Buyer-Induced Exclusive Dealing¹

David E. Mills Department of Economics P.O. Box 400182 University of Virginia Charlottesville, VA 22904-4182 434.924.3061 (phone) 434.924.7659 (fax) <u>mills@virginia.edu</u>

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Abstract

Large retailers or distributors may exercise buyer power in their interactions with suppliers in order to obtain preferential terms of sale. This paper explores the use of exclusive dealing arrangements by such large retailers to win advantageous pricing from an oligopoly of suppliers who produce a differentiated product. The retailer's strategy involves playing the suppliers off against each other by soliciting bids for an exclusive supplier arrangement. In equilibrium, the retailer lowers its acquisition cost of the exclusive brand and reduces the retail price of that brand to encourage "brand switching" by consumers who favor an excluded brand. Conditions in which this exercise of buyer power decreases or increases consumer welfare are distinguished.

I. Introduction

Exclusive dealing arrangements obligate a buyer to purchase a good exclusively or chiefly from a single supplier. The buyer may be a retailer or distributor who resells the good, or may be an end user. In most instances it is the seller who imposes exclusive dealing. The seller's motivation for the restraint may be procompetitive as, for instance, preventing competing suppliers from free riding on the seller's investments in a retailer's sales effectiveness (Marvel, 1982). But an exclusive dealing arrangement may have an adverse effect on competition if it forecloses the supplier's competitors from a sufficiently large portion of the market for a sufficient period of time. Exclusive dealing may exclude even an entrant who is more efficient than the incumbent seller who imposes exclusive dealing on its buyers.²

Although the extensive literature on exclusive dealing concerns mainly those arrangements imposed by sellers, some exclusive dealing arrangements are prompted by buyers rather than sellers. For instance, a chain of convenience stores may choose to sell a single brand of light bulbs or sun glasses, or a chain of fast-food restaurants may sell a single company's fountain beverages. In the health sector, insurers and health maintenance organizations may impose tight restrictions on patients' choice of drugs and care providers.

Buyer-induced exclusive dealing arrangements have different motivations and effects than seller-imposed deals. In many distribution channels, there is more market power at the distribution stage than upstream at the manufacturing stage because "consumers are more

² There is a substantial literature on the uses of exclusive dealing to deter entry, beginning with Aghion and Bolton (1987) and followed by Rasmusen, Ramseyer and Wiley (1991), Bernheim and Whinston (1998) and Segal and Whinston (2000) among others. This literature was precipitated by, and ultimately qualified, Bork's (1978) claim that an exclusive dealing agreement can only increase rather than decrease consumer benefits because retail competition compels the retailer to act as an agent for consumers. Bork reasoned that the manufacturer would have to compensate the retailer for any loss in consumer benefits created by exclusive dealing, and that this requirement would make anticompetitive exclusive dealing unprofitable for the manufacturer. With this line of reasoning, the only exclusive dealing agreements that would be consummated are those that increase consumer welfare.

disposed to switch brands within store than switch stores within brand" (Steiner, 1985). Large retailers or distributors may exercise buyer power to obtain preferential terms of sale from suppliers that are not available to small buyers. Dobson (2008) observed that "buyer-led restraints . . . occur most commonly . . . [when] the buyer holds some bargaining advantage over suppliers that ensures their compliance or consent" (p. 1931).

One tactic for such a buyer is to use the prospect of exclusivity to play one supplier off against another to reduce purchase prices as Galbraith (1952) once argued. Steuer (2000) wrote that a large customer with buying power "may announce to would-be suppliers that it will commit to buy from only one of them and that if they hope to be selected they had better offer their products on the most attractive terms It is an all-or-nothing game, with each supplier knowing that it must offer the best terms to obtain any of that customer's business" (p.239-240). Similarly, Abbott and Wright (forthcoming) note that large buyers may use exclusive dealing "to intensify competition by manufacturers for their business and to improve purchase terms" (p. 28).³

When a distributor or retailer commits to a single supplier of a branded consumer good, exclusive dealing reduces consumers' choices. Faced with limited brand selection, those consumers who do not find their preferred brand in stock at a retailer must either switch brands

³ The UK Competition Commission conducted a survey of nearly 500 suppliers to grocery retailers in the UK in 2006. This survey revealed that 35 percent of suppliers had been asked to enter into an exclusivity agreement by a customer, and "[o]verall 19 percent of all suppliers actually entered into an exclusivity agreement" (2006, p. 39). Large customers were the most active solicitors of exclusivity agreements. Of those suppliers receiving these requests, two-thirds were made by one of the four largest supermarket chains in the UK. These responses include both exclusive dealing and exclusive distribution agreements. (An exclusive dealing arrangement occurs when the supplier is the retailer's exclusive source for some line of goods. An exclusive distributor arrangement occurs when the retailer is the supplier's exclusive customer.) This survey provides some evidence that large retailers pit suppliers against each other in contests to win distribution. The Commission reported that 30 percent of the suppliers indicated that they had "tendered for business via auctions" (2006, p. 65). Of those suppliers who claimed they have bid for business via auction, 72 percent indicated that the auction was with one of the four largest supermarket chains. This survey also indicates that 79 percent of the suppliers who bid for business via auction earned lower gross margins on these sales than on other sales.

or switch stores. Having driven its acquisition costs down by playing one supplier off against another, the retailer may reduce retail prices to discourage store switching and encourage brand switching (Klein and Murphy, 2008). Whether consumer welfare decreases because brand selection is limited or increases because retail prices are lower is unclear a priori. That is the question examined in this paper.

Section II briefly summarizes some of the literature that is related to the issues in this paper. Section III models the interactions between a retailer with market power and two suppliers of differentiated goods in the absence of an exclusive supplier arrangement. This model assumes that the firms in this vertical structure contract efficiently. The outcome produced serves as the benchmark for comparison with the outcome produced when the retailer plays one supplier off against the other in pursuit of an exclusive deal. Section IV models interactions between the retailer and the suppliers as a three-stage non-cooperative game in which the retailer has the option to commit to choosing a single supplier before it solicits terms of sale from the suppliers. The analysis produces a necessary and sufficient condition for predicting when the retailer opts for inducing an exclusive dealing arrangement.

Section V extends the analysis of section IV by introducing a discrete choice model with heterogeneous consumers. This model incorporates elements of both vertical and horizontal product differentiation. The analysis shows that the retailer opts for an exclusive supply arrangement when consumers' brand preferences are not too strong. Consumers are not necessarily injured if the retailer pursues an exclusive supply arrangement. The retailer's opting for exclusive dealing may increase or reduce consumer welfare depending on model parameters.

II. Buyer Power and Downstream Prices

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Klein and Murphy and Gabrielsen and Sørgard (1999) each investigate buyer-induced exclusive dealing. Both show that under certain conditions, exclusive distribution contracts between retailers and suppliers can reduce retail prices of the exclusive brand enough to increase consumer welfare even though some consumers do not purchase their preferred brand. This possibility is consistent with Galbraith's (1952) early argument that price concessions won by large buyers upstream translate into lower prices for consumers downstream.

