Center for Research on Economic and Social Theory

and

Department of Economics

Working Paper Series

Nonlinear Supply Contracts, Foreclosure, and Exclusive Dealing

Daniel P. O'Brien
Greg Shaffer

November, 1994
Number 94-15

DEPARTMENT OF ECONOMICS
University of Michigan
Ann Arbor, MI 48109-1220

Nonlinear Supply Contracts, Foreclosure, and Exclusive Dealing

Daniel P. O'Brien*
U.S. Department of Justice
Judiciary Center Building
555 4th Street N.W.
Washington, D.C. 20001

and

Greg Shaffer
Department of Economics
University of Michigan
Ann Arbor, MI 48109-1220

October 1991

This Version: November 1994

Abstract

We examine the incentives for market foreclosure when two upstream firms contract with a retail monopolist. We find that if nonlinear supply contracts are feasible, an exclusive dealing arrangement offers an upstream firm no advantage it would not have had without the arrangement. If a fully integrated (horizontally and vertically) firm would sell only one product, an upstream firm can foreclose its rival with a nonlinear supply contract and achieve the same profit it would receive if it required exclusive dealing. If a fully integrated firm would sell both products, the feasibility of nonlinear supply contracts renders it unprofitable to foreclose, with or without exclusive dealing.

JEL Classification Numbers: D43, L13

Keywords: Exclusive Dealing, Nonlinear pricing, Market Foreclosure.

*We thank Steve Salop for his initial encouragement of this research. We also thank Darlene Chisholm, Howard Marvel, Scott Masten, G. Frank Mathewson, Barbara McCutcheon, Paul Milgrom, Shiou Shieh, Gregory Werden, Mike Whinston, Ralph Winter, and seminar participants at Ohio State, Michigan, Toronto, the U.S. Department of Justice, the U.S. General Accounting Office, and the 1992 Western Economic Association Meetings for their helpful comments. The views expressed herein are not purported to represent those of the U.S. Department of Justice.

1 Introduction

An exclusive dealing arrangement is a contractual agreement between a manufacturer and retailer that prohibits the latter from selling the products of rival manufacturers. Such arrangements necessarily foreclose market opportunities to the excluded firms and thus are seen by some to pose an anticompetitive danger. Providing a substantial fraction of the retail market has been foreclosed, exclusive dealing may be found to "substantially lessen competition" under the Clayton Act §3 and to be "an unfair method of competition" under the FTC Act §5.[1]

There may be other ways to foreclose rivals, however, that do not risk antitrust violation. For instance, manufacturers can offer price breaks such as quantity discounts and other incentives to induce retailers to push their products relative to those of a rival. If the price breaks are sufficient in magnitude, retailers may even choose to deal exclusively in one product so as to qualify for the manufacturer's maximum discount.[2] As long as there are no sanctions for selling competing products,[3] and the price breaks are neither below-cost or discriminatory,[4] such nonlinear supply contracts are presumed lawful and often viewed as procompetitive because of the "likelihood that the discount(s) will ultimately inure to the benefit of the consumer."[5]

The law distinguishes between price breaks that may foreclose rivals and exclusive dealing arrangements on the grounds that the latter constrain a retailer's freedom of choice.[6] Yet, without more, these grounds do not provide a compelling economic rationale for the legal asymmetry. As Bork (1978, p. 304) and Director and Levi (1956) observe, a manufacturer seeking exclusivity must compensate the retailer for not selling competing products, whether or not it restricts the retailer's freedom of choice. Bork concludes that, in terms of foreclosing its rival, an exclusive dealing contract offers a manufacturer no advantage it would not have had without the contract. If Bork is right, current antitrust law may unintentionally serve only to discourage efficiency-based exclusive dealing arrangements for which there may be no good substitute.[7]

Despite the need to examine exclusive dealing arrangements in conjunction with nonlinear supply contracts, the exclusive dealing literature typically restricts attention to supply contracts with unit wholesale prices.[8] By doing so, the literature precludes the use of quantity discounts as a means of foreclosing rivals and thus cannot adequately assess Bork's claim. In this paper, we consider a situation in which two manufacturers simultaneously make contract offers to a retail monopolist, and examine how a manufacturer's incentive to require exclusive dealing is affected when nonlinear supply contracts are feasible.

We find that if a fully integrated (horizontally and vertically) firm would *not* want to sell both products, all subgame perfect equilibria entail market foreclosure and yield the same division of profit. Since nonlinear contracting alone can induce some of these foreclosure equilibria, a ban on exclusive dealing arrangements in this instance would not affect the incidence of market foreclosure or its welfare consequence. This supports Bork's claim that an exclusive dealing contract offers a manufacturer no advantage in foreclosing rivals. Surprisingly, Bork's claim also holds even if a fully integrated firm would want to sell both products, for in that instance, the mere feasibility of nonlinear supply contracts renders it unprofitable for a manufacturer to foreclose its rival.

Our results contrast with Mathewson and Winter (1987), who demonstrate a foreclosure role for exclusive dealing arrangements in a similar setting when quantity discounts and other kinds of price breaks are infeasible. The critical difference between the two models lies in the efficiency with which surplus can be extracted from the retailer. When a manufacturer is restricted to charge a unit wholesale price, its profit depends solely on its own sales. This leads to a double markup distortion, a well-known pricing externality that keeps joint profit from being maximized. By requiring exclusive dealing, and thus preventing sales of a rival's product from substituting for its own, a manufacturer can sometimes increase its profit even if joint profit would thereby decrease. On the other hand, a manufacturer's profit depends on its product's incremental contribution to joint profit when nonlinear supply contracts are feasible. Since surplus is extracted efficiently in this case, the retailer is able to internalize all pricing externalities. It is thus not surprising that a manufacturer's preferences coincide with those of a fully integrated firm, even if this means sharing sales with its rival. Nonetheless, it is ironic that the desire to foreclose is not enhanced, and may even be eliminated, when additional ways of foreclosing rivals, e.g. quantity discounts, are allowed.

Since our focus is on market foreclosure, we follow Bernheim and Whinston (1985), Katz (1989), and Gal-Or (1991) in considering delegated agency whereby a common retailer does not have to deal with both manufacturers.[9] We differ from these analyses, however, in that we do not allow an excluded manufacturer to distribute through an alternative supply of retailers. Our model thus corresponds to situations in which patronage by certain retailers is critical to each manufacturer's survival, which is when manufacturers have the most to gain by excluding their rivals. It also allows us to examine upstream rivalry in nonlinear supply contracts when market foreclosure does not arise, but when manufacturers nonetheless must guard against its ever present threat.

The remainder of this paper is organized as follows. Section 2 presents the model and derives necessary and sufficient conditions for supply contracts to arise in a subgame perfect equilibrium. Section 3 examines Bork's claim and focuses on the existence and profitability of market foreclosure equilibria. Section 4 discusses the model's implications for exclusive dealing arrangements and market foreclosure. Section 5 concludes.

