer has committed not to sell to the S segment through retailer 2. As a result, when the manufacturer bargains with retailer 2 in the first period, retailer 2 can effectively threaten to nullify the manufacturer's threat in the subsequent negotiation with retailer 1 to reallocate the S-segment sales from retailer 1 to retailer 2. The manufacturer's disagreement value in the first-period bargaining with retailer 2 would then be reduced, because the negotiation breakdown would remove the bargaining externality and hurt the manufacturer's payoff extraction in the subsequent negotiation with retailer 1. This constitutes a strategic backlash effect on the initial negotiation with retailer 2, thus resulting in a lower ω_2 (which in turn leads to a lower ω_1).

In contrast to the above case, the manufacturer's preference for the bargaining sequences can be reversed when channel 1's relative profitability is sufficiently low. To see this, note that when the manufacturer is initially bargaining with retailer 2, the parties may anticipate that subsequently the manufacturer

may not sell through retailer 1 if a sufficiently high ω_2 is to be contracted. If retailer 1 is strategically stocked out in equilibrium, the S-segment consumers will buy from retailer 2 whose sales will increase. Retailer 2 would then be willing to pay a higher wholesale price to the manufacturer. When retailer 1's profitability is sufficiently low, such a high wholesale price can be agreed upon between the manufacturer and retailer 2, which then acts as a credible (and self-enforcing) commitment that the manufacturer will subsequently stock out retailer 1. That is, this commitment effect of sequential bargaining creates an endogenous exclusivity outcome, and as a result, the manufacturer may end up selling to only one retailer in equilibrium. Note that such a commitment effect is necessarily absent if the bargaining occurs first with retailer 1, because given $P_1 < P_2$, the manufacturer always wants to sell through channel 2. The benefit of this commitment effect in extracting a high ω_2 can be so strong that the manufacturer prefers bargaining first with retailer 2 and selling only through this channel over negotiating first with retailer 1 and selling to all consumers. In other words, the benefit of a high ω_2 as a result of the commitment effect can dominate the cost to the manufacturer of the reduced demand from not selling at all to the $L1$ consumers.

The discussion above indicates that the asymmetric bargaining externality can result in two distinct incentives that determine the manufacturer's preference for the order of negotiations with the retailers. It can be exploited by the manufacturer either as a credible threat in the channel 1 bargaining or as a credible commitment in bargaining with retailer 2 before bargaining with retailer 1. Identifying these two incentives allows us to uncover an important result that links the market asymmetry between competing retailers to the sequence in which the manufacturer should conduct the negotiations. When the retail prices and the relative profitability are not too different, it is beneficial for the manufacturer to negotiate with the lower-priced retailer first and thereby sell to all consumers in the market. In this case, the presence of the subsequent negotiation with the higher-priced and more profitable retailer acts as a credible threat that helps the manufacturer negotiate a higher ω_1 in the initial negotiation. In contrast, when the difference in the retail prices and profitability is sufficiently large, it is optimal for the manufacturer to negotiate first with the higher-priced retailer, because the possibility of the subsequent negotiation with the lower-priced retailer permits to bargain for a sufficiently high wholesale price ω_2 and credibly commit to stock out the less profitable retailer. This high wholesale price is enough to counterbalance the loss of demand at the lower-priced retailer.

2. *Equal retail prices ($P_1 = P_2$)*: Now the bargaining externality is symmetric in the sense that in equilibrium both retailers can sell to the S consumers. Without loss of generality, suppose that the manufacturer negotiates first with retailer 1. The channel 2 bargaining yields $\omega_2 = \alpha P_2$ if the channel 1 bargaining failed, $\omega_2 = \alpha P_2 + (1-\alpha)\beta\omega_1$ if the (anticipated) channel 1 wholesale price is $\omega_1 < (1/\beta)P_2$, and $\omega_2 = \bigotimes$ if otherwise. Then in the bargaining with retailer 1, the manufacturer's disagreement point is $\pi^0_{M1} = ((1+\beta)/2))(\alpha P_2)$. One can then readily obtain the equilibrium bargaining outcome $\omega_1^* = (\alpha[1+(1-\alpha)\beta]/(1+(1-\alpha)^2\beta))P_1$ and $\omega_2^* = (\alpha[1 + (1-\alpha)\beta + (1-\alpha)^2\beta(1+\beta)]/(1+(1-\alpha)^2\beta))P_2$, which implies $\pi^*_{Mi} > \alpha\Pi_i$ and $\pi_i^* < \alpha\Pi_i$, $i = 1, 2$.

3.3. Equilibrium Bargaining Timing

The analysis above shows that the role of the bargaining externality differs under alternative timing of negotiations. We now proceed to examine the manufacturer's choice between simultaneous and sequential bargaining. This can shed light on the potential use of bargaining timing as a strategic instrument for the manufacturer in multilateral channel negotiations.

Proposition 3. *The manufacturer's incentives for bargaining timing are as follows*:

(i) *When the retail prices are equal ($P_1 = P_2$), the manufacturer is better off bargaining simultaneously with both retailers*.

(ii) *When the retail prices are close to each other ($P_1 > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$ and $P_2 > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_1$), the manufacturer is indifferent between either bargaining timing*.

(iii) *Finally, when the retail price dispersion is sufficiently large ($P_1 \le (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$ or $P_2 \le (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_1$), the manufacturer is better off bargaining sequentially.*

The manufacturer's preference for simultaneous bargaining increases with the similarity in retail prices. When the retailers are symmetric in their price choices, the manufacturer strictly prefers simultaneous over sequential bargaining. When the retail prices are different but close to each other, negotiating with both retailers simultaneously produces the same bargaining outcomes as negotiating first with the lower-priced retailer. But when the retail price dispersion becomes substantial, the manufacturer can exploit the asymmetry in the retail channel profitability to extract more surplus from the retailers through sequential bargaining.

The intuition for the superiority of simultaneous bargaining when the retail prices are equal is as follows. Note first that it is under sequential bargaining, but not under simultaneous bargaining, that the parties can observe whether the other (first-period) bargaining broke down. As a result, although the bargaining externality may exist in both channels

under either bargaining timing strategy, it is only in the second-period negotiation under sequential bargaining that this bargaining externality can be endogenously absent (should the first-period negotiation fail). In particular, under simultaneous bargaining, whether the negotiation with a retailer fails does not directly influence the bargaining externality in the negotiation with the other retailer. Thus, the bargaining externality effect would necessarily arise in the negotiation with either retailer, because in equilibrium the negotiations in both channels would always succeed. In contrast, under sequential bargaining, the parties in the second-period bargaining can observe whether the first-period bargaining succeeded. Should the first-period bargaining fail, in the second-period negotiation it is no longer feasible for the manufacturer to threaten to reallocate the demand from the S segment to the retailer with whom it bargained in the first period. This in turn implies that the manufacturer will have a lower disagreement value in the first period, which negatively influences the manufacturer's equilibrium payoffs. Note that, with equal retail prices, this strategic backlash effect is unavoidable under sequential bargaining, because in this case the bargaining externality is symmetric and, irrespective of the bargaining sequence, can be endogenously nullified in the second period (if the first-period negotiation failed).