These issues are related to those addressed in two clusters of papers in the literature on exclusive dealing arrangements. The first cluster includes contributions by Mathewson and Winter (1987), O'Brien and Shaffer (1997) and Bernheim and Whinston (1998). These papers explore interactions in vertical structures similar to the one explored here (<u>i.e.</u>, two manufacturers and a single retailer), but where the initiative in vertical contracting is assigned to the upstream suppliers rather than to the downstream buyer. Mathewson and Winter's suppliers compete in linear tariffs coupled with the option to offer the retailer an exclusive dealing requirement. They find that exclusive dealing may arise in equilibrium, and that total welfare may increase as a result. O'Brien and Shaffer, and Bernheim and Whinston do not restrict suppliers to linear tariffs and find that where nonlinear tariffs are feasible, exclusive dealing does not arise in equilibrium. This paper asks similar questions, but the initiative in vertical contracting is assigned to the buyer rather than the suppliers. This is in keeping with the paper's focus on the presumed buyer power of large buyers.

Contributions such as Mathewson and Winter (1997), Marvel and Yang (2008), Dana (2012) and Chen and Li (2013) are in a second cluster of related papers. These examine the welfare effects of exclusive supply arrangements orchestrated by buying groups. Independent buyers of intermediate products form buying groups and consolidate orders to exercise buyer

power when purchasing from sellers of competing brands. Hospital buying groups, for instance, are formed to negotiate the purchase of hospital supplies and equipment for its members. Diverse state and municipal agencies often pool their purchasing in the same way. These buying groups exist mainly because they are able to leverage their sales volume to wrest advantageous terms from suppliers. These organizations differ from large retailers or distributors with buyer power in that they are comprised of end users of the goods purchased. This paper examines vertical structures in which retailers or distributors with buyer power resell rather than consume the goods in question.

III. The Benchmark Scenario

This paper will analyze the performance of a vertical structure that consists of a single retailer and two manufacturers that produce differentiated brands of the same good. To assess the effect of buyer-induced exclusive supplier arrangements in the vertical structure, it is necessary to provide a benchmark scenario for comparison. To make things interesting, this benchmark should depict an arrangement in which the retailer distributes the goods sold by both manufacturers as, for instance, when a retailer distributes competing brands of some consumer good. The benchmark I use is a scenario in which the retailer contracts efficiently with both manufacturers so that the joint surplus of the three firms is maximized. I limit the analysis to the case where efficient contracting involves the distribution of positive quantities of both brands.

The manufacturers in this model have no fixed costs and have constant marginal costs which, for analytical ease, we assume are zero. The retailer's operating costs are fixed and sunk, and the marginal cost of handling and reselling a unit of either manufacturer's brand is constant and zero.

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The retailer has market power when reselling the good to consumers in the downstream market. This market power may be due to the firm's size, location, or other distinguishing characteristics.⁴ Or in the case of grocery stores, mass merchandisers and the like, some degree of market power is due to consumers' shopping for several items simultaneously instead of single items. Shopping for several items simultaneously conserves shopping costs, but it reduces consumers' in-store demand elasticities for specific goods.⁵ In addition, large retailers have significant populations of loyal customers who incur switching costs if they shop elsewhere.⁶ Consumers' inverse demands $f_i(q_1, q_2)$ for the two goods at the retailer's establishment have

$$\frac{\partial f_i}{\partial q_i} < 0, \frac{\partial f_i}{\partial q_j} < 0 \text{ and } \frac{\partial^2 f}{\partial q_i \partial q_j} \le 0 \text{ for } i, j = 1, 2.$$

Events in the vertical structure take place in two stages in the benchmark scenario. At the first stage the retailer negotiates simultaneously and separately with each manufacturer. These negotiations determine the quantity $q_i \ge 0$ of each good the retailer acquires and the payment $T_i \ge 0$ each manufacturer receives from the retailer. This representation allows the firms to negotiate nonlinear pricing schedules. At the second stage the retailer sets the retail price $p_i = f_i(q_1, q_2) \ge 0, i = 1, 2$ of each good. The retailer cannot price discriminate among consumers.

The outcome of the firms' negotiations is given by the Nash bargaining solution. Following Chipty and Snyder's (1999) formulation of Nash bargaining when a single agent (in this case, a buyer) bargains simultaneously with two or more agents (in this case, suppliers), the

⁴ Size is essential. Inderst and Shaffer (2008, p. 1630) write that "[t]he main source of buyer power . . . is the ability to substitute away from any given supplier's input. . . . [I]n general the profitability and thus the credibility of substitution should increase with the buyer's relative size."

⁵ Bliss (1988, p. 38) identifies this "captive buyer" effect as a contributing factor to retailers' market power in the sale of specific goods.

⁶ Dobson (2005) attributes some of the buyer power acquired by large retailers that distribute many products to the asymmetry between the large number of products and suppliers these firms have and the small number of products and customers served by the suppliers.

firms exchange those quantities of each good that maximize their joint surplus. The firms divide that surplus according to the rule: the retailer and each manufacturer equally divide the incremental surplus created by their agreement *on the assumption that the retailer and the other manufacturer exchange the surplus-maximizing quantity.*⁷ Although it is unnecessary to go into details, the Nash bargaining solution is formally implemented by a dynamic, noncooperative bargaining game, as Rubinstein (1982) demonstrated.

Let
$$V(q_1, q_2) = \sum_{i,2} q_i f_i(q_1, q_2)$$
 be the firms' strictly concave joint surplus function, and let

 (q_1^*, q_2^*) be the unique quantities that maximize this surplus:

$$q_1^* = \arg\max[V(x, q_2^*)] \text{ and } q_2^* = \arg\max[V(q_1^*, x)]$$
 (1)

These are the equilibrium quantities exchanged in the Nash bargaining solution. The distribution of $V(q_1^*, q_2^*)$ among the firms in this equilibrium depends on the firms' incremental contribution to the joint surplus. To calculate these contributions, assume that the retailer and manufacturer *i* believe that negotiations between the retailer and manufacturer *j* lead to the efficient quantity q_j^* .⁸ These beliefs mean that the firms anticipate that manufacturer *j* and the retailer will exchange q_j^* units even if their own negotiations break down so that $q_i = 0$. With this, the incremental contribution created and shared by the retailer and manufacturer *I* is $V(q_1^*, q_2^*) - V(0, q_2^*)$ because $q_i = 0$ if negotiations break down between that manufacturer and the

⁷ In addition to Chipty and Snyder (1999), similar formulations of simultaneous bilateral bargaining have been used by Horn and Wolinsky (1988), Stole and Zwiebel (1996) and Inderst and Mazzarotto (2008). The interactions between a retailer and its manufacturers have been modeled in various ways. When there is a single party on one side and more than one party on the other side, Whinston (2006) distinguishes multi-stage, noncooperative games where the single party makes a take or leave offer to other parties in the first stage from games where the other parties submit bids in the first stage. O'Brien and Shaffer (1997) model these interactions by allowing one party to make a take or leave offer of a *menu* of contracts from which the other parties choose.