2 The Model and Notation

Suppose firms X and Y respectively produce goods X and Y, which are substitutes in the sense that an increase in the retail price of one leads to an increase in consumer demand for the other. Suppose also that these goods are distributed to final consumers through local retail monopolists and that the technology of distribution is such that neither firm is willing to enter the downstream market to sell only its good. This technology assumption captures the fact that for many consumer goods, the degree of economies of scope achieved by spreading overhead costs over multiple products is too high to warrant opening a single-product outlet. It is thus imperative that the manufacturers secure retailer patronage. The retail monopoly assumption simplifies the analysis and permits an examination of exclusive dealing under conditions seemingly most conducive to market foreclosure. It also corresponds to the situation in *Standard Fashion v. Magrane-Houston Co.*, 258 U.S. 346 (1922), where the Court concluded that the defendant's exclusive dealing policy affected "hundreds, if not thousands of communities" in which there is a single retailer for the product.

We consider a two-stage model of pricing and distribution. In the initial stage, firms X and Y simultaneously and independently choose their supply contract and whether to require exclusive dealing. The supply contracts, $T_x(X)$ and $T_y(Y)$, specify the retailer's payment for each good as a function of the amount it purchases and are assumed individually to depend only on own quantity.[10] We place two additional restrictions on supply contracts. First, we assume that $T_i(0) = 0$, $i = X, Y$; if the retailer does not purchase from a given firm, her payment to that firm is zero. Second, we assume that the payment asked for any given quantity must not be less than the total cost of producing that quantity. Let $C_i(\cdot)$ be firm i's cost function, with $C_i(0) = 0$, and denote firm i's decision on whether to require exclusive dealing by the indicator variable ED_i, which equals one if exclusive dealing is required and zero otherwise. Faced with the first stage choices by firms X and Y, the retailer chooses how much of each good to purchase in stage 2.[11] We let $R(X,Y)$ denote the retailer's maximum obtainable resale revenue as a function of its purchases and express the retailer's profit as $R(X,Y) - T_x(X) - T_y(Y)$.

Our solution concept is subgame perfection, and so we begin by solving for retailer optimality in the second stage. The retailer chooses X and Y to maximize its profit given the supply contracts it faces and any exclusive dealing requirement. In the event that neither manufacturer requires exclusive dealing, the retailer may choose $X, Y \geq 0$. The retailer might still opt to deal exclusively in one product, but this would be its choice. In all other cases, however, the retailer maximizes its profit subject to $XY = 0$. To keep track of the possibilities, define $\mathcal{A}_i$ and $\mathcal{A}$ as follows

$$\mathcal{A}_i(ED_j) \equiv \begin{cases} \{(X,Y)|XY \geq 0\} & \text{if } ED_j = 0 \\ \{(X,Y)|XY = 0\} & \text{if } ED_j = 1 \end{cases} \quad \text{and} \quad \mathcal{A}(ED_x, ED_y) = \mathcal{A}_x \cap \mathcal{A}_y.$$

The retailer's optimal stage-two quantity pair(s) is then given by the set Ω, where

$$\Omega(T_x(\cdot), ED_x, T_y(\cdot), ED_y) = \left\{(X,Y) \in \arg\max_{x,y} \{R(X,Y) - T_x(X) - T_y(Y) | (X,Y) \in \mathcal{A}\}\right\}.$$

We now derive necessary and sufficient conditions for supply contracts to be subgame perfect. Let $(T_x^e(\cdot), ED_x^e)$ and $\left(T_y^e(\cdot), ED_y^e\right)$ induce the retailer to purchase $(X^e, Y^e) \in \Omega$, yielding maximized profit for the retailer of $\Pi_{x,y} = R(X^e, Y^e) - T_x^e(X^e) - T_y^e(Y^e)$. Let the retailer's maximized

profit if it were to sell only one good be $\Pi_x = \max_x [R(X,0) - T_x^e(X)]$, if X were that good, and $\Pi_y = \max_y \left[R(0,Y) - T_y^e(Y)\right]$ otherwise. The following lemma is proved in appendix A.

lemma 1 *$(T_x^e(\cdot), ED_x^e)$ and $(T_y^e(\cdot), ED_y^e)$ arise in a subgame perfect equilibrium if and only if the following conditions hold:*

$$\max_{(X,Y)\in\mathcal{A}_x} R(X,Y) - C_x(X) - T_y^e(Y) = R(X^e,Y^e) - C_x(X^e) - T_y^e(Y^e) \tag{1}$$

$$\max_{(X,Y)\in\mathcal{A}_y} R(X,Y) - C_y(Y) - T_x^e(X) = R(X^e,Y^e) - C_y(Y^e) - T_x^e(X^e) \tag{2}$$

$$\Pi_{x,y} = \Pi_x = \Pi_y \tag{3}$$

The expression on the right-hand side of condition (1) is the joint profit of the retailer and firm X evaluated at the equilibrium quantities (X^e, Y^e). The equality with the left-hand side of (1) means that the equilibrium quantities maximize the joint profit of the retailer and firm X, subject to any exclusive dealing constraint imposed by firm Y. Condition (2) is interpreted similarly. Intuitively, if bilateral joint profits were not maximized, at least one of the firms could offer an alternative contract that would increase its joint profit with the retailer, allowing both of their profits to increase. Condition (3) requires that the retailer be indifferent between buying both goods, only good X, and only good Y. Each manufacturer thus extracts its product's incremental contribution to the retailer's profit. If it attempts to extract more, the retailer will not buy from it. If it attempts to extract less, it will not be profit maximizing.

Condition (1) implies $X^e = \arg\max \{R(X,Y^e) - C_x(X) | (X,Y^e) \in \mathcal{A}_x\}$; therefore, either $X^e = 0$, or the retailer is induced to purchase the quantity of X at which marginal revenue with respect to X, when evaluated at (X^e, Y^e), equals firm X's marginal cost. Condition (2) is symmetric. Conditions (1) and (2) imply that in every subgame perfect equilibrium, the retail price of any good sold is efficient in the sense that there is no double markup distortion. This suggests there may be a relationship between the equilibrium quantities (X^e, Y^e) and the quantities that maximize joint profit, $(X^I, Y^I) = \Omega(C_x(\cdot), 0, C_y(\cdot), 0)$.

Note that $X^I = \arg\max_x \left[R(X,Y^I) - C_x(X)\right]$ and similarly for Y^I. Assuming joint profit is single peaked on $\Re^2_{++}$, it follows that if it is optimal for a fully integrated firm to sell both goods, i.e., $X^I Y^I > 0$, joint profit will be maximized in all non-foreclosure equilibria, but will not be maximized if $X^e Y^e = 0$. Conversely, if it is optimal for a fully integrated firm to sell a single good[12], i.e., $X^I Y^I = 0$, joint profit will be maximized in all foreclosure equilibria, but will not be maximized if $X^e Y^e > 0$. The relationship between a fully integrated firm's optimal strategy and non-foreclosure equilibria is summarized in the proposition below, which is proved in appendix B.