When the retail prices are different, the bargaining externality becomes asymmetric, which may exist only in the negotiation with the lower priced retailer. Under simultaneous negotiations, this bargaining externality would arise if the retailers' prices (and hence relative profitability) are not sufficiently different from each other. Similarly, such a bargaining externality is present under sequential bargaining if the manufacturer chooses to bargain first with the lower-priced retailer. Moreover, bargaining first with the lower-priced retailer helps avoid the adverse impact of the strategic backlash effect. Consequently, when the retail prices are different but close to each other, the manufacturer's equilibrium payoffs are the same under either option of bargaining timing.

When the retail prices are different enough, sequential bargaining can become more beneficial to the manufacturer. This is due to the commitment effect, which arises when the manufacturer strategically negotiates with the higher-priced retailer to stock out the lower-priced retailer. However, this works only when the manufacturer can credibly exercise the option not to stock out the lower-priced retailer in the event that an agreement was not reached with the higher-priced retailer. Such a backup option is credible only under sequential bargaining: should the first negotiation fail and the stockout plan not materialize, the manufacturer can always subsequently contract to supply the lower-priced retailer. In contrast, under simultaneous bargaining, selling through the lower-priced retailer cannot serve as a "plan B" for the stockout commitment. This is because the bargaining with the lower-priced retailer cannot directly respond to whether the stockout plan has been agreed by the higher-priced retailer. Thus the existence of the backup option under sequential bargaining allows the manufacturer to extract more retail surplus in the initial negotiation. Moreover, the stockout commitment becomes easier to sustain as the dispersion in the retailers' relative profitability increases. Thus sequential bargaining (and bargaining first with the higher-priced retailer) dominates simultaneous bargaining when the retailer prices are sufficiently dispersed.

We also analyze the retailers' preferences for the timing of negotiations, even though in practice it can be infeasible for them to exert influence on the timing arrangement. First, when the retail prices are equal, the retailers prefer sequential bargaining and desire to be the first one to negotiate with the manufacturer. This is due to the strategic backlash effect that can lead to a lower wholesale price in the first bargaining. It is also because of this effect that both retailers prefer the retailer 2 first bargaining timing when the retail prices become dispersed but still close to each other. In this case it is only when the bargaining occurs first with the higher-priced retailer 2 that the strategic backlash effect can arise, benefiting not only retailer 2 in the first bargaining but also retailer 1 in the subsequent negotiation. Next, when the retail price dispersion further increases, the strategic commitment effect may arise endogenously. Then both retailers prefer to be the first one to bargain with the manufacturer: the higher-priced retailer 2 wants to stock out the lower-priced retailer 1, whereas the latter desires to avoid the stockout. Finally, when the retail prices become sufficiently different, the lower-priced retailer 1 would necessarily be excluded by the manufacturer even in the absence of the commitment effect. As a result, retailer 2 would not want to be the first one to negotiate in order to avoid committing to paying a higher wholesale price, and retailer 1 would be indifferent. Overall, the retailers' preferences for bargaining timing are generally not aligned with the manufacturer's, except that the manufacturer and the higher-priced retailer 2 may sometimes (when the retail price dispersion is neither too small nor too large) find it mutually beneficial to engage in the retailer 2 first bargaining timing in order to commit to stocking out the lower-priced retailer.

3.4. Retail Competition

In setting retail prices, the retailers balance the following conflicting incentives. First, a retailer is inclined to undercut its rival to compete for the S consumers. The retailer also desires to maintain its profitability

without giving away too much surplus to the consumers, so that the total pie to be shared with the manufacturer is as large as possible. Moreover, the retailers need to care about the dispersion of retail prices, which may influence the bargaining externality and their anticipated payoffs in the ex post renegotiations. For instance, the manufacturer may stock out the less profitable channel if the retail prices are sufficiently dispersed. That is, exclusive selling may endogenously arise from the ex post renegotiation process, which would in turn affect the setting of retail prices.

To proceed with the analysis, note that there is no pure-strategy equilibrium in the retail pricing game. The reasoning is standard. If, for example, retailer 2 charges a price P_2 that is not too low, retailer 1 is willing to undercut just below P_2 to compete for the S consumers. There are, however, two forces preventing the price from being cut to retail marginal cost: (i) When P_2 is too low, retailer 1 is better off giving up the S consumers by charging the reservation price r and selling only to the $L1$ segment. (ii) If the price P_1 is too low (e.g., $P_1 \le (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$), then retailer 2 can expect to have an exclusive contract with the manufacturer. Therefore, $P_i = (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))r$ constitutes a lower bound for the equilibrium retail price support in the mixed-strategy equilibrium, which is absent in the standard models of retail promotion (e.g., Varian 1980, Narasimhan 1988). As a result, there are two types of equilibria depending on whether this stockout constraint is binding.

3.4.1. Both Retailers Served in Equilibrium. Let us denote the cumulative probability for the retail price P_i in the mixed-strategy equilibrium as $F_i(p) \equiv \Pr(P_i \le p)$, $i = 1, 2$. It can be shown that the equilibrium price support is continuous with $P_i \in (P_b, r)$, where the lower bound P_b will be determined in the equilibrium. Suppose for a moment that P_b is sufficiently high such that, for any ex post retail price drawn from the mixed-strategy price support, both channels will be served following the renegotiations; i.e., $P_b > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))r$. The expected profit for retailer 1 when it charges price P_1 is then

$$\hat{\pi}_1 = \frac{(1-\alpha)(1-\beta)}{2} P_1 F_2(P_1) + \int_{P_1}^{r} \frac{(1-\alpha)(1+\beta)}{2}\left(P_1 - \frac{2\alpha\beta}{1+\beta}P\right) dF_2(P). \quad (2)$$

The first term in the right-hand side of (2) is retailer 1's expected profit conditional on $P_2 \le P_1$. The conditional expected profit for retailer 1 when $P_1 \le P_2$ is given in the second term. Note that when retailer 1 charges a lower price than retailer 2, the ex post profit for retailer 1 is decreasing in retailer 2's price. Ex post renegotiations therefore generate an additional externality in retail price competition. The equilibrium in retail competition is presented in Proposition 4.

Proposition 4. *When the fraction of the S consumers is small enough and thus retail competition is not too intense (i.e., $\beta < \beta^*$, where β^* is given in the appendix), in equilibrium the manufacturer sells through both retail channels. The equilibrium retail price strategies are symmetric and mixed, with cumulative probability distribution given by $F_i(p) = (1+\beta)/(2\beta) - ((1-\beta)/(2\beta))(r/p)^{1/(1-\alpha)}$, where $p \in (((1-\beta)/(1+\beta))^{1-\alpha} r, r)$. The equilibrium profit for each retailer is $\hat{\pi}_i = ((1-\alpha)(1-\beta)/2)r$.*

When the fraction of the S consumers is small ($\beta < \beta^*$), both retailers tend to charge relatively high prices. As a result, the equilibrium dispersion in the ex post retail prices is not large such that the manufacturer always sells the product through both channels. In this equilibrium each retailer earns an expected profit proportional to its bargaining power and the size of its loyal consumers. The retail price distribution function is decreasing with the manufacturer bargaining power α. Moreover, the lower bound of price support $P_b = ((1-\beta)/(1+\beta))^{1-\alpha} r$ is increasing with α. The mean of the equilibrium retail price is therefore increasing in the manufacturer bargaining power.