⁸ McAfee and Schwartz (1994) call these "passive beliefs."

retailer. Similarly, the incremental contribution created and shared by the retailer and manufacturer 2 is $V(q_1^*, q_2^*) - V(q_1^*, 0)$.

The equilibrium payments (T_1^*, T_2^*) are calculated to distribute the incremental contribution of each transaction equally between the parties to the transactions:

$$T_{1}^{*} = \frac{V(q_{1}^{*}, q_{2}^{*}) - V(0, q_{2}^{*})}{2} \text{ and } T_{2}^{*} = \frac{V(q_{1}^{*}, q_{2}^{*}) - V(q_{1}^{*}, 0)}{2}$$
(2)

These payments are the manufacturers' profits:

$$\pi_1^* = T_1^* \text{ and } \pi_2^* = T_2^*$$
 (3)

The retailer's prices are $p_1^* = f_1(q_1^*, q_2^*)$ and $p_2^* = f_2(q_1^*, q_2^*)$, and its profit is:

$$\pi_{R}^{*} = V(q_{I}^{*}, q_{2}^{*}) - T_{I}^{*} - T_{2}^{*} = \frac{V(q_{I}^{*}, 0) + V(0, q_{2}^{*})}{2}$$
(4)

The values in equations (1) - (4) represent the outcome of efficient contracting in the vertical structure. I assume that there are no barriers or transaction costs in the vertical structure that would impede this outcome. Hence, this outcome is feasible and serves as a benchmark for comparison with the outcome, considered next, that accompanies buyer-induced exclusive dealing.⁹

IV. The Exclusive-Supplier Case

Even though efficient contracting maximizes the firms' joint surplus in this vertical structure, the retailer's profit may be greater if the firm forgoes negotiations that culminate in an efficient contract with both manufacturers and instead pursues an exclusive supply contract with a single manufacturer. The retailer's market power means that some of the consumers it serves

⁹ Subsequently, I will mention some implications of substituting an alternative benchmark case.

could be prompted to "switch brands" rather than "switch stores" if the retailer does not offer their preferred brand.

In asymmetric vertical structures like this one, with a single party at one level and two (or more) parties at the other level, it is plausible (and in fact generally assumed) that the single party can initiate the form of contract negotiations with the parties at the other level. In this instance, the retailer has the ability to initiate and control interactions by committing itself to a single source of supply *ex ante* and by soliciting an exclusive dealing arrangement with one manufacturer. By soliciting bids from the manufacturers for an exclusive supply contract, the retailer can exploit what Galbraith called "the opportunity of a strong buyer to play one seller off against the other" (1952, p. 123). With the manufacturers' bids in hand, the retailer can then award an exclusive supply contract to the manufacturer who offers the retailer the best deal.

IV. A. The Exclusive-Supplier Equilibrium

If the retailer opts for selecting an exclusive supplier, events in the vertical structure take place in three stages. At the first stage the retailer solicits (q_i, T_i) bids from each manufacturer.¹⁰ The manufacturers submit bids in the second stage that specify both q_i and T_i . At the third stage the retailer contracts with one of the manufacturers and sets the relevant retail price. This game has a perfect equilibrium in which one of the manufacturers wins the contract to supply the retailer.

The firms' equilibrium strategies are found using backward recursion. Suppose that the retailer commits to purchasing from a single manufacturer (as yet unselected) at the first stage,

¹⁰ It is not unusual for large buyers and their suppliers to have long-term, fixed-quantity contracts. Noll (2005, p. 603), for instance, observes that large buyers often do not exercise their dominance by "posting a low buying price and waiting for sellers to arrive. Instead the common practice is for buyers and sellers to negotiate a long-term contract that specifies both price and quantity."

and that the manufacturers submit bids (q_i, T_i) at the second stage. Then at the third stage, the retailer accepts manufacturer 1's offer if $[V(q_1, 0) - T_1] > [V(0, q_2) - T_2]$ and sets $p_1 = f_1(q_1, 0)$. With this outcome, the retailer's profit is $V(q_1, 0) - T_1$ and manufacturer 1's profit is T_1 . If $[V(q_1, 0) - T_1] < [V(0, q_2) - T_2]$, the retailer accepts manufacturer 2's offer and sets $p_2 = f_2(0, q_2)$. Here the retailer's profit is $V(0, q_2) - T_2$ and manufacturer 2's profit is T_2 . If $[V(q_1, 0) - T_1] = [V(0, q_2) - T_2]$, the retailer chooses a supplier at random.

Now consider the second stage, again assuming that the retailer commits to purchasing from a single manufacturer at the first stage. At the second stage, if manufacturer *i* offers any (q_i, T_i) which is less profitable for the retailer than some (q_i, T_j) where $T_j \ge 0$, manufacturer *j* would respond by making an offer that is more profitable for the retailer than (q_i, T_i) . Of course, neither manufacturer would make an offer (q_i, T_i) where $T_i < 0$.

Let (\hat{q}_1, \hat{q}_2) be the unique quantities:

$$\hat{q}_1 = \arg\max[V(x,0)] \text{ and } \hat{q}_2 = \arg\max[V(0,x)]$$
(5)

These "stand alone" quantities maximize the joint surplus of the retailer and one manufacturer when the retailer does not contract with the other manufacturer. With no loss of generality, assume that good *I* is the more popular brand in the sense that $V(\hat{q}_1, 0) \ge V(0, \hat{q}_2)$. Because manufacturer 2 will not offer the retailer any (\hat{q}_2, T_2) where $T_2 < 0$, manufacturer *I* can profitably undercut any offer that manufacturer 2 makes.

In equilibrium, manufacturer *1* offers, and the retailer accepts, the bid(\hat{q}_{I}, \hat{T}_{I}) where:

$$\hat{T}_{l} = V(\hat{q}_{l}, 0) - V(0, \hat{q}_{2})$$
(6)

The retailer charges consumers the price $\hat{p}_1 = f_1(\hat{q}_1, 0)$ and earns

$$\hat{\pi}_R = V(0, \hat{q}_2) \tag{7}$$

in profit. That is, the retailer contracts with the manufacturer that can provide the greater stand alone surplus, but only retains profit equal to the stand alone surplus that the excluded manufacturer might have provided. Manufacturer *1*'s profit is

$$\hat{\pi}_1 = \hat{T}_1 \tag{8}$$

and manufacturer 2 has no sales and earns no profit. This equilibrium is the outcome of Bertrand-like competition between manufacturers for an exclusive supply contract with the retailer.