Proposition 1 *Non-foreclosure equilibria exist if and only if it is optimal for a fully integrated firm to sell both goods. For all such equilibria, joint profit is maximized.*[13]

Bernheim and Whinston (1985) also show that a retail monopolist which sells both goods perfectly coordinates the independent pricing decisions of the upstream firms so as to maximize joint profit. Their model differs in an important way from ours, however, in their assumption that firms cannot be excluded from the market; should the common retailer drop one of the goods, the excluded firm simply contracts with an independent retailer and remains a viable competitor. As a consequence, manufacturers do not seek exclusivity in their model, for if they were to succeed, the downstream market structure would become a duopoly and the upstream firms would lose the coordination benefits provided by the common retailer.[14] By contrast, manufacturers will seek exclusivity in our model if, as is sometimes the case, the induced decrease in joint profit is offset by the gain to the excluding firm and retailer from sharing the surplus with one less firm.

Our model also differs from Bernheim and Whinston (1985) even when market foreclosure does not arise, for the mere threat of foreclosure affects the division of profit among firms. Whereas the upstream firms in their model jointly extract all of the retailer's profit in every perfect equilibrium, the retailer's profit is never driven to zero in our model. To see this, note that $\Pi_{x,y} = 0$ would imply $\Pi_x + \Pi_y = \Pi_{x,y}$ from condition (3). But this equality cannot be satisfied in equilibrium, for evaluating Π_x and Π_y at (X^e, Y^e), and subtracting common terms, yields $R(X^e,0) + R(0,Y^e) \leq R(X^e,Y^e)$, which violates the definition of substitute goods when X^e and Y^e are strictly positive.[15]

Intuitively, the price that consumers are willing to pay for a given amount of one good is less if another good is available, and therefore the retailer's combined revenue from selling both goods is less than the sum of its individual revenues if the same amount of each good were sold alone. Thus, although the retailer's revenue is known with certainty, nonlinear supply contracts that jointly extract all of the retailer's profit do not arise.

3 Market Foreclosure Equilibria

Turning to the existence and profitability of market foreclosure equilibria, we assume firm X is the dominant manufacturer so that $\max_x [R(X,0) - C_x(X)] \geq \max_y [R(0,Y) - C_y(Y)]$. It follows from condition (1) and using $T_y^e(Y) \geq C_y(Y)$, that if the above inequality is strict, only firm X can obtain exclusivity in equilibrium. Let $X^m = \arg\max_x [R(X,0) - C_x(X)]$ and note that condition (1) requires $X^e = X^m$ in any equilibrium in which only good X is sold.

3.1 Foreclosure through Nonlinear Supply Contracts

The retailer's opportunity cost of selling good Y depends on the terms of firm X's supply contract in an obvious way. By offering quantity discounts, for instance, firm X can raise this opportunity cost, and thereby make the retailer less inclined to push its rival's product. If the discounts are sufficient in magnitude, the retailer may even choose to deal exclusively in good X so as to qualify for the maximum possible discount. In this way, firm X may be able to foreclose firm Y from the market even without an exclusive dealing arrangement. The following proposition, proved in appendix C, gives the conditions for such equilibria to exist.

Proposition 2 *Foreclosure equilibria exist in which neither manufacturer requires exclusive dealing if and only if* $\max_y [R(X^m,Y) - C_y(Y)] = R(X^m,0)$, *i.e.,* $\arg\max_y [R(X^m,Y) - C_y(Y)] = 0$.

Of the three conditions in lemma 1, condition (2) is the most difficult to satisfy if firm X is to foreclose firm Y by nonlinear contracting alone. For instance, firm X has a variety of ways to induce the retailer to purchase X^m, e.g., quantity forcing, and thus to satisfy condition (1). Moreover, by varying the fixed component of its supply contract, firm X can easily satisfy condition (3).

Satisfying condition (2), however, is beyond firm X's control and depends on firm Y's production technology. Proposition 2 states that firm X can obtain exclusivity by nonlinear contracting alone if and only if the cost of producing good Y everywhere exceeds good Y's incremental contribution to the retailer's revenue when the latter is evaluated at X^m.

If a fully integrated firm would choose $(X^m, 0)$ to maximize joint profit, the same firm constrained to choose X^m would also choose not to sell good Y. This means that whenever non-foreclosure equilibria do *not* exist, foreclosure equilibria in which neither firm requires exclusive dealing *will* exist. On the other hand, the converse is false. By the definition of X^I, a fully integrated firm would strictly want to sell both goods if and only if $\arg\max_y \left[R(X^I, Y) - C_y(Y)\right] \neq 0$, a condition which is not inconsistent with the condition in proposition 2. The following proposition, proved by example in appendix D, establishes yet another difference between our game and the one analyzed by Bernheim and Whinston (1985).

Proposition 3 *Foreclosure equilibria in which neither manufacturer requires exclusive dealing can exist even when a fully integrated firm would strictly want to sell both goods.*

Joint profit is *not* necessarily maximized in all equilibria with nonlinear contracting. Rather, it is sometimes possible for a manufacturer to foreclose its rival by nonlinear contracting alone even though a fully integrated firm would sell both goods. Whether such foreclosure equilibria are desirable for the excluding firm is considered in section 3.3.

3.2 Foreclosure through Exclusive Dealing Arrangements

Firm X can foreclose firm Y directly by unilaterally requiring exclusive dealing. This widens the set of foreclosure equilibria because it restricts the domain of maximization in condition (2); since the retailer does not have the option of selling both goods under an exclusive dealing arrangement, firm Y's production technology does not constrain whether foreclosure can arise.

Proposition 4 *Foreclosure equilibria always exist in which at least one manufacturer requires exclusive dealing.*

Proof: The proof is by construction. Consider a candidate equilibrium pair of strategies in which both manufacturers require exclusive dealing and the retailer is allowed to purchase marginal units of each good at cost. Formally, let firm X and Y's candidate equilibrium supply contracts be

$$T_x^e(X) = \begin{cases} 0 & \text{if } X = 0 \\ F_x + C_x(X) & \text{if } X > 0 \end{cases}, \quad \text{and} \quad T_y^e(Y) = \begin{cases} 0 & \text{if } Y = 0 \\ C_y(Y) & \text{if } Y > 0 \end{cases}, \tag{4}$$

where $F_x = R(X^m, 0) - C_x(X^m) - \max_y (R(0, Y) - C_y(Y))$ is a lump-sum transfer from the retailer to firm X. Then it is straightforward to verify that lemma 1 is satisfied. *Q.E.D.*

We have shown that if it is optimal for a fully integrated firm to sell only good X, foreclosure equilibria can arise with or without an exclusive dealing arrangement, but non-foreclosure equilibria do not exist. If it is optimal for a fully integrated firm to sell both goods, foreclosure as well as non-foreclosure equilibria always exist. Given the substantial overlap of different types of equilibria, it is natural to ask which method of foreclosure, assuming firms have a choice, is more profitable, and how do firm profits compare among foreclosure and non-foreclosure equilibria?

3.3 Comparing Profits Across Equilibria

We begin this subsection by comparing firm X's profit among alternative foreclosure methods. For what follows, let $Y^m = \arg\max_y [R(0, Y) - C_y(Y)]$.

lemma 2 *In any foreclosure equilibrium, the excluded firm Y offers $T_y^e(Y^m) = C_y(Y^m)$.*

Proof: Suppose not. Then there exists a foreclosure equilibrium in which $T_y^e(Y^m) > C_y(Y^m)$. But using condition (3), this implies $R(0, Y^m) - C_y(Y^m) > \Pi_y = \Pi_x$, which violates condition (2).

