Upfront payments and exclusion in downstream markets

Leslie M. Marx*

and

Greg Shaffer**

Although upfront payments are often observed in contracts between manufacturers and retailers, little is known about their competitive effects or the role retailers play in securing them. In this article, we consider a model in which two competing retailers make take-it-or-leave-it offers to a common manufacturer. We find that upfront payments are a feature of equilibrium contracts, and in all equilibria, only one retailer buys from the manufacturer. These findings support the claims of small manufacturers who argue that they are often unable to obtain widespread distribution for their products because of upfront payments.

1. Introduction

■ Upfront payments are fixed fees paid by manufacturers to retailers ostensibly to obtain access to shelf space, defray upfront costs, and support downstream promotional activities. The term is descriptive of when these payments are actually made, that is, at the time the contract is signed and/or at the beginning of each year if the length of the contract spans several years. Slotting allowances belong to this class of payments, as do so-called listing fees, pay-to-stay fees, and street money. These payments, which in aggregate may amount to billions of dollars annually, are commonly observed not only in the grocery industry but also in many other industries. With this much money at stake, it is perhaps not surprising that the debate over their competitive effects is contentious.

The main theories of competitive harm focus on the potential of upfront payments to inhibit small manufacturers from obtaining adequate distribution for their products. According to one theory, small manufacturers are disadvantaged relative to large, dominant manufacturers because they lack adequate access to capital markets and thus cannot afford to pay the large upfront fees that are often demanded by retailers. Another prominent theory posits that large manufacturers may abuse their dominant positions when they use upfront payments to bid up the price of scarce

shelf space for the purpose of raising their rivals' costs.[1] In this article, we propose a new theory of competitive harm, one that does not put the blame on capital markets, or large manufacturers, but instead emphasizes the role of downstream buyer power in excluding competitors and limiting the distribution of small manufacturers' products.

It is no secret that retailers with buyer power have the opportunity and the clout to demand and receive upfront payments, and that many of them in fact do so. For example, there is a consensus among industry observers that the perceived shift in the balance of power from manufacturers to retailers in recent years has contributed to an increase in the incidence and the magnitude of upfront payments.[2] Small manufacturers, who may have little bargaining power, may be particularly vulnerable. But this begs the question: why do some retailers use their buyer power to negotiate upfront payments rather than, for example, lower wholesale prices? The explanation we offer here is that upfront payments may allow a retailer to earn positive profit while preventing the manufacturer and a rival retailer from profitably cannibalizing its sales. As a result, the manufacturer does not trade with the rival retailer (because if it did, it would risk losing the first retailer's participation), even though the rival retailer might have contributed to overall sales, not only from the lower retail prices that might have been induced but also from the differentiation it might have added.

In this article, we consider a retailer's motivation in securing upfront payments by focusing on the important case in which it has all the bargaining power vis-à-vis a manufacturer. In particular, we consider a model in which two competing retailers make take-it-or-leave-it offers to a common manufacturer. We find that upfront payments are a feature of equilibrium contracts, and in all equilibria, only one retailer buys from the manufacturer. These results do not depend on whether the manufacturer has adequate access to capital markets (we assume it does), and the mechanism for exclusion does not rely on the existence of economies of scale or scarce shelf space (we assume there are no shelf-space constraints and the results apply even when the production and distribution technologies exhibit constant returns to scale).

Our results go against conventional wisdom, which suggests that the key to understanding whether upfront payments may be anticompetitive is in knowing which side initiates them. Upfront payments are typically thought to be innocuous (unlikely to lead to exclusion) when they are demanded by retailers, but potentially harmful when they are offered by manufacturers, particularly when they are offered by a dominant manufacturer who may want to exclude an upstream rival. However, in our model, exclusion arises in equilibrium (only one retailer buys from the manufacturer) and yet the upfront payments are a direct consequence of the retailers' buyer power. If the manufacturer could make the offers, there would be no upfront payments and no exclusion in equilibrium (the manufacturer would sell to both retailers). Thus, our findings support the claims of small manufacturers who argue that they are often unable to obtain widespread distribution for their products. And, because consumers will have fewer choices in the marketplace (and face potentially higher retail prices) when the retailers make the offers, our findings also cast doubt on the efficacy of the retailers' buyer power in ensuring that consumers obtain socially beneficial outcomes.

The role of upfront payments has been explored in several recent articles. They have also been a topic of concern in U.S. congressional committees that oversee small businesses and the focus of recent reports by the Federal Trade Commission.[3] One view is that dominant

---

[1] See Bloom, Gundlach, and Cannon (2000), the Federal Trade Commission's (2001) report on slotting allowances and other related practices in the grocery industry, and the Canadian Bureau of Competition's (2002) report on the abuse of dominance provisions in the retail grocery industry.

[2] In the FTC's workshop on slotting allowances in 2001, one panelist stated that "manufacturers and retailers agree that slotting allowances are associated with the exercise of retail market power," and another stated, "When it comes to small manufacturers, the retailer probably has all of the power." These quotes come from transcripts of the workshop and can be found in FTC (2001, p. 55).

[3] See "Slotting: Fair for Small Business and Consumers? Hearing before the Senate Committee on Small Business," 106th Congress, 1st Session 386 (1999), FTC (2001), and FTC (2003).

manufacturers might use upfront payments to raise their rivals' costs and prevent small firms from obtaining adequate distribution.[4] An alternative view, however, is that upfront payments enhance social welfare by providing retailers with an efficient way to allocate scarce retail shelf space. The typical story posits that each manufacturer possesses private information about whether its product will be a "success" or "failure" in the marketplace, and that by offering upfront payments the manufacturer will be able to credibly convey this information to retailers (alternatively, by demanding upfront payments, retailers can effectively screen which manufacturers' products are better than others; see, for example, Chu, 1992).[5] According to the former view, small manufacturers are unfairly disadvantaged because upfront payments are subject to abuse by dominant manufacturers. According to the latter view, if small manufacturers are excluded from distribution, then it must be because they are producing socially less desirable products than their larger rivals.

What is different in our model is the emphasis on the retailers' buyer power. Small manufacturers (or any manufacturer who is without bargaining power vis-à-vis its retailers) are prevented from obtaining adequate distribution in equilibrium even though no dominant manufacturer is buying up scarce shelf space, and even though their products may be socialy desirable. Moreover, downstream exclusion occurs regardless of whether retailers compete in prices or quantities, regardless of the strength of their differentiation (although some demand-side substitution is necessary), and regardless of whether there are economies of scale in production or distribution.

The article that is most closely related to ours is Shaffer (1991), which also considers why retailers with buyer power might prefer to use their bargaining strength to obtain upfront payments rather than lower wholesale prices. In Shaffer's model, retailers who receive slotting allowances benefit in two ways. The lump-sum payments increase bottom-line profits and the higher wholesale prices indirectly reduce downstream price competition. By not seeking a lower wholesale price, a retailer essentially announces its intention to be less aggressive in its pricing. Other firms are induced to raise their retail prices, and the original firm gains through the feedback effects. However, the key difference between his model and ours is that each retailer in his model can choose from a large pool of homogeneous manufacturers and thus exclusion is ruled out *a priori*.

The rest of the article proceeds as follows. We introduce the model in Section 2. We solve the game in Section 3 and show that exclusion occurs in all equilibria. In Section 4, we extend the analysis in three ways. We discuss the effects of a more even distribution of bargaining power, we consider a case in which upfront payments are not allowed, and we consider a case in which the set of contracts is expanded to include a minimum-purchase requirement. We offer concluding remarks in Section 5.

2. The model

■ We consider a contracting environment with one upstream firm (the manufacturer) and two competing downstream firms (retailer 1 and retailer 2). In this environment, the manufacturer produces an input that can be used by the retailers to produce (imperfect) substitute products for resale to final consumers. We assume the retailers incur no costs of production or distribution other than what they must pay the manufacturer for its input, and we denote the manufacturer's

---

[4] According to this view, the price of shelf space to any one manufacturer is endogenously determined by what the retailer could earn instead by selling its most profitable alternative, which allows manufacturers to be strategic in the sense that each firm can unilaterally raise its rivals' cost of obtaining scarce shelf space simply by offering a higher upfront payment. See Shaffer (2005).

[5] The idea is that manufacturers who are willing to pay more for shelf space credibly signal that their products will provide better value to consumers. See, for example, Kelly (1991) and Lariviere and Padmanabhan (1997). See also Sullivan (1997), who finds that slotting fees are "consistent with competitive behavior" and could have been caused by an increase in the supply of new products.

cost of producing its input by $c(q_1, q_2)$, where $c(q_1, q_2)$ is non-negative and weakly increasing in each argument, and $q_i \geq 0$ is the quantity of the input purchased by retailer i, $i \in \{1, 2\}$. The downstream production process is such that one unit of input is needed for each unit of output produced. For example, we have in mind a situation in which each unit of the manufacturer's input is placed directly on the retailers' display shelves for resale.

Contracts between the manufacturer and each retailer consist of a mapping from the quantity purchased by the retailer to the amount it must pay the manufacturer. Because we are interested in the possibility of exclusion in the absence of explicit exclusive-dealing provisions, we focus on contracts of the form $T_i(q_i)$ in which retailer i's payment to the manufacturer depends only on its own input purchases, and not on how much its rival purchases. In particular, we consider contracts of the form

$$T_i(q_i) = \begin{cases} S_i & \text{if } q_i = 0, \\ w_i q_i + F_i + S_i & \text{if } q_i > 0. \end{cases}$$

In other words, the contract between the manufacturer and retailer i consists of an upfront payment, S_i, which is paid when the contract is signed, and a variable component defined by (w_i, F_i), which is paid if and only if a positive input quantity is purchased, where w_i is the per-unit price of the input and F_i is the manufacturer's fixed fee.[6] We place no restrictions on the sign of S_i or F_i, but as we show below, in equilibrium, S_i is non-positive and F_i is non-negative. We assume for ease of exposition that each retailer observes its rival's contract with the manufacturer prior to making its own quantity choices.[7] We also assume that S_i is sunk when $T_i(q_i)$ is signed, an assumption that is necessary to make the distinction between S_i and F_i meaningful.

We model retail competition in reduced form. If both retailers purchase positive quantities from the manufacturer, then we assume that an equilibrium in the downstream market exists and equilibrium flow payoffs are unique. Let $\pi_i(w_1, w_2)$ denote retailer i's equilibrium flow payoff when wholesale prices are w_1 and w_2, respectively. For any $w_j \geq 0$, we assume there exists a threshold such that for all w_i above this threshold, $\pi_i(w_1, w_2) = 0$, and for all w_i below this threshold, $\pi_i(w_1, w_2) > 0$. If both retailers' flow payoffs are positive, we assume retailer i's flow payoff is continuously decreasing in its own wholesale price and continuously increasing in the wholesale price of its rival. These assumptions hold in standard oligopoly models, and they imply that for all (w_1, w_2) such that both retailers purchase from the manufacturer,

$$\pi_1(w_1, w_2) < \pi_1(w_1, \infty) \quad \text{and} \quad \pi_2(w_1, w_2) < \pi_2(\infty, w_2). \tag{1}$$

In other words, each retailer would strictly prefer to be a monopolist downstream.

Let $q_i(w_1, w_2)$ denote retailer i's equilibrium input demand as a function of both retailers' wholesale prices. Then the manufacturer's equilibrium flow payoff is

$$\pi_0(w_1, w_2) \equiv \sum_{i=1}^{2} w_i q_i(w_1, w_2) - c(q_1(w_1, w_2), q_2(w_1, w_2)).$$

Assuming both retailers purchase positive quantities from the manufacturer, the manufacturer's overall payoff is $\pi_0(w_1, w_2) + \sum_{i=1}^{2}(F_i + S_i)$, retailer i's overall payoff is $\pi_i(w_1, w_2) - F_i - S_i$, and the joint payoff of the manufacturer and the retailers is

$$\Pi(w_1, w_2) \equiv \sum_{i=0}^{2} \pi_i(w_1, w_2).$$

---

[6] With some additional structure on the downstream product-market game, it can be shown that our exclusion results extend to any mapping $T_i(q_i)$ subject to conditions that guarantee the existence of an equilibrium in every subgame. For example, instead of assuming a variable component defined by a two-part tariff, it is sufficient to assume that $T_i(q_i)$ is a finite menu of price-quantity pairs.