IV. B. Opting for an Exclusive Supplier

Whether the retailer opts for exclusive dealing depends on how the firm's profit under such an arrangement compares to its profit in the benchmark scenario where it negotiates efficient contracts with both suppliers. Comparing π_R^* and $\hat{\pi}_R$ in equations (4) and (7) gives:

Proposition 1: The retailer opts for an exclusive supplier iff

$$V(\theta, \hat{q}_2) \ge \frac{V(q_1^*, \theta) + V(\theta, q_2^*)}{2}$$

A necessary and sufficient condition for the retailer to seek an exclusive dealing arrangement is that the stand alone surplus with the excluded good is no less than the average of the surpluses defined by the firms' disagreement payoffs if the retailer contracts without an exclusivity provision. Whether this condition is met, leading to an exclusive supplier arrangement, cannot be determined generally because it depends on the retailer's demand functions $f_i(q_1, q_2), i = 1, 2$. Each of the stand alone quantities (\hat{q}_1, \hat{q}_2) is greater than the corresponding quantity when the joint surplus of all three firms is maximized (See the Appendix for a Proof):

Proposition 2: $\hat{q}_i > q_i^*$ for i = 1, 2

This *Proposition* shows that when the retailer opts for an exclusive supplier, the firm's unit sales of that supplier's brand is greater than where both brands are distributed: $\hat{q}_1 > q_1^*$. Apart from this result, it is not possible to compare outcomes in the two equilibria without further restricting the demand functions $f_i(q_1, q_2), i = 1, 2$. In principle, the price of the exclusive good \hat{p}_1 may be greater or less than the price of the same good p_1^* if the retailer negotiates contracts with both manufacturers.

In order to analyze more thoroughly whether and when the retailer opts for an exclusive supplier, and to explore welfare implications of this practice, it is necessary to depict consumers' demand for the goods more completely. The next section considers a demand specification that extends the analysis.

V. Discrete Choices with Heterogeneous Consumers

Suppose the retailer serves two types of consumers. Type *1* consumers prefer brand *1* over brand 2, and conversely for type 2 consumers. The retailer has a continuum [0, 1] of consumers where $a \in (1/2, 1)$ are type 1 and the remaining 1 - a are type 2. This is in keeping with the previous assumption that brand 1 is more popular. Every consumer of either type has a taste parameter θ , where θ is uniformly distributed on [0, 1]. Consumers purchase a single unit of one brand or else purchase nothing. The retailer cannot observe consumers' taste parameters or types, and so cannot price discriminate among consumers.

A representative type *I* consumer's utility is $\theta - p_2$ if she buys a unit of brand *2* and is $\beta\theta - p_1$ if she buys a unit of brand *1*, where $\beta > 1$. If she purchases neither good, the consumer's utility is θ . A representative type 2 consumer's utility is $\theta - p_1$ if she buys a unit of brand *1*, $\beta\theta - p_2$ if she buys a unit of brand *2*, and θ if she buys neither good. These preferences allow for both vertical and horizontal differentiation. Within types, all consumers prefer the same brand, albeit with different intensities. This is the vertical element. Between types, consumers' rank the brands differently. This is the horizontal element.

V. A. Distributing Both Brands

If the retailer elects to distribute both brands, the firm negotiates efficient contracts with the manufacturers for the quantities (q_i^*, q_2^*) as defined by equation (1). To find these quantities, I must derive the demands for both brands by consumers of each type. Let q_j^i be the number of units of brand *j* sold to type *i* consumers so that $q_j = q_j^i + q_j^2$.

Consider type *1* consumers first. Ordering consumers by descending values of θ , type *1* consumers' inverse demand for brand *1* is:

$$\phi_l^I = \beta (1 - \frac{q}{a}), \tag{9}$$

neglecting the brand 2 option. Similarly, neglecting the brand *1* option, type *1* consumers' inverse demand for brand *2* is:

$$\phi_2^I = (1 - \frac{q}{a}). \tag{10}$$

Where both brands are available, type *I* consumers' demands for each brand depend on both p_1 and p_2 . Non-negative quantities of q_1^l and q_2^l require prices that satisfy:

$$p_2 \in [0,1] \text{ and } p_1 \in [0, p_2 + \beta - 1].$$
 (11)

For prices that satisfy (11), type *I* consumers' demands are derived from two conditions based on equations (9) and (10):

$$\beta(1 - \frac{q_1^{\prime}}{a}) - p_1 = (1 - \frac{q_1^{\prime}}{a}) - p_2$$
(12)

$$1 - \frac{q_1^l + q_2^l}{a} - p_2 = 0.$$
(13)

These conditions are depicted in *Figure 1*. Those type *I* consumers who purchase brand *I* have greater θ -values than those who purchase brand 2. Condition (12) identifies the margin between those type *I* consumers who choose brand *I* and those who choose brand 2. A type *I* consumer is indifferent between purchasing a unit of brand *I* and brand 2 when the consumer's surplus is the same with either purchase. At the same time, those type *I* consumers who purchase brand 2 have greater θ -values than those who purchase neither brand. Condition (13) identifies the margin between those type *I* consumers who choose brand 2 and those who purchase neither brand. A type *I* consumer is indifferent between purchasing a unit of brand 2 and those who purchase neither brand. A type *I* consumer is indifferent between purchasing a unit of brand 2 and purchasing neither brand when prices are such that brand 2 confers no surplus.

Combining equations (12) and (13) gives type *I* consumers' inverse demands for each brand over $q_1 \in [0, a]$ and $q_2 \in [0, 1-a]$:

$$f_1^{\ l} = \beta (1 - \frac{q_1^{\ l}}{a}) - \frac{q_2^{\ l}}{a} \text{ and } f_2^{\ l} = 1 - \frac{q_1^{\ l}}{a} - \frac{q_2^{\ l}}{a}$$
(14)

With these demands for type *1* consumers, it follows that (See the Appendix for a Proof):

Lemma 1: The firms' joint surplus from sales to type 1 consumers is

maximized when
$$q_1^1 = \frac{a}{2}$$
 and $q_2^1 = 0$; these quantities are sustained by
prices $p_1 = \frac{\beta}{2}$ and $p_2 \in [\frac{1}{2}, 1]$.

Capturing as much surplus as possible from sales to type *1* consumers involves selling at prices that produce no sales of brand *2*.

Now consider sales to type 2 consumers. Using the same reasoning as before with type *1* consumers, we can derive type 2 consumers' demands to get the analogous result (the proof is analogous to the proof of *Lemma 1*):

Lemma 2: The firms' joint surplus from sales to type 2 consumers is maximized when $q_1^2 = 0$ and $q_2^2 = \frac{1-a}{2}$; these quantities are sustained by prices $p_1 \in [\frac{1}{2}, 1]$ and $p_2 = \frac{\beta}{2}$.

Taken together, *Lemmas 1* and 2 indicate that maximizing the firms' joint surplus from sales to *all* consumers involves no consumer purchasing a unit of their less preferred brand:

Proposition 3: The firms' joint surplus from sales to all consumers is

maximized at $q_1^* = \frac{a}{2}$ and $q_2^* = \frac{1-a}{2}$; these quantities are sustained by prices $p_1^* = p_2^* = \frac{\beta}{2}$.

The values in *Proposition 3* are the prices and quantities that arise under efficient contracting between the retailer and the manufacturers.