Lemma (2) is useful in establishing the division of profit between firm X and the retailer in any subgame perfect equilibrium with market foreclosure. Since the retailer purchases X^m in any foreclosure equilibrium, bilateral joint profit equals $R(X^m, 0) - C_x(X^m)$. Of this profit, condition (3) requires that the retailer earn its opportunity cost of selling good X, which, from lemma 2, is equal to $R(0,Y^m) - C_y(Y^m)$. Thus, firm X's profit in any subgame perfect equilibrium in which only good X is purchased is uniquely given by

$$R(X^m,0) - C_x(X^m) - (R(0,Y^m) - C_y(Y^m)). \tag{5}$$

Obtaining exclusivity can be a pyrrhic victory. The more symmetric are consumer demands for goods X and Y, the lower firm X's equilibrium foreclosure profit will be. In the polar case in which goods X and Y are perfect substitutes, and in which the two firms' production technologies are identical, firm X earns zero profit. Thus, there is no guarantee that firm X's profit in (5) will exceed its profit in any given non-foreclosure equilibrium. We now turn to this comparison.

Firm X's profit in non-foreclosure equilibria is not unique; by offering nonlinear supply terms to induce the retailer to push its product, firm Y can raise the retailer's opportunity cost of selling good X, and hence decrease the amount of surplus that firm X can extract. The precise relationship between firm X's profit in any non-foreclosure equilibrium and firm Y's equilibrium supply contract can nonetheless be derived from condition (3) by noting that $\Pi_{x,y} = \Pi_y$. Writing this equality with (X^I, Y^I) substituted for (X^e, Y^e), rearranging, and subtracting $C_x(X^I)$ from both sides yields

$$T_x^e(X^I) - C_x(X^I) = R(X^I,Y^I) - C_x(X^I) - T_y^e(Y^I) - \Pi_y. \tag{6}$$

This says that firm X's profit in any non-foreclosure equilibrium equals the joint profit of the retailer and firm X minus the retailer's maximized profit if it were to sell only good Y.

Subtracting firm X's unique equilibrium foreclosure profit in (5) from its non-foreclosure equilibrium profit in (6) and grouping like terms yields

$$\left[R(X^I,Y^I) - C_x(X^I) - T_y^e(Y^I) - (R(X^m,0) - C_x(X^m))\right] + \left[R(0,Y^m) - C_y(Y^m) - \Pi_y\right]. \tag{7}$$

The first set of bracketed terms is the increase in the joint profit of firm X and the retailer when good Y is also sold. Condition (1) ensures it is non-negative whenever non-foreclosure equilibria exist. The second set of bracketed terms is also non-negative since $R(0,Y^m) - C_y(Y^m)$ is defined as the maximized joint profit of the retailer and firm Y. This means that firm X's profit in all

non-foreclosure equilibria, although it can vary substantially depending on the terms of firm Y's supply contract, is never lower than its unique equilibrium foreclosure profit.

Proposition 5 *Firms X and Y earn at least as much profit in all non-foreclosure equilibria as they earn in all foreclosure equilibria.*

Given that joint profit is maximized in all non-foreclosure equilibria, exclusive dealing cannot be profitable for firm X unless (a) firm Y is extracting more than its product's incremental contribution to joint profit, or (b) it offsets the induced loss in joint profit by extracting more from the retailer. To see why (a) fails, note that the maximized joint profit from selling only good X is less than or equal to the joint profit that firm X and the retailer can earn from selling both goods whenever non-foreclosure equilibria exist. That is $R(X^m,0) - C_x(X^m) \leq R(X^I,Y^I) - C_x(X^I) - T_y^e(Y^I)$. Subtracting $C_y(Y^I)$ from both sides of this inequality and rearranging yields

$$T_y^e(Y^I) - C_y(Y^I) \leq R(X^I,Y^I) - C_x(X^I) - C_y(Y^I) - (R(X^m,0) - C_x(X^m)), \tag{8}$$

which means that firm Y's profit never exceeds the drop in joint profit that would occur if the retailer were to sell only good X.[16] To see why (b) fails, note that market foreclosure in effect creates an auction between firms X and Y to determine whose product will be sold. As a consequence, the Bertrand-like competition leads to the excluded firm Y offering to sell Y^m at cost. Firm X thus extracts less, not more, from the retailer, whose unique profit in all foreclosure equilibria, $R(0,Y^m) - C_y(Y^m)$, is always greater than or equal to what it could earn in any given non-foreclosure equilibrium.

4 Exclusive Dealing Arrangements and Market Foreclosure

We have shown that nonlinear supply contracts render it unprofitable for a manufacturer to foreclose its rival whenever a fully integrated firm would strictly want to sell both goods. On the other hand, if a fully integrated firm would not want to sell both goods, non-foreclosure equilibria do not exist. In this case, foreclosure is profitable and can be achieved through an exclusive dealing arrangement or by nonlinear contracting alone. We now discuss related literature and the implications of our findings for manufacturers, retailers, and antitrust policy.

4.1 Implications for Manufacturers

Director and Levi (1956) and Bork (1978) assert that it is not normally profitable for a manufacturer to require exclusive dealing to foreclose its rivals, since the manufacturer cannot both extract all that its product is worth and at the same time compensate the retailer for dropping its rivals' products. To induce the retailer to sell its product exclusively, it is alleged that a manufacturer would have to sacrifice some of its profit, thereby making foreclosure undesirable.

This assertion appears to rely on four conditions: (a) neither manufacturer has a first mover advantage, and both are committed to producing according to the terms of their supply contracts; (b) joint profit is maximized in all non-foreclosure equilibria; (c) each manufacturer chooses its supply terms to make the retailer just indifferent to buy from it; and (d) each manufacturer extracts no more than its product's incremental contribution to joint profit, leaving surplus from sales of its good to be split between the other upstream firm and retailer.

Condition (a) incorporates Director and Levi's own caution that exclusive dealing for the purpose of foreclosing rivals may be profitable if it imposes a greater cost on potential entrants than it does on the incumbent firm. This might happen, for instance, if the incumbent can foreclose a large enough fraction of the retail market to prevent a potential entrant from realizing the scale economies it would need for profitable entry. Rasmusen et. al. (1991) formalize this idea and show that if scale economies are sufficiently important to require entry on a large scale, an exclusive dealing arrangement may enable an incumbent to foreclose its potential rivals cheaply.[17] Foreclosure would not be possible in their model, however, if the incumbent and entrant simultaneously offered supply terms and the entrant could commit to producing on an individual retailer basis rather than waiting to see if the sum of the retailers' purchases would allow it to realize its scale economies.[18]

The importance of nonlinear supply contracts in rendering it unprofitable for a manufacturer to foreclose its rival, and hence the importance of conditions (b) and (c), is apparent when our findings

are contrasted with Mathewson and Winter (1987). In a similar set-up with two manufacturers selling to a retail monopolist, they find that exclusive dealing arrangements can sometimes be profitable, even in the absence of scale economies, if the upstream firms are restricted to charge unit wholesale prices.[19] Such a restriction prevents each manufacturer from extracting all that its product is worth; condition (b) is violated because some surplus is dissipated to consumers via a double markup distortion, and condition (c) is violated because excess surplus is retained by the retailer, who is not indifferent to selling each manufacturer's product.