3.4.2. Retailers May Be Ex Post Stocked Out: Endogenous Exclusivity. Consider now the case when the segment of comparison shoppers is sufficiently large and the retail market becomes more competitive (i.e., $\beta \ge \beta^*$). The condition that $P_b \ge (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))r$ is now binding, with the equilibrium price support being $[(2\alpha\beta/(1+\beta-2\alpha\cdot(1-\alpha)\beta))r, r]$. This is because the equilibrium price dispersion now becomes large enough that the manufacturer might have the incentive to ex post stock out one of the retailers and thereby endogenously create an exclusive distribution arrangement.

Interestingly, it can be shown that there are mass points at both $P_b = (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))r$ and r. Denote the probability mass at P_b and r as $\underline{\theta}$ and $\bar{\theta}$, respectively. The expected payoff for retailer 1 when charging r is then

$$\hat{\pi}_1 = \bar{\theta}\frac{(1-\alpha)(1-\beta)}{2[1-(1-\alpha)\beta]} r + \underline{\theta}\frac{(1-\alpha)(1+\beta)(r-\alpha P_b)}{2} + (1-\bar{\theta}-\underline{\theta})\frac{(1-\alpha)(1-\beta)}{2} r. \quad (3)$$

The three terms in the right-hand side of (3) are retailer 1's profits when retailer 2's price is r, P_b, and in the range (P_b, r), respectively. Similarly, retailer 1's profit when it charges P_b is

$$\hat{\pi}_1 = \underline{\theta}\frac{(1-\alpha)(1-\beta)}{2[1-(1-\alpha)\beta]} P_b + \int_{P_b}^{r} \frac{(1-\alpha)(1+\beta)}{2}\left(P_b - \frac{2\alpha\beta}{1+\beta}P\right) dF_2(P). \quad (4)$$

The terms in the right-hand side of (4) denote retailer 1's profits when retailer 2 charges the price P_b and when P_2 is above P_b, respectively. Retailer 1's expected payoff when $P_1 \in (P_b, r)$ is still given by (2). The retail price equilibrium is given by the solution to the system of ordinary differential Equations (2)–(4). To facilitate exposition, we concentrate on the case $\beta \to 1$, i.e., when the market approaches perfect competition.

Proposition 5. *When $\beta \to 1$ and thus there is almost perfect retail competition, in equilibrium each retailer may be stocked out with positive probability. The retail price equilibrium is symmetric and in mixed strategy, with support $[(\alpha/(1-\alpha(1-\alpha)))r, r]$ and the following cumulative probability distribution*:

$$F_i(p) = \begin{cases} 1 - \dfrac{[(\alpha r)/((1-\alpha(1-\alpha))p)]^{1/(1-\alpha)}}{1+(1-\alpha)[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}}, \\ \qquad \dfrac{\alpha}{1-\alpha(1-\alpha)} r \le p < r; \\ 1, \quad p \ge r. \end{cases}$$

The equilibrium retailer payoff $\hat{\pi}_i$ is strictly positive.

The equilibrium retail price distribution when $\beta \to 1$ is plotted in Figure 2. There are two mass points at $P_b = (\alpha/(1-\alpha(1-\alpha)))r$ and r with probabilities $\underline{\theta}$ and $\bar{\theta}$, respectively. The mass point at the lowest price P_b reflects a retailer's reluctance to charge a price that is too much below its rival's. This is due to the stockout effect whereby in the ex post renegotiation the manufacturer may not supply a retailer whose channel profitability is too low relative to the rival's. A retailer's relative profitability is inversely related to its rival's price. Therefore this stockout effect limits the equilibrium price range and prevents the retailers from charging prices that are too low.

The retailers also charge the reservation price r with positive probability. This is interesting because, unlike the standard models in the literature, the retailers may not always offer a price discount despite almost perfect retail competition (i.e., $\beta \to 1$). This is because the retailers have to share the channel profits with the manufacturer, and charging a high price allows a retailer to sustain high channel profitability that ensures superior bargaining position compared to the rival retailer. A retailer can exploit its rival being stocked out by the manufacturer and thus enjoy the demand from the comparison shopping segment S, even when charging the reservation price.

These results highlight the role of multilateral channel bargaining in retail price competition. Figure 3 presents the equilibrium probability mass $\underline{\theta}$ and $\bar{\theta}$ as a function of the manufacturer bargaining power (α). It shows that as the manufacturer bargaining power increases, the probability that the retailers do not offer any promotion (i.e., $\bar{\theta}$) is higher. However, the probability of the lowest price P_b being charged increases with the manufacturer bargaining power when the manufacturer bargaining power is not too high, but decreases otherwise.

To understand the relationship between the mass points and the manufacturer bargaining power, note that as α increases, there is greater incentive for the manufacturer to stock out the less profitable retailer and create exclusive retailing. Because of the greater likelihood of stocking out, the range of equilibrium prices charged by the retailers becomes narrower. This leads to an increase in the probability of both mass points. In addition, an increase in the manufacturer bargaining power can also exert a competition-mitigation impact on the retailers' incentive to cut prices. In other words, as the proportion of channel payoff appropriated by the manufacturer increases, the retailers' desire to compete for the S consumers is mitigated. The retailers are therefore more likely to charge higher prices. This competition-mitigation

Figure 2 **Equilibrium Retail Price Distribution** ($\beta \to 1$)

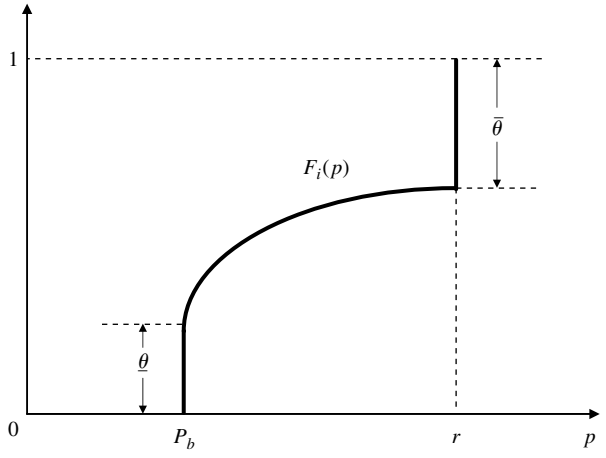
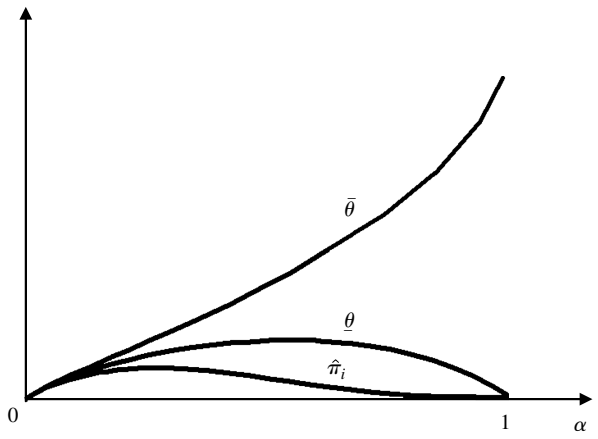


Figure 3 **Equilibrium Retail Profits and Probability Mass** ($\beta \to 1$)



effect looms larger when the manufacturer bargaining power is higher. Thus the interplay of the stockout and the competition-mitigation effects explains why the probability mass at $\bar{\theta}$ increases monotonically with α, whereas that at $\underline{\theta}$ first increases when α is small but decreases when α is large.