[7] As we will show, for our results, it is sufficient that a retailer observes only whether its competitor has a contract with the manufacturer, not the details of that contract, prior to choosing its quantity.

We assume that the joint payoff of all three firms is strictly concave, and that it attains its unique maximum at $\Pi^* \equiv \Pi(w_1^*, w_2^*)$, where $w_1^* = \arg\max_{w_1 \geq 0} \Pi(w_1, w_2^*)$ and $w_2^* = \arg\max_{w_2 \geq 0} \Pi(w_1^*, w_2)$. Typically, we would expect w_1^* and w_2^* to be above the manufacturer's marginal cost of supplying its input to the retailers. These relationships hold, for example, in the standard price-quantity duopoly models, where downstream competition reduces downstream margins, and hence upstream margins are needed to maintain downstream prices and quantities at the monopoly levels.

Because our assumptions imply that $\pi_1(\infty, w_2) = 0$ and $\pi_2(w_1, \infty) = 0$, the overall joint payoff of all three firms if retailer 2 does not trade with the manufacturer is

$$\Pi(w_1, \infty) \equiv \pi_0(w_1, \infty) + \pi_1(w_1, \infty),$$

and the overall joint payoff if retailer 1 does not trade with the manufacturer is

$$\Pi(\infty, w_2) \equiv \pi_0(\infty, w_2) + \pi_2(\infty, w_2).$$

In the former case, we denote the overall joint-payoff maximum by $\Pi_1^m \equiv \Pi(w_1^m, \infty)$, where $w_1^m = \arg\max_{w_1 \geq 0} \Pi(w_1, \infty)$, and in the latter case, we denote the overall joint-payoff maximum by $\Pi_2^m \equiv \Pi(\infty, w_2^m)$, where $w_2^m = \arg\max_{w_2 \geq 0} \Pi(\infty, w_2)$. In contrast to the case in which both retailers purchase from the manufacturer, we would typically expect w_1^m and w_2^m to be equal to the manufacturer's marginal cost of supplying its input in order to avoid the well-known problem of double marginalization.

In what follows, we assume that overall joint payoff is maximized when both retailers purchase from the manufacturer, $\Pi^* > \max\{\Pi_1^m, \Pi_2^m\}$, and that trade with retailer 1 only is weakly more profitable than trade with retailer 2 only, $\Pi_1^m \geq \Pi_2^m$.

☐ **Timing of the game.** We consider a typical three-stage vertical model. Contracts are offered in stage one. Contracts are accepted or rejected in stage two. Input quantities are purchased and all flow payoffs are determined in stage three. This setup is seemingly ubiquitous in the vertical-contracting literature. However, instead of assuming the offers in stage one are made by the manufacturer, as is usually done in this literature, we assume the retailers make the offers and, thus, the retailers have all the bargaining power.

In stage one, retailer 1 offers (S_1, w_1, F_1) and retailer 2 offers (S_2, w_2, F_2). In stage two, the manufacturer accepts or rejects each offer. If the manufacturer rejects retailer i's offer, then retailer i earns zero and does not trade with the manufacturer. If the manufacturer accepts retailer i's offer, then retailer i pays S_i to the manufacturer (in equilibrium, $S_i \leq 0$, so it is really a payment from the manufacturer to retailer i) and the game proceeds to stage three. At the start of stage three, all acceptances, rejections, and terms of each contract become public knowledge.[8] Retailers that have accepted contracts then purchase their input quantities and pay the manufacturer according to their contracts; for example, retailer i pays $w_i q_i + F_i$ if $q_i > 0$ and zero otherwise.

Using subgame-perfect Nash equilibrium as our equilibrium concept, we proceed by solving first for the Nash equilibrium outcomes in stage three. There are two cases to consider. In the case in which the manufacturer has accepted only retailer i's contract, it is optimal for retailer i to purchase a positive quantity from the manufacturer if and only if $\pi_i(w_i, \infty) \geq F_i$.[9] In the case in which the manufacturer has accepted both retailers' contracts, we assume that retailer i purchases from the manufacturer (and thus pays F_i) if $\pi_i(w_1, w_2) \geq F_i$ but does not purchase from the manufacturer (and thus does not pay F_i) if $\pi_i(w_i, \infty) < F_i$. If $\pi_i(w_1, w_2) < F_i \leq \pi_i(w_i, \infty)$, then retailer i purchases from the manufacturer if $\pi_j(w_j, \infty) < F_j$ but does not purchase from the manufacturer if $\pi_j(w_1, w_2) \geq F_j$. If $\pi_i(w_1, w_2) < F_i \leq \pi_i(w_i, \infty)$ and

---

[8] Our results continue to hold if, when one retailer's contract is rejected, we allow the manufacturer and the remaining retailer to renegotiate their contract, as long as any changes made in renegotiation are mutually agreeable using the original contract offer to define each firm's disagreement payoff.

[9] We abuse notation here by writing $\pi_i(w_i, \infty)$ to mean $\pi_1(w_1, \infty)$ if $i = 1$ and $\pi_2(\infty, w_2)$ if $i = 2$.

$\pi_j(w_1, w_2) < F_j \leq \pi_j(w_j, \infty)$, then there exists a pure-strategy equilibrium in which only retailer 1 purchases a positive input quantity in stage three and another in which only retailer 2 purchases a positive input quantity in stage three. In this case, in which there are multiple pure-strategy stage-three equilibria, our results continue to hold regardless of which pure-strategy equilibrium is played.

The manufacturer accepts or rejects each offer in stage two in order to maximize its overall payoff while anticipating the consequences of its choices in stage three. Thus, for example, if (S_1, w_1, F_1) and (S_2, w_2, F_2) are such that $\pi_i(w_1, w_2) \geq F_i$ for $i \in \{1, 2\}$ (so that each retailer would purchase from the manufacturer in stage three), then it is optimal for the manufacturer to accept both contract offers if and only if

$$\pi_0(w_1, w_2) + \sum_{i=1}^{2}(F_i + S_i) \geq \max\{0, \pi_0(w_1, \infty) + F_1 + S_1, \pi_0(\infty, w_2) + F_2 + S_2\},$$

where the left-hand side of this condition corresponds to its payoff if it accepts both contracts, and the right-hand side of this condition corresponds to its payoff if it rejects both contracts, accepts only retailer 1's contract, or accepts only retailer 2's contract, respectively. For all other possible combinations of contract offers, only one retailer would be willing to purchase from the manufacturer in stage three. In these cases, it is also straightforward to characterize the manufacturer's optimal choices.

The retailers choose their offers in stage one to maximize their payoffs while anticipating the effects of their actions on the subsequent play of the game. It follows immediately that the condition above (for when it is optimal for the manufacturer to accept both contract offers) must hold with equality in any equilibrium in which both retailers purchase positive quantities from the manufacturer. The reason is that if it were strictly optimal for the manufacturer to accept both offers instead of only retailer i's offer, the rival retailer could profitably ask for a higher upfront payment (because doing so would have no effect on the decisions in stage three). This implies the following lemma, which along with condition (1) will prove useful in what follows.

Lemma 1. In any equilibrium with contracts $(\hat{S}_1, \hat{w}_1, \hat{F}_1)$ and $(\hat{S}_2, \hat{w}_2, \hat{F}_2)$ in which both retailers purchase the manufacturer's input, the manufacturer's payoff is

$$\pi_0(\hat{w}_1, \hat{w}_2) + \sum_{i=1}^{2}(\hat{F}_i + \hat{S}_i) = \pi_0(\hat{w}_1, \infty) + \hat{F}_1 + \hat{S}_1 = \pi_0(\infty, \hat{w}_2) + \hat{F}_2 + \hat{S}_2.$$

Proof. See the Appendix.

Lemma 1 follows from the fact that the retailers make the contract offers in stage one. As neither retailer has any incentive to leave surplus on the table, it follows that in any equilibrium in which both retailers purchase from it, the manufacturer will be indifferent between accepting both retailers' offers or only one retailer's offer.

3. Main result

■ We can use Lemma 1 to characterize the retailers' equilibrium offers, and thus solve for the pure-strategy equilibria. Suppose there exists an equilibrium in which the retailers offer $(\hat{S}_1, \hat{w}_1, \hat{F}_1)$ and $(\hat{S}_2, \hat{w}_2, \hat{F}_2)$, the manufacturer accepts both offers, and each retailer purchases from the manufacturer. Then, it follows from Lemma 1 and retailer 1's payoff that the joint payoff of the manufacturer and retailer 1 in equilibrium is

$$\pi_0(\hat{w}_1, \infty) + \hat{F}_1 + \hat{S}_1 + \pi_1(\hat{w}_1, \hat{w}_2) - \hat{F}_1 - \hat{S}_1,$$

which, using condition (1) and the definition of Π_1^M, implies that their joint payoff is

$$\pi_0(\hat{w}_1, \infty) + \pi_1(\hat{w}_1, \hat{w}_2) < \pi_0(\hat{w}_1, \infty) + \pi_1(\hat{w}_1, \infty) \leq \Pi_1^M.$$

This implies, however, that the joint payoff of the manufacturer and retailer 1 in any equilibrium in which both retailers purchase from the manufacturer is less than Π_1^M, which is what the manufacturer and retailer 1 could jointly earn in retailer 2's absence.

It follows that, given $(\hat{S}_1, \hat{w}_1, \hat{F}_1)$ and $(\hat{S}_2, \hat{w}_2, \hat{F}_2)$, retailer 1 has a profitable deviation in which it offers the manufacturer an "exclusionary" contract of the form

$$S_1 < 0, \quad w_1 = w_1^m, \quad \text{and} \quad F_1 = \pi_1(w_1^m, \infty),$$

where retailer 1 proposes that the manufacturer provide it with upfront money in exchange for its entire flow payoff in the event that it purchases a positive quantity from the manufacturer in stage three. Because $S_1 < 0$, it is optimal for the manufacturer to accept retailer 1's offer only if it expects retailer 1 to purchase its input. But the catch is that retailer 1 will only purchase from the manufacturer if the manufacturer does not also sell to retailer 2 (because otherwise retailer 1's flow payoff would be less than F_1). Hence, under the proposed deviation contract, it is optimal for the manufacturer to accept only one retailer's contract. As accepting retailer 1's contract (and not retailer 2's contract) yields an overall joint payoff of Π_1^M, which is greater than what the manufacturer and retailer 1 can jointly earn in the proposed equilibrium, it is easy to see that there exists $S_1 < 0$ such that it is profitable for the manufacturer to accept only retailer 1's contract and makes retailer 1 better off.[10] Thus, it follows from this reasoning that there can be no pure-strategy equilibrium of the three-stage game in which both retailers purchase the manufacturer's input.

It remains to determine whether pure-strategy equilibria exist in which only one retailer purchases from the manufacturer. In such an equilibrium, it should be clear that the excluded retailer can do no better than to offer its entire profit to the manufacturer (in a vain effort to keep from being excluded). Given this, and the fact that exclusionary contracts of the form described above essentially force the manufacturer to choose between one or the other retailer, it is straightforward to verify that there exists an equilibrium in which retailer 1 offers $(S_1, w_1, F_1) = (-(\Pi_1^m - \Pi_2^m), w_1^m, \pi_1(w_1^m, \infty))$, retailer 2 offers $(S_2, w_2, F_2) = (0, w_2^m, \pi_2(\infty, w_2^m))$, and the manufacturer accepts only retailer 1's offer. Retailer 2 is excluded from the market because the manufacturer does not want to cannibalize retailer 1's sales and thus jeopardize its participation.[11]

□ **Exclusionary equilibria.** The following proposition characterizes the equilibrium offers in any pure-strategy equilibrium and solves for the equilibrium payoffs of the manufacturer and retailers.