Condition (d), when combined with the other conditions, ensures that a manufacturer would have to sacrifice profit to induce the retailer to accept exclusivity. It is violated if, for instance, the cost of producing good Y is so high that a fully integrated firm would strictly want to sell only good X, since the incremental contribution to joint profit from sales of good Y's product would then be negative. When this happens, all subgame perfect equilibria entail market foreclosure.

4.2 Implications for Retailers

In his critique of antitrust policy, Bork (1978, p. 307) asserts that a retailer will agree to an exclusive dealing arrangement only if the compensation it receives, e.g., a lower marginal transfer price, ultimately inures to the benefit of consumers. In Bork's view, the retailer will ensure that the gain to consumers from the (assumed) lower retail price on the included firm's product will exceed the loss to consumers from the reduction in product variety.

Our findings do not support this assertion. With nonlinear supply contracts, the retailer can be compensated through fixed payments that independently have no bearing on the retail price. And while the marginal transfer price may fall with exclusive dealing, it will rise or stay the same if production marginal costs are increasing or constant. This means that the retail price may not fall with exclusive dealing, and so consumers may not be better off. Indeed, even if consumers would be worse off, the retailer would still prefer market foreclosure, since $R(0, Y^m) - C_y(Y^m)$, its unique profit in all foreclosure equilibria, is always greater than or equal to Π_y, its profit in any given non-foreclosure equilibrium.[20] Intuitively, the retailer, who is forced to indifference between selling or not selling each manufacturer's product, suffers no direct loss from foreclosure and may even gain if it thereby secures more favorable contract terms from the manufacturers.

An immediate implication is that the retailer, who is a party to negotiations with both manufacturers, would like to exploit a lack of coordination among the upstream firms by convincing each that its rival has offered an exclusive dealing arrangement.[21] By doing so, the retailer stands to gain from the Bertrand-like upstream competition that is created. Failing this, however, the retailer might resort to other ways to increase its profit. For example, consider a modified game in which the retailer can manipulate upstream competition by choosing whether to build enough shelf space to accomodate both goods or only one good.[22] As long as its decision is irreversible, and assuming the rest of the game proceeds with manufacturers announcing their supply terms, and the retailer choosing from whom to buy and how much to purchase, the retailer weakly gains by purposely limiting its shelf space.

Of course, one factor that influences a retailer's shelf space decision in reality is its bargaining power vis-a-vis the manufacturers. In O'Brien and Shaffer (1992), we showed that the retailer's incentive to limit its shelf space is eliminated when it has all the bargaining power. The reason is that in this polar case, the retailer's profit is identical to joint profit and thus it often prefers to sell both products. When its bargaining power is weak, on the other hand, the retailer is concerned more with its opportunity cost of selling good X, which is maximized by limiting its shelf space. Thus, it is not surprising that an intermediate level of retailer bargaining power exists above which the retailer has no strategic incentive to limit its shelf space and below which it does. This may partly explain why retail chains, which are presumably the ones with the most bargaining power, tend to have a larger product selection than local and independent stores.

4.3 Implications for Antitrust Policy

Although the retailer cannot be relied upon to agree to exclusive dealing arrangements only when they are in the public interest, our findings do not justify an antitrust policy critical of exclusive dealing. In terms of foreclosing its rival, an exclusive dealing arrangement offers a manufacturer no advantage it would not have had without the arrangement (see Bork (1978, p. 304). If a fully integrated firm would sell only one good, a manufacturer can foreclose its rival with a nonlinear supply contract and achieve the same profit it would receive if it required exclusive dealing. Nonlinear supply contracts thus provide an equally good substitute means to foreclose. Banning exclusive dealing arrangements in this case would not affect the incidence of market foreclosure or its social welfare consequence.

If a fully integrated firm would sell both goods, foreclosure is unprofitable. Although the set of foreclosure equilibria is enlarged by the feasibility of exclusive dealing, the additional equilibria are Pareto dominated for the manufacturer by all non-foreclosure equilibria. If one believes that Pareto dominated equilibria (for the manufacturer) are unlikely to arise, then banning exclusive dealing in this case would also have no effect on social welfare in the model. Intuitively, when nonlinear supply contracts are feasible, each manufacturer's profit is linked directly to joint profit. Since the retail monopolist internalizes all pricing externalities, there is no incentive for a manufacturer to foreclose its rival when sales of both goods are required to maximize joint profit.

The danger of an antitrust policy critical of exclusive dealing in practice, of course, is that it may discourage efficiency-based exclusive dealing arrangements for which there may be no good substitutes. For example, Besanko and Perry (1993) consider exclusive dealing in a model in which manufacturers distribute their products through perfectly competitive retailers. Because downstream competition in their model yields marginal cost pricing and thus zero markups, nonlinear supply contracts offer manufacturers no gain relative to contracts with unit wholesale prices. There is thus no way to mitigate the interbrand externality that arises in the absence of exclusive dealing when non-contractible promotional activities cannot otherwise be made product specific.[23]

5 Conclusion

An important issue that arises when manufacturers sell to retailers is how the surplus from sales to final consumers will be shared. While this issue is frequently resolved in practice with nonlinear supply contracts, the literature on exclusive dealing typically considers only supply contracts with unit wholesale prices. This restriction is not innocuous when retailers have market power. It leads to contracting inefficiencies such as the well-known double markup distortion and apriori rules out alternative ways that manufacturers may have to foreclose their rivals. As a result, the literature tends to overestimate the importance of exclusive dealing arrangements for market foreclosure.

By examining exclusive dealing arrangements in conjunction with nonlinear supply contracts, our analysis offers new insights. For example, we find that a manufacturer's preferences always coincide with those of a fully integrated firm, even if this means sharing sales with its rival. By contrast, the retail monopolist always prefers market foreclosure, even though it may not receive a wholesale price concession, and even though its consumers lose product variety (compare with Bork (1978, p. 307). Finally, we find that whenever foreclosing a rival is profitable for a manufacturer, nonlinear supply contracts, e.g. quantity discounts, provide a perfect substitute for exclusive dealing arrangements. This latter finding has important implications for antitrust policy.

One direction for future research is to delineate when an antitrust policy critical of exclusive dealing would discourage market foreclosure and when it would not. In this paper, the retail monopolist serves to maximize joint profit. More generally, in markets with competing retailers, the combined upstream and downstream rivalry would be unlikely to maximize joint profit. There may then be a role for exclusive dealing arrangements if the coordination benefits received from vertical control over a smaller set of products exceed the potential loss in joint profit from reduced product variety. See Shaffer (1994) for such a model in which exclusive dealing arrangements are strictly preferred to nonlinear supply contracts alone.