It is important to emphasize that the retailers earn positive profits in equilibrium even when the market is close to perfect competition. This is because ex post renegotiations respond to and counteract the degree of retail competition through the stockout effect. As a result, a retailer can charge the reservation price while being able to make positive sales by exploiting the event that its rival overcuts prices and is ex post excluded by the manufacturer. Moreover, as seen in Figure 3, the equilibrium retail profits also display an inverted-U relationship with the manufacturer bargaining power. This is due to the interplay of the stockout and the competition-mitigation effects as well. Note that the retailers' profitability in this perfectly competitive market relies completely on its rival being ex post stocked out. Therefore, interestingly, when α is small and the stockout effect is dominant, the retailers' profits can increase with the manufacturer bargaining power. When α is large and the competition-mitigation effect becomes more important, $\underline{\theta}$ goes down with α and so do the equilibrium retail profits. Furthermore, there is a direct, negative profit-extracting effect of increasing manufacturer bargaining power on the retail profits. Consequently, as α grows, the retail profits start to drop with increasing manufacturer bargaining power sooner than $\underline{\theta}$ does.

3.5. Discussion of Business Implications

An interesting implication of multilateral bargaining in this paper is the occurrence of endogenous exclusivity in retailing whenever one of the competing retailers has a sufficiently high relative profitability. Some observed practices in toy retailing can illustrate this point. Mattel sells about 40% of its toys through three major retailers, Walmart, Target, and Toys "R" Us. Most of the top-selling and popular toys are introduced during the holiday season, and the retailers typically advertise prices to consumers in advance and before the toys are physically available. Mattel often uses exclusive selling contracts to sell through one of the big three retailers, even though at the company-wide level, it has ongoing relationships with all of them. A retailer may decide to focus its marketing on a specific toy line and may end up having an advantage in selling that line. Over time, different popular toys have been sold exclusively through different retailers.[11] However, these exclusive arrangements are rarely permanent but are negotiated based on how profitable a retailer is for Mattel.

Another feature of retail price competition under multilateral bargaining in our model setup is that in sufficiently competitive markets, the retail price equilibrium has mass points both at the reservation price and also at the lower bound of the price distribution. Note that the extant research on price promotions does not typically have the feature that retailers would charge the lowest sale price with positive probability. In our model, and as discussed in §3.4.2, this prediction results from multilateral bargaining incentives and the retailers' desire to avoid being stocked out. This prediction can also be seen as consistent with some of the empirical evidence in the price promotions literature that the price distribution is bimodal and that retailers either offer deep promotions often or else charge the regular price (see, for example, Rao et al. 1995, Villas-Boas 1995).

4. Extensions

We now present some important extensions to the basic model, which help us investigate the robustness of the main results on equilibrium bargaining timing.

4.1. Consumer Breakup Penalties

One important assumption in the basic model is that the retailers commit their prices to the consumers before they renegotiate with the manufacturer on the terms of trade to procure the product. Such commitments normally involve not only a promise not to change the charged retail price but also an implicit guarantee to fulfill consumer demand. If a retailer fails to fulfill consumer demand, it may face some negative consequences, which can take the form of either financial penalties or loss of goodwill. As a result, in renegotiating with the manufacturer, the retailers' outside options in the event of bargaining breakdown need to take into account these negative consequences. To tackle this issue, let us now extend the basic model by supposing that the retailers would incur a breakup penalty should it fail to satisfy consumer demand.[12] In particular, let the breakup penalty be a proportion of the anticipated demand and the charged retail price (i.e., retailer revenue), where the penalty proportion δ is positive but sufficiently small. For example, if $P_1 < P_2$, then retailer 2's disagreement payoffs in the ex post

[11] For example, Mattel sold its Retro-Action DC Super Heroes figures exclusively through Toys "R" Us, but at the 2008 New York Comic Con, it announced that Walmart would begin carrying DC Universe Classics figures, in addition to receiving a store-exclusive wave in November 2008. In contrast, another recent offering based on the *Justice League Unlimited* animated series was originally sold in all stores but then became a Target exclusive.

[12] We thank the associate editor for suggesting this extension.

renegotiations would be $-\delta((1-\beta)/2)P_2$ if it is anticipated that the channel 1 bargaining will succeed and $-\delta((1+\beta)/2)P_2$ if otherwise. We can readily show that by replacing the retail prices P_i with the normalized ones $\tilde{P}_i \equiv (1+\delta)P_i$, $i=1, 2$, the equilibrium results on the third-stage renegotiations are qualitatively the same as those in the basic model with zero retailer disagreement payoffs. Nevertheless, the presence of the breakup penalties can mitigate the retailers' incentive for price cut in the second-stage price competition and, unsurprisingly, can reduce the retailers' ex ante payoffs.

4.2. Early Ordering

Consider the case when the product has to be delivered and physically carried by the retailers prior to retail price setting, i.e., early ordering. As discussed in §2, this alternative timing yields a three-stage game.[13] The first stage involves ex ante contracting between the manufacturer and the retailers. The retailers then simultaneously decide on the amount of inventory to build up in the second stage, and they set the retail prices in the third stage. This setup will help us understand how the manufacturer's preference for the timing of negotiations is affected by whether the retailers should hold stock at the time of making market decisions.

We first examine the retailers' price setting decisions and the resulting expected profits, conditional on the ordered inventories x_i, $i=1, 2$. The optimal ordering decisions are then derived where the retailers pay the manufacturer according to the contracted per-unit wholesale price ω_i, $i=1, 2$. We then analyze how the wholesale prices are determined in the ex ante channel negotiations, in the light of the influence on the retailers' subsequent ordering and pricing behavior. This allows us to evaluate the relative desirability of the alternative bargaining timing from the manufacturer's perspective for this case of early ordering.

4.2.1. Retail Pricing and Inventory Ordering. Note first that no retailer would order more than its maximum possible demand; i.e., $x_i \le (1+\beta)/2$. Given this, when the total retail inventories are less than the market size (i.e., $x_1+x_2<1$) it is straightforward that each retailer would charge the reservation price r and sell all the capacity. Moreover, if $\omega_i \in [0, r)$, a retailer would order an amount that is at least equal to its loyal customer size; i.e., $x_i \ge (1-\beta)/2$. Therefore, in investigating the retail pricing decisions, we can focus on the range $x_i \in [(1-\beta)/2, (1+\beta)/2]$ and $x_1+x_2 \ge 1$.