When the quantities in *Proposition 3* are produced the firms' joint surplus is

 $V(q_1^*, q_2^*) = \frac{\beta}{4}$. To find how this surplus is distributed among the firms in equilibrium, we must

use the disagreement payoffs for the retailer's negotiations with manufacturer *1* and *2* respectively:

$$V(0,q_{2}^{*}) = p_{2}^{*}q_{2}^{*} = \frac{(1-a)\beta}{4}$$

$$V(q_{1}^{*},0) = p_{1}^{*}q_{1}^{*} = \frac{a\beta}{4}$$
(15)

These values indicate that the *incremental* surplus attributable to the transaction between the retailer and manufacturer *1* is:

$$V(q_1^*, q_2^*) - V(0, q_2^*) = \frac{a\beta}{4}.$$
(16)

Similarly, the *incremental* surplus attributable to the transaction between the retailer and manufacturer 2 is

$$V(q_1^*, q_2^*) - V(q_1^*, 0) = \frac{(1-a)\beta}{4}.$$
(17)

The retailer's payments to the manufacturers (T_1^*, T_2^*) are calculated to distribute the incremental surplus of each transaction equally between the retailer and the relevant manufacturer:

$$T_{1}^{*} = \frac{V(q_{1}^{*}, q_{2}^{*}) - V(0, q_{2}^{*})}{2} = \frac{a\beta}{8}$$

$$T_{2}^{*} = \frac{V(q_{1}^{*}, q_{2}^{*}) - V(q_{1}^{*}, 0)}{2} = \frac{(1-a)\beta}{8}$$
(18)

The retailer retains the residual surplus $V(q_1^*, q_2^*) - T_1^* - T_2^*$. In sum, the firms' profits in the equilibrium with simultaneous bilateral bargaining are:

$$\pi_1^* = \frac{a\beta}{8}, \ \pi_2^* = \frac{(1-a)\beta}{8} \text{ and } \pi_R^* = \frac{\beta}{8}$$
 (19)

V. B. Distributing a Single Brand

Now suppose the retailer elects at the outset to contract with an exclusive supplier instead of distributing both brands. To determine whether the retailer's profit would be greater than π_R^* if the firm opts for an exclusive supply arrangement, we must compare π_R^* in equation (19) to $\hat{\pi}_R$ as defined in equation (4). To calculate $\hat{\pi}_R$, recall that in equilibrium the retailer contracts with the manufacturer that can provide the greater stand alone surplus, but only retains profit equal to the stand alone surplus that the excluded manufacturer might have provided. The retailer contracts with manufacturer 1 if $V(\hat{q}_1, 0) \ge V(0, \hat{q}_2)$; otherwise the firm contracts with manufacturer 2. The retailer's profit $\hat{\pi}_R$ is the lesser of $V(\hat{q}_1, 0)$ and $V(0, \hat{q}_2)$.

The quantities \hat{q}_1 and \hat{q}_2 are defined by equation (5). If the retailer sells only brand *I*, then the inverse demands for that brand on the part of type *I* and type 2 consumers are:

$$f_{I}^{I} = \beta (1 - \frac{q_{I}^{I}}{a}) \text{ and } f_{I}^{2} = 1 - \frac{q_{I}^{2}}{1 - a}.$$
 (20)

To get the total inverse demand for brand 1 when brand 2 is not offered, we invert the functions (20), add them together to get the total demand for the brand, and then invert back:

$$f_1 = \frac{\beta(1-q_1)}{a+\beta-a\beta} \tag{21}$$

Using (21), the value of q_1 that maximizes $V(q_1, 0)$ and the maximized value of $V(q_1, 0)$ are:

$$\hat{q}_{1} = \frac{1}{2} \text{ and } V(\hat{q}_{1}, 0) = \frac{\beta}{4(a+\beta-a\beta)}$$
 (22)

A similar derivation for brand 2 when brand 1 is not offered yields:

$$\hat{q}_2 = \frac{1}{2} \text{ and } V(0, \hat{q}_2) = \frac{\beta}{4(1 - a + a\beta)}$$
 (23)

With
$$a > \frac{1}{2}$$
 and $\beta > 1$, equations (22) and (23) indicate that $V(\hat{q}_1, 0) > V(0, \hat{q}_2)$. This

means that if the retailer seeks an exclusive supply arrangement, manufacturer *1* will be the exclusive supplier (See the Appendix for a Proof):

Proposition 4: If the retailer opts for an exclusive supplier, the firm buys $\hat{q}_1 = \frac{1}{2}$

units from manufacturer 1 for $\hat{T}_1 = \frac{B(2a-1)(\beta-1)}{4(a+\beta-a\beta)(1-a+a\beta)}$. The retailer

charges consumers
$$\hat{p}_1 = \frac{\beta}{2(a+\beta-a\beta)}$$

If the retailer opts for an exclusive supplier, manufacturer 2's brand is excluded from the retailer's distribution. Using equations (7) and (8), the firms' profits are:

$$\hat{\pi}_{1} = \hat{T}_{1}, \ \hat{\pi}_{2} = 0 \text{ and } \hat{\pi}_{R} = \frac{\beta}{4(1 - a + a\beta)}$$
 (24)

Comparing *Propositions 3* and *4* confirms that $\hat{q}_1 > q_1^*$ in the discrete choice model, as predicted by *Proposition 2*. The propositions also show that $\hat{q}_1 = q_1^* + q_2^*$ in the discrete choice model. The retailer sells more units of the more popular brand with an exclusivity arrangement, but the firm's total unit sales are the same whether or not it chooses an exclusive supplier. The retail price of the exclusive brand is less than it would be if the retailer distributes both brands: $\hat{p}_1 < p_1^*$. The price p_1 falls just enough for increased unit sales of the more popular brand to offset the displaced unit sales of the less popular brand.

V. C. The Retailer's Choice

The retailer will elect to pursue an exclusive supply arrangement if $\hat{\pi}_R \ge \pi_R^*$. Otherwise the firm will fall back on efficient contracting with both manufacturers. Comparing π_R^* and $\hat{\pi}_R$ in equations (19) and (24) indicates whether the retailer opts for an exclusive dealing arrangement:

Proposition 5: The retailer opts for an exclusive supplier iff $\beta \leq \frac{1+a}{a}$

To interpret *Proposition 5*, notice that the parameters β and *a* correspond, respectively, to the extent of vertical and horizontal product differentiation between the manufacturers' brands. The parameter β is a measure, within types, of the intensity of consumers' brand preferences. The greater is β , the greater is the premium consumers are willing to pay for their favored brand. This parameter reflects the extent of vertical product differentiation. The parameter *a* reflects the size asymmetry of the two consumer groups. A smaller value of *a* indicates that consumers' preferences reflect greater horizontal product differentiation. But as $a \rightarrow I$, horizontal product differentiation disappears altogether.