Appendix A

<u>Proof of Lemma 1</u>

Necessity. The proof is by contradiction. Consider first the necessity of condition (3). By definition, $\Pi_{x,y} \geq \Pi_x, \Pi_y$. Suppose one of the inequalities were strict. Then the firm failing to extract all of its incremental profit could increase its profit by raising the fixed component of its supply contract. Next, consider the necessity of (1). Suppose $(T_x^e(\cdot), ED_x^e)$ and $(T_y^e(\cdot), ED_y^e)$ arise in a subgame perfect equilibrium, but that $\max_{x,y}\left\{R(X,Y) - C_x(X) - T_y^e(Y) | (X,Y) \in \mathcal{A}_x(ED_y^e)\right\} \neq R(X^e, Y^e) - C_x(X^e) - T_y^e(Y^e)$. Using $\Pi_{x,y} = \Pi_y$, this inequality becomes

$$\max_{X,Y}\left\{R(X,Y) - C_x(X) - T_y^e(Y) - T_x^e(X^e) + C_x(X^e) | (X,Y) \in \mathcal{A}_x(ED_y^e)\right\} \neq \Pi_y. \qquad (9)$$

If the left-hand side of (9) were less than the right-hand side, the retailer would earn less by buying X^e and Y^e than by buying only good Y, a contradiction. Suppose the left-hand side were greater than the right-hand side. Then for some positive ω,

$$\max_{X,Y}\left\{R(X,Y) - C_x(X) - T_y^e(Y) - T_x^e(X^e) + C_x(X^e) - \omega | (X,Y) \in \mathcal{A}_x(ED_y^e)\right\} > \Pi_y. \qquad (10)$$

But consider the supply contract

$$T_x^*(X) = \begin{cases} 0 & \text{if } X = 0, \\ T_x^e(X^e) + C_x(X) - C_x(X^e) + \omega & \text{otherwise.} \end{cases}$$

Substituting this contract into (10) gives

$$\max_{x,y}\left\{R(X,Y) - T_x^*(X) - T_y^e(Y) | (X,Y) \in \mathcal{A}_x(ED_y^e)\right\} > \Pi_y,$$

which means that the retailer purchases a positive amount of good X under $T_x^*(\cdot)$. Since firm X earns ω more profit under $(T_x^*(\cdot), ED_x^e)$ than under $(T_x^e(\cdot), ED_x^e)$, the latter is not a best response to $(T_y^e(\cdot), ED_y^e)$. The necessity of condition (2) is similarly established.

Sufficiency. Suppose that conditions (1) through (3) hold, but that $(T_x^e(\cdot), ED_x^e)$ and $(T_y^e(\cdot), ED_y^e)$ do not arise in a subgame perfect equilibrium. Then at least one firm can alter its strategy and increase its profit. Without loss of generality, suppose firm X can do so. Then there exists $(\hat{T}_x(\cdot), \hat{ED}_x)$ that induces the retailer to choose $X > 0$ and makes firm X better off. That is,

$$\max_{x,y}\left\{R(X,Y)-\hat{T}_x(X)-T_y^e(Y)|(X,Y)\in\mathcal{A}(\hat{ED}_x,ED_y^e)\right\}>\Pi_y, \tag{11}$$

and $\hat{T}_x(X)>T_x^e(X^e)-C_x(X^e)+C_x(X)$, $\forall(X,Y)\in\Omega(\hat{T}_x(\cdot),\hat{ED}_x,T_y^e(\cdot),ED_y^e)$. Let $(\hat{X},\hat{Y})$ be the retailer's choice of (X,Y). Then there exists some $\hat{w}>0$ such that $\hat{T}_x(\hat{X})=T_x^e(X^e)-C_x(X^e)+C_x(\hat{X})+\hat{w}$. Substituting this expression into condition (1), and using $\Pi_{x,y}=\Pi_y$, yields

$$\max_{x,y}\left\{R(X,Y)-C_x(X)-T_y^e(Y)-\hat{T}_x(\hat{X})+C_x(\hat{X})+\hat{\omega}|(X,Y)\in\mathcal{A}_x(ED_y^e)\right\}=\Pi_y. \tag{12}$$

Since $\mathcal{A}(\hat{ED}_x,ED_y^e)\subset\mathcal{A}_x(ED_y^e)$, and so $(\hat{X},\hat{Y})\in\mathcal{A}_x(ED_y^e)$, the left-hand side of (12) can be evaluated at $(\hat{X},\hat{Y})$ to yield $R(\hat{X},\hat{Y})-T_y^e(\hat{Y})-\hat{T}_x(\hat{X})+\hat{\omega}\leq\Pi_y$, which means that

$$R(\hat{X},\hat{Y})-T_y^e(\hat{Y})-\hat{T}_x(\hat{X})<\Pi_y. \tag{13}$$

But by the definition of $(\hat{X},\hat{Y})$, condition (13) contradicts condition (11).

Appendix B

Proof of Proposition 1

Necessity. This part of the proof is by contradiction. Suppose a non-foreclosure equilibrium exists, but that it is not optimal for a fully integrated firm to sell both goods. That is, suppose there exists $(T_x^e,0)$ and $(T_y^e,0)$ that induce $(X^e,Y^e)\in\Omega(T_x^e,0,T_y^e,0)$ such that $X^eY^e>0$ and conditions (1) - (3) are satisfied, but that a fully integrated firm would strictly want to sell good X only,

$$R(X^I,0)-C_x(X^I)>\sup_{x,y>0}\left[R(X,Y)-C_x(X)-C_y(Y)\right]. \tag{14}$$

Using $T_y^e(Y)\geq C_y(Y)$, $\forall Y$, condition (14) implies $R(X^I,0)-C_x(X^I)>R(X^e,Y^e)-C_x(X^e)-T_y^e(Y^e)$, which violates condition (1).

Sufficiency. This part of the proof is by construction. Suppose it is optimal for a fully integrated firm to sell both goods, and consider a candidate equilibrium pair of upstream strategies in which neither firm requires exclusive dealing and the retailer is allowed to purchase marginal units of each

good at cost. Formally, let firm X and Y's candidate equilibrium supply contracts be

$$T_x^e(X)=\begin{cases}0 & \text{if } X=0\\ F_x+C_x(X) & \text{if } X>0\end{cases},\quad\text{and}\quad T_y^e(Y)=\begin{cases}0 & \text{if } Y=0\\ F_y+C_y(Y) & \text{if } Y>0,\end{cases} \tag{15}$$

where $F_x=R(X^I,Y^I)-C_x(X^I)-C_y(Y^I)-\max_y(R(0,Y)-C_y(Y))$, and $F_y=R(X^I,Y^I)-C_x(X^I)-C_y(Y^I)-\max_x(R(X,0)-C_x(X))$, are lump-sum transfers from the retailer to firms X and Y respectively. Then it is straightforward to verify that conditions (1) - (3) are satisfied.

Appendix C

Proof of Proposition 2

Necessity. This part of the proof is by contradiction. Suppose there exists $(T_x^e,0)$ and $(T_y^e,0)$ that induce $(X^e,Y^e)\in\Omega(T_x^e,0,T_y^e,0)$ such that $X^eY^e=0$ and conditions (1) - (3) are satisfied, but $\max_y[R(X^m,Y)-C_y(Y)]\neq R(X^m,0)$. Subtracting $T_x^e(X^m)$ from both sides, and noting that the left-hand side of this inequality cannot be less than the right-hand side, yields

$$\max_y\left[R(X^m,Y)-C_y(Y)-T_x^e(X^m)\right]>R(X^m,0)-T_x^e(X^m), \tag{16}$$

which is a direct violation of condition (2), given that $X^e=X^m$ and $Y^e=0$ in any equilibrium in which only good X is sold.