A retailer $i=1, 2$ can guarantee itself a profit of at least $(1-x_j)r$, $j=3-i$. Its maximum demand is x_i when its price is lower than the rival's. Following standard arguments, the equilibrium pricing strategy is mixed for both retailers except when $x_1+x_2=1$. The lower bound of price support for the mixed-strategy equilibrium is the same for both retailers and given by $P_b = \max\{((1-x_2)/x_1)r, ((1-x_1)/x_2)r\}$. Moreover, when $x_1(1-x_1) \le x_2(1-x_2)$, the retailers can earn an equilibrium profit of $\pi_1 = (1-x_2)r$ and $\pi_2 = (x_2(1-x_2)/x_1)r$, respectively. Similarly, when $x_1(1-x_1) \ge x_2(1-x_2)$, the equilibrium retail profits are, respectively, $\pi_1 = (x_1(1-x_1)/x_2)r$ and $\pi_2 = (1-x_1)r$.

Let us now investigate the retail ordering decisions. To this end, we first derive the retailers' best ordering response functions. Note that for any $\omega_i \in [0, r)$ and $\omega_j = \bigotimes$, $i=1, 2$, $j=3-i$, the retailer i would simply order $x_i = (1+\beta)/2$. When $\omega_1 \in [0, r)$ and $\omega_2 \in [0, r)$, consider first, for example, $x_2 \in [(1-\beta)/2, 1/2]$. Retailer 1's expected profit is $\pi_1 = (1-x_2)r - x_1\omega_1$ if it orders $x_1 \ge 1-x_2$. So in this case the best response for retailer 1 is $x_1 = 1-x_2$. Consider then $x_2 \in [1/2, (1+\beta)/2]$. If $x_1 \ge x_2$, retailer 1 earns an expected profit of $\pi_1 = (1-x_2)r - x_1\omega_1$. If $1-x_2 \le x_1 \le x_2$, we have $\pi_1 = (x_1(1-x_1)/x_2)r - x_1\omega_1$, yielding the conditional response $x_1 = (r-x_2\omega_1)/(2r)$. Therefore, the best ordering response function for retailer 1 is $x_1(x_2) = \max\{1-x_2, (r-x_2\omega_1)/(2r)\}$ for all $x_2 \in [(1-\beta)/2, (1+\beta)/2]$. Similarly, we can obtain retailer 2's best response function $x_2(x_1) = \max\{1-x_1, (r-x_1\omega_2)/(2r)\}$ for all $x_1 \in [(1-\beta)/2, (1+\beta)/2]$. This leads to the following proposition on the retailers' equilibrium ordering behavior.

Proposition 6. *When retail inventory ordering precedes pricing and for $\omega_1 \in [0, r)$ and $\omega_2 \in [0, r)$, the equilibrium ordering decisions are given by $x_1^* = x$ and $x_2^* = 1-x$, where $\max\{(1-\beta)/2, (r-\omega_1)/(2r-\omega_1)\} \le x \le \min\{(1+\beta)/2, r/(2r-\omega_2)\}$. In equilibrium the expected profit is $x_i^*(r-\omega_i)$ for retailer $i=1, 2$.*

This suggests that there exist a continuum of equilibria in the early ordering scenario. But in each of the equilibria, the total amount ordered by the retailers is constant and equal to the market size. In other words, following each of the ordering equilibria, a retailer can sell its whole stock while charging the reservation price r. In equilibrium each retailer acts as if it is a local monopoly. This results from the sequential property of the ordering-then-pricing setup where the retailers can use constrained quantity as an effective commitment to soften subsequent price competition (Kreps and Scheinkman 1983). With the specific demand structure we analyze here, this stock commitment effect yields a strong result that no retail price promotion occurs in equilibrium.

4.2.2. Bargaining Timing. Let us now investigate how the wholesale prices are to be negotiated between the channel members in the first stage and

[13] Because the firms' transactions are cleared prior to the setting of retail prices, ex post renegotiation is immaterial.

examine the manufacturer's preference for the alternative bargaining timing. We will consider all possible equilibria in the subsequent stages, where the retailers' equilibrium inventories are x and $1-x$, respectively, as in Proposition 6.

Consider first simultaneous bargaining. Note that conditional on $\omega_1 \in [0, r)$ and $\omega_2 \in [0, r)$, the firms' expected profits are given by $\pi_M = x\omega_1 + (1-x)\omega_2$, $\pi_1 = x(r-\omega_1)$, and $\pi_2 = (1-x)(r-\omega_2)$. If, for example, the negotiation in channel 1 broke down, retailer 2 then becomes the only player in the retail market. Retailer 2 would then order and sell the amount $(1+\beta)/2$. This implies that the threat value for the manufacturer in bargaining with retailer 1 is $\pi_{M1}^0 = ((1+\beta)/2)\omega_2$. We then have

$$\omega_1(\omega_2) = \begin{cases} \alpha r, & \text{if } \omega_2 = \bigotimes; \\ \alpha r + \dfrac{(1-\alpha)(2x-1+\beta)}{2x}\omega_2, & \\ \qquad \text{if } \omega_2 < \dfrac{2x\alpha r}{2x\alpha - \alpha(1-\beta)}; & \\ \bigotimes, \quad \text{if otherwise.} \end{cases}$$

The wholesale price response function for retailer 2 is analogous. Solving the bargaining response functions simultaneously, we obtain the equilibrium wholesale prices $\omega_1^* = ((1-x)[2(2-\alpha)x - (1-\alpha)\cdot(1-\beta)]/(4\alpha(2-\alpha)x(1-x) + (1-\alpha)^2(1-\beta^2)))r$, and $\omega_2^* = (2\alpha x[3-\alpha\beta+\beta-\alpha-2(2-\alpha)x]/(4\alpha(2-\alpha)x\cdot(1-x) + (1-\alpha)^2(1-\beta^2)))r$.

Next consider the case of sequential bargaining. Suppose, without loss of generality, that the manufacturer negotiates first with retailer 1. The bargaining response in the subsequent negotiation is similar to the simultaneous bargaining case. That is, if the negotiation with retailer 1 failed, we have $\omega_2 = \alpha r$; if, instead, the bargaining with retailer 1 succeeded, then $\omega_2(\omega_1) = \alpha r + ((1-\alpha)(1+\beta-2x)/(2(1-x)))\omega_1$. We can then readily follow the procedure as in §3.2 to derive the equilibrium wholesale price in the negotiation with retailer 1: $\omega_1 = (\alpha[2(2-\alpha)x - (1-\alpha)\cdot(1-\beta)]/((1-\alpha)^2(1+\beta) + 2\alpha(2-\alpha)x))r$.