Proposition 1. Pure-strategy equilibria exist, and in all such equilibria, only one retailer purchases from the manufacturer. The equilibrium contracts are such that

  (i) if $\Pi_1^m > \Pi_2^m$, then $(S_1, w_1, F_1) = (-(\Pi_1^m - \Pi_2^m), w_1^m, \pi_1(w_1^m, \infty))$, and (S_2, w_2, F_2) is such that $w_2 = w_2^m$, $F_2 \leq \pi_2(\infty, w_2^m)$, and $S_2 + F_2 = \pi_2(\infty, w_2^m)$;
  (ii) if $\Pi_1^m = \Pi_2^m$, then, for some $i \in \{1, 2\}$, $(S_i, w_i, F_i) = (0, w_i^m, \pi_i(w_i^m, \infty))$ and for $j \neq i$, (S_j, w_j, F_j) is such that $w_j = w_j^m$, $F_j \leq \pi_j(w_j^m, \infty)$, and $S_j + F_j = \pi_j(w_j^m, \infty)$.

In these pure-strategy equilibria, the manufacturer's equilibrium payoff is Π_2^m, retailer 1's equilibrium payoff is $\Pi_1^m - \Pi_2^m$, and retailer 2's equilibrium payoff is zero.

Proof. See the Appendix.

---

[10] For example, the contract offer $(S_1, w_1, F_1) = (-\pi_1(\hat{w}_1, \hat{w}_2) + \hat{S}_1 + \hat{F}_1 - \varepsilon, w_1^m, \pi_1(w_1^m, \infty))$, where $\varepsilon \in (0, \Pi_1^m - \pi_0(\hat{w}_1, \hat{w}_2) - \pi_1(\hat{w}_1, \hat{w}_2) - \hat{S}_2 - \hat{F}_2)$, makes the manufacturer and retailer 1 better off.

[11] A numerical example may help to fix ideas. The equilibria have the following qualitative features: the manufacturer pays retailer 1 $50 at the time of contracting, and then retailer 1 pays the manufacturer a lump sum of $40 and buys 100 units at $3 per unit, a price which is profitable for the manufacturer but yields no flow of profit to retailer 1. Retailer 2, who competes with retailer 1, stands ready to buy from the manufacturer too, but being somewhat smaller, it would not buy 100 units at that price, and so the manufacturer prefers not to cannibalize its sales through retailer 1.

Proposition 1 implies that exclusion occurs in all pure-strategy equilibria. This result follows, as we have seen, from condition (1) and Lemma 1. Proposition 1 also implies that pure-strategy equilibria exist, which is easy to verify given the contracts in (i) and (ii). Last, Proposition 1 implies that if $\Pi_1^m > \Pi_2^m$, then retailer 1 earns $\Pi_1^m - \Pi_2^m > 0$ in equilibrium and retailer 2 is excluded from the market. If $\Pi_1^m = \Pi_2^m$, then there are equilibria in which either retailer 1 or retailer 2 is excluded and each retailer earns zero payoff in equilibrium. In all equilibria, the manufacturer earns Π_2^m.

The intuition for the main result can be understood as follows. In any shared-market equilibrium, the manufacturer must be indifferent between accepting both contract offers or only one contract offer, otherwise, one retailer could ask for a higher upfront payment (doing so has no impact on the retailer's *ex post* purchasing decisions and, clearly, cannot induce the manufacturer to accept only the deviating retailer's contract). But if the manufacturer accepts only retailer i's offer, then retailer i earns more than its equilibrium payoff (as it then faces a higher demand for its product). Therefore, in equilibrium, the manufacturer and retailer i get together less than if the manufacturer were to accept retailer i's offer only, and thus they get less than Π_i^m. This means that excluding the rival retailer is profitable. Short of offering an explicit exclusive-dealing provision, retailer i can *de facto* exclude retailer j by offering the manufacturer a contract with F_i set equal to its monopoly flow of profit and $S_i < 0$ set to divide the surplus. In doing so, it obtains its entire payoff upfront.

The exclusion is inefficient—Proposition 1 implies that the overall joint payoff in equilibrium is Π_1^m, which is less than the joint payoff that potentially could have been obtained (in the absence of the exclusionary contracts) if both retailers had purchased from the manufacturer. It is as though this potential extra surplus were simply thrown away, harming in the process final consumers who would have valued having the ability to purchase the manufacturer's input at both retail outlets. Moreover, the source of the inefficiency can be attributed in large part to the exercise of the retailers' buyer power. It is straightforward to show, for example, that if the manufacturer (and not the retailers) were to make the offers in stage one, and the retailers were to accept or reject these offers in stage two, with all else in the model being the same, the manufacturer would sell its input to both retailers while setting its per-unit prices at w_1^* and w_2^*, respectively, thereby inducing them to maximize the overall joint payoff.

The fact that the overall joint payoff is not maximized when the downstream firms make the offers is not necessarily bad for consumer welfare if the failure arises because the retailers have used their buyer power to obtain lower wholesale prices (which would then likely be passed on to consumers in the form of lower retail prices). Indeed, pressure by "strong" buyers to keep upstream margins to a minimum is typically thought to be one of the main benefits to consumers of retailer buyer power. But this reasoning presumes that competition downstream is otherwise healthy, and that exit and entry in the downstream market is independent of the contract negotiations in the input market. When retailers make the contract offers, however, this presumption does not hold. Although this is not entirely surprising given that each retailer would prefer to be a monopolist, the "surprise" here is the helplessness of the manufacturer in preventing exclusion, the ease with which the "dominant" retailer can use its buyer power to induce exclusion, and the notable lack of any non-exclusionary equilibria.

It is natural to ask whether a vertical merger between the manufacturer and one or both of its potential retailers might be profitable in the model, and thus whether vertical integration can solve the problem of inefficient exclusion. The short answer is no—and the reason is that there is no way to split the surplus to make the merging parties better off. Hence, firms have no incentive to vertically integrate. To see this, consider the incentives of the manufacturer and retailer i to merge. If they merge, the subsequent contracting between the newly merged entity and retailer j will be efficient, and thus the overall joint payoff will be maximized. Assuming retailer j gets to make the offer, however, it is easy to show that retailer j will be able to extract its marginal contribution to this payoff, which is $\Pi^* - \Pi_i^m$. But notice that this leaves only Π_i^m in surplus left over for the merged entity, which is what the manufacturer and retailer i would have earned

absent the merger. Hence, there is no incentive for the manufacturer and retailer i to merge. Now consider the possibility that all three firms merge. Then clearly prices will be set to consumers to maximize the overall joint payoff. By opting out of the merger, however, retailer j can ensure itself a payoff of $\Pi^* - \Pi_i^m$, for the reasons given above, and therefore it will not be willing to accept any offer to merge for any amount less than this. This means that the joint payoff of the manufacturer and retailer i from the merger will be at most Π_i^m, and so once again it follows that there is no incentive for the manufacturer and retailer i to merge.

We conclude this section by noting that our result that only one retailer buys the manufacturer's input in all pure-strategy equilibria does not depend on the assumption that the retailers can observe each other's contract before making their quantity choices in the downstream market.[12] Instead, it holds even if a retailer does not observe the contract offered by its rival. To see this, note that in equilibrium there is exclusion, so contracts are not observed in equilibrium. Furthermore, given the rival's equilibrium contract, each retailer expects exclusion to occur regardless of any deviation on its part, so the lack of observability does not affect retailers' best replies.

☐ **Role of upfront payments.** As we have seen, upfront payments play a central role in ensuring that there are no equilibria in which both retailers purchase from the manufacturer (because they make possible contracts of the form $S_1 < 0$, $w_1 = w_1^m$, and $F_1 = \pi_1(w_1^m, \infty)$). But what we have not yet seen is why, under some conditions, these payments arise *in equilibrium*. After all, it is seemingly easy to construct exclusionary equilibria in which there are no upfront payments. For example, in any equilibrium in which it is excluded, retailer 2 can do no better than to offer its entire flow payoff to the manufacturer with the contract $(S_2, w_2, F_2) = (0, w_2^m, \pi_2(\infty, w_2^m))$. Given retailer 2's offer, it is a best response for retailer 1 to offer $(S_1, w_1, F_1) = (0, w_1^m, \Pi_2^m - \pi_0(w_1^m, \infty))$, and given these offers, it is optimal for the manufacturer to accept only retailer 1's contract. In this proposed equilibrium, retailer 2 is excluded, and the manufacturer earns Π_2^m, retailer 1 earns $\Pi_1^m - \Pi_2^m$, and retailer 2 earns zero, as is required by Proposition 1.

The problem with the proposed equilibrium, however, is that given retailer 1's offer of $(S_1, w_1, F_1) = (0, w_1^m, \Pi_2^m - \pi_0(w_1^m, \infty))$, it is *not* a best response for retailer 2 to offer $(S_2, w_2, F_2) = (0, w_2^m, \pi_2(\infty, w_2^m))$ when $\Pi_1^m > \Pi_2^m$. The reason is that, in this case, retailer 2 can exploit the fact that retailer 1 earns positive net flow payoff:

$$\pi_1\big(w_1^m, \infty\big) - F_1 = \pi_1\big(w_1^m, \infty\big) - \big(\Pi_2^m - \pi_0\big(w_1^m, \infty\big)\big)$$
$$= \Pi_1^m - \Pi_2^m$$
$$> 0.$$

For example, retailer 2 can profitably deviate to the contract $(\tilde{S}_2, \tilde{w}_2, \tilde{F}_2)$, where the contract terms are such that (i) retailer 1 would continue to purchase from the manufacturer even if retailer 2 were also purchasing from the manufacturer, (ii) retailer 2 would earn positive profit if its contract were accepted, and (iii) the manufacturer would accept retailer 2's contract. To see that such terms exist, note that it suffices to show that there exist w_2 such that the following two conditions hold:

$$\pi_1\big(w_1^m, w_2\big) - \big(\Pi_2^m - \pi_0\big(w_1^m, \infty\big)\big) > 0 \tag{2}$$

and

$$\pi_0\big(w_1^m, w_2\big) + \big(\Pi_2^m - \pi_0\big(w_1^m, \infty\big)\big) + \pi_2\big(w_1^m, w_2\big) > \Pi_2^m, \tag{3}$$

where condition (2) ensures that retailer 1 would earn positive flow payoff even if retailer 2 were also purchasing from the manufacturer, and condition (3) ensures that the joint payoff of the

---

[12] Whether or not contracts are observable is critical in many models of vertical contracting. See, for example, Hart and Tirole (1990), O'Brien and Shaffer (1992), and McAfee and Schwartz (1994).

manufacturer and retailer 2 would be higher if the manufacturer accepted both contracts than if it accepted only retailer 1's contract. As the left-hand side of (2) is equal to $\Pi_1^m - \Pi_2^m$ when $w_2 = \infty$, and is increasing in w_2 whenever retailer 2 has positive flow payoff, and as the left-hand side of (3) is equal to Π_2^m when $w_2 = \infty$, and is decreasing in w_2 for all w_2 beyond some threshold such that retailer 2 has positive flow payoff (by the strict concavity of Π), it follows by the continuity of π_i that there exist w_2 such that (2) and (3) are satisfied when $\Pi_1^m > \Pi_2^m$.

As the same reasoning applies to any contract retailer 1 might offer in which $F_1 < \pi_1(w_1^m, \infty)$, it follows from this discussion that in any equilibrium, retailer 1 must give its entire flow payoff to the manufacturer in order to prevent retailer 2 from having a profitable deviation. This means that retailer 1's equilibrium payoff must come from the upfront payment it receives from the manufacturer and, thus, both $F_1 = \pi_1(w_1^m, \infty)$ *and* upfront payments are necessary to support the equilibrium outcome when $\Pi_1^m > \Pi_2^m$. These findings are summarized in the following proposition.