Sufficiency. This part of the proof is by construction. Suppose $\max_y[R(X^m,Y)-C_y(Y)]=R(X^m,0)$ and consider a candidate equilibrium pair of upstream strategies in which neither firm requires exclusive dealing and firm X and Y's candidate equilibrium supply contracts are

$$T_x^e(X)=\begin{cases}0 & \text{if } X=0\\ F_x^* & \text{if } X=X^m\\ \infty & \text{otherwise}\end{cases},\quad\text{and}\quad T_y^e(Y)=\begin{cases}0 & \text{if } Y=0\\ C_y(Y^m) & \text{if } Y=Y^m\\ \infty & \text{otherwise}\end{cases},$$

where $F_x^*=R(X^m,0)-(R(0,Y^m)-C_y(Y^m))$, and $Y^m=\arg\max_y[R(0,Y)-C_y(Y)]$. Then it is straightforward to verify that conditions (1) - (3) are satisfied.

Appendix D

Proof of Proposition 3

The proof of proposition 3 proceeds by example. Suppose the aggregate preferences of consumers can be summarized by the quadratic function

$$U = \alpha(X+Y) - \frac{(X+Y)^2}{2} - \frac{(X-Y)^2}{2(1+2\gamma)} - P_x X - P_y Y,$$

where P_x and P_y are the prices of goods X and Y respectively. This yields inverse demands

$$P_x = \alpha - (X+Y) - \frac{(X-Y)}{1+2\gamma} \text{ and } P_y = \alpha - (X+Y) - \frac{(Y-X)}{1+2\gamma}.$$

Suppose also that production technologies are characterized by fixed costs, $F_y \geq F_x$, and a constant marginal cost c. In any foreclosure equilibrium, $X^e = X^m$ is the solution to

$$\max_x \left(\alpha - X - \frac{X}{1+2\gamma}\right) X - cX - F_x. \tag{17}$$

Solving (17) yields $X^m = (1+2\gamma)(\alpha - c)/(4(1+\gamma))$. Let Ω_x denote the maximized joint profit.

From proposition 2, foreclosure equilibria in which neither firm requires exclusive dealing exist if and only if $\max_y [R(X^m, Y) - C_y(Y) - C_x(X^m)] = \Omega_x$. In other words, foreclosure equilibria exist if $\sup_{y>0} [R(X^m, Y) - C_y(Y) - C_x(X^m)] < \Omega_x$. It is straightforward to show that this condition is satisfied for all

$$F_y > \frac{(\alpha - c)^2(1+2\gamma)}{8(1+\gamma)^3}. \tag{18}$$

To see that (18) is consistent with the existence of non-foreclosure equilibria, note that the solution to

$$\max_{x,y} \left(\alpha - (X+Y) - \frac{X-Y}{1+2\gamma}\right) X + \left(\alpha - (X+Y) - \frac{Y-X}{1+2\gamma}\right) Y - c(X+Y) - F_x - F_y, \tag{19}$$

yields $X = X^I > 0$ and $Y = Y^I > 0$ if and only if

$$F_y < \frac{(\alpha - c)^2(1+2\gamma+\gamma^2)}{8(1+g)^3}. \tag{20}$$

In other words, a fully integrated firm would strictly want to sell both goods if and only if (20) is satisfied. Comparing (20) with (18) reveals that both conditions can be simultaneously satisfied.

Endnotes

1. In *Standard Oil Co. v. United States*, 337 U.S. 293, 314 (1949), the Court held that a violation of the Clayton Act §3 "is satisfied by proof that competition has been foreclosed in a substantial share of the line of commerce affected." Similarly, in *Brown Shoe Co.*, 62 F.T.C. 679 (1963), the Commission held that the FTC Act §5 prohibits exclusive dealing arrangements when foreclosure occurs in a "significant number" of outlets. Both the Court, in *Tampa Electric Co. v. Nashville Coal Co.*, 365 U.S. 320 (1961), and the Commission, in *Beltone Electronics Corp.*, 100 F.T.C. 68 (1982), have since broadened their scope of inquiry to include in addition such factors as the duration of the exclusive dealing agreement, the ease of entry, and whether there are procompetitive justifications.

2. Several Ann Arbor, MI restaurants, for example, decline to handle *Discover* and *American Express* credit cards in order to qualify for the maximum rebate discount offered by *Visa*.

3. See *Antitrust Law Developments Third* (1992, p. 176) and the cases cited therein.

4. Price breaks that are below-cost may violate the Sherman Act §2. Price breaks offered to some retailers, but not to all, may violate the Clayton Act §2 as amended by the Robinson-Patman Act of 1936, which makes it unlawful for a seller "to discriminate in price between different purchasers of commodities of like grade and quality" where substantial injury to competition may result. As interpreted by the courts, an antitrust violation has often been found upon a mere showing of injury to competitors. See O'Brien and Shaffer (1994) for a critique of the Robinson-Patman Act as it applies to secondary line cases.

5. The quote is from *Fedway Associates, Inc. v. United States*, 976 F.2d at 1423, (D.C. Cir. 1992). See also *Barry Wright Corp. v. ITT Grinnell Corp.*, 724 F.2d 227 (1st Cir. 1983), in which the court found that Grinnel's decision to purchase all of its expected needs from Pacific Scientific Company (and thus none from Barry Wright) in return for special 30 percent / 25 percent price discounts was lawful. To challenge such price cuts, the Court said, would threaten to "chill highly desirable procompetitive price cutting."

6. Areeda and Kaplow (1988, p. 775) draw the distinction as follows: "while all buyers might conceivably choose to make each purchase from the large firm in any event, that possibility does not dissolve our concern with the contractual limitation on their future freedom of choice." See also the opinion in *Fedway*, where the D.C. circuit court ruled that "to exclude a rival does not

usually mean taking some action that merely leads someone else – here, a retailer – to make a free economic choice not to purchase the rival" (976 F.2d at 1421). And, in *FTC v. Brown Shoe*, 384 U.S. at 321 (1966), the Supreme Court found that Brown's exclusive dealing arrangement conflicts with "section 3 of the Clayton Act against contracts which take away freedom of purchasers to buy in an open market."

7. The Supreme Court has recognized since *Standard Oil Co. v. United States*, 337 U.S. 293 (1949), that exclusive dealing arrangements may promote efficiencies by assuring buyers (sellers) of a dependable supply (demand) of the product at a given price. Recently, in *Ryko Mfg. Co. v. Eden Servs.*, 823 F. 2d 1215, (8th Cir. 1987), *cert. denied*, 484 U.S. 1026 (1988), the potential role of exclusive dealing in promoting interbrand competition by preventing free riding has also been acknowledged. See Marvel (1982) and Besanko and Perry (1993).

8. For example, see Aghion and Bolton (1987), Mathewson and Winter (1987), Rasmusen, Ramseyer, and Wiley (1991), Chang (1992), and Perry and Besanko (1993, 1994).