The manufacturer's equilibrium profits under simultaneous and sequential bargaining are

$$\pi_M^* = \frac{4\alpha(1+\beta-\alpha\beta)x(1-x)}{4\alpha(2-\alpha)x(1-x) + (1-\alpha)^2(1-\beta^2)}r$$

and

$$\pi_M^* = \frac{\alpha[2(2\alpha + (1-\alpha^2)(1+\beta))x + (1-\alpha)^2(1+\beta)^2]}{2[2\alpha(2-\alpha)x + (1-\alpha)^2(1+\beta)]}r,$$

respectively. Denote the difference between these manufacturer profits as $\Delta\pi_M$. It can be shown that $\Delta\pi_M > 0$ for $(1-\beta)/2 \le x < (1+\beta)/2$, and $\Delta\pi_M = 0$ when $x = (1+\beta)/2$. Thus across all the possible stocking equilibria defined in Proposition 6, the manufacturer is weakly better off under simultaneous bargaining when the product is delivered to the retailers before retail price setting.

The underlying mechanisms for these results are similar to those in the late ordering case that we analyze in §3.3. Note first that, when $(1-\beta)/2 \le x < (1+\beta)/2$ in the early ordering case, retailer 2 can sell a positive amount to the S-segment consumers. This means that there may exist the bargaining externality in the negotiation with retailer 2. Recall that sequential bargaining will then yield the strategic backlash effect whereby the bargaining externality in the second period can be endogenously nullified by retailer 1's threat to fail the first negotiation. As a result, as shown in Proposition 3(i), sequential bargaining would be strictly dominated by simultaneous bargaining. However, when $x = (1+\beta)/2$, only retailer 1 sells to the S-segment consumers, which implies that the bargaining externality can exist only in the negotiation in channel 1. Therefore, similar to that in Proposition 3(ii), the strategic backlash effect can be avoided if the manufacturer bargains first with retailer 1, which then leads to the same equilibrium outcome as that under simultaneous bargaining. Finally, note that the strategic commitment effect, which can exist under sequential bargaining in the late ordering case, does not arise here. This is because, under early ordering, in equilibrium both retailers will charge the same prices and thus have the same profitability. In other words, irrespective of which valid contract is signed in the first negotiation, the manufacturer always has an incentive to sell the residual demand through the other retailer. This explains why, unlike the case of late ordering, here sequential bargaining can never be more beneficial than simultaneous bargaining.

4.3. Unconstrained Renegotiation Across Periods

Consider the alternative case when the manufacturer can renegotiate with a retailer in both periods in the third stage of the game. In each period the manufacturer can bargain with either or both of the retailers. That is, even if the manufacturer failed to reach an agreement with a retailer in the first period, they can still bargain again in the second period. This extension increases the firms' flexibility to bargain with each other. The other assumptions are the same as in the basic model. We present the full analysis in the supplementary appendix and highlight the main points here.

When the retail prices are sufficiently close to each other, both channels will be served in equilibrium and the firms' increasing bargaining flexibility does not change the bargaining outcomes. When the retail

price dispersion is not very small, as we show in the basic model, the manufacturer can make use of sequential bargaining to commit to an exclusive contract with the higher-priced retailer and to strategically stock out the lower-priced retailer. Recall that the extent to which this strategic commitment influences the equilibrium wholesale price hinges on the parties' outside options if a contract were not signed in the first-period negotiation. In the basic model in which only one negotiation is possible with any retailer, the manufacturer's outside option in the first-period bargaining is to sell only through the other retailer. However, in this alternative setup with unconstrained negotiation, the manufacturer's outside option is to bargain again with both retailers in the second period. This implies that the manufacturer has a higher disagreement payoff in the first-period bargaining. As a result, the first-period bargaining with the higher-priced retailer can lead to a higher wholesale price. Moreover, we show that the amount of retail price dispersion that is necessary for the strategic commitment effect to emerge in equilibrium is smaller relative to the basic case.

Nevertheless, the increasing bargaining flexibility is a double-edged sword that can improve not only the manufacturer's but also the retailers' outside options. This is especially the case when the retail prices are sufficiently dispersed (i.e., $P_1 \leq (2\alpha\beta/(1+\beta))P_2$) such that it is always optimal for the manufacturer to sell only through the higher-priced retailer. This implies that, even if the first-period negotiation with the more profitable retailer failed, the second-period bargaining would still result in contracting with the same retailer, which is otherwise infeasible in the basic model. As a result, the increasing bargaining flexibility can enhance the (higher-priced) retailer's first-period disagreement payoff and hence hurt the manufacturer's ability to extract retail surplus. In particular, we show that when the retail price dispersion is either sufficiently large or sufficiently small, the equilibrium wholesale price is equal to αP_2 and that it is only when the retail price dispersion is intermediate that the strategic commitment effect allows the manufacturer to negotiate for a higher wholesale price. This stands in contrast to the basic model in which an increasing retail price dispersion always facilitates the occurrence of the strategic commitment effect.

Regarding retail competition we can show that unconstrained bargaining leads to higher P_b, $\bar{\theta}$, and $\underline{\theta}$. That is, when the manufacturer can negotiate in an unconstrained fashion across the two periods, the equilibrium retail price range is narrower, the retailers offer less frequent sales, and retail stockouts are more frequent. These results are driven by the retailers' increasing likelihood of being ex post stocked out even with relatively smaller retail price dispersion. Moreover, the unconstrained bargaining case yields relatively higher (lower) retail profits when α is low (high). This is because, as discussed above, the increasing bargaining flexibility can result in more frequent ex post exclusive selling and allow the manufacturer to extract more retailer surplus. When the manufacturer bargaining power is low, the positive effect of excluding the rival on the retailers' equilibrium profits is more important. When the manufacturer bargaining power is higher, the negative effect of the manufacturer extracting more retail surplus will become dominant.

5. Summary and Conclusion

Many distribution relationships involve multilateral contracting between an upstream party and downstream retailers who compete in the end consumer market. We capture this through a model of multilateral negotiations with endogenous bargaining externality. We also highlight an important question that arises naturally in multilateral negotiations: Should the manufacturer negotiate simultaneously with both the retailers, or should the negotiations be sequential and with one retailer at a time? In doing so, we investigate how the timing of negotiations affects the bargaining externality across the retailers and the nature of retail price competition. Thus this paper links the degree of market competition to the structure of bargaining in the distribution relationship.

The analysis identifies the economic effects that determine the choice of timing in multilateral negotiations. First, in multilateral negotiations the manufacturer's ability to extract surplus from a retailer depends not only on its relative bargaining power but also on the bargaining externality across the retailers that determines the manufacturer's outside option in the event of a negotiation breakdown. Second, the bargaining externality can be differentially influenced by sequential versus simultaneous bargaining. This is because the success or breakdown in the first negotiation can directly influence the manufacturer's payoff in the subsequent negotiation, whereas there is no such direct impact in the case of simultaneous bargaining. As a result, sequential bargaining can yield the strategic backlash and the strategic commitment effects.