Proposition 2. Upfront payments arise in equilibrium if and only if $\Pi_1^m > \Pi_2^m$. When they arise in equilibrium, the payments flow from the manufacturer to retailer 1, with retailer 1 receiving an upfront payment of $\Pi_1^m - \Pi_2^m$ from the manufacturer.

Proposition 2 implies that all upfront payments flow from the manufacturer to retailer 1, and thus the manufacturer will be paid only when its input is purchased. Proposition 2 also implies that whether upfront payments arise in equilibrium depends on the difference between Π_1^m and Π_2^m. If $\Pi_1^m = \Pi_2^m$, then neither retailer earns positive profit in equilibrium and therefore neither is able to command an upfront payment from the manufacturer. However, if $\Pi_1^m > \Pi_2^m$, then retailer 1 is able to exclude retailer 2 *and* earn a positive payoff. In this case, retailer 1 will use its buyer power to obtain its entire profit upfront. In doing so, it prevents the manufacturer and retailer 2 from being able to cannibalize profitably its sales. That is, when the manufacturer is the claimant of all payoff that flows through retailer 1's sales, there is no scope for the manufacturer and excluded retailer to increase their joint payoff.

☐ **Relation to the literature on exclusive dealing.** The roles of S_1 and F_1 should now be clear. To induce exclusion, both payments are needed in equilibrium. By setting $S_1 < 0$, retailer 1 ensures that the manufacturer will not accept its contract unless it wants retailer 1 to buy its input, and by setting $F_1 = \pi_1(w_1^m, \infty)$, retailer 1 ensures that retailer 2 and the manufacturer will not be able to profit by cannibalizing its sales. If the manufacturer were to accept retailer 2's offer, retailer 1 would simply exit the market without buying from the manufacturer and the manufacturer would not be able to recover the loss from its upfront payment.

An alternative way for retailer 1 to exclude its rival, in lieu of requiring an upfront payment, is to write an exclusive-dealing provision into its contract with the manufacturer and then to set $w_1 = w_1^m$ and $F_1 = \Pi_2^m - \pi_0(w_1^m, \infty)$. Such a contract would make it illegal for the manufacturer to sell inputs to retailer 2, thus preventing the manufacturer from cannibalizing retailer 1's sales even though retailer 1's net flow payoff would be positive. Indeed, it is easy to show (see the Appendix) that if exclusive-dealing provisions are feasible and all other assumptions of the model remain the same, there is an equilibrium in which retailer 1 specifies exclusive dealing and offers $(S_1, w_1, F_1) = (0, w_1^m, \Pi_2^m - \pi_0(w_1^m, \infty))$ and retailer 2 offers $(S_2, w_2, F_2) = (0, w_2^m, \pi_2(\infty, w_2^m))$.

There is a large literature on exclusive-dealing contracts, which are judged according to the rule of reason in antitrust law.[13] Some authors have suggested that exclusive dealing can be efficient (Marvel, 1982; Segal and Whinston, 2000a; Sass, 2005), whereas others have suggested that exclusive-dealing provisions may enable one firm to monopolize the market. The seminal

---

[13] If a substantial fraction of the retail market has been foreclosed, exclusive dealing may be found to "substantially lessen competition" under the Clayton Act §3, to be "an unfair method of competition" under the FTC Act §5, and to be conduct in violation of the Sherman Act §2.

works in the latter vein include Aghion and Bolton (1987), Mathewson and Winter (1987), and Rasmusen, Ramseyer, and Wiley (1991).[14]

Aghion and Bolton (1987) show that exclusive-dealing contracts that contain penalty-escape clauses can lead to inefficient exclusion when a single retailer contracts sequentially with two manufacturers and there is incomplete information about the more efficient manufacturer's costs. In their model, if the contracting were simultaneous, or if the manufacturers' production costs were known, inefficient exclusion would not be profitable. In contrast, our results on exclusion are obtained even though the contract offers are made simultaneously and there is complete information on costs.

Rasmusen, Ramseyer, and Wiley (1991) show that exclusion can arise when there are economies of scale in upstream production and coordination failures at the downstream level. They consider an environment with a single manufacturer and multiple, independent retailers. Although agreeing to an exclusionary contract is collectively not in the retailers' interest, any one retailer has an incentive to sign the agreement and obtain compensation, however small, if it believes that enough other retailers will do the same. In the absence of scale economies or coordination failures, inefficient exclusionary contracts do not arise in their model (Innes and Sexton, 1994). In contrast, in our model, there is no coordination failure as the manufacturer internalizes its accept and reject decisions. Moreover, our results do not depend on scale economies or selection among multiple equilibria, as they do in Rasmusen, Ramseyer, and Wiley (1991), and unlike in their model, if the retailers in our model were independent, there would be no exclusion.

Mathewson and Winter (1987) consider an environment with two manufacturers and one retailer and give conditions under which the stronger manufacturer can profitably induce the retailer to exclude its rival. The manufacturer's inducements take the form of a lower per-unit price that compensates the retailer for its lost revenue from not selling the excluded manufacturer's product. Subsequent literature, however, has shown that this result depends on the restriction to linear contracts (O'Brien and Shaffer, 1997; Bernheim and Whinston, 1998). If "sell-out" contracts were allowed in their model, for example, it would not be possible for the stronger manufacturer both to compensate the retailer for lost revenue and to increase its own payoff by excluding its rival. Hence, exclusion would not be profitable. In contrast, in our model, we show that exclusion arises in all pure-strategy equilibria even though sell-out contracts are feasible. Whether by explicitly requiring exclusive dealing, or by requiring an upfront payment, the stronger retailer is always able to compensate the manufacturer for lost revenue and to increase its own payoff by excluding its rival.

To develop some further insight, it is useful to consider why sell-out contracts that maximize overall joint payoff, and which are often optimal in environments of common agency when there is complete information (see Bernheim and Whinston, 1985; here the retailers are the principals and the manufacturer is the common agent), do not arise in equilibrium. For example, why is it that the sell-out contracts $(\bar{S}_i, \bar{w}_i, \bar{F}_i) \equiv (-(\Pi^* - \Pi_j^m), w_i^*, \pi_i(w_1^*, w_2^*))$, $i \in \{1, 2\}$, $j \neq i$, where each retailer receives its entire payoff in the form of an upfront payment in exchange for giving up its flow profit when both retailers purchase the manufacturer's input, cannot arise in equilibrium?

It is easy to see that it is a best reply for the manufacturer to accept each retailer's offer, and that, given this, both retailers will buy the manufacturer's input and the overall joint payoff will be maximized. Thus, given these contracts, the manufacturer earns $\Pi_1^m + \Pi_2^m - \Pi^*$, retailer 1 earns $\Pi^* - \Pi_2^m$, and retailer 2 earns $\Pi^* - \Pi_1^m$. But this means that the joint payoff of the manufacturer and retailer i is Π_i^m, which cannot hold if both Lemma 1 and condition (1) are satisfied. Thus, as condition (1) is assumed, it must be that Lemma 1 is not satisfied when retailers 1 and 2 offer these contracts.

To understand why this is the case, note that if the manufacturer were to accept, for example, only retailer 2's contract, it would earn $\pi_0(\infty, \bar{w}_2) + \bar{F}_2 + \bar{S}_2$. Using the fact that $\Pi_2^m = \pi_0(\infty, w_2^m) + \pi_2(\infty, w_2^m) > \pi_0(\infty, w_2^*) + \pi_2(w_1^*, w_2^*)$, one can show that

---

$$\pi_0(\infty, \bar{w}_2) + \bar{F}_2 + \bar{S}_2 = \pi_0(\infty, w_2^*) - \Pi^* + \Pi_1^m + \pi_2(w_1^*, w_2^*)$$
$$< \pi_0(\infty, w_2^*) - \Pi^* + \Pi_1^m + \pi_2(w_1^*, w_2^*)$$
$$+ \Pi_2^m - \pi_0(\infty, w_2^*) - \pi_2(w_1^*, w_2^*)$$
$$= \Pi_1^m + \Pi_2^m - \Pi^*.$$

Because the manufacturer's payoff is less than $\Pi_1^m + \Pi_2^m - \Pi^*$ when it rejects retailer 1's offer, it follows that the manufacturer *strictly* prefers to accept retailer 1's contract (this demonstrates that Lemma 1 is not satisfied), and thus it follows that retailer 1 can profitably deviate by asking for a larger upfront payment from the manufacturer.

4. Extensions

■ We now consider three extensions to the model. In the first subsection, we offer some thoughts on the robustness of our exclusion results to a more even distribution of bargaining power between the manufacturer and its retailers. We consider what happens, for example, when only one retailer can make a take-it-or-leave-it offer (mixed bargaining). In the second subsection, we consider a game in which upfront payments are infeasible. This allows us to offer some insights into the welfare effects of these payments (assuming that exclusive-dealing provisions are also infeasible). In the third subsection, we expand the set of feasible contracts to allow for minimum-purchase requirements. We consider whether, or to what extent, our results would be affected if retailer 1 had to purchase a minimum quantity to keep its upfront payment.

□ **More even distribution of bargaining power.** We have assumed that the retailers can make take-it-or-leave-it offers to the manufacturer, and we have shown that this leads to exclusion in all pure-strategy equilibria. It is natural to ask how this result would differ if the bargaining power were more evenly distributed. To gain some intuition for this, consider first the other extreme. If the manufacturer could make both offers, then clearly there would be no exclusion. The manufacturer would offer $(S_i, w_i, F_i) = (0, w_i^*, \pi_i(w_1^*, w_2^*))$, both retailers would accept their contracts, and the overall joint payoff would be maximized at $\Pi^* > \Pi_1^m$.

This suggests that exclusion will occur in equilibrium only if the retailers have "enough" bargaining power. Intuitively, exclusion arises because of the combination of three critical factors: (i) condition (1), which says that each retailer would prefer to be a monopolist in the downstream market; (ii) Lemma 1, which says that the manufacturer will be indifferent between accepting both contracts or only one contract in any equilibrium in which it accepts both contracts; and (iii) the ability of firms to offer exclusionary contracts (supported by upfront payments or via exclusive dealing).

Of these factors, (i) and (iii) do not depend on the ability of the retailers to make take-it-or-leave-it offers. For example, condition (1) would continue to hold because retailer i's flow payoff is increasing in w_j for any distribution of wholesale prices and fixed fees (as long as both retailers purchase from the manufacturer), and the ability of firms to offer exclusionary contracts would be unaffected because, for example, retailer 1 and the manufacturer can induce exclusion by agreeing to $w_1 = w_1^m$ and $F_1 = \pi_1(w_1^m, \infty)$, whether or not retailer 1 receives an upfront payment of $\Pi_1^m - \Pi_2^m$.

The conditions in Lemma 1, however, are affected by the ability of the retailers to make take-it-or-leave-it offers. When the manufacturer can extract some of the incremental surplus for itself, it will in general no longer be indifferent between accepting both contracts or only one contract in any equilibrium in which it accepts both contracts. In this case, although retailer 1's flow payoff would be lower if the manufacturer trades with retailer 2, the manufacturer's payoff would be higher, making the change in their joint payoff if the manufacturer trades with retailer 2 ambiguous. This implies that under Nash bargaining, or some other bargaining rule in which negotiating firms maximize their bilateral joint payoff, exclusion will not necessarily be induced

because the manufacturer and retailer 1 may be able to increase their joint payoff by allowing the manufacturer to trade with retailer 2. Whether the joint payoff of the manufacturer and retailer 1 is likely to increase will depend on how much bargaining power the manufacturer has vis-à-vis retailer 2. Loosely speaking, we would expect that the more bargaining power the manufacturer has vis-à-vis retailer 2, the more likely the increase in the manufacturer's payoff will outweigh the decrease in retailer 1's flow payoff, and thus the less likely the firms will want to induce exclusion.