Proposition 5 shows that if consumers' brand preferences are weak (β is small), the retailer opts for an exclusive supply arrangement. In lieu of distributing both brands, it is more profitable for the retailer to distribute only brand *1* and charge a lower price to induce some consumers with a preference for brand 2 to switch brands. However if consumers' brand preferences are strong enough (β is large), then the retailer exploits them by distributing both brands rather than a selling only brand *1*. This result explains why a retailer's distribution strategy may be different for different consumer good categories. For instance, a convenience store that sells only one brand of light bulbs may sell more than one brand of beer because

consumers' brand preferences are more pronounced for beer than light bulbs. The same result also suggests an explanation for why some prominent retailers, such as Costco, stock many fewer brands of all consumer goods than other retailers.¹¹ This explanation is that Costco serves a population of loyal consumers whose brand preferences are not notably strong.

Proposition 5 shows that the minimal strength of consumers' brand preferences β for the retailer to opt for distributing both brands depends on the parameter *a*. The threshold value of β is lower where *a* is large because one of the brands is substantially more popular that the other. When one brand is favored by a large majority of consumers, the retailer does not want to reduce the price of that brand enough to cause the minority to switch brands.

V. D. Comparison with Previous Results

Klein and Murphy and also Gabrielsen and Sørgard explored issues similar to those in this paper.¹² Some of the results in this paper are consistent with the findings these authors reported. The results in these earlier papers, like those here, pertain to specific stylized models of consumer demand and to interactions between two manufacturers and a single retailer. In this paper, the retailer uses the lure of an exclusive supply arrangement to play the manufacturers off against each other and win advantageous terms. Klein and Murphy also assume that, having committed to the selection of an exclusive supplier, the retailer plays the manufacturers off against each other. Gabrielsen and Sørgard do not allow this kind of "playing off."

¹¹ "A typical Costco store stocks 4,000 types of items, including perhaps just four toothpaste brands, while a Wal-Mart typically stocks more than 100,000 types of items and may carry 60 sizes and brands of toothpastes. Narrowing the number of options increases the sales volume of each, allowing Costco to squeeze deeper and deeper bulk discounts from suppliers" (Greenhouse, 2005).

¹² Klein and Murphy's (2008) analysis of buyer-induced exclusive dealing is not the focal point of their paper. The main thrust is that a retailer's ability to shift incremental sales from one brand to another can reduce wholesale and retail prices.

Both Klein and Murphy and Gabrielsen and Sørgard begin with reduced-form aggregate demand functions and assume that in the absence of an exclusivity arrangement, manufacturers' wholesale prices are determined by Bertrand interactions. In this paper, I assume that wholesale prices are determined by efficient contracting in the absence of an exclusivity agreement.

Gabrielsen and Sørgard assume that the retailer marks wholesale prices up in doublemarginalization fashion for resale to consumers. Klein and Murphy assume that downstream competition compels the retailer to charge retail prices that merely cover costs. Gabrielsen and Sørgard's characterization of retail pricing assumes that the firms cannot avoid squandering a significant share of the joint surplus latent in the vertical structure. Klein and Murphy's assumption that retail prices are competitive rules out any exercise of downstream market power even though retailers with upstream buyer power often possess downstream market power as well. In this paper, retail prices are determined differently depending on whether the retailer opts for an exclusive supplier. If the retailer distributes both brands, then retail prices effectively are set by efficient contracting. If the retailer opts for exclusive dealing, retail prices maximize the retailer's profits.

A comparison of *Propositions 3* and *4* indicates that buyer-induced exclusive dealing reduces the retail price of the brand selected by the retailer. Both Klein and Murphy and Gabrielsen and Sørgard get a similar result.¹³ Although Klein and Murphy's analysis provides no indication that a retailer would ever reject an opportunity to contract with an exclusive supplier, Gabrielsen and Sørgard model the retailer's decision about whether to use exclusive dealing. They predict that the retailer is more likely to seek an exclusive supplier where one of the brands is preferred by a significant majority of consumers. *Proposition 5* makes the opposite

¹³ Mathewson and Winter (1987) find that seller-induced exclusive dealing reduces wholesale prices but may or may not reduce retail prices.

prediction. This is because "playing off" is less remunerative for the retailer when few consumers prefer the second brand. Gabrielsen and Sørgard also predict that the retailer is more likely to seek an exclusive supplier where the brands are strongly differentiated. This prediction is counterintuitive. It means that the retailer denies consumers variety where consumers value variety most. *Proposition 5* predicts that the retailer will not opt for an exclusive supplier where the brands are strongly differentiated (β is large).

V. E. Welfare Effects

The retailer chooses unilaterally whether to pursue an exclusive supply arrangement, but the firm's choice has pronounced redistributive effects for other market participants. The effect on the suppliers is the least surprising. If exclusive dealing is profitable for the retailer, then it reduces profits for both suppliers (See the Appendix for a Proof):

Proposition 6:
$$\hat{\pi}_i < \pi_i^*$$
 for $i = 1, 2$ iff $\beta \le \frac{1+a}{a}$

The reduction in profit is more extreme for manufacturer 2 than for manufacturer 1 because brand 2 is not distributed at all when the retailer contracts exclusively with manufacturer 1.

Consumers also are affected by the retailer's decision about whether to pursue an exclusive supply arrangement. Consumer welfare may be greater or less when the retailer opts for an exclusive supplier (See the Appendix for a Proof):

Proposition 7: Consumer welfare is greater with an exclusive supplier iff

$$\beta \geq \frac{4a}{4a-1}$$

This *Proposition* shows that if consumers' brand preferences are sufficiently strong (i.e., β is large), an exclusive supply arrangement increases consumer welfare. This happens even though

consumers who prefer the excluded brand lose that option. With exclusive dealing, the retailer cuts the price of brand I to induce some of the type 2 consumers to switch. This price-cutting unambiguously increases the welfare of type I consumers. As the number of type I consumers gets large (i.e., a is large), consumers' preferences do not have to be as strong (i.e., β does not have to be as large) in order for total consumer welfare to increase if the retailer opts for an exclusive supplier. Even where the strength of consumers' preferences is not great, an exclusive dealing arrangement increases consumer welfare if one of the goods is favored by a large majority.

A comparison of *Propositions 5* and 7 shows that the interests of the retailer and its consumers are sometimes, but not always, aligned. The parameter thresholds in these *Propositions* are depicted in *Figure 2*. *Proposition 5* shows that the retailer chooses an exclusive supplier when parameter values fall *below* the upper threshold, but elects to distribute both brands when parameter values lie *above* this threshold. Similarly, *Proposition 7* shows that consumer welfare is greater if the retailer contracts with an exclusive supplier when parameter values are *above* the lower threshold, and conversely for values *below* this threshold.