We find that under sequential bargaining, and when the dispersion in the retail prices is not too large, it is optimal for the manufacturer to negotiate first with the lower-priced retailer. Because of the strategic backlash effect, should the manufacturer bargain first with the higher-priced retailer, the breakdown of the first-period negotiation will endogenously nullify the bargaining externality in the second period, thus adversely affecting the manufacturer's disagreement payoff and the equilibrium

wholesale price in the first-period negotiation. In contrast, when there is sufficient dispersion in the retail prices it is optimal for the manufacturer to negotiate first with the higher-priced retailer. This can lead to a sufficiently high wholesale price in negotiating with the higher-priced retailer, which can act as a credible commitment on the part of the manufacturer to stock out the lower-priced retailer. Thus by creating this endogenous exclusivity with the higher-priced retailer, the manufacturer is able to overcome the disadvantage of the backlash effect.

The equilibrium bargaining timing calls for the manufacturer to negotiate simultaneously with the retailers when the retail price dispersion is small, whereas sequential bargaining is optimal when the dispersion in the retail prices is large enough. This result is also driven by the strategic backlash and the strategic commitment effects that can arise under sequential bargaining.

Moreover, we show that ex post renegotiations can adjust to retail competition and buffer its impact on equilibrium retail profits. When retail competition is very intense, the equilibrium price dispersion increases, and the manufacturer has a higher incentive to create endogenous exclusivity by stocking out the lower priced retailer. This in turn mitigates retail competition by preventing the retailers from excessively charging low prices. Thus it is possible for the retailers to make positive profits even in markets that are close to perfect competition.

There are several related problems in multilateral bargaining that can be fruitfully investigated in future research. With regard to the timing of negotiations, the distinction between sequential and simultaneous bargaining is also relevant in other contexts such as union wage negotiations. A notable example is the U.S. automobile industry where the United Auto Workers (UAW) negotiates worker wages with competing automobile manufacturers such as Ford, General Motors, and Chrysler. As the supplier of labor, the UAW may have similar incentives as the upstream manufacturer to use the endogenous bargaining externality across the firms and the timing of negotiations to extract favorable wage deals. Nevertheless, there might also be some unique aspects of wage negotiations that would need to be modeled (e.g., the trade-offs of a strike to workers in the event of negotiation breakdown). Another important problem would be to analyze multilateral bargaining between upstream manufacturers and common-agent retailers who carry the products of multiple manufacturers. Such an analysis should help in understanding how the upstream competition between the manufacturers affects the bargaining externality in multilateral negotiations. Finally, it might also be useful to investigate other types of retail competition (e.g., quantity, service).

Supplemental Material

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Appendix

Proof of Proposition 2. Consider the equilibrium bargaining when the manufacturer negotiates with retailer 1 first. It is obvious that in the subsequent channel 2 bargaining, we have $\omega_2 = \alpha P_2$, with demand $(1-\beta)/2$ or $(1+\beta)/2$, depending on whether channel 1 bargaining succeeded or failed, respectively. Given this, the manufacturer's disagreement point in channel 1 bargaining is $\pi^0_{M1} = ((1+\beta)/2)(\alpha P_2)$. This, coupled with $\pi_M = ((1+\beta)/2)\omega_1 + ((1-\beta)/2)(\alpha P_2)$ and $\pi_1 = ((1+\beta)/2)(P_1 - \omega_1)$, yields $\omega_1 = \alpha P_1 + (2\alpha(1-\alpha)\beta/(1+\beta))P_2$ if the condition $P_1 > (2\alpha\beta/(1+\beta))P_2$ holds. If $P_1 \le (2\alpha\beta/(1+\beta))P_2$, then it is better for the manufacturer to sell only through retailer 2 (note that the conditions are obtained by comparing the respective profits).

Consider now the case when negotiation in channel 2 takes place first. Conditional on the first bargaining outcome, the subsequent negotiation in channel 1 gives rise to

$$\omega_1(\omega_2; P) = \begin{cases} \alpha P_1, & \text{if } \omega_2 = \bigotimes; \\ \alpha P_1 + \dfrac{2(1-\alpha)\beta}{1+\beta}\omega_2, & \text{if } \omega_2 < \dfrac{1+\beta}{2\beta}P_1; \\ \bigotimes, & \text{if otherwise.} \end{cases}$$

Suppose $\omega_2 < ((1+\beta)/(2\beta))P_1$. Then in channel 2 bargaining, we have $\pi_M = ((1+\beta)/2)[\alpha P_1 + (2(1-\alpha)\beta/(1+\beta))\omega_2] + ((1-\beta)/2)\omega_2$, $\pi_2 = ((1-\beta)/2)(P_2 - \omega_2)$, and $\pi^0_{M2} = ((1+\beta)/2)(\alpha P_1)$. Plugging these into (1), we obtain $\omega_2 = (\alpha(1-\beta)/(1-\beta+2(1-\alpha)^2\beta))P_2$. Suppose then $\omega_2 \ge ((1+\beta)/(2\beta))P_1$. In channel 2 bargaining, we have $\pi_M = ((1+\beta)/2)\omega_2$, $\pi_2 = ((1+\beta)/2)(P_2 - \omega_2)$, and $\pi^0_{M2} = ((1+\beta)/2)(\alpha P_1)$. So $\omega_2 = \alpha(1-\alpha)P_1 + \alpha P_2$.

Note that $(\alpha(1-\beta)/(1-\beta+2(1-\alpha)^2\beta))P_2 < \alpha(1-\alpha)P_1 + \alpha P_2$. So if $((1+\beta)/(2\beta))P_1 \le (\alpha(1-\beta)/(1-\beta+2(1-\alpha)^2\beta))P_2$, the only equilibrium is $\omega_2 = \alpha(1-\alpha)P_1 + \alpha P_2$. When $(\alpha(1-\beta)/(1-\beta+2(1-\alpha)^2\beta))P_2 < ((1+\beta)/(2\beta))P_1 \le \alpha(1-\alpha)\cdot P_1 + \alpha P_2$, both $\omega_2 = (\alpha(1-\beta)/(1-\beta+2(1-\alpha)^2\beta))P_2$ and $\omega_2 = \alpha(1-\alpha)P_1 + \alpha P_2$ are acceptable to retailer 2. However, it is better off for the manufacturer to charge $\omega_2 = \alpha(1-\alpha)P_1 + \alpha P_2$. Finally, when $\alpha(1-\alpha)P_1 + \alpha P_2 < ((1+\beta)/(2\beta))P_1$, the only equilibrium is $\omega_2 = (\alpha(1-\beta)/(1-\beta+2(1-\alpha)^2\beta))P_2$. So under the channel 2 first bargaining, $\omega_2 = \alpha(1-\alpha)P_1 + \alpha P_2$ if and only if $\alpha(1-\alpha)P_1 + \alpha P_2 \ge ((1+\beta)/(2\beta))P_1$, which is equivalent to $P_1 \le (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$.

We are then ready to determine the equilibrium bargaining order by comparing the manufacturer's payoffs under these two alternative bargaining sequences. Note that

$(2\alpha\beta/(1+\beta))P_2 < (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$. We have three alternative situations.

(i) Suppose $P_1 > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$. Then if channel 1 bargaining occurs first, we have $\omega_1 = \alpha P_1 + (2\alpha(1-\alpha)\beta/(1+\beta))P_2$ and $\omega_2 = \alpha P_2$. However, if channel 2 is bargained first, the manufacturer has lower wholesale prices for both channels, since now $\omega_2 = (\alpha(1-\beta)/(1-\beta+2(1-\alpha)^2\beta))P_2 < \alpha P_2$, and the channel 1 wholesale price follows the same response function (for given ω_2). Because the equilibrium demand situations are the same across the two bargaining scenarios, it is better off for the manufacturer to negotiate first with retailer 1.