Sequential game with mixed bargaining. This reasoning suggests that retailer 2's bargaining power vis-à-vis the manufacturer is an important factor in determining whether the manufacturer and retailer 1 want to induce exclusion. We can formalize this insight in a non-cooperative framework by considering a game of sequential contracting with mixed bargaining in which the manufacturer negotiates with the retailers sequentially, and in which one side makes a take-it-or-leave-it offer in each negotiation. This gives rise to four scenarios, one in which the manufacturer makes both offers, one in which it receives both offers, and two "mixed" cases in which the manufacturer makes one offer and receives the other.

The timing of the game is as follows. In stage one, the manufacturer contracts with retailer 1. The offer is made by the firm with the bargaining power. If the offer is rejected, retailer 1 earns zero payoff and becomes inactive. If the offer is accepted, then any upfront payment is made, and the game proceeds to stage two. In stage two, retailer 2 first observes the terms of retailer 1's contract and then contracts with the manufacturer. Once again, the firm with the bargaining power makes the offer. If the offer is rejected, retailer 2 earns zero payoff and becomes inactive. If the offer is accepted, then any upfront payment is made, and the game proceeds to stage three.

At the start of stage three, all acceptances, rejections, and terms of the contracts are revealed. Input quantities are then purchased and flow payoffs are determined. Our solution concept and all other assumptions and notation are the same as before.

We now state the main result in this section (see Marx and Shaffer, 2004).

Proposition 3. Pure-strategy equilibria of the sequential game with mixed bargaining exist, and in all such equilibria, both retailers purchase from the manufacturer if and only if the manufacturer makes the offer in stage two. If retailer 2 makes the offer, retailer 2 is excluded if $\Pi_1^m > \Pi_2^m$, and either retailer 1 or 2 is excluded if $\Pi_1^m = \Pi_2^m$.

Proof. Available on request.

Proposition 3 implies that whether or not exclusion arises in the sequential game with mixed bargaining depends on the bargaining power of retailer 2. The idea is that if the manufacturer knows that retailer 2 will make the offer in stage two, then the manufacturer and retailer 1 will agree to an exclusionary contract in stage one (the manufacturer will be indifferent to contracting with retailer 2, but retailer 1 will prefer that it not; hence, the joint payoff of the manufacturer and retailer 1 will be higher when retailer 2 is excluded). On the other hand, if the manufacturer knows that it will make the offer in stage two, then there will be no exclusion and the manufacturer and retailer 1 will choose their terms to maximize overall joint payoff.

☐ **Equilibrium without upfront payments.** In this section we assume that upfront payments are not allowed, and thus we restrict attention to two-part tariff contracts, (w_i, F_i). One can show in this case that no pure-strategy equilibrium exists if the retailers simultaneously make take-it-or-leave-it offers to the manufacturer. Thus, in order to obtain clean results for welfare comparisons, we focus on the sequential contracting game described above and, in particular, we focus on the case in which the retailers make both offers. Recall that with upfront payments, exclusion is the unique equilibrium outcome in this case. Without upfront payments, as we will now show, there is no exclusion in equilibrium.

In the sequential game, in the second stage, retailer 2 chooses w_2 and F_2 to solve

$$\max_{w_2, F_2} \pi_2(w_1, w_2) - F_2,$$

subject to

$$\pi_0(w_1, w_2) + F_1 + F_2 \geq \pi_0(w_1, \infty) + F_1,$$

so that the manufacturer will accept retailer 2's contract offer. Given retailer 2's optimal contract, which we can write as a function of w_1, $(\hat{w}_2(w_1), \hat{F}_2(w_1))$, it is optimal in the first stage for retailer 1 to choose w_1 and F_1 to solve

$$\max_{w_1, F_1} \pi_1(w_1, \hat{w}_2(w_1)) - F_1,$$

subject to

$$\pi_0(w_1, \hat{w}_2(w_1)) + F_1 + \hat{F}_2(w_1) \geq 0.$$

In what follows, we simplify by assuming that $\pi_1(w_1^m, 0) > 0$, so that for all feasible $w_2 \geq 0$, retailer 1's flow payoff is positive when it has wholesale price w_1^m. In other words, we assume that retailer 1's "choke price" is greater than w_1^m when $w_2 = 0$.

Although exclusionary contracts that do not rely on upfront payments or exclusive-dealing provisions exist in this environment—note that if retailer 1 offers the manufacturer the contract $(w_1^m, \pi_1(w_1^m, \infty))$, then it will only buy from the manufacturer if retailer 2 does not buy from the manufacturer—they do not arise in equilibrium. The reason is that if retailer 1 were to make this contract offer, its payoff would be zero, as the fixed fee is equal to its flow payoff. But as retailer 1 can secure a positive payoff with a different contract offer, this offer cannot arise in equilibrium.

We now summarize the main result in this section.

Proposition 4. In any equilibrium of the sequential game without upfront payments, both retailers purchase from the manufacturer.

Proof. See the Appendix.

Proposition 4 implies that there is no exclusion in any equilibrium of the sequential game without upfront payments. The intuition is that if retailer 1 offers a contract with a fixed fee equal to its stand-alone flow payoff, then it can exclude retailer 2, but as just described, this contract leaves retailer 1 with zero payoff, so this is not an equilibrium. But if retailer 1 offers a contract with a fixed fee less than its stand-alone flow payoff, then, as described in Section 3, retailer 2 can offer a contract that is acceptable to the manufacturer, results in both retailers buying from the manufacturer, and gives retailer 2 a positive payoff. Thus, retailer 2 is not excluded.

□ **Contracts with minimum-purchase requirements.** We have seen that retailer 1 purchases zero quantity (but keeps its upfront money) in the out-of-equilibrium event in which the manufacturer sells to retailer 2, and it is this threat to purchase zero quantity if the manufacturer attempts to cannibalize its sales that keeps the manufacturer in line. The interested reader may wonder whether we would obtain similar results if retailer 1 were required (either by contract or law) to purchase a positive quantity from the manufacturer in order to keep its upfront money. We will show in this section that the answer is yes, our results are robust to this extension. The idea is that retailer 1 needs some way to penalize the manufacturer if the latter sells to retailer 2, and this can be achieved whether or not there is a minimum-purchase requirement in its contract. As long as the difference between the required minimum purchase and retailer 1's equilibrium purchase in the absence of cannibalization is sufficiently large, the manufacturer will be disciplined.

To establish this result, in this section, we consider contracts of the form

$$
T_i(q_i) = \begin{cases}
\infty & \text{if } q_i < \bar{q}_i, \\
S_i & \text{if } q_i = \bar{q}_i, \\
w_i q_i + F_i + S_i & \text{if } q_i > \bar{q}_i,
\end{cases}
$$

where $\bar{q}_i$ is the required minimum purchase, S_i is the upfront payment, and (w_i, F_i) is the variable component, which is in effect only if retailer i purchases more than $\bar{q}_i$.

Let $R_i(q_1, q_2)$ denote retailer i's revenue from the downstream product market when retailers 1 and 2 purchase input quantities q_1 and q_2, respectively. Then, assuming both retailers purchase positive quantities from the manufacturer, we can write retailer i's payoff as $R_i(q_1, q_2) - T_i(q_i)$, the manufacturer's payoff as $\sum_{i=1}^{2} T_i(q_i) - c(q_1, q_2)$, and the overall joint payoff of all three firms as $\tilde{\Pi}(q_1, q_2) \equiv \sum_{i=1}^{2} R_i(q_1, q_2) - c(q_1, q_2)$.

We assume that $R_i(q_1, q_2) = 0$ when evaluated at $q_i = 0$, and that $R_i(q_1, q_2)$ is continuous and decreasing in q_j for all q_1, q_2 such that both revenues are positive. The latter two assumptions imply that each retailer prefers to be a monopolist, and thus we have the analogue to (1): for all (q_1, q_2) such that $R_1(q_1, q_2) > 0$ and $R_2(q_1, q_2) > 0$,

$$
R_1(q_1, q_2) < R_1(q_1, 0) \text{ and } R_2(q_1, q_2) < R_2(0, q_2). \tag{4}
$$

We also assume that $\tilde{\Pi}(q_1, q_2)$ is strictly concave, and that it attains a maximum of $\tilde{\Pi}^* \equiv \tilde{\Pi}(q_1^*, q_2^*)$, where $q_1^* = \arg\max_{q_1 \geq 0} \tilde{\Pi}(q_1, q_2^*)$ and $q_2^* = \arg\max_{q_2 \geq 0} \tilde{\Pi}(q_1^*, q_2)$. Our assumption that $R_i(q_1, q_2) = 0$ when evaluated at $q_i = 0$ implies that the overall joint payoff of all three firms if retailer 2 does not trade with the manufacturer is

$$
\tilde{\Pi}(q_1, 0) \equiv R_1(q_1, 0) - c(q_1, 0),
$$

and the overall joint payoff if retailer 1 does not trade with the manufacturer is

$$
\tilde{\Pi}(0, q_2) \equiv R_2(0, q_2) - c(0, q_2).
$$

In the former case, we denote the overall joint-payoff maximum by $\tilde{\Pi}_1^m \equiv \tilde{\Pi}(q_1^m, 0)$, where $q_1^m = \arg\max_{q_1 \geq 0} \tilde{\Pi}(q_1, 0)$, and in the latter case, we denote the overall joint-payoff maximum by $\tilde{\Pi}_2^m \equiv \tilde{\Pi}(0, q_2^m)$, where $q_2^m = \arg\max_{q_2 \geq 0} \tilde{\Pi}(0, q_2)$. It is useful also to let w_i^m denote the wholesale price such that $q_i^m \in \arg\max_{q_i \geq 0} R_i(q_i, 0) - w_i^m q_i$.

We further assume that the overall joint payoff is maximized when both retailers purchase from the manufacturer, $\tilde{\Pi}^* > \max\{\tilde{\Pi}_1^m, \tilde{\Pi}_2^m\}$, and that the monopoly surplus is higher if retailer 1 is in the market than if retailer 2 is in the market, $\tilde{\Pi}_1^m \geq \tilde{\Pi}_2^m$.

Last, for $i \in \{1, 2\}$ and $j \neq i$, we define the set Φ_i by $\Phi_i \equiv \{q_i < q_i^m \mid R_i(q_i, 0) \leq \tilde{\Pi}_1^m - \tilde{\Pi}_2^m\}$, and we assume the timing of the game (simultaneous offers) and all other assumptions (analogues) are the same as before. Then we have the following result:

Proposition 5. Pure-strategy equilibria exist, and in all such equilibria, only one retailer purchases from the manufacturer. The equilibrium contracts are such that

(i) if $\tilde{\Pi}_1^m > \tilde{\Pi}_2^m$, then for any $\bar{q}_1 \in \Phi_1$, there exists an equilibrium in which retailer 1 offers $(S_1, w_1, F_1) = (-(\tilde{\Pi}_1^m - \tilde{\Pi}_2^m) + R_1(\bar{q}_1, 0), w_1^m, R_1(q_1^m, 0) - q_1^m w_1^m - R_1(\bar{q}_1, 0));$

(ii) if $\tilde{\Pi}_1^m = \tilde{\Pi}_2^m$, then for some $i \in \{1, 2\}$, in all equilibria in which retailer i is the active retailer, retailer i offers $\bar{q}_i = 0$ and $(S_i, w_i, F_i) = (0, w_i^m, R_i(q_i^m, 0) - q_i^m w_i^m).$ [15]

In these pure-strategy equilibria, the manufacturer's equilibrium payoff is $\tilde{\Pi}_2^m$, retailer 1's equilibrium payoff is $\tilde{\Pi}_1^m - \tilde{\Pi}_2^m$, and retailer 2's equilibrium payoff is zero.

Proof. See the Appendix.