The parameter values that fall in between the thresholds, as depicted in *Figure 2*, are those where the retailer takes on an exclusive supplier and consumers are the beneficiaries of this decision. Depending on the relative size of the two consumer groups, this alignment of the retailer's and consumers' interests occurs when consumers are willing to pay 33–100 percent more for their preferred brand than the alternative. With sufficiently high values of β , the retailer will not contract with an exclusive supplier even though consumers prefer that outcome. And with sufficiently low values of β , the retailer will contract with an exclusive supplier even though consumers prefer the two-brand outcome afforded by efficient contracting. The possibility that buyer-induced exclusive dealing reduces retail prices enough to increase consumer welfare even though some consumers do not purchase their preferred brand is even greater if the efficient contracting benchmark of section III is replaced by an alternative benchmark case. If the retailer does not opt to solicit an exclusive supply arrangement, suppose that the firm's interactions with its suppliers are depicted in a two-stage game. At the first stage, the suppliers choose linear prices simultaneously. At the second stage, the retailer chooses how many units of both brands to purchase and resell, and sets retail prices accordingly. The equilibrium of this game exhibits double marginalization such that the firms' joint surplus is less than in the Nash bargaining solution. More importantly, retail prices are higher than in Nash bargaining solution so that consumer welfare is lower. Because this alternative contracting benchmark yields less consumer welfare than the Nash bargaining solution, those parameter values that associate an increase in consumer welfare with buyer-induced exclusive dealing vis à vis the Nash bargaining solution increase it even more when compared to the double marginalization benchmark.

The possibility that buyer-induced exclusive dealing increases consumer welfare harkens back to Galbraith's notion that the countervailing power of large retailers is beneficial to consumers. Galbraith's claim does not apply to every large retailer with buyer power, but research on the downstream effects of countervailing power supports his claim in certain circumstances. Heretofore, all such circumstances have required competition at the retail level to discipline a large retailer's retail prices even though that firm exercises countervailing power upstream.¹⁴ This paper identifies a different mechanism whereby countervailing power reduces retail prices and increases consumer welfare. Strictly speaking, this mechanism does not require

¹⁴ For example, see von Ungen-Sternberg (1996), Dobson and Waterson (1997), Chen (2003) and Mills (2013).

downstream competition to compel a large retailer to share its gains from the exercise of buyer power upstream. A large retailer may reduce acquisition costs by playing suppliers off against each other and offering consumers a limited selection of brands. The firm then reduces retail prices to encourage brand switching in lieu of store switching. If retail prices are reduced sufficiently, consumer welfare may increase.

Even though consumer welfare may increase when the supplier opts for an exclusive supplier, *total welfare* does not. This is because the retailer's gain from exclusive dealing, coupled with the increase in consumer welfare, does not offset the manufacturers' loss in profit. If exclusive dealing is profitable for the retailer, then it reduces total welfare (See the Appendix for a Proof):

Proposition 8: Total welfare is less with an exclusive supplier iff $\beta \leq \frac{1+a}{a}$

The welfare implications of *Propositions* 7 and 8 agree at some but not all points with those in the papers by Klein and Murphy and by Gabrielsen and Sørgard. Klein and Murphy's model suggests that buyer-induced exclusive dealing always increases consumer welfare as well as total welfare.¹⁵ In Gabrielsen and Sørgard's model, buyer-induced exclusive dealing may have a positive effect on total welfare but "will reduce welfare if the products are sufficiently differentiated" (1999, p. 135).

VI. Conclusion

The motivation and effects of exclusive dealing arrangements that are solicited by large retailers and distributors with market power are different than exclusivity arrangements

¹⁵ Zenger (2010) shows that this result depends on the assumption in Klein and Murphy's model that the demand for the available brands is symmetric. If one of the brands is notably more popular, then exclusive dealing may reduce rather than increase total welfare.

orchestrated by manufacturers and suppliers with market power. When a retailer plays the suppliers of different brands of a consumer good off against each other by offering exclusive distribution to win advantageous wholesale pricing, there are mixed effects for consumers. The obvious first effect of buyer-induced exclusive dealing is that consumers served by the retailer have fewer brand choices. The excluded brands are the least popular. At the same time, the analysis here indicates that buyer-induced exclusivity reduces the retail price of the exclusive brand. Retail prices for brands supplied exclusively are reduced to encourage those customers who prefer an excluded brand to switch brands rather than switch stores. Consumers who prefer the brand selected for exclusive distribution are better off, but those who prefer an excluded brand may or may not be better off. Total consumer welfare may increase or decrease as a result of this exclusivity.

The conditions that cause consumer welfare to increase when a retailer selects an exclusive supplier are different than, but overlap with, the conditions that cause the retailer to opt for an exclusive supplier. The retailer's interest and the interest of consumers are in alignment unless consumers' brand preferences are either "too weak" or "too strong." If consumers have sufficiently weak brand preferences, the retailer distributes a single brand even though consumer welfare would be greater if the retailer distributed more brands. If consumers have sufficiently strong brand preferences, the retailer distributes more brands even though consumer welfare would be greater if the retailer distributes more brands even though consumer welfare would be greater if the retailer distributes more brands even though consumer welfare would be greater if the retailer distributes more brands even though consumer welfare would be greater if the retailer distributes more brands even though consumer welfare would be greater if the retailer distributes more brands even though consumer welfare would be greater if the retailer distributes more brands even though consumer welfare would be greater if the retailer opted for exclusive dealing.

The analysis in this paper has implications for vertical relationships in markets where firms bundle their own goods X with complementary products Y. When complementary products are differentiated and are produced by two or more independent sellers, the producer of X may bundle X with the Y of a single supplier. This denies the firm's customers the opportunity to choose a different brand of Y when they purchase X. For instance, automobile manufacturers select the manufacturers of the tires and audio systems that are installed in new cars. Microsoft selects the software products that occupy the Windows desktop on new personal computers. A hospital may select the anesthesiology practice that its patients must use for surgical procedures, and a cable TV system may limit the programming choices that are available to its subscribers. Where a large producer of X chooses a brand of Y for its customers, rather than allowing the customers to choose, the firm may leverage this ability to win advantageous terms of sale from Y producers. The welfare effects of this practice are similar to buyer-induced exclusive dealing in the distribution sector.

Exclusive dealing arrangements that are sought by suppliers with market power sometimes have anticompetitive exclusionary effects. It is unlikely that an exclusive dealing arrangement instigated by a retailer or distributor would be motivated by the goal of excluding suppliers or impeding the entry of new suppliers.¹⁶ But it is worth asking whether a dominant retailer or distributor's buyer-induced exclusive dealing might nevertheless be exclusionary because it restricts the distribution of less popular brands or the brands introduced by new entrants. It is not inevitable, and probably not even likely, that buyer-induced exclusive dealing has serious exclusionary effects. Even when the consumer population served by a large retailer has a(β , *a*) combination that makes exclusive dealing advantageous for that retailer, this does not prevent the brands excluded by that retailer from being distributed by other retailers who serve different customer populations. Nor does it prevent consumers from switching retailers. And of course the retailer is not interested in driving the excluded supplier out of business because that would strengthen the strategic position of the retailer's exclusive supplier.

¹⁶ This kind of exclusion is the primary concern of the papers cited in footnote 2.