9. Bernheim and Whinston (1986) focus on intrinsic agency whereby the common agent either deals with both principals or does not participate. They do not consider the possibility of foreclosure. Anton and Yao (1989) analyze split award auctions in which the government solicits bids from two homogeneous goods producers for the right to supply some or all of the government's unit demand requirement. We differ from them in that our firms produce imperfect substitutes, face downward sloping demands, and are not allowed to condition their supply terms, in the absence of an explicit exclusive dealing requirement, on the amount the retailer purchases from the rival.

10. Supply contracts that are contingent on the rival firm's quantity may not be enforceable and, in addition, may increase the risk of antitrust challenge.

11. Our results are not sensitive to the take-it or leave-it contract offer assumption. In O'Brien and Shaffer (1992), we extend the analysis to a simultaneous Nash bargaining setting.

12. This situation may arise, for instance, if fixed costs in the production of at least one of the goods are sufficiently large to outweigh the good's incremental contribution to the integrated firm's revenue.

13. Bernheim and Whinston (1992) have independently derived this result for the case in which

supply contracts can depend on the rival firm's quantity.

14. Gal-Or (1991) has shown that when retail agents have access to private information about their costs, manufacturers may prefer contracting with independent retailers. This is so if the loss in pricing coordination is more than offset by the upstream firms' increased ability to extract information rents.

15. This result has also been derived in a similar context by Calem and Spulber (1984), who consider competing firms charging two-part tariffs to a representative consumer, and by Shaffer (1991), who considers a multi-product upstream monopolist charging brand-specific two-part tariffs to a downstream monopolist.

16. Firm Y achieves its upper bound on profit for the pair of contracts used in appendix B to demonstrate the existence of non-foreclosure equilibria. See O'Brien and Shaffer (1992) for examples of non-foreclosure equilibrium supply contracts in which the upstream firms do not reach their upper bounds on profit.

17. In one variant of their model, if each retailer believes that enough other (noncompeting) retailers will agree to an exclusive dealing contract with the incumbent, then each will also believe that the potential entrant will be unable to realize its scale economies, and hence, that entry will not be forthcoming. Any one retailer thus loses nothing by agreeing to sell the incumbent's product exclusively.

18. Committing to production may be risky if scale economies are large. Unless the entrant does so, however, it is subject to possible foreclosure as in Rasmusen et al (1991).

19. In addition to its restriction to linear supply contracts, Mathewson and Winter's set-up also differs from ours in its timing of moves. Whereas firms in our model choose exclusive dealing and supply contract terms simultaneously, firms in their model make these decisions in two stages. We have shown in O'Brien and Shaffer (1992), however, that this difference in timing is inessential.

20. Mathewson and Winter (1987) were the first to challenge Bork's assertion. For some parameter values, they found that the retailer would agree to an exclusive dealing arrangement even though consumer and social welfare would be higher in its absence.

21. For evidence that retailers sometimes seek exclusive dealing arrangements from manufacturers against their will, see *U.S. v. Eastman Kodak Company*, 93-MC-45, at p. 61, (Western District of New York, 1994), in which the defendant states "Kodak has no intention of, or interest in, coercing retailers to carry only Kodak film. However, it is on occasion asked to bid or may wish to bid to become an exclusive supplier at a particular location."

22. We have in mind a situation in which each good requires at least one shelf-facing to display the product to consumers. In this case, it is the width of the shelf space that matters and not the depth, as units of the same good can be stacked one behind the other.

23. Marvel (1982) argues that non-contractible promotional activities undertaken by a manufacturer to increase demand for its product may be underprovided when they also generate customers for its rivals. This underprovision may be exacerbated if retailers can influence consumers to purchase the brands of rival manufacturers from which higher retail margins are earned.

BIBLIOGRAPHY

Aghion, P. and P. Bolton, 1987, "Contracts as a Barrier to Entry," *American Economic Review*, 77, 388-401.

American Bar Association Antitrust Section, *Antitrust Law Developments*, (3d ed. 1992).

Anton, J.J. and D.A. Yao, 1989, "Split Awards, Procurement, and Innovation," *The Rand Journal of Economics*, 20, 538-552.

Areeda, P. and P. Kaplow, 1988, *Antitrust Analysis: Problems, Text, Cases*, Boston, MA: Little, Brown, and Company.

Bernheim, B.D. and M.D. Whinston, 1985, "Common Marketing Agency as a Device for Facilitating Collusion," *The Rand Journal of Economics*, 16, 269-281.

Bernheim, B.D. and M.D. Whinston, 1986, "Common Agency," *Econometrica*, 54, 923-942.

Bernheim, B.D. and M.D. Whinston, 1992, "Exclusive Dealing," Harvard University Discussion Paper #1622.

Besanko, D. and M. Perry, 1993, "Equilibrium Incentives for Exclusive Dealing in a Differentiated Products Oligopoly," *Rand Journal of Economics*, 24, 646-667.

Besanko, D. and M. Perry, 1994, "Exclusive Dealing in a Spatial Model of Retail Competition," *International Journal of Industrial Organization*, 12, 297-329.

Bork, R., 1978, *Antitrust Paradox: A Policy at War With Itself*, New York, NY: Basic Books.

Calem, P. and D. Spulber, 1984, "Multiproduct Two-Part Tariffs," *International Journal of Industrial Organization*, 2, 105-115.

Chang, M.H., 1992, "Exclusive Dealing Contracts in a Successive Duopoly with Side Payments," *Southern Economic Journal*, 59: 180-193.

Director, A. and E. Levi, 1956, "Law and the Future: Trade Regulation," *Northwestern University Law Review*, 51, 281-296.

Gal-Or, E., 1991, "A Common Agency with Incomplete Information," *Rand Journal of Economics*, 22, 274-286.

Katz, M.L., 1989, "Vertical Contractual Relations," in R. Schmalensee and R.D. Willig, eds., *Handbook of Industrial Organization*, v.1, Amsterdam: North Holland, 655-721.

Marvel, H., 1982, "Exclusive Dealing," *Journal of Law and Economics*, 25, 1-25.

Mathewson, G.F. and R.A. Winter, 1987, "The Competitive Effects of Vertical Agreements: Comment," *American Economic Review*, 77, 1057-1062.

O'Brien, D.P. and G. Shaffer, 1992, "Nonlinear Contracts, Foreclosure, and Exclusive Dealing," University of Michigan CREST working paper #92-6.

O'Brien, D.P. and G. Shaffer, 1994, "The Welfare Effects of Forbidding Discriminatory Discounts: A Secondary Line Analysis of Robinson-Patman," forthcoming in *Journal of Law, Economics, and Organization*.

Rasmusen, E., J.M. Ramseyer, and J. Wiley, Jr., 1991, "Naked Exclusion," *American Economic Review*, 81, 1137-1145.

Shaffer, G., 1991, "Capturing Strategic Rent: Full-line Forcing, Brand Discounts, Aggregate Rebates and Maximum Resale Price Maintenance," *Journal of Industrial Economics*, 39, 557-575.

Shaffer, G., 1994, "Exclusive Dealing with Competing Retailers," mimeo.