---

[15] We abuse notation here by writing $R_i(q_i^m, 0)$ to mean $R_1(q_1^m, 0)$ if $i = 1$ and $R_2(0, q_2^m)$ if $i = 2$.

Proposition 5 implies that exclusion occurs in all pure-strategy equilibria (analogue to Proposition 1). As $\bar{q}_1 \in \Phi_1$ implies $R_1(\bar{q}_1, 0) \leq \tilde{\Pi}_1^m - \tilde{\Pi}_2^m$, Proposition 5 also implies that the manufacturer does not receive an upfront payment, and that whether the active retailer receives an upfront payment depends on the difference between $\tilde{\Pi}_1^m$ and $\tilde{\Pi}_2^m$. In the case where $\tilde{\Pi}_1^m = \tilde{\Pi}_2^m$, neither retailer earns positive profit in equilibrium (although either may be the active retailer) and therefore the active retailer is not able to command an upfront payment from the manufacturer. In the case where $\tilde{\Pi}_1^m > \tilde{\Pi}_2^m$, retailer 1 is able to exclude retailer 2 *and* earn a positive payoff. In this case, retailer 1 will use its buyer power to obtain an upfront payment (analogue to Proposition 2); however, it does not obtain its entire payoff upfront. This is because in order to receive the upfront payment, retailer 1 must purchase at least $\bar{q}_1$, which allows it to earn a net flow payoff of $R_1(\bar{q}_1, 0)$ in the product market. Although the manufacturer and rival retailer might like to cannibalize the sales of retailer 1 that are above $\bar{q}_1$, the threat of retailer 1 purchasing less than its equilibrium quantity is sufficient to dissuade the manufacturer and rival retailer from doing so.

5. Conclusion

■   In this article, we contribute to the vertical-contracting literature on exclusion by highlighting a previously unnoticed implication of retailer buyer power—when two competing retailers attempt to buy inputs from the same manufacturer, and the retailers make the offers, one retailer is excluded from trade in all pure-strategy equilibria. The dominant retailer uses its buyer power to obtain an upfront payment, and this, combined with its other contract terms, leads to the exclusion of its rival. The idea is that having given the dominant retailer an upfront payment to buy its input, the manufacturer will not then want to trade with the rival retailer because of fears that if it did, the dominant retailer would cut back on some or all of its planned purchases. Consumers lose in this case because retail prices are potentially higher, and with fewer retailers buying from the manufacturer, choice in the marketplace is reduced. If the manufacturer were to make the offers, there would be no exclusion.

The extant literature on exclusion tends to focus on upstream markets and has different prerequisites. In Rasmusen, Ramseyer, and Wiley (1991), the driving factors are economies of scale at the upstream level and coordination failures among the agents receiving the offers. Here, there need not be any economies of scale and a single agent makes the accept or reject decisions. In Aghion and Bolton (1987), incomplete information about an entrant's costs is necessary to get exclusion. Here, firms have complete information on costs. In Mathewson and Winter (1987), the results are driven by the restriction to linear contracts. Here, we assume firms can offer nonlinear contracts.

Our exclusion result is robust to whether the contracting occurs simultaneously or sequentially, and it does not rely on the observability of contract terms among rival downstream firms. Instead, its robustness stems from the fact that, in any candidate equilibrium in which both retailers purchase from the manufacturer, the manufacturer and retailer i would jointly earn less than their bilateral monopoly profit, implying that retailer i would thus have an incentive to deviate to an exclusive relationship.

Our exclusion result is also robust to whether or not explicit exclusive-dealing arrangements are feasible. We find that exclusion can arise without such restrictions because the retailers can impose *de facto* exclusivity by demanding upfront payments that are sunk when the contract is signed. The contract terms are structured so that the dominant retailer will buy only if it has an exclusive relationship with the manufacturer, and thus our result relies on the manufacturer rejecting one of the retailers' offers even though it would have preferred *ex ante* to sell to both retailers.

We also contribute in this article to the literature on countervailing buyer power. Although this literature has had a long history (e.g., Galbraith, 1954; Stigler, 1954), there has been little formal modelling of the effects on competition when retailers have buyer power. Early attempts such as Horn and Wolinsky (1988), Von Ungern-Sternberg (1996), and Dobson and Waterson

(1997) restrict attention to linear contracts, where manufacturers always want higher per-unit prices and retailers always want lower per-unit prices. However, when nonlinear contracts are feasible, we find that retailers do not necessarily want lower per-unit prices. Instead, they may prefer to use their buyer power to negotiate upfront payments, which can be exclusionary.[16]

Our third contribution is to the policy debate on the role of upfront payments. These payments have attracted increasing scrutiny in recent years, and they are a source of controversy in antitrust. One school of thought suggests that they improve distribution efficiency by allowing manufacturers to signal high-quality products and reduce retailers' risk of product failure. Another school of thought, however, views upfront payments as a means of enhancing market power or dampening competition.[17]

Currently, there two main concerns in antitrust regarding upfront payments. These concerns are distinguishable according to which side initiates the payments. If a manufacturer is believed to have initiated the payments, then the main concern is whether the manufacturer might be using them to raise rivals' costs by bidding up the price of shelf space. The concern is that this strategy, if successful, could lead to exclusion in the upstream market, which would harm consumers because fewer products would obtain distribution and retail prices would be higher. In contrast, if the payments are initiated by the retailers, then the main concern is whether one retailer might be securing better terms of trade (higher upfront payments) than another, particularly vis-à-vis a smaller rival, putting the latter at a competitive disadvantage (where protection of the smaller retailer is provided by the Robinson-Patman Act).[18]

Our results have elements of both concerns. Although the payments are initiated by the retailers, exclusion is the central feature of the model. This suggests that policymakers should be concerned with exclusion not just in upstream markets but also in downstream markets, and not just when the payments are deemed to be initiated by the manufacturers but also when they are initiated by the retailers. Consumers lose in the case we consider because the manufacturer's product is sold by fewer retailers than is optimal, and, as with upstream exclusion, retail prices are potentially higher as a result. Note that the Robinson-Patman Act would be ineffective in dealing with the kind of competitive harm we identify precisely because exclusion is at issue. In a secondary-line case under the Robinson-Patman Act, a necessary condition for a case to proceed is that strictly positive sales must be made to both the advantaged and disadvantaged retailer. In our model, the disadvantaged retailer is excluded from the market and therefore purchases nothing. Thus, the kind of competitive harm that we consider in this article would be missed under current antitrust laws and thinking.

Finally, it is worth noting that our analysis suggests that "who has the bargaining power" plays an important role: exclusion does not arise in the model if the manufacturer has all the bargaining power, but does arise if instead the retailers have all the bargaining power. Any attempt to ban upfront payments when the retailers have all the bargaining power may be futile, however, if the retailers can freely achieve exclusion through other means (e.g., through an explicit exclusive-dealing provision). Hence, banning upfront payments without also prohibiting exclusive-dealing provisions when retailers have buyer power may not be sufficient to alter the final outcome.

Appendix

■ This appendix contains the proofs of Lemma 1, Proposition 1, equilibrium with exclusive dealing, Proposition 4, and Proposition 5.

---

[16] The finding that more buyer power is not necessarily good for social welfare is also a theme in other recent work, for example, Chen (2003), Inderst and Wey (2003, 2006), and Inderst and Shaffer (2007).

[17] For a nice summary of the different controversies, see Bloom, Gundlach, and Cannon (2000). For some empirical tests of the various hypotheses, see FTC (2003), Israilevich (2004), Bronsteen, Elzinga, and Mills (2005), and Sudhir and Rao (2006). Balto (2002) discusses recently litigated cases and their policy implications.

[18] Another concern is that upfront payments may serve to dampen downstream competition, resulting in higher prices for consumers. See Shaffer (1991) for a model and discussion of this concern.

Proof of Lemma 1. Suppose there is an equilibrium with contracts $(\hat{S}_1, \hat{w}_1, \hat{F}_1)$ and $(\hat{S}_2, \hat{w}_2, \hat{F}_2)$ in which the manufacturer accepts both contracts and both retailers purchase from the manufacturer (the reasoning is similar if both contracts are accepted but only one retailer purchases from the manufacturer). Then the manufacturer's equilibrium payoff is $M \equiv \pi_0(\hat{w}_1, \hat{w}_2) + \sum_{k=1}^{2}(\hat{F}_k + \hat{S}_k)$. If for some i, $M < \pi_0(\hat{w}_i, \infty) + \hat{F}_i + \hat{S}_i$, then the manufacturer can profitably deviate by rejecting retailer j's contract, a contradiction. Thus, for all i, $M \geq \pi_0(\hat{w}_i, \infty) + \hat{F}_i + \hat{S}_i$.

Suppose that for some i, $M > \pi_0(\hat{w}_i, \infty) + \hat{F}_i + \hat{S}_i$. Let $\varepsilon \in (0, M - \pi_0(\hat{w}_i, \infty) - \hat{F}_i - \hat{S}_i)$. Consider a deviation by retailer j to the contract $(\hat{S}_j - \varepsilon, \hat{w}_j, \hat{F}_j)$. If the manufacturer accepts both retailers' offers, then both retailers purchase the manufacturer's input and the manufacturer's payoff is $M - \varepsilon$. If the manufacturer accepts only retailer i's offer, its payoff is $\pi_0(\hat{w}_i, \infty) + \hat{F}_i + \hat{S}_i < M - \varepsilon$ (by the definition of ε). Thus, the manufacturer accepts retailer j's offer (and possibly also retailer i's) in any equilibrium of the continuation game, implying that retailer j's payoff from the deviation is at least $\pi_j(\hat{w}_1, \hat{w}_2) - \hat{F}_j - \hat{S}_j + \varepsilon$, so the deviation is profitable for retailer j, a contradiction. Thus, for all i, $M = \pi_0(\hat{w}_i, \infty) + \hat{F}_i + \hat{S}_i$. *Q.E.D.*

Proof of Proposition 1. It is straightforward to show that there is an equilibrium in which retailer 1 offers $(S_1, w_1, F_1) = (-(\Pi_1^m - \Pi_2^m), w_1^m, \pi_1(w_1^m, \infty))$ and retailer 2 offers $(S_2, w_2, F_2) = (0, w_2^m, \pi_2(\infty, w_2^m))$; given these offers, the manufacturer only accepts the offer of retailer 1, and off the equilibrium path, it accepts the offer or offers giving it the highest payoff in the continuation game; and the retailers with accepted offers play an equilibrium of the third stage of the game. In this equilibrium, the manufacturer's equilibrium payoff is Π_2^m, retailer 1's equilibrium payoff is $\Pi_1^m - \Pi_2^m$, and retailer 2's equilibrium payoff is zero. Given the contracts, if retailer 1 (respectively, retailer 2) buys from the manufacturer, then retailer 2 (respectively, retailer 1) cannot recover its fixed fee and so does not purchase from the manufacturer, so there is no continuation equilibrium in which both retailers purchase from the manufacturer. Thus, it is a best reply for the manufacturer to accept only the contract of retailer 1. As the manufacturer's payoff if it accepts only retailer 1's contract is Π_2^m, there is no profitable deviation by retailer 2. Retailer 1 also has no profitable deviation because the manufacturer prefers to accept only retailer 2's contract if its payoff from accepting only the contract with retailer 1 is less than Π_2^m.

To complete the proof, we show that in equilibrium only one retailer purchases the manufacturer's input, that equilibrium payoffs are unique, and finally that the equilibrium contract offers are as stated in the proposition.