(ii) Suppose then $(2\alpha\beta/(1+\beta))P_2 < P_1 \le (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))P_2$. As shown above, if channel 2 is now bargained first, it is better for the manufacturer to offer $\omega_2 = \alpha(1-\alpha)P_1 + \alpha P_2$ and sell only to retailer 2 than charging $\omega_1 = P_1$ and $\omega_2 = ((1+\beta)/(2\beta))P_1$ and having both retailers carry the product. The latter option is in turn better than choosing to bargain with retailer 1 first, which yields lower wholesale prices for both channels with the same equilibrium demand across the retailers. This shows that bargaining first with retailer 2 is a better option under this condition.

(iii) Finally, suppose $P_1 \le (2\alpha\beta/(1+\beta))P_2$. The superiority of negotiating first with retailer 2 is obvious, because in equilibrium the manufacturer sells only through retailer 2 irrespective of the order of channel bargaining, but the manufacturer can charge a higher wholesale price when it negotiates first with retailer 2. Q.E.D.

Proof of Proposition 4. We first show that there is no pure-strategy equilibrium. To see this, note that there is no pure-strategy equilibrium such that $P_1 = P_2$. Retailer 1's profit is $((1-\alpha)(1-\beta)/2)P_2$ if its price is $P_1 = P_2$. However, if it cuts the price by ϵ, its profit will be $((1-\alpha)(1+\beta)/2)(P_2 - \epsilon - (2\alpha\beta/(1+\beta))P_2)$. Then if ϵ is small enough, the deviating profit is higher. Note also that $P_1 < P_2$ can not be an equilibrium either, because retailer 1 can always increase P_1 without decreasing its demand. Similar to Narasimhan (1988), it can be shown that the equilibrium price support for both retailers is continuous on (P_b, r), where P_b is to be defined below. Given that $P_b > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))r$, the expected profit for retailer 1 when it charges P_1 is then

$$\hat{\pi}_1 = \frac{(1-\alpha)(1-\beta)}{2} P_1 F_2(P_1) + \int_{P_1}^{r} \frac{(1-\alpha)(1+\beta)}{2}\left(P_1 - \frac{2\alpha\beta}{1+\beta}P\right) dF_2(P).$$

A mixed-strategy equilibrium requires that the profit is invariant for any price in the support

$$\frac{d\hat{\pi}_1}{dP_1} = (1-\alpha)\left[\frac{1+\beta}{2} - (1-\alpha)\beta P_1 F_2'(P_1) - \beta F_2(P_1)\right] = 0,$$

where $F_2'(P_1)$ is the derivative of $F_2(P_1)$. The solution to this ordinary differential equation, using the boundary condition $F_2(r) = 1$, yields $F_2(P_1) = (1+\beta)/(2\beta) - ((1-\beta)/(2\beta))(r/P_1)^{1/(1-\alpha)}$.

To determine P_b, note that $F_2(P_b) = 0$. This yields $P_b = ((1-\beta)/(1+\beta))^{1-\alpha} r$. The condition that $P_b > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))r$ then requires that $((1-\beta)/(1+\beta))^{1-\alpha} > 2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta)$. Note that the left-hand side is decreasing while the right-hand side is increasing with β. Moreover, the inequality is satisfied when β goes to 0, though not so when β goes to 1. Therefore, there must exist a unique $\beta^* \in (0,1)$ solving $((1-\beta)/(1+\beta))^{1-\alpha} = 2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta)$, such that $P_b > (2\alpha\beta/(1+\beta-2\alpha(1-\alpha)\beta))r$ if and only if $\beta < \beta^*$. To obtain the equilibrium retail profits, note that when a retailer charges the price r its profit is $((1-\alpha)(1-\beta)/2)r$. This completes the proof. Q.E.D.

Proof of Proposition 5. Let us first establish that when $\beta \to 1$, the price support must be continuous between $P_b = (\alpha/(1-\alpha(1-\alpha)))r$ and r and that there are mass points at P_b and r. The continuity and the boundary of the price support are straightforward. There cannot be any mass point for any $P_b < P_i < r$ either. Suppose now that there is no mass point: $F(P_b) = 0$ and $F(r) = 1$. For any P_1 in the price support, (2) must then be satisfied. Solving this ordinary differential equation, using the boundary condition $F_2(r) = 1$ we get $F_2(P_b) > 0$, and using $F_2(P_b) = 0$ we get $F_2(r) < 1$. So there must be mass point at P_b or r, or both. Suppose $F_2(P_b) = 0$ and $F_2(r) < 1$. Then retailer 1 is better off moving all the mass at r to $r - \epsilon$, where ϵ is a sufficiently small positive number. Suppose, instead, $F_2(P_b) > 0$ and $F_2(r) = 1$. Then retailer 1 is better off charging r with positive probability. This shows that there must be mass points at both $(\alpha/(1-\alpha(1-\alpha)))r$ and r, and we denote the mass probabilities as $\underline{\theta}$ and $\bar{\theta}$, respectively.

For any $P_b < P_1 < r$, we must have $d\hat{\pi}_1/dP_1 = 0$ because of the invariability of equilibrium payoff under mixed strategies, where $\hat{\pi}_1$ is given by (2). Solving this ordinary differential equation using the boundary condition $F_2(P_b) = \underline{\theta}$, we obtain $F_2(P_1) = 1 - (1-\underline{\theta})[\alpha r/([1-\alpha(1-\alpha)]P_1)]^{1/(1-\alpha)}$. Since $F_2(r) = 1 - \bar{\theta}$, we therefore have $\bar{\theta} = (1-\underline{\theta})[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}$. This, along with (3) and (4) when $\beta = 1$ and $F_2(P_1) = 1 - (1-\underline{\theta})[\alpha r/([1-\alpha(1-\alpha)]P_1)]^{1/(1-\alpha)}$ are plugged in, constitutes a system of three first-order equations in three unknown variables: $\underline{\theta}$, $\bar{\theta}$, and $\hat{\pi}_1$. The solution then yields the equilibrium results. That is,

$$\underline{\theta} = \frac{(1-\alpha)[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}}{1+(1-\alpha)[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}},$$

$$\bar{\theta} = \frac{[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}}{1+(1-\alpha)[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}}, \quad \text{and}$$

$$\hat{\pi}_i = \frac{(1-\alpha)^3[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}}{1+\alpha(1-\alpha)[[\alpha/(1-\alpha(1-\alpha))]^{\alpha/(1-\alpha)}-1]} r.$$

The probability that a retailer is stocked out in the ex post bargaining is given by

$$\underline{\theta}\bar{\theta} = \frac{1-\alpha}{[1-\alpha+[\alpha/(1-\alpha(1-\alpha))]^{1/(1-\alpha)}]^2}.$$ Q.E.D.

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