At present, the consensus view of exclusive dealing arrangements is that they can be either anticompetitive or efficiency-promoting depending on several factors. This view is predicated mainly on the analysis of seller-induced exclusive dealing. This paper's analysis of buyer-induced exclusive dealing only reinforces the consensus view.¹⁷ Exclusive dealing arrangements arise for different reasons in different commercial environments, and their effects on competition and welfare are not always the same. Submitting these practices to the rule of reason, rather than *per se* prohibition, remains the best antitrust response.

¹⁷ In his survey of a wide variety of buyer-led vertical restraints, Dobson (2008) reaches a similar conclusion.



Figure 1



Figure 2

Appendix

Proposition 2: $\hat{q}_i > q_i^*$ for i = 1, 2

Proof: Recalling that $V(q_1, q_2) = \sum_{l,2} q_l f_l(q_1, q_2)$, we have:

$$\frac{\partial V(q_1^*, q_2^*)}{\partial q_1} = f_1(q_1^*, q_2^*) + q_1^* \left(\frac{\partial f_1(q_1^*, q_2^*)}{\partial q_1} \right) + q_2^* \left(\frac{\partial f_2(q_1^*, q_2^*)}{\partial q_1} \right) = 0.$$
(25)

Because $q_2^* > 0$ and $\frac{\partial f_2}{\partial q_1} < 0$, equation (25) implies that:

$$f_{I}(q_{I}^{*},q_{2}^{*}) + q_{I}^{*}\left(\frac{\partial f_{I}(q_{I}^{*},q_{2}^{*})}{\partial q_{I}}\right) > 0$$
(26)

Also, we have:

$$\frac{\partial V(\hat{q}_1,0)}{\partial q_1} = f_1(\hat{q}_1,0) + \hat{q}_1\left(\frac{\partial f_1(\hat{q}_1,0)}{\partial q_1}\right) = 0.$$
(27)

Because $q_2^* > 0$ and because $\frac{\partial f_1}{\partial q_1} < 0$ and $\frac{\partial^2 f_1}{\partial q_1 \partial q_2} \le 0$, equations (26) and (27) indicate that $\hat{q}_1 > q_1^*$.

Similarly, $\hat{q}_2 > q_2^*$. \Box

Lemma 1: The firms' joint surplus from sales to type 1 consumers is maximized with $q_1^{I} = \frac{a}{2}$ and $q_2^{I} = 0$; these quantities are sustained by prices $p_1 = \frac{\beta}{2}$ and $p_2 \in [\frac{1}{2}, 1]$. *Proof:* The firms' joint surplus from sales to type 1 consumers is $p_1q_1^{I} + p_2q_2^{I}$, or using equations (12) and (13):

$$V(q_1^{I}, q_2^{I}) = q_1^{I} \left(\beta(1 - \frac{q_1^{I}}{a}) - \frac{q_2^{I}}{a} \right) + q_2^{I} \left(1 - \frac{q_1^{I}}{a} - \frac{q_2^{I}}{a} \right).$$
(28)

First order conditions that are sufficient for maximizing this expression are:

$$\frac{\partial V}{\partial q_1^I} = \beta \left(1 - \frac{q_1^I}{a} \right) - \frac{2q_2^I}{a} - \frac{\beta q_1^I}{a} = 0$$

$$\frac{\partial V}{\partial q_2^I} = -\frac{2q_1^I}{a} + 1 - \frac{2q_2^I}{a} = 0$$
(29)

Solving the equations in (29) simultaneously gives $q_1^{\prime} = \frac{a}{2}$ and $q_2^{\prime} = 0$, which quantities are

demanded by type *1* consumers with $p_1 = \frac{\beta}{2}$ and $p_2 \in [\frac{1}{2}, 1]$. \Box

Proposition 4: If the retailer opts for an exclusive supplier, the firm buys $\hat{q}_1 = \frac{1}{2}$ units from

manufacturer 1 for $\hat{T}_{I} = \frac{B(2a-1)(\beta-1)}{4(a+\beta-a\beta)(1-a+a\beta)}$. The retailer charges consumers

$$\hat{p}_{I} = \frac{\beta}{2(a+\beta-a\beta)}.$$

Proof: Equations (21) and (22) together show that $\hat{q}_1 = \frac{1}{2}$ and $\hat{p}_1 = \frac{\beta}{2(a+\beta-a\beta)}$. Substituting

the values of $V(\hat{q}_1, 0)$ and $V(0, \hat{q}_2)$ in equation (22) and (23) into equation (6) gives

$$\hat{T}_{I} = \frac{B(2a-1)(\beta-1)}{4(a+\beta-a\beta)(1-a+a\beta)}. \Box$$

Proposition 6: $\hat{\pi}_i < \pi_i^*$ for i = 1, 2 iff $\beta \le \frac{1+a}{a}$

Proof: Equations (19) and (23) show that $\hat{\pi}_2 < \pi_2^*$. Also, **Proposition 4** and equations (18) and (24) indicate that $\hat{\pi}_1 < \pi_1^*$ iff:

$$\frac{(2a-1)(\beta-1)}{(a+\beta-a\beta)(1-a+a\beta)} < \frac{a}{2}.$$
(30)

This inequality holds for any $a \in (\frac{1}{2}, 1)$ and $\beta < \frac{1+a}{a}$. \Box

Proposition 7: Consumer welfare is greater with an exclusive supplier iff $\beta \ge \frac{4a}{4a-1}$.

Proof: Proposition 3 gives the values of prices and quantities in the equilibrium without exclusivity. With these values, consumers' surplus is:

$$S^* = \frac{\beta}{8} \tag{31}$$

Proposition 4 gives the values of \hat{p}_i and \hat{q}_i in the equilibrium with an exclusive supplier. With these values, consumers' surplus is:

$$\hat{S} = \frac{-4\beta^2 a^2 + 8\beta a^2 - 4a^2 + 4\beta^2 a - 8\beta a + 4a + \beta}{8(a + \beta - a\beta)}$$
(32)

Comparing expressions (31) and (32), we get:

$$\hat{S} \ge S * \text{ iff } \beta \ge \frac{4a}{4a-1} \tag{33}$$

which establishes the result. \Box

Proposition 8: Total welfare is less with an exclusive supplier iff $\beta \leq \frac{1+a}{a}$

Proof: The prices and quantities in *Proposition 3* indicate that total welfare in the equilibrium without exclusivity is:

$$W^* = \frac{3\beta}{8} \tag{34}$$

The values of \hat{p}_1 and \hat{q}_1 in *Proposition 4* indicate that total welfare in the equilibrium with an exclusive supplier is:

$$\hat{W} = \frac{-4\beta^2 a^2 + 8\beta a^2 - 4a^2 + 4\beta^2 a - 8\beta a + 4a + 3\beta}{8(a+\beta-a\beta)}$$
(35)

Comparing expressions (34) and (35), we get:

$$\hat{W} \le W * \text{ iff } \beta \le \frac{l+a}{a} \tag{36}$$

which establishes the result. \Box

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