Proof that in equilibrium only one retailer buys the manufacturer's input. Suppose there is an equilibrium with contracts $(\hat{S}_1, \hat{w}_1, \hat{F}_1)$ and $(\hat{S}_2, \hat{w}_2, \hat{F}_2)$ in which both retailers buy the manufacturer's input. Because the retailers must have non-negative equilibrium payoffs, $\pi_i(\hat{w}_1, \hat{w}_2) \geq \hat{S}_i + \hat{F}_i$, and because the retailers choose to buy from the manufacturer, $\pi_i(\hat{w}_1, \hat{w}_2) - \hat{S}_i - \hat{F}_i \geq -\hat{S}_i$. It follows that $\pi_i(\hat{w}_i, \infty) \geq \hat{S}_i + \hat{F}_i$ and $\pi_i(\hat{w}_i, \infty) - \hat{S}_i - \hat{F}_i \geq -\hat{S}_i$, which implies that retailer i purchases the manufacturer's input if the manufacturer accepts only the contract of retailer i.

If the manufacturer accepts only the contract of retailer 1, the manufacturer's payoff is $M \equiv \pi_0(\hat{w}_1, \infty) + \hat{S}_1 + \hat{F}_1$ and retailer 1's payoff is $\pi_1(\hat{w}_1, \infty) - \hat{S}_1 - \hat{F}_1$. Because in this case the joint payoff of the manufacturer and retailer 1 is bounded above by Π_1^m, the manufacturer's payoff is bounded above by $\Pi_1^m - \pi_1(\hat{w}_1, \infty) + \hat{S}_1 + \hat{F}_1$, that is, $M \leq \Pi_1^m - \pi_1(\hat{w}_1, \infty) + \hat{S}_1 + \hat{F}_1$. As $\pi_1(\hat{w}_1, \hat{w}_2) < \pi_1(\hat{w}_1, \infty)$, this implies

$$M < \Pi_1^m - \pi_1(\hat{w}_1, \hat{w}_2) + \hat{S}_1 + \hat{F}_1.$$

In addition, using Lemma 1, $M = \pi_0(\infty, \hat{w}_2) + \hat{S}_2 + \hat{F}_2$.

Let $\varepsilon \in (0, \Pi_1^m - \pi_1(\hat{w}_1, \hat{w}_2) + \hat{S}_1 + \hat{F}_1 - M)$. Suppose retailer 1 deviates by offering $(\tilde{S}_1, \tilde{w}_1, \tilde{F}_1) \equiv (M - \Pi_1^m + \varepsilon, w_1^m, \pi_1(w_1^m, \infty))$. Note that the definition of ε implies that $\tilde{S}_1 < -\pi_1(\hat{w}_1, \hat{w}_2) + \hat{S}_1 + \hat{F}_1 \leq 0$. Given this contract, retailer 1 does not purchase from the manufacturer if retailer 2 does. If the manufacturer accepts only retailer 1's contract, its payoff is $M + \varepsilon$. If the manufacturer accepts both contracts and only retailer 2 buys the manufacturer's input, the manufacturer's payoff is $\tilde{S}_1 + M < M$. If the manufacturer accepts only retailer 2's contract, its payoff is M. Thus, in any equilibrium of the continuation game, the manufacturer accepts retailer 1's contract (and possibly also retailer 2's) and only retailer 1 buys the manufacturer's input. Thus, retailer 1's payoff from the deviation is

$$\pi_1(\tilde{w}_1, \infty) - \tilde{S}_1 - \tilde{F}_1 = -M + \Pi_1^m - \varepsilon > \pi_1(\hat{w}_1, \hat{w}_2) - \hat{S}_1 - \hat{F}_1,$$

where the inequality uses the definition of ε. Thus, retailer 1's deviation is profitable, a contradiction. Thus, there is no equilibrium in which both retailers purchase from the manufacturer. In addition, one can easily show that if $\Pi_1^m > \Pi_2^m$, then there is no equilibrium in which only retailer 2 purchases from the manufacturer, as then retailer 1 could profitably deviate by offering a contract that induces the manufacturer to accept only its contract and that gives the manufacturer strictly higher payoff and gives retailer 1 positive payoff.

Proof that equilibrium payoffs are unique. Suppose there is an equilibrium in which retailer 1's payoff is greater than $\Pi_1^m - \Pi_2^m$. Then, given the above result that only one retailer buys the manufacturer's input, it must be that only retailer 1 buys the manufacturer's input. It follows that the manufacturer's equilibrium payoff M satisfies $M < \Pi_2^m$, which implies that there is a profitable deviation for retailer 2 in which it offers $(-\varepsilon, w_2^m, \pi_2(\infty, w_2^m))$, where $\varepsilon \in (0, \Pi_2^m - M)$, a contradiction. Thus, retailer 1's payoff is no greater than $\Pi_1^m - \Pi_2^m$.

Suppose there is an equilibrium in which retailer 1's payoff is $X < \Pi_1^m - \Pi_2^m$. As the manufacturer's payoff if it sells only to retailer 2 is bounded above by Π_2^m, there is a profitable deviation for retailer 1 in which it offers

$(\Pi_2^m - \Pi_1^m + \varepsilon, w_1^m, \pi_1(w_1^m, \infty))$, where $\varepsilon \in (0, \Pi_1^m - \Pi_2^m - X)$, a contradiction. Thus, in any equilibrium, retailer 1's payoff is equal to $\Pi_1^m - \Pi_2^m$.

Suppose there is an equilibrium in which retailer 2's payoff is greater than zero. Then the manufacturer's payoff is less than Π_2^m, and once again there is a profitable deviation by retailer 1 in which it offers $(\Pi_2^m - \Pi_1^m, w_1^m, \pi_1(w_1^m, \infty))$. Thus, in any equilibrium, retailer 2's payoff is equal to zero. It follows then that in any equilibrium, the manufacturer's payoff is equal to Π_2^m. This establishes that equilibrium payoffs are unique.

Proof that equilibrium contract offers are as stated in the proposition. Suppose there exists an equilibrium with contracts $(\hat{S}_1, \hat{w}_1, \hat{F}_1)$ and $(\hat{S}_2, \hat{w}_2, \hat{F}_2)$. We have shown that only one retailer buys the manufacturer's input, and if $\Pi_1^m > \Pi_2^m$, the retailer that purchases from the manufacturer must be retailer 1.

Let i be the retailer that buys from the manufacturer in equilibrium. If $\Pi_1^m > \Pi_2^m$, then $i = 1$. As, from above, the joint payoff of retailer i and the manufacturer is Π_i^m, it must be that $\hat{w}_i = w_i^m$ and $\pi_i(w_i^m, \infty) \geq \hat{F}_i$.

Suppose $\pi_i(w_i^m, \infty) > \hat{F}_i$. Let w_j' be such that

$$\Pi(w_i^m, \infty) - \pi_i(w_i^m, \infty) < \Pi(w_i^m, w_j') - \pi_i(w_i^m, w_j') \tag{A.1}$$

and $\pi_i(w_i^m, w_j') > \hat{F}_i$. By the strict concavity of Π and the continuity of π_i, such a w_j' exists. Note that (A.1) implies $q_j(w_i^m, w_j') > 0$ and $\pi_j(w_i^m, w_j') > 0$. Note also that (A.1) can be rewritten as $\pi_0(w_i^m, \infty) < \pi_0(w_i^m, w_j') + \pi_j(w_i^m, w_j')$. Let $\varepsilon \in (0, \pi_0(w_i^m, w_j') + \pi_j(w_i^m, w_j') - \pi_0(w_i^m, \infty))$. Consider a deviation by retailer j (the excluded retailer) in which it offers $(\tilde{S}_j, \tilde{w}_j, \tilde{F}_j) \equiv (\pi_j(w_i^m, w_j') - \varepsilon, w_j', 0)$. The manufacturer has payoff $\pi_0(w_i^m, \infty) + \hat{S}_i + \hat{F}_i$ if it only accepts retailer i's offer and payoff $\pi_0(w_i^m, w_j') + \hat{S}_i + \hat{F}_i + \tilde{S}_j$ if it accepts both retailers' offers (retailer i buys a positive quantity because $\pi_i(w_i^m, w_j') > \hat{F}_i$ and retailer j buys a positive quantity because $\pi_j(w_i^m, w_j') > \tilde{F}_j$). Using the definition of $\tilde{S}_j$,

$$\pi_0(w_i^m, w_j') + \hat{S}_i + \hat{F}_i + \pi_j(w_i^m, w_j') - \varepsilon > \pi_0(w_i^m, \infty) + \hat{S}_i + \hat{F}_i,$$

so the manufacturer accepts retailer j's offer and retailer j's payoff is at least $\pi_j(w_i^m, w_j') > 0$. Thus, the deviation is profitable for retailer j, a contradiction. We conclude that $\pi_i(w_i^m, \infty) = \hat{F}_i$. Together with the equilibrium payoffs, this establishes that $(S_i, w_i, F_i) = (-(\Pi_1^m - \Pi_2^m), w_i^m, \pi_i(w_i^m, \infty))$, where $i = 1$ if $\pi_1 > \pi_2$.

It remains to find the equilibrium contract of the excluded retailer. Let j be the excluded retailer ($j = 2$ if $\Pi_1^m > \Pi_2^m$). Because the manufacturer's equilibrium payoff is $\Pi_2^m = \Pi_j^m$ and because Lemma 1 implies $\pi_0(\infty, \hat{w}_j) + \hat{S}_j + \hat{F}_j = \Pi_j^m$, the excluded retailer must operate when only its contract is accepted, that is, $\pi_j(\infty, \hat{w}_j) \geq \hat{F}_j$, and it must be that $\hat{w}_j = w_j^m$. Further, $\pi_0(\infty, w_j^m) + \hat{S}_j + \hat{F}_j = \Pi_2^m$ implies $\hat{S}_j + \hat{F}_j = \pi_j(\infty, w_2^m)$.   *Q.E.D.*

Proof of equilibrium with exclusive dealing. We show that there is an equilibrium in which retailer 1 specifies exclusive dealing and offers $(S_1, w_1, F_1) = (0, w_1^m, \Pi_2^m - \pi_0(w_1^m, \infty))$ and retailer 2 offers $(S_2, w_2, F_2) = (0, w_2^m, \pi_2(\infty, w_2^m))$. First, note that it is a best reply for the manufacturer to accept only the contract of retailer 1. Because the manufacturer's payoff if it accepts only the contract of retailer 1 is Π_2^m, and because the exclusive-dealing clause in retailer 1's contract prevents the manufacturer from selling to both retailers, there is no profitable deviation by retailer 2. Given retailer 2's contract, retailer 1 has no profitable deviation. If retailer 1 buys from the manufacturer, then retailer 2 cannot recover its fixed fee and so does not purchase from the manufacturer, so there is no continuation equilibrium in which both retailers purchase from the manufacturer, and retailer 1 cannot extract additional surplus from the manufacturer, as the manufacturer prefers to accept only retailer 2's contract if its payoff from trading with retailer 1 is less than Π_2^m.   *Q.E.D.*

Proof of Proposition 4. The proof that the manufacturer accepts retailer 1's offer, that retailer 1 purchases from the manufacturer, and that (w_1, F_1) satisfies $\pi_1(w_1, \infty) > F_1$ proceeds in three steps. First, there is no equilibrium in which retailer 1's offer is rejected by the manufacturer. If retailer 1's offer is rejected, it can profitably deviate by offering the contract (w_1^m, F_1'), where $0 < F_1' < \pi_1(w_1^m, 0)$. In this case, if the manufacturer accepts retailer 1's offer, the manufacturer's payoff is bounded below by $\pi_0(w_1^m, \infty) + F_1' > 0$, and if the manufacturer rejects retailer 1's offer, its payoff is zero in any equilibrium of the continuation game. Thus, the manufacturer strictly prefers to accept retailer 1's offer. By the choice of F_1', in any equilibrium of the continuation game, retailer 1 has positive payoff, and so the deviation is profitable. Second, this same argument implies that there is no equilibrium in which retailer 1's offer is accepted but in which it does not purchase from the manufacturer, as then its payoff is zero. Third, this same argument also implies that there is no equilibrium in which retailer 1's offer (w_1, F_1) satisfies $\pi_1(w_1, \infty) \leq F_1$, as then its payoff is again zero. Thus, in any equilibrium, retailer 1's offer (w_1, F_1) is accepted, satisfies $\pi_1(w_1, \infty) > F_1$, and retailer 1 purchases from the manufacturer.

Finally, we show that retailer 2 also purchases from the manufacturer. To see this, note that given (w_1, F_1) satisfying $\pi_1(w_1, \infty) > F_1$, retailer 2 can offer a contract that is accepted by the manufacturer, results in both retailers buying from the manufacturer, and gives retailer 2 positive payoff. More specifically, let w_2' be such that $\pi_1(w_1, w_2') > F_1$ and

$$\Pi(w_1, w_2') - \pi_1(w_1, w_2') > \Pi(w_1, \infty) - \pi_1(w_1, \infty). \tag{A.2}$$

By the strict concavity of Π and the continuity of π_1, such a w_2' exists. Using the definition of Π, condition (A.2) implies that $\pi_0(w_1, \infty) - \pi_0(w_1, w_2') < \pi_2(w_1, w_2')$. Thus, we can let $F_2' \geq 0$ be such that $\pi_0(w_1, \infty) - \pi_0(w_1, w_2') < F_2' <$

$\pi_2(w_1, w_2')$. If retailer 2 offers the contract (w_2', F_2') and the manufacturer accepts retailer 2's contract, then both retailers purchase from the manufacturer and the manufacturer's payoff is $\pi_0(w_1, w_2') + F_1 + F_2 > \pi_0(w_1, \infty) + F_1$. Thus, the manufacturer strictly prefers to accept retailer 2's contract, and retailer 2 buys from the manufacturer.   *Q.E.D.*

Proof of Proposition 5. As in the proof of Proposition 1, it is straightforward to show that an equilibrium exists that satisfies the conditions of the proposition. For example, the contracts of Proposition 1, which have minimum-purchase requirements of zero, suffice. It is also straightforward to show that the analog to Lemma 1 holds.

Because the contracts of Proposition 1 continue to be feasible in an environment with minimum-purchase requirements, the logic and deviation contracts given in the proof of Proposition 1 imply that there is no equilibrium in which both retailers buy the manufacturer's input, that only retailer 1 buys the manufacturer's input if $\tilde{\Pi}_1^m > \tilde{\Pi}_2^m$, and that the equilibrium payoffs are unique. One can easily check that under the contracts given in the proposition, firms receive their equilibrium payoffs when the manufacturer accepts only the contract of firm 1 if $\tilde{\Pi}_1^m > \tilde{\Pi}_2^m$ or firm i if $\tilde{\Pi}_1^m = \tilde{\Pi}_2^m$. It remains to show that the contracts given in the proposition are equilibrium contracts.

Let retailer i be the included retailer and j be the excluded retailer ($i = 1$ and $j = 2$ if $\Pi_1^m > \Pi_2^m$). Because the manufacturer's equilibrium payoff is $\tilde{\Pi}_2^m$, we know from Lemma 1 that the manufacturer's payoff if it only accepts j's contract is $\tilde{\Pi}_2^m = \tilde{\Pi}_j^m$. Thus, retailer j must offer a contract such that when only its contract is accepted, retailer j chooses q_j^m and pays $R_j(q_j^m, 0) - q_j^m w_j^m$ to the manufacturer. Given this, retailer i has no profitable deviation. In addition, there is no profitable deviation by the excluded retailer in which only the excluded retailer trades with the manufacturer in the continuation game.

Suppose that $\tilde{\Pi}_1^m > \tilde{\Pi}_2^m$. Suppose retailer 2 offers $(\bar{q}_2, S_2, w_2, F_2)$ such that the manufacturer accepts both retailers' contracts and retailer 2 trades with the manufacturer. Then retailer 1 chooses quantity $\bar{q}_1$, and so the joint payoff of the manufacturer and retailer 2 is bounded above by

$$
S_1 + \max_{q_2 \geq 0}(R_2(\bar{q}_1, q_2) - c(\bar{q}_1, q_2)) = -\left(\tilde{\Pi}_1^m - \tilde{\Pi}_2^m\right) + R_1(\bar{q}_1, 0)
$$
$$
+ \max_{q_2 \geq 0}(R_2(\bar{q}_1, q_2) - c(\bar{q}_1, q_2))
$$
$$
\leq -\left(\tilde{\Pi}_1^m - \tilde{\Pi}_2^m\right) + R_1(\bar{q}_1, 0) + \tilde{\Pi}_2^m
$$
$$
\leq \tilde{\Pi}_2^m,
$$

where the last inequality uses $\bar{q}_1 \in \Phi_1$ and the definition of Φ_1. Thus, there is no deviation by retailer 2 that increases the joint payoff of the manufacturer and retailer 2 above $\tilde{\Pi}_2^m$, which is the manufacturer's equilibrium payoff. It follows that there is no profitable deviation for retailer 2.

Suppose that $\tilde{\Pi}_1^m = \tilde{\Pi}_2^m$. Suppose the excluded retailer offers $(\bar{q}_j, S_j, w_j, F_j)$ such that the manufacturer accepts both retailers' contracts and retailer j trades with the manufacturer. Then retailer i chooses quantity $\bar{q}_i = 0$, and so the joint payoff of the manufacturer and retailer 2 is bounded above by $S_i + \tilde{\Pi}_j^m = \tilde{\Pi}_j^m$. Thus, once again, there is no profitable deviation for the excluded retailer.   *Q.E.D.*

References

AGHION, P. AND BOLTON, P. "Contracts as a Barrier to Entry." *American Economic Review,* Vol. 77 (1987), pp. 388–401.

BALTO, D. "Recent Legal and Regulatory Developments in Slotting Allowances and Category Management." *Journal of Public Policy & Marketing,* Vol. 21 (2002), pp. 289–294.

BERNHEIM, D. AND WHINSTON, M. "Common Marketing Agency as a Device for Facilitating Collusion." *RAND Journal of Economics,* Vol. 16 (1985), pp. 269–281.

———. "Exclusive Dealing." *Journal of Political Economy,* Vol. 106 (1998), pp. 64–103.

BESANKO, D. AND PERRY, M.K. "Equilibrium Incentives for Exclusive Dealing in a Differentiated Products Oligopoly." *RAND Journal of Economics,* Vol. 24 (1993), pp. 646–667.

BLOOM, P., GUNDLACH, G., AND CANNON, J. "Slotting Allowances and Fees: Schools of Thought and the Views of Practicing Managers." *Journal of Marketing,* Vol. 64 (2000), pp. 92–108.

BRONSTEEN, P., ELZINGA, K., AND MILLS, D. "Price-Competition and Slotting Allowances." *Antitrust Bulletin,* Vol. 50 (2005), pp. 267–284.

CANADIAN BUREAU OF COMPETITION. *The Abuse of Dominance Provisions (Sections 78 and 79 of the Competition Act) as Applied to the Canadian Grocery Sector,* 2002.

CHEN, Z. "Dominant Retailers and the Countervailing-Power Hypothesis." *RAND Journal of Economics,* Vol. 34 (2003), pp. 612–625.

CHU, W. "Demand Signaling and Screening in Channels of Distribution." *Marketing Science,* Vol. 11 (1992), pp. 327–347.

DOBSON, P. AND WATERSON, M. "Countervailing Power and Consumer Prices." *Economic Journal,* Vol. 107 (1997), pp. 418–430.

FEDERAL TRADE COMMISSION. *Report on the Federal Trade Commission Workshop on Slotting Allowances and Other Marketing Practices in the Grocery Industry,* 2001.

MARX AND SHAFFER / 843

bibliography———. *Slotting Allowances in the Retail Grocery Industry: Selected Case Studies in Five Product Categories,* 2003.

Galbraith, J.K. "Countervailing Power." *American Economic Review,* Vol. 44 (1954), pp. 1–6.

Hart, O. and Tirole, J. "Vertical Integration and Market Foreclosure." *Brookings Papers on Economic Activity: Microeconomics (Special Issue)* 1990, pp. 205–276.

Horn, H. and Wolinsky, A. "Bilateral Monopolies and Incentives for Merger." *RAND Journal of Economics,* Vol. 19 (1988), pp. 408–419.

Inderst, R. and Shaffer, G. "Retail Mergers, Buyer Power and Product Variety." *Economic Journal,* Vol. 117 (2007), pp. 45–67.

Inderst, R. and Wey, C. "Bargaining, Mergers, and Technology Choice in Bilaterally Oligopolistic Industries." *RAND Journal of Economics,* Vol. 34 (2003), pp. 1–19.

———. "Buyer Power and Supplier Incentives." *European Economic Review,* Vol. 51 (2006), pp. 647–667.

Innes, R. and Sexton, R. "Strategic Buyers and Exclusionary Contracts." *American Economic Review,* Vol. 84 (1994), pp. 566–584.

Israilevich, G. "Assessing Supermarket Product-Line Decisions: The Impact of Slotting Fees." *Quantitative Marketing and Economics,* Vol. 2 (2004), pp. 141–167.

Kelly, K. "Antitrust Analysis of Grocery Slotting Allowances: The Procompetitive Case." *Journal of Public Policy and Marketing,* Vol. 10 (1991), pp. 187–198.

Lariviere, M. and Padmanabhan, V. "Slotting Allowances and New Product Introductions." *Marketing Science,* Vol. 16 (1997), pp. 112–128.

Marvel, H. "Exclusive Dealing." *Journal of Law & Economics,* Vol. 25 (1982), pp. 1–25.

Marx, L. and Shaffer, G. "Upfront Payments and Exclusion in Downstream Markets." Duke University Working Paper, 2004.

Mathewson, G.F. and Winter, R. "The Competitive Effects of Vertical Agreements: Comment." *American Economic Review,* Vol. 77 (1987), pp. 1057–1062.

McAfee, R.P. and Schwartz, M. "Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity." *American Economic Review,* Vol. 84 (1994), pp. 210–230.

O'Brien, D.P. and Shaffer, G. "Vertical Control with Bilateral Contracts." *RAND Journal of Economics,* Vol. 23 (1992), pp. 299–308.

———. "Nonlinear Supply Contracts, Exclusive Dealing, and Equilibrium Market Foreclosure." *Journal of Economics & Management Strategy,* Vol. 6 (1997), pp. 755–785.

Rasmusen, E., Ramseyer, J. and Wiley, J. "Naked Exclusion." *American Economic Review,* Vol. 81 (1991), pp. 1137–1145.

Sass, T. "The Competitive Effects of Exclusive Dealing: Evidence from the U.S. Beer Industry." *International Journal of Industrial Organization,* Vol. 23 (2005), pp. 203–225.

Schwartz, M. "The Competitive Effects of Vertical Agreements: Comment." *American Economic Review,* Vol. 77 (1987), pp. 1063–1068.

Segal, I. and Whinston, M. "Exclusive Dealing and Protection of Investments." *RAND Journal of Economics,* Vol. 31 (2000a), pp. 603–633.

———. "Naked Exclusion: Comment." *American Economic Review,* Vol. 90 (2000b), pp. 296–311.

Shaffer, G. "Slotting Allowances and Resale Price Maintenance: A Comparison of Facilitating Practices." *RAND Journal of Economics,* Vol. 22 (1991), pp. 120–135.

———. "Slotting Allowances and Optimal Product Variety." *Advances in Economic Analysis & Policy,* Vol. 5 (2005), no. 1, Article 3.

Stigler, G.J. "The Economist Plays with Blocs." *American Economic Review,* Vol. 44 (1954), pp. 7–14.

Sudhir, K. and Rao, V. "Slotting Allowances: An Empirical Investigation." *Journal of Marketing Research,* Vol. 43 (2006), pp. 137–155.

Sullivan, M. "Slotting Allowances and the Market for New Products." *Journal of Law and Economics,* Vol. 40 (1997), pp. 461–493.

Von Ungern-Sternberg, T. "Countervailing Power Revisited." *International Journal of Industrial Organization,* Vol. 14 (1996), pp. 507–520.

© RAND 